New Law for New Space:
The Case for a Comprehensive Canadian Space Law

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Abstract

Space is no longer the domain of national space agencies. Today, a significant majority of space activities are carried out by non-governmental entities, resulting in the accelerated evolution of space technologies and their applications. This operational shift from public to private does not mean, however, that States are no longer relevant in this era of New Space. Quite the contrary: as the operational role of the State has diminished, its regulatory role has correspondingly increased. Acknowledging that the commercial landscape in space is ever-changing, this project seeks to explore the manner by which Canada has adapted to the new commercial space landscape and whether it is prepared to carry out its authorisation and supervision responsibilities as regulator of Canada's space industry. The fundamental research question asked in this project, therefore, is whether Canada's space regulatory framework is appropriate given the ever-increasing commercialisation of space. To best answer this question, the project undertakes a doctrinal analysis of Canada's historical space policy and current space laws, an empirical survey into the perspectives of those currently interacting with the existing Canadian space regulatory framework and a comparative exploration of how other jurisdictions oversee commercial space activities. Motivated by legal, moral and economic requirements, the project recommends that Canada enact a comprehensive Canadian space law and provides an annotated draft law for this purpose. This project sparks a meaningful conversation on how Canada ought to carry out its regulatory responsibilities, a hitherto unaddressed topic in public and academic discourse.

Résumé

L'espace n'est plus du domaine des agences spatiales nationales. Aujourd'hui, une grande majorité des activités spatiales sont menées par des entités non gouvernementales, ce qui entraine une évolution accélérée des technologies spatiales et de leurs applications. Ce passage opérationnel du public au privé ne signifie cependant pas que les États ne sont plus pertinents à l'ère du Nouvel Espace. Bien au contraire : au fur et à mesure que le rôle opérationnel de l'État diminue, son rôle régulateur augmente. Reconnaissant que le paysage commercial dans l'espace est en constante évolution, ce projet cherche à explorer la manière dont le Canada s'est adapté au nouveau paysage spatial commercial et la mesure dans laquelle il est prêt à assumer ses responsabilités d'autorisation et de supervision en tant que régulateur de l'industrie spatiale canadienne. Ce projet entend donc s'interroger sur le caractère approprié du cadre de réglementation spatiale du Canada compte tenu de la commercialisation croissante de l'espace. Afin de répondre au mieux à cette question, nous commencerons par une analyse doctrinale de l'histoire de la politique spatiale du Canada ainsi que des lois spatiales actuelles. Ensuite, nous entreprendrons une étude empirique des perspectives de ceux qui interagissent présentement avec le cadre réglementaire spatial canadien existant et une étude comparative de la façon dont d'autres juridictions supervisent les activités spatiales commerciales. Motivé par des exigences juridiques, morales et économiques, le projet recommande que le Canada adopte une loi spatiale canadienne complète et fournisse un projet de loi annoté à cette fin. Cette thèse soulève divers questionnements significatifs relatifs à la façon dont le Canada devrait s'acquitter de ses responsabilités réglementaires ; sujet jusqu'ici peu abordé dans le discours public ou universitaire.

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Thank you to Dr. David Kendall for agreeing, without reservation, to serve on my Thesis Advisory Committee and for passionately providing a practical counterbalance to my often-esoteric narration; your frank guidance has ensured the accuracy and applicability of this project. I know we share the common desire that this project positively impact the development of Canadian space policy and, if successful, it will be due, in large part, to your enthusiastic and enduring service to Canada.

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Chapter 1: Introduction

Purpose and Research Question

Space is no longer the domain of national space agencies. Over the past two decades, the number of space activities carried out by government-funded space agencies has fallen in comparison to those carried out by privately-funded commercial operators; indeed, the speed of this transition from public to private has increased over the last several years. Today, a significant majority of space activities are carried out by non-governmental entities. This operational shift does not mean, however, that States are no longer relevant in this era of New Space.

Quite the contrary: as the operational role of the State has diminished, its regulatory role has correspondingly increased. By virtue of international space law, to which all space faring nations are subject, States have agreed to assume the responsibility of authorising and continually supervising the space activities of non-governmental entities. The result of this obligation is that States remain very much involved in overseeing space activities even though they are not carrying out such activities themselves. This reality is equally true in all States, regardless of its status as a well-established space power, middle space power or emerging space power.

In order to fulfill their role as regulator, States must establish a coherent domestic regulatory framework through which they may satisfy their obligations to authorise and supervise. Although each State's space regulatory framework is different, most rely on a combination of legislation, subordinate legislation, long-term plans, strategy documents and guidance material. A State's use of these various regulatory instruments will depend largely on their internal legal structures, the context of their space activities and their unique national priorities. As a result, no two space regulatory frameworks are identical.

As commercial operators continue to research and develop new space technologies and applications, State regulators must equally prepare their regulatory frameworks to ensure they are able to carry out their authorisation and supervision obligations. Although the regulation of traditional space activities (such as launch, telecommunications, broadcasting and remote sensing) may be adequately supported by existing legal structures, the continual evolution of space technologies and the emergence of new space activities will require adaptations to established regulatory frameworks. Indeed, as emerging space activities transition from the realm of hypothetical to the realm of feasible, commercial operators will demand regulatory support; States must be willing to invest in their roles as regulators to ensure their domestic commercial space industries can compete in the international marketplace.

Acknowledging that the technological and commercial landscape in space is changing, this project seeks to explore the manner by which Canada has adapted to the new commercial space landscape and whether it is prepared to carry out its responsibilities as regulator of the commercial Canadian space sector. The fundamental research question asked in this project, therefore, is whether Canada's space regulatory framework is appropriate given the ever-increasing commercialisation of space. Providing an answer to this seemingly simple question requires significant exhaustive examinations of Canada's historical and contemporary involvements in space, its desired future engagements as well as its national priorities: importantly, therefore, the appropriateness of the regulatory framework will very much depend on its context, objectives and outcomes. Accordingly, the objective of this project is to provide Canadian decision makers (namely, government representatives charged with determining the nation's space policy) with the information necessary to ensure Canada is capably situated, from a regulatory perspective, to oversee the activities of the commercial space sector.

As will become evident in the ensuing chapter-by-chapter summary, the breadth of this project is uncharacteristic of a doctoral dissertation. In contrast to traditional doctoral-level projects that focus their attention on a single discrete idea and drill down to provide new insights or perspectives on a hitherto well-understood phenomenon, this project is much more broad than it is deep. Indeed, this project was never intended to provide a new perspective on the Canadian space regulatory framework: it was intended to provide the first perspective. Although the commercialisation of space activities has continued unabated over the previous decade, discussions related to the efficacy of the Canadian space regulatory framework have been largely ignored in public and academic discourse. Given the dearth of scholarship, this project is the first step in initiating these extremely relevant and important discussions and is intended to provide a sweeping analysis of the multiple facets of the Canadian regulatory regime. To this end, this project is intended to fertilise the intellectual soil in which future discussions related to this topic may bear additional fruit; it is likely, and, in fact, desired, that future examinations of this work dig deeper and provide new perspectives different from those offered in this project.

Chapter Summaries

The eight substantive chapters that make up this project are the individual components of the overall discussion that leads to the answers sought with respect to the above research question.

As such, each chapter has been designed to build on its preceding chapters, moving forward the investigation into determining whether Canada's legal framework is appropriately suited to the ongoing commercialisation of space activities and, if not, how it may be improved. The content of the chapters progress logically by first providing a background to the commercial realities of space activities, then exploring the existing legal capabilities of the Canadian space regulatory system, then gathering insights from the Canadian space community and the legal frameworks of other jurisdictions before providing an answer and recommendation to satisfy the inquiries of the research question.

Appropriately, Chapter 2, the first substantive chapter, acts as a background to the entire project. It is intended to establish the various international and Canadian historical accomplishments in space, discuss the current commercial realities of space and project the ongoing effects of commercialisation into the future. Specifically, the chapter surveys the technological and economic aspects of space activities from both a global and Canadian perspective, highlighting the recent accomplishments of commercial space operators and portraying the likely development of specific emerging space activities. The chapter, therefore, presents a likely portrait of the future global space environment to make clear the kinds of technologies, activities and applications for which State regulators ought to prepare. The discussions presented are in no way an exhaustive representation of the space sector and although great care has been taken to ensure the information presented is accurate to March 2020, given the extremely evolutive nature of the commercial space industry the domain has likely changed significantly since publication.

The focus of Chapter 3 is to present the underlying international legal framework related to space and clarify the nature of a State's varied obligations not only in its own space activities, but also with respect to the space activities of it's non-governmental entities. Indeed, the intentional creation of international space law more than five decades ago is distinct from all other areas of law - including seemingly analogous domains such as the law of the sea - resulting in a non-traditional legal framework that relies equally, at present, on binding treaties as well as non-binding normative instruments. This chapter builds on its predecessor by adding a legal dimension to the discussions related to the commercialisation of space, highlighting the overall structure of the international space law regime in which emerging activities, at present and into the future, are situated.

Chapter 4 presents the historical origins of Canada's space policy as well as the current regulatory framework applicable to Canadian commercial space activities. Canada's space program stretches back more than fifty years and includes a number of significant accomplishments, such as being the third State to have a satellite placed in orbit or the first State to implement its own domestic geostationary communication satellite system. These accomplishments are the direct result of prudent planning and the diligent implementation of national priorities; by surveying the history of Canadian space policy, the chapter presents a coherent picture of where the country has been, what it ought to have learned and where it may go. Further, by analysing the various legislative instruments that make up the patchwork of Canada's current space regulatory framework, the chapter provides insights into the legal vehicles through which commercial space activities are authorised and supervised. Given the discussions related to emerging space activities and Canada's international obligations in the preceding chapters, this chapter highlights the potential lacunae of the existing regulatory regime.

In transitioning the project's focus away from discussions that describe the world "as it is" to discussions that describe the world "as it may be", Chapter 5 constructs the theoretical and practical foundations of the remainder of the project. Although based entirely in law, the chapter is structured in such a way that it offers both a moral perspective for why Canada ought to engage in the appropriate regulation of commercial space activities as well as a more obvious economic justification; in concert, the parallel arguments demonstrate the impetus for regulatory action. Indeed, the chapter establishes that Canada's regulation of commercial space activities is not only of a fiduciary nature to its own citizens but it is a responsibility it must fulfill for all of humanity. In satisfying this fiduciary obligation, Canada has the opportunity to simultaneously satisfy the desires of its commercial space industry if it chooses to create a legal framework that is clear, certain and consistent.

Building upon the conceptual discussions of the preceding chapter, Chapter 6 provides real-world Canadian perspectives from those who are actively engaged in the day-to-day nuances of space operations. The discussions presented in this chapter center on the responses provided by representatives of government, industry and third-party groups to the questionnaire created for the purposes of this project (a copy of which is presented at Appendix I); indeed, the questionnaire is the first survey of its kind and elicits honest responses. As a result, the findings are the unvarnished opinions of the Canadian space community on the efficacy, opportunities and desires related to

Canada's space regulatory framework: in short, the existing regime is out-dated with significant room for improvement. The chapter contextualises and analyses the varied responses that lead to this conclusion and highlights the emergent themes that support the recommendations presented in the succeeding chapters.

Having identified the shortcomings of the Canadian space regulatory framework, Chapter 7 surveys the regulatory frameworks of other jurisdictions, comparing them and considering them as potential models for a reformed Canadian regulatory regime. The comparative nature of this chapter chronologically presents the features of each State's comprehensive national space law, discussing both the common and unique provisions found in the 23 different laws (a table summarising the findings is presented at Appendix II). The result is a chapter that thoroughly demonstrates the individual components of comprehensive national space laws and contrasts their efficacy with the legal frameworks of space-faring States that have not yet enacted comprehensive laws. Practically, the chapter presents the characteristics common to most comprehensive national space laws and presents their idealised forms for consideration when designing a new, or amending an existing, space regulatory framework; the identified elements are the integral pieces of a functioning space regulatory framework.

Given the nature of current and future commercial space activities, the obligations and opportunities related to their regulation, the failures of the existing Canadian regime, the Canadian space community's desire for an improved regulatory system and the various models from which to seek inspiration, Chapter 8 concludes that Canada ought to enact a comprehensive Canadian space law to best prepare for the ongoing commercialisation of Canadian space activities. One expected advantage of the proposed regulatory reformation includes the creation of a robust yet flexible system that provides regulatory clarity to both operators currently undertaking established space activities and those interested in carrying out emergent space activities; indeed, only a broad comprehensive national space law (as opposed to other possible methods of reforming the existing system) can play such a foundational role. Nevertheless, the chapter acknowledges that, while necessary, such a law is not sufficient and must be supplemented by other regulatory improvements to ensure the success of a Canadian commercial space industry. The chapter also justifies the nature and legitimacy of the proposal by responding to a number of likely criticisms.

Following the recommendation that Canada enact a comprehensive space law, Chapter 9 concretises this abstract recommendation by providing a draft of such a law (a copy of which is

presented at Appendix III) and analysing its various provisions. The analysis demonstrates that such a law need only provide the skeletal structure of the space regulatory framework and that, by drafting the law in a sufficiently broad manner, the law would bring within its scope both existing and emerging space activities while still ensuring the regulation of such activities are in line with established general objectives. Some of the draft law's notable provisions include its demarcation of airspace and outer space, condonation of non-governmental experts and exemption of certain public interest space activities. The draft law's hallmark feature, however, is its creation of a fund that directs some of the benefits of Canadian commercial space activities towards the improvement of communities around the world. Notwithstanding the specific justifications for each of the suggested provisions, the chapter recognises the need for input from various stakeholders and advocates that the government reach out to the general Canadian space community before enacting any law, including that proposed in this project.

By understanding the intricacies of the space sector, acknowledging Canada's fundamental international obligations, recognising the shortcomings of its existing regulatory framework, appreciating the moral and economic motivations for a robust regulatory regime, heeding the concerns of the space community and considering the regulatory models of other jurisdictions, the project ultimately concludes and recommends the enactment of a comprehensive Canadian space law. In sum, therefore, the independent chapters of this project represent a logical progression of how Canada can improve its space regulatory framework to move its commercial space industry from where it is to where it wants to go.

Methodological Approaches

This project utilises a number of methodological approaches to unearth the information required to adequately answer the project's research question. Over the course of the ensuing chapters, the project employs doctrinal, empirical and comparative methodologies to present objective realities, interpret subjective perspectives and coalesce seemingly disparate information. The result of this tri-methodological approach is a scholarly product that, although firmly rooted in theoretical motivations, provides a relatively robust practical dimension. Indeed, the overwhelming desire of this undertaking is that readers can make use of the presented information regardless of whether they are approaching the project from a theoretical or practical perspective.

To this end, the doctrinal approach is used to both illustrate the evolving nature of commercial space activities (paying particular attention to future possibilities) and analysing the Canadian space regulatory framework (mainly through its space policy documents and domestic and international laws). With respect to the technological and economic survey of commercial space activities, the project relies significantly on non-traditional legal academic sources, such as news articles, press releases and company publications. With respect to the policy and legal discussions, the project intentionally relies almost-exclusively on primary source documents. In both instances, the intention is to maintain an accurate representation of the motivations underlying the various statements, publications or laws to ensure the conclusions and recommendations made in the final chapters are relevant, reliable and realistic.

As mentioned above, the empirical approach is employed in Chapter 6 to generate otherwise non-existent information related to the thoughts, perspectives and desires of the Canadian space community. Although in contrast to other domains the Canadian space community is relatively small (and only a small percentage of this group provided their perspectives), the first-hand responses from community members represent a unique and relatively unfiltered expression of the viewpoints of the very individuals and organisations at the forefront of the commercialisation of space activities in Canada. Even though regulatory frameworks are conceptualised in the abstract, they are employed in the real world with tangible consequences; this project's empirical findings ensure those most impacted by this framework have an opportunity to contribute to its development. To this end, the information generated by implementing this empirical approach is a first in Canada and, aside from proving useful in this project, it is desired that the findings can be used by others in future projects exploring similar issues.

Finally, the comparative approach is used in Chapter 7 to provide insights into the space regulatory frameworks of jurisdictions other than Canada. The motivation to use this approach is that such a comparison would demonstrate the salient characteristics, if any, of a generic comprehensive domestic space law that could be adapted for use in other jurisdictions. By comparing the laws of nearly 30 countries, the project identifies specific regulatory themes as necessary to allow a State to effectively fulfill its authorisation and supervision obligations while protecting its national interests. By analysing these themes and determining which, if any, would prove effective in the Canadian context, the project's ultimate recommendation benefits from

ensuring international trends are recognised and, where applicable, harmonised. To this end, the common characteristics identified as effective in other jurisdictions can be implemented more easily into Canada's space regulatory framework, thereby ensuring Canadian regulatory processes are well suited for the global commercial space environment.

Original Contribution

This project represents an original contribution to the scholarship of domestic space law discussions in Canada. In fact, many of the individual chapters of this project represent original contributions to their respective fields, for example: Chapter 4 conducts an in-depth historical and contemporary presentation, discussion and analysis of Canada's space policy and space laws; Chapter 5 provides a legal framework that unites moral and practical perspectives related to a State's regulation of commercial space activities; Chapter 6 empirically engages with the Canadian space community related to the legal framework that oversees their activities; Chapter 7 evaluates, in detail, the space law regimes of nearly 30 jurisdictions and teases out the common characteristics of comprehensive national space laws; and Chapter 9 proposes a novel comprehensive Canadian space law that has, thus far, neither been discussed widely nor considered seriously. Indeed, as will be discussed in Chapter 10, the individual chapters discussed above are each potential starting points for further academic and scholarly study, with each chapter capable of supporting in-depth research and analysis sufficient to fulfill the requirements of a doctoral dissertation. In total, however, the project itself represents a unified discussion that traces the historical origins of Canada's space program, the existing realities of its commercial space activities, the complexities associated with the present regulatory framework and a recommendation on how to prepare for the desired future: such a project has hitherto not been undertaken and the expectation is that this completed project will assist in the continued development of Canadian space policy and, specifically, the Canadian space regulatory framework.

Chapter 2: International and Canadian Space Activities

Purpose and Outline

The purpose of this chapter is to provide background information related to the importance and ubiquity of space as well as to highlight the ongoing and intensifying trend of commercialisation. The chapter weaves parallel narratives related to space activities from a general, global perspective as well as from a Canadian perspective. In particular, the chapter focuses on the significant historical developments that have led to the current manifestation of the Canadian space program as well as some of the various players who are maintaining the Canadian presence in space. Given the highly evolutive character of space activities, the discussions and references in this chapter are current to March 2020.

The chapter begins with a discussion of historical space activities, highlighting specifically the role of large government agencies in carrying out nascent, but nevertheless ambitious, space programs. The chapter then focuses on the current trend of commercialisation where space activities are transitioning from the domain of public institutions to private companies, with a prioritisation on economic growth as opposed to scientific discovery; the chapter grants specific attention to select companies currently leading this transition in Canada. The chapter then considers the various emerging technologies and novel applications likely to be deployed in the near- and long-term, especially those gaining widespread acceptance on the basis of their potential feasibility, while also highlighting the growing importance and trends related to international cooperation in space. The chapter culminates with brief remarks related to the future of space activities and the challenges they pose.

Historical Space Activities

Over the last sixty years, humanity's use of space has evolved significantly. Modern life depends on space-based assets and much of humanity's knowledge of Earth systems and the universe are grounded in its ability to study them with space-based tools. Although the roots of human space exploration trace back much further[1], the 1957 launch of Sputnik-1 by the Union of Soviet Socialist Republics (USSR) traditionally signals the start of humanity's tactile interaction

[1] For example, Wernher von Braun developed the V2 rocket for Adolf Hitler, the chief instrument used in the bombing of London during WWII. Already in 1952, while working for NASA, von Braun published *Das Marsprojekt* on space travel (a document still highly relevant and instructional today) establishing exactly what was needed to land humans on Mars. Although NASA never followed through on the proposal, he predicted many of the technological developments needed to undertake his vision that have since come to fruition, such as the Space Shuttle and SpaceX's reusable rockets. Stephan Petranek, "How We'll Live on Mars" (Simon and Schuster: New York, 2015) at pp 13-15.

with space; this first successful launch and orbit of a manmade space object allowed the Soviet Union to study the Earth's ionosphere for nearly three months before it lost altitude and burned up in the Earth's atmosphere.[2] More importantly, it started the "Space Race", mostly between the USSR and the US, that led to the rapid development of space as an essential tool for both civil and defense purposes.

The first animal, a canine named Laika, was launched aboard Sputnik-2 (less than a month after Sputnik-1) and had her heart rate, blood pressure and other vitals measured, in addition to the radiation levels to which she was exposed, while in orbit beyond the Earth's atmosphere.[3] In 1961, Yuri Gagarin became the first human in space, after orbiting Earth once and successfully landing in Russia.[4] In 1969, Apollo 11 touched down on the Moon and humans walked on the surface of another celestial body for the first time, culminating the "space race" between the US and USSR.[5] Since the "conclusion" of the space race, various nations have engaged in scientific and commercial enterprises on, from and in space, such as telecommunication, broadcasting and remote sensing as well as the development of global navigation satellite systems (GNSS, such as GPS, GLONASS, Galileo and BeiDou, among others).[6] In addition, space scientists have explored many of the celestial bodies found in the solar system, interplanetary space and beyond using spacecraft. The biggest public (and intergovernmental) project to date has been the construction and operation of the International Space Station (ISS) in low-Earth orbit (LEO).[7]

Although private space entities have recently increased their exploration and use of space, there is a rich history of commercial space activities dating back to 1962 when Telestar 1 was launched by the US (and developed in association with the UK and France) to provide trans-Atlantic transmission capabilities for audio/video, telephone and telegraph.[8] In due course, private

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[2] Steve Garber, *Sputnik and the Dawn of the Space Age*, NASA History, 10 Oct 2007, online: <https://history.nasa.gov/sputnik/>.
[3] Alex Wellerstein, *Remembering Laika, Space Dog and Soviet Hero*, New Yorker, 3 Nov 2017, online: <https://www.newyorker.com/tech/elements/remembering-laika-space-dog-and-soviet-hero>.
[4] Nola Taylor Redd, *Yuri Gagarin: First Man in Space*, Space.com, 24 Jul 2012, online: <https://www.space.com/16159-first-man-in-space.html>.
[5] Sarah Loff, *Apollo 11 Mission Overview*, NASA, 21 Dec 2017, online: <https://www.space.com/16159-first-man-in-space.html>.
[6] National Coordination Office for Space-Based Positioning, Navigation and Timing, *Other Global Navigation Satellite Systems (GNSS)*, gps.Gov, 18 Dec 2017, online: <https://www.gps.gov/systems/gnss/>.
[7] Elizabeth Howell, *International Space Station: Facts, History & Tracking*, Space.com, 7 Feb 2018, online: <https://www.space.com/16748-international-space-station.html>.
[8] Adam Mann, *Telestar 1: The Little Satellite that Created the Modern World 50 Years Ago*, Wired, 10 Jul 2012, online: <https://www.wired.com/2012/07/50th-anniversary-telstar-1/>.

broadcasting satellites, remote sensing satellites and other more specific systems were launched and operated from around the world. Indeed, many of these space systems were placed in orbit by private, commercially developed launch systems. Needless to say, the use of the data provided by space systems has spurred on entirely new industries such as the use of GNSS data to create location-based software or the use of Earth observation and automatic identification system data to monitor the movement of shipping vessels. The myriad of recent developments pioneered by private companies will be discussed in further detail below.

Historical Canadian Space Activities

Canada has a long, proud and productive history of engaging with space. With its origins in space science reaching back to before WWII[9] to the development of the first, second (and expected third) robotic Canadarms, Canadians have developed an expertise in a variety of space-related fields, leading to important discoveries and invaluable contributions to science, telecommunications, remote sensing, robotics and other fields related to space.

Space Science

Canadian interests in space science were historically significant, stimulated in part by Canada's vast northern territory and the unique advantage from which it allowed for the study of space (which, at that time in the first half of the 20th century, consisted mostly of studying the atmosphere).[10] With the launch of Sputnik in 1957, countries around the world began exploring their own abilities to study space using ground based and space-based scientific instruments. Recognising the potential role that the Arctic may play in the ongoing Cold War[11], Canada desired to develop its own communications and monitoring capabilities in the region. The scientific developments of these studies went hand-in-hand with Canada's other non-exclusive space activities and would lead to varied social and economic advances. Canada's space activities today, including those undertaken by its astronauts, continue in this tradition of understanding space and its ability to provide a new perspective in understanding Earth.

[9] Gordon Shepherd & Agnes Kruchio,"Canada's Fifty Years in Space" (Burlington: Apogee Books, 2008) at p 33.
[10] *Ibid* at pp 33-35
[11] *Ibid* at p 85.

Atmospheric Studies

As far back at the beginning of the twentieth century, Canadian scientists and researchers played a particularly important role in the study of the atmosphere, specifically, the ionosphere. Originally interested in the *aurorae borealis* (commonly referred to as the Northern Lights)[12], teams of scientists worked tirelessly to document and appreciate the intricacies of such natural phenomena and, during the International Geophysical Year of 1957, Canadian scientists coordinated their efforts with the international community to participate in a number of studies related to understanding the natural world.[13] Individually, however, Canadian studies, specifically those related to the ionosphere, led to a better understanding of the atmosphere's reflective capabilities, making long-distance communication a possibility and, indeed, a reality.[14] Studying the physics of the upper atmosphere was a priority of the Defence Research Board (DRB) for many years, first using ground-based radio and optical measurements, followed by balloon- and later rocket-based measurements.[15] Much of their focus was understanding the "spectroscopic and ionic characteristics of the upper atmosphere"[16] which allowed for the development of improved communications.[17] In fact, the specific northern geographical position of the country granted Canada a near-monopoly on the ability to conduct certain experiments, leading some in government to believe Canada had a moral obligation to carry them out.[18]

High Altitude Research Program (HARP)

In the 1960s, Canada became interested in designing its own orbital launch system and investigated a number of possibilities. One of the concepts it explored was the use of a large, high-powered gun to place small satellites into orbit by firing them at extremely high-velocities as initially envisioned by Gerald Bull while working at the Canadian Armament Research and

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[12] *Ibid* at p 13.
[13] *Ibid* at pp 86-89; Andrew Godefroy, "The Canadian Space Program: From Black Brant to the International Space Station" (Cham: Springer, 2017) [*Godefroy*] at pp 13-16.
[14] "[Canadian scientists and engineers] were also considered world experts in the study of the effects of the upper atmosphere on electronics and communication, a field that Canadian researchers had seriously pursued since the beginning of the twentieth century." *Ibid* at pp 7-8.
[15] Omond Solandt, *A Space Program for Canada*, Science Council of Canada, Government of Canada, Report No 1, 1967 [*Solandt Report*] at p 19.
[16] *Ibid*.
[17] John Chapman et al, *Upper Atmosphere and Space Programs in Canada*, Science Secretariat, Government of Canada, 1967 [*Chapman Report*] at p 5.
[18] "By virtue of having a monopoly of the locations for certain observations Canada has perhaps acquired a moral obligation to make them." *Solandt Report*, *supra* note 15 at p 16.

Development Establishment (CARDE). In 1961, Bull moved to McGill University's Space Research Institute and for many years led the HARP-McGill project.[19] The majority of the HARP's experiments were conducted using a large gun installation located in Barbados, with a smaller gun located in Quebec, and supported by funds from the US and Canadian governments. The project had three theoretical advantages (namely, efficiency, fuel economy and accuracy) over traditional launch vehicles and two significant disadvantages (namely, acceleration and payload dimension).[20] Although demonstrating considerable progress and success in its early testing, the inherent disadvantages of the launch system eventually resulted in its funding being redirected to more viable alternatives.[21] Nevertheless, the achievements of the HARP-McGill project were groundbreaking and evidence of the Canadian government's willingness to investigate and fund theoretically-possible alternatives to its launch requirements.

Communications

Canada has historically been interested in the development of space-based communications capabilities, motivated largely by its small population spread across its large territory. In addition to the scientific advances Canada made with respect to space-based communications, Canada was also a proponent of the commercial applications, designing its own systems and partnering internationally, for example, as a founding member of INTELSAT[22].

Alouette-ISIS Program

In 1959, after receiving acceptance by NASA to launch a satellite to conduct space science experiments of the ionosphere, the Canadian DRB began developing what would become Canada's first satellite, the Alouette-I.[23] In 1962, following NASA's launch of Alouette-I, Canada became the third country (following the Soviet Union and the United States) to have launched into orbit an indigenous satellite.[24] Although the Alouette-1 was expected to operate for roughly three

[19] *Chapman Report*, *supra* note 17 at p 219.
[20] *Ibid* at pp 217-218.
[21] *Godefroy*, *supra* note 13 at pp 90-91. Following the loss of funding and eventual interest by the Canadian and US governments, Bull went on to continue designing and building large-bore guns for other States, namely South Africa and Iraq. He was assassinated by an unknown assailant in 1990 while living in Belgium.
[22] *Chapman Report*, *supra* note 17 at pp 14-17; *Godefroy*, *supra* note 13 at p 74.
[23] *Chapman Report*, *supra* note 17 at p 11. For a more in-depth analysis of the *Chapman Report*, as well as a discussion of its value to the Canadian space sector, *see* Chapter 4, *Canadian Space Polcy*.
[24] Canadian Space Agency, *Alouette I and II*, Government of Canada, 5 Mar 2012, online: <http://www.asc-csa.gc.ca/eng/satellites/alouette.asp>.

months before it failed, with many even doubting a lifespan of that length, when Alouette-1 was eventually shut down by ground command (at which point it was still operational), ten years had passed.[25] Following Alouette-1's success, Canada and the US agreed to enter into the International Satellites for Ionosphere Studies (ISIS) program, which comprised of a further four satellites (Alouette-II, ISIS-A, ISIS-B and ISIS-C) built in Canada and launched by NASA.[26] The Canadian government insisted that industry participate to the greatest extent feasible so that, by the culmination of the program, a skilled industry should exist in Canada.[27]

Although the development of Alouette-II in 1963 took place within government auspices, companies were selected to build the satellite and industry personnel were trained to play a significant role in its operation. Even during the infancy of the Alouette-ISIS Program, the emergence of specific competencies and expertise in spacecraft design and manufacturing in both government and industry allowed Canada to engage with its counterparts in the US and sell various satellite components at economically viable prices.[28] Given this prioritisation on industry contribution and collaboration, by the end of the decade the Canadian company Heroux-Devtek had secured the NASA contract to build the legs of the Apollo-11 landing module, which safely touched-down on the Moon in 1969, allowing humanity to take its first steps on another celestial body.[29]

ANIK Program

Recognising the need for continued and long-term telecommunications-related coverage of Canada's expansive territory, the government believed, as early as 1968, that a domestic communications satellite system would most effectively serve this need.[30] Simultaneously, the government was interested in involving Canadian industry so as to develop its technical capability.

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[25] *Godefroy*, *supra* note 13 at p 71. More than 1,200 papers and scientific reports have been published on the basis of Alouette-I's data and in 1987 it was recognised as one of the ten most outstanding Canadian engineering achievements over the previous 100 years. Graham Gibbs & W Mac Evans, *Part 2: A History of the Canadian Space Program - Policies & Lessons Learned Coping with Modest Budgets*, The Commercial Space Blog, 26 Mar 2017, online: <http://acuriousguy.blogspot.com/2017/03/part-2-history-of-canadian-space.html> [*Gibbs & Evans Part 2*].
[26] *Chapman Report*, *supra* note 17 at p 11.
[27] *Ibid*.
[28] *Chapman Report*, *supra* note 17 at pp 12-13.
[29] Nicolas van Praet, *Heroux-Devtek sells aerostructure, industrial products divisions for $300M*, Financial Post, 17 Jul 2012, online: <http://business.financialpost.com/investing/heroux-hevtek-sells-aerostructure-industrial-products-divisions-for-300m>.
[30] *Gibbs & Evans Part 2*, *supra* note 25.

By September 1969, the necessary legislation had been drafted, assented to and come into force and the Telesat Canada Corporation came into existence, owned jointly by the federal government and telephone companies.[31] Telesat was charged with designing and manufacturing satellites capable of providing telecommunications services to the entirety of Canada.

In 1972, 1973 and 1975, three successive Anik-A series satellites were placed in orbit, marking the first time in the world a country had a domestic communication satellite system in geostationary orbit.[32] Although successful, the Anik-A series of satellites were controversial from their outset as they were designed and built by the American Hughes Aircraft Company. The government's choice in selecting a foreign industrial partner was criticised as directly contradicting the very purpose of creating a Crown corporation, which was to build and operate a communication satellite system with domestic industrial partners to develop Canadian space capabilities.[33] Nevertheless, Telesat went on to oversee the design and creation of the Anik-B through -G series of satellites over the next forty years.

CTS Program

Canada's population in the 1970s was less urbanised than at present. As such, the government desired a space-based solution to connect remote communities with the rest of the country through the provision of communications, television and information-processing technologies with a high-powered system.[34] Although similar in purpose to Anik (namely, the provision of telecommunications), the solution came by way of the proposed Communications Technology Satellite (CTS, later renamed Hermes), a groundbreaking sophisticated communications system that incorporated many new and yet-undeveloped components.[35] For example, the satellite used "higher power and higher frequency [transmissions] than existing systems, thus making possible direct communications with low-cost ground terminals in individual homes and communities." Given its scope, complexity and potential for failure, the Department of Communications led the development of this project in association with the US government and

[31] *Godefroy*, *supra* note 13 at p 126; *Gibbs & Evans Part 2*, *supra* note 25.
[32] *Godefroy*, *supra* note 13 at p 128; Canadian Space Agency, *Anik A1 Satellite*, Government of Canada, 10 Feb 2014, online: <http://www.asc-csa.gc.ca/eng/search/images/watch.asp?id=156>.
[33] *Godefroy*, *supra* note 13 at p 126.
[34] *Ibid* at p 124.
[35] Graham Gibbs & W Mac Evans, *Part 4: A History of the Canadian Space Program - Policies & Lessons Learned Coping with Modest Budgets*, The Commercial Space Blog, 26 Mar 2017, online: <http://acuriousguy.blogspot.com/2017/04/part-4-history-of-canadian-space.html> [*Gibbs & Evans Part 4*].

industry partners. The US agreed to provide certain specialised components and a launch vehicle in exchange for equal use of the satellite once in orbit.[36] The technological demonstrations aboard CTS proved successful and demonstrated the use of satellites for providing direct broadcast; with it, Canada once again demonstrated the capabilities that made it a global leader in space-based communications.

Remote Sensing

Canada's involvement in remote sensing was a result of its participation in the US SEASAT program (a follow-on to the earlier US LANDSAT program). SEASAT was designed to monitor coastlines from space using synthetic aperture radar (SAR), a technique that allows a satellite to "see" through clouds, day or night. Canada was responsible for creating ground stations and developing a "quick look" facility to process the data.[37] Upon canvassing the Canadian scientific community for its interest in data from SEASAT, the Canadian government realised there was overwhelming support for the use of such data in all spheres, not only limited to coastline observation. Although SEASAT was rendered inoperable after a few months in orbit, the data it did generate over its short lifespan was extremely useful for Canadian scientists in all domains, including natural resource management. Importantly, the Canadian company Macdonald, Dettwiler & Associates developed a technique to digitally process the SEASAT data in a way that was vastly more efficient in time and produced a significantly better quality image than any of its competitors.[38]

Following the overwhelming support of the scientific and governmental communities related to the use of Earth observation data, the Department of Energy, Mines and Resources engaged NASA to partner on the development of a Canadian remote sensing satellite. Beginning in 1980, Canada undertook the development of a SAR satellite (led by the federal government and in partnership with provincial governments, the US and the Canadian private sector) that culminated with the launch of RADARSAT in 1995.[39] Canada committed over $600 million to

[36] *Godefroy*, *supra* note 13 at p 124.
[37] John Kirton, *Canadian Space Policy*, (1990) 6:1 Space Policy 61 at p 66 [*Kirton*].
[38] *Godefroy*, *supra* note 13 at p 200.
[39] Canadian Space Agency, *RADARSAT-2*, Government of Canada, 14 Dec 2017, online: <http://www.asc-csa.gc.ca/eng/satellites/radarsat2/Default.asp>. The RADARSAT Constellation will come online in 2018. Canadian Space Agency, *RADARSAT Constellation*, Government of Canada, 30 Mar 2017, online: < http://www.asc-csa.gc.ca/eng/satellites/radarsat/Default.asp>.

conceive, design and build the state-of-the-art satellite that was expected to last five years; by the time RADARSAT lost power in 2013, it had generated over $1 billion in benefits to Canada's public and private sectors.[40] Given RADARSAT's success, Canada would go on to develop, in partnership with a private company, RADARSAT-2 (launched in 2007) as well as the RADARSAT Constellation Mission (launched in 2019).

Human Spaceflight

Although historically interested in human exploration, Canada did not have the means to send astronauts into space itself and so would therefore have to rely on either American or Soviet support in achieving this objective. Having missed out on the opportunity to partner with the US in its Skylab program (the precursor to the International Space Station (ISS)) and ideologically at odds with the USSR, Canada sought to take advantage of future American opportunities for manned space flight.[41] With the development of the Space Transportation System (STS, commonly referred to as the space shuttle program), Canada saw an opportunity to provide a component that would garner it an opportunity to participate in manned spaceflight activities. Canada proposed its development of a shuttle remote manipulator system (SRMS) to assist in the operation of payloads while in space. In 1981, Canada's most easily recognisable space achievement, the Canadarm, was deployed on the Space Shuttle Columbia to help manoeuvre payloads and eventually help construct the International Space Station[42]. In exchange, NASA offered Canada the opportunity to fly its own astronauts aboard a shuttle mission for a six month stay every two years[43], an offer Canada accepted. A Canadian astronaut recruitment campaign in the early-1980s resulted in the creation of a six-person astronaut corps. On 5 October 1984, Marc Garneau became the first Canadian in space when he reached orbit aboard the Space Shuttle Challenger.[44] In 2001, the Canadarm2 was permanently installed on the International Space Station, helping to catch, manoeuvre, dock and otherwise assist in the maintenance of the station.[45]

[40] *Godefroy*, *supra* note 13 at pp 200-203; Canadian Space Agency, *RADARSAT-1*, Government of Canada, 21 Mar 2014, online: <http://www.asc-csa.gc.ca/eng/satellites/radarsat1/default.asp>.
[41] *Godefroy*, *supra* note 13 at p 141.
[42] Elizabeth Howell, *Space Shuttle's Robotic Arm Goes on Display at Canadian Museum*, Space.com, 2 May 2013, online:<https://www.space.com/20949-space-shuttle-canadarm-museum-exhibit.html>.
[43] *Kirton*, *supra* note 37 at p 67.
[44] *Godefroy*, *supra* note 13 at pp 163-164.
[45] Canadian Space Agency, *Canadarm2, The Canadian Robotic Arm of the International Space Station*, Government of Canada, 4 Oct 2017, online: <http://www.asc-csa.gc.ca/eng/iss/canadarm2/default.asp>.

This, along with other various contributions, have allowed Canada to maintain its astronaut corps and send to space many more astronauts, including those who participated in missions to the Russian space station Mir and extended stays aboard the ISS.[46]

Current Space Activities

The global space economy was an estimated USD $360 billion in 2018 (up from USD $345 billion in 2016[47]), with less than one-quarter dedicated to government budgets and more than three-quarters generated as commercial revenues.[48] In 2016, the public expenditure of financial resources allocated to space differed significantly among nations, breaking down as follows: the US (through various agencies and offices) spent an estimated $48 billion, China (through the China Aerospace Science and Technology Corporation) spends $11 billion, Europe (through ESA) spends $7 billion[49] and Russia (through Roscosmos) spends $4 billion.[50] Following these leaders are India (roughly $4 billion), Japan (roughly $3 billion), France (roughly $2.4 billion), Germany (roughly $1.6 billion) and Italy (roughly $1.2 billion).[51]

The global satellite sector (from which nearly all commercial space revenues are generated) amounted to roughly $260.5 billion in 2016, a 2% increase over 2015 and a decade-long doubling from 2006[52], amounting to 77% of the total space economy for that year[53]. In 2018 the space satellite industry's rate of growth matched that of 2016, totalling $277 billion.[54] By and large, most satellites are dedicated to communications (35%, plus an additional 14% for government communications) and Earth observation (19%), with other notable categories including military

[46] *Godefroy*, *supra* note 13 at p 209.
[47] Bryce Space, *Global Space Industry Dynamics: Research Paper for Australian Government, Department of Industry, Innovation and Science*, Bryce Space and Technology, 2017, online: <https://brycetech.com/downloads/Global_Space_Industry_Dynamics_2017.pdf> [*Bryce Space 1*] at p 3.
[48] Bryce Space, *2018 Global Space Economy*, Bryce Space and Technology, 2018, online: <https://brycetech.com/downloads/2018_Global_Space_Economy.pdf> [*Bryce Space 2*].
[49] There have been calls from the European Commission to significantly increase spending on space in the coming years. Peter de Selding, *EU Commission Proposes 25%-plus increase in space spending for 2021-2027 budget*, Space Intel Report, 3 May 2018, online: <https://www.spaceintelreport.com/eu-commission-proposes-25-plus-increase-in-space-spending-for-2021-2027-budget>.
[50] *Bryce Space 1*, *supra* note 47 at pp 3-4.
[51] *Ibid*.
[52] Satellite Industry Association, *State of the Satellite Industry Report*, Satellite Industry Association, Jun 2017, online: <https://www.sia.org/annual-state-of-the-satellite-industry-reports/2017-sia-state-of-satellite-industry-report/> [*SIA*] at pp 4-5.
[53] *Ibid* at p 7.
[54] *Bryce Space 2*, supra note 48.

surveillance, navigation, science and meteorology.[55] Driven primarily by technological efficiency (as in, lower end-to-end costs), increasing investment by private players (many of whom are new to the space domain) and the increasing demand for diverse data streams (largely for use with machine learning and AI), both upstream and downstream activities related to space will likely continue to stimulate economic growth.[56] Upstream activities include the research and development, manufacturing and launch of space systems while downstream activities include the operation and maintenance of space systems as well as the use of the information created by the satellites, the dissemination of the data, the creation of value added products, etc.

Private investment in space also continues to grow. In 2017, there was roughly $4 billion invested in space companies and, 2018, $1 billion was invested in the first quarter, putting it on track for another $4 billion year.[57] Regions outside North America experienced even more significant growth in investment: in Europe, investment in space start-ups quadrupled as opposed to US doubling. For example, the Centre National d'Études Spatiales (CNES - the French space agency), planned to raise approximately $100 million to support start-ups focussed on space, in collaboration with CosmiCapital (a European space technology venture fund)[58].[59]

Current Canadian Space Activities

There are a variety of methods by which to measure the engagements of Canada and Canadian entities with space, including the economic impact of their activities, the scientific and cultural benefits of a national space program and the specific space activities currently undertaken by various operators, each of which provide value. Canada's current involvement with the space domain spans public and private space programs with a variety of space activities.

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[55] *SIA*, *supra* note 52 at p 8.
[56] *Bryce Space 1*, *supra* note 47 at p 11.
[57] Jeff Foust, *Space ventures raise nearly $1 billion in first quarter of 2018, led by SpaceX*, Space News, 12 Apr 2018, online: <https://spacenews.com/space-ventures-raise-nearly-1-billion-in-first-quarter-of-2018-led-by-spacex>. For example, EarthNow recently publicised that it had received investments from Bill Gates, Softbank, Airbus and OneWeb to promote the development and maturation of its technologies. Although the amount of the investment was not made public, it was likely considerable. Alan Boyle, *Bill Gates, Airbus and SoftBank invest in satellite video startup that wants to help us "see and understand the Earth live and unfiltered'*, GeekWire, 18 Apr 2018, online: <https://www.geekwire.com/2018/earthnow-satellite-video-bill-gates>.
[58] CosmiCapital, *A unique Venture Capital fund dedicated to Space*, CosmiCapital, accessed 12 Apr 2019, online: <https://cosmicapital.com/space-tech-fund/>.
[59] Debra Werner, *CNES seeks 80 to 100 million Euros for CosmiCapital venture fund*, Space News, 14 Sep 2018, online: <https://spacenews.com/cnes-cosmicapital-venture-fund>.

Economic Impact of Canadian Space Sector

The Canadian space sector contributes more than national prestige, scientific knowledge and services to remote communities. Although identifying the indirect economic value of sending astronauts to space, designing equipment for use aboard the ISS or monitoring services above the Arctic circle is difficult, there are more clear and direct economic benefits associated with general space activities. In 2015, the Canadian Space Agency commissioned a report on the socio-economic impact of the Canadian space sector.[60] This report outlined many ways in which space grows the economy, creates jobs and improves knowledge. In real dollar terms, the space sector generated annual revenues of $5.4 billion in 2013, directly employing nearly 10,000 highly skilled workers, indirectly employing another nearly 8,000 and inducing the employment of nearly 7,000 more.[61] Importantly, after removing the space industry's $2.5 billion in operating costs from its $5.4 billion in revenues, the space industry generated $2.9 billion of industry profits[62] - an economic contribution that flows back into the Canadian economy. While this only amounted to 0.18% of Canada's total GDP in 2013, the space sector had a "spill-over effect" of $1.20 for every $1.00 spent; this means that for every dollar spent on space, an additional $1.20 was created in related industries, most of which employed highly skilled workers. Although more recent official figures have not been released, it is highly likely that the past several years have seen these figures all increase.

During this same period, in the global context, Canada's space industry accounted for nearly 2% of the market although its total government funding only amounted to about 1%.[63] This doubling of return-over-investment is significant, demonstrating the quality of Canadian private enterprise in relation to competition from other global players. Nevertheless, Canada invested and continues to invest far less in space, per capita, than many other countries, including Italy, Japan, Germany and France.[64]

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[60] Adam Keith, *Comprehensive Socio-Economic Impact Assessment of the Canadian Space Sector*, Euroconsult, 27 Mar 2015, online: <http://www.asc-csa.gc.ca/eng/publications/2015-assessment-canadian-space-sector.asp> [*Keith*] at p 1. A separate but related study was conducted in 2018 but did not provide the same kind of economic analysis as the 2015 report. *See* Adam Keith, *Socio-economic Benefits of Space Utilization Final Report*, Euroconsult, 7 Sep 2018, online: <https://www.asc-csa.gc.ca/pdf/eng/publications/2018-socio-economic-benefits-spce-utilization.pdf>.
[61] *Keith*, *supra* note 60 at p 38.
[62] This is assuming that GDP is a measure of the value generated by a particular industry after its costs - so, a $5.37 billion industry generated $2.9 billion in profits after costs. *Ibid* at p 32.
[63] *Ibid* at p II.
[64] *Ibid* at pp 20-21.

In 2013, the ten largest private companies accounted for almost 90% of the space industry's revenues[65], highlighting the particularly high cost-of-entry that seemingly limited opportunities to non-legacy players; nevertheless, the extent of this economic stratification has likely changed over the previous few years, given the surge in popularity of low-cost smallsats. Additionally, of all the commercial revenue, 79% was generated by downstream services.[66] This is not surprising as, like the Internet, there is more value in the products that rely on the Internet rather than the Internet itself (mainly servers and wires); similarly, most of the revenue generated in space comes from the products and services that are made available by satellites, rather than the manufacturing or research and development of satellites and ground stations.

Many of the important trends described above remain similar today: the revenues and GDP generated by space activities remains consistent, the number of personnel and the percentage of highly skilled workers remains steady and a handful of organisations generate most of the commercial revenues.[67] Importantly, however, in 2017 the difference between revenues generated domestically versus revenues generated by exports continued to close, with domestic revenues dropping 3.2% and export revenues increasing 11%.[68] This metric demonstrates not only that the domestic market contracted, but highlights the importance of Canada's export business related to space - in order to keep growing, Canadian entities must continue to develop products and services sought by the international community.[69]

Canadian Space Agency

The CSA is the most obvious Canadian public actor in space, as it is the main governmental agency responsible for conducting national space operations. Its mission is to support "the development and application of space knowledge for the benefit of Canadians and humanity"[70] through funding and managing diverse activities, including Earth observation, astronomy and astronaut-led science experiments. The CSA receives a baseline budget from the federal

[65] *Ibid* at p II.
[66] *Ibid* at p 10.
[67] Canadian Space Agency, *State of the Canadian Space Sector Report 2018: Facts and Figures 2017*, Government of Canada, online: <http://www.asc-csa.gc.ca/pdf/eng/publications/2018-state-canadian-space-sector.pdf> at p 4.
[68] *Ibid* at p 16.
[69] *Ibid* at p 16.
[70] Canadian Space Agency, *Mission and Mandate*, Government of Canada, 28 Jul 2015, online: <http://asc-csa.gc.ca/eng/about/mission.asp>.

government and also receives ad hoc funding for specific programs.[71] The planned budget for 2018-2019 was $349 million.[72] With inflation and growing costs, the real-dollar value of the CSA's budget has decreased over time, with additional cuts initiated by the Harper government.[73] In comparison with other national space agencies, the CSA focusses much of its budget on a few key technologies rather than spending its resources broadly.[74] In terms of ongoing projects, the CSA is currently a partner in the ISS, a cooperating member of the European Space Agency (ESA) and contributes to a number of high-profile space science missions including the OSIRIS-REx mission to the asteroid Bennu and the James Webb Space Telescope. In addition to these projects and its on-going astronaut core, the CSA also managed the development of the Radarsat Constellation Mission[75] launched in 2019 as well as Canada's recently announced contribution to the Lunar Orbital Platform-Gateway (LOP-G) project[76].

Macdonald Dettwiler and Associates

Macdonald Dettwiler and Associates Ltd. (MDA) is Canada's most prominent commercial space actor and is publicly traded on both the Toronto Stock Exchange and the New York Stock Exchange. Founded in 1969, MDA assisted in developing notable Canadian projects such as the Canadarm, Canadarm2 and RADARSAT. Following MDA's acquisition of DigitalGlobe in 2017, it rebranded as Maxar Technologies (a holding company for MDA, DigitalGlobe, Space Systems Loral and Radiant Solutions) and legally incorporated in the US.[77] As a subsidiary, however, MDA chose to retain its numerous facilities, factories and associated jobs in Canada. In late 2019, MDA was sold by Maxar Technologies to a consortium of Canadian entities, led by Northern

[71] *Keith*, *supra* note 60 at p 19.
[72] Marc Boucher, *Canadian Space Agency Budget Continues Downward Spiral (Update)*, SpaceQ, 16 Apr 2018, online: <http://spaceq.ca/canadian-space-agency-budget-continues-downward-spiral>.
[73] "The current federal government has inherited a problem from its predecessor: about 15 years of flat or declining space budgets of about one-seventh of what NASA gets, taking population into account." Ewan Reid, *Shoot for the moon: Why Canada must become a leader in space*, The Globe and Mail: Opinion, 25 Feb 2018, online: <https://www.theglobeandmail.com/opinion/shoot-for-the-moon-why-canada-must-become-a-leader-inspace/article38086405/> [*Reid*].
[74] "[T]he government has thrown very limited money at a handful of specific projects - the equivalent of addressing universal poverty by opening shelters in one city." *Ibid*.
[75] Canadian Space Agency, *What is the RCM?*, Government of Canada, 12 Jun 2019, online: <http://www.asc-csa.gc.ca/eng/satellites/radarsat/what-is-rcm.asp>.
[76] Canadian Space Agency, *The Lunar Gateway*, Government of Canada, 25 Jul 2019, online: <http://www.asc-csa.gc.ca/eng/astronomy/moon-exploration/lunar-gateway.asp>.
[77] Reid, *supra* note 73.

Private Capital, for CAD $1 billion, effectively repatriating Canada's most recognisable space company.[78]

In developing RADARSAT, MDA received significant financial and technical contribution from the Government of Canada, amounting to roughly $450 million or 75% of the total development cost.[79] When RADARSAT was fully privatised following its launch, the Government of Canada secured access to, and the use of, the data generated by its synthetic aperture radar (SAR) Earth observation system equal to its initial investment. MDA benefitted similarly from the Canadian government in relation to the RADARSAT-2 mission, although the intention was always for RADARSAT-2 to be owned and operated by the private company. Although there were significant concerns with the Canadian government's contributions to the development of a what-were-then state of the art remote sensing space systems following MDA's sale to a US corporation[80], those fears have partially been allayed since its repatriation. MDA sells its Earth observation products to various clients, including private companies and foreign governments and Canada oversees MDA's RADARSAT missions by licensing its space systems under the Remote Sensing Space Systems Act (RSSSA). MDA is also engaged in other space endeavours, including developing specialised components and subcomponents.

Telesat

Originally a Crown corporation created by an act of Parliament, Telesat is a publicly-traded Canadian satellite-based communications company; the Canadian Public Sector Pension Investment Board[81] and Loral Space & Communications[82] are majority shareholders[83].

[78] Marc Boucher, *Maxar Sells MDA to a Consortium Led by Toronto Based Northern Private Capital*, SpaceQ, 31 Dec 2019, online: <https://spaceq.ca/maxar-sells-mda-to-a-consortium-led-by-toronto-based-northern-private-capital/>.
[79] Libby Davies, *Edited Hansard: Number 129*, House of Commons, 38th Parliament, 1st Session, 30 Sep 2005, online: <http://www.ourcommons.ca/DocumentViewer/en/38-1/house/sitting-129/hansard> at 1025.
[80] David Pugliese, *U.S. firm stages 'stealth takeover' of Canada's largest space tech company*, National Post, 17 Oct 2016, online: <https://nationalpost.com/news/canada/u-s-firm-stages-stealth-takeover-of-canadas-largest-space-tech-company>.
[81] The Public Sector Pension Investment Board is a Crown corporation that invests the pensions of the Canadian Public Service as well as that of the Armed Forces, Reserve Forces and the RCMP. Public Service Pension Investments, *Profile*, PSP Investments, accessed 14 Mar 2018, online: <http://www.investpsp.com/en/about-profile.html>.
[82] Loral Space & Communications is a US satellite service provider, based in New York, with an ownership interest of 62.7% in Telesat as well as 56% of Xtar, a provider of satellite services to various governments on the X band. Loral Space & Communications, *Company Profile*, Loral Space & Communications, accessed 14 Mar 2018, online: <http://www.loral.com/Company/Company-Profile/default.aspx>.
[83] Although Loral Space & Communications owns 62.7% ownership of Telesat, it only has 32.7% voting rights; PSPIB holds the remainder. This has become a particularly distressing arrangement for both sides recently, as the two parties

Headquartered in Ottawa, Telesat has noted changing demographics and actively engaged with local populations to take advantage of Canada's next generation of space professionals[84]; as with other space companies[85], hiring local talent with a background in STEM has proved difficult and so Telesat has attempted to improve its marketability towards young, promising professionals.[86]

A pioneer in the field of satellite-based telecommunications for over fifty years, Telesat's long history includes being the first company to provide an intercontinental satellite TV transmission, the first to place a domestic satellite in geostationary orbit as well as the first to commercially operate in the Ku and Ka bands. Over the years, Telesat has improved the capabilities of space-based communications and has been recognised as a global leader.[87] Telesat currently operates 15 GEO satellites as well as a handful of LEO satellites, with a global LEO constellation under development and expected to begin operations in 2022.[88] Telesat expects its LEO constellation to deliver high-quality Internet connectivity services to unconnected and underserved remote communities around the world.[89] Ontario has invested CAD $20 million[90] and the federal government has invested $85 million[91] in Telesat's LEO constellation on the basis

have been unable to agree on a strategic direction forward for Telesat (complicated by the fact that XTAR's revenues have dropped significantly and is behind on its lease payments, of which Telesat is a collector). Caleb Henry, *Loral warns of possible Telesat legal battle, Xtar restructuring*, Space News, 16 Mar 2018, online: <http://spacenews.com/loral-warns-of-possible-telesat-legal-battle-xtar-restructuring>.

[84] Craig Lord, *Ottawa satellite firm Telesat moving downtown with new Place Bell lease*, Ottawa Business Journal, 12 Mar 2018, online: <http://www.obj.ca/article/ottawa-satellite-firm-telesat-moving-downtown-new-place-bell-lease>.

[85] Caleb Henry, *New talent hard to come by for space companies*, Space News 12 Mar 2018, online: <http://spacenews.com/new-talent-hard-to-come-by-for-space-companies/>.

[86] Carie Lemack, *'Billions and Billions': Space Exploration is Not Just for Billionaires*, Space.com Op Ed, 10 Mar 2018, online: <https://www.space.com/39943-space-exploration-not-just-for-billionaires.html>.

[87] David Sali, *CEO of the Year: Telesat's Dan Goldberg is at the 'epicentre of everything'*, Ottawa Business Journal, 11 Oct 2019, online: <https://obj.ca/article/ceo-year-telesats-dan-goldberg-epicentre-everything> [*Sali*]; Telesat, *History & Industry Firsts*, Telesat, accessed 14 Mar 2018, online: <https://www.telesat.com/about-us/telesat-history>.

[88] Telesat, *Who We Are*, Telesat, accessed 14 Mar 2018, online: <https://www.telesat.com/about-us/who-we-are>.

[89] Telesat, *Telesat LEO - Transforming Global Communications*, Telesat, accessed 14 Mar 2018, online: <https://www.telesat.com/services/leo>.

[90] Telesat, *Telesat Applauds Government of Ontario Support of Telesat's LEO Satellite Constellation in Budget 2018*, Telesat, 29 Mar 2018, online: <https://www.telesat.com/news-events/telesat-applauds-government-ontario-support-telesats-leo-satellite-constellation-budget>; Kendall Russell, *Backed by Government, Telesat to Initiate First Customer LEO Trials This Year*, Via Satellite, 18 Apr 2018, online: <https://www.satellitetoday.com/telecom/2018/04/18/backed-by-government-telesat-to-initiate-first-customer-leo-trials-this-year/>.

[91] Telesat, *The Government of Canada and Telesat Partner to Bridge Canada's Digital Divide through Low Earth Orbit (LEO) Satellite Technology, Over $1 Billion in Revenue for Telesat expected*, Telesat, 24 Jul 2019, online: <https://www.telesat.com/news-events/government-canada-and-telesat-partner-bridge-canadas-digital-divide-through-low-earth> [*Telesat*].

of their governmental commitments to providing quality communication capabilities to rural communities throughout the province and Canada, respectively.[92]

Urthecast

Urthecast is a publicly-traded Canadian Earth observation company based out of Vancouver, which first gained prominence by installing an Earth observation cameras aboard the ISS. Urthecast operates two satellites, Deimos-1 and Deimos-2, through its Spanish subsidiary, Deimos Imaging.[93] Urthecast is concurrently developing two separate satellite constellations, SAR-XL (formerly OptiSAR) and UrtheDaily, meant to image the entire landmass of the Earth, everyday, using different technologies.[94] Urthecast intends to upload all of its data to a cloud-based server so as to grant customers an easy, intuitive and accessible method by which to access the terabytes of information generated by its satellite systems.[95] Like other Earth observation companies, Urthecast's true utility will become apparent when the downstream applications of its data are fully realised. Although large, industrialised entities currently benefit from monitoring things like long-term forest growth, receding shorelines, melting permafrost, etc., when innovative technologies find a functional, every day outlet that leverages the data amassed by the daily mapping of the Earth, Urthecast's true value will become known; it is likely such information will generate offshoots in ways similar to those that GPS data and location-based services did when used in conjunction with mobile devices.

ExactEarth

ExactEarth is a Canadian publicly-traded company, founded in 2009, that focuses on leveraging maritime shipping's automatic identification system (AIS) from space using satellites (S-AIS). The International Maritime Organisation requires all ships over a certain size and weight to broadcast key information (for example, their origin, destination, bearing, speed, location, etc.) using a common system known as AIS, so that other nearby ships and coastal authorities remain

[92] *Sali*, *supra* note 87.
[93] Urthecast, *Corporate Profile*, Urthecast, accessed 8 Mar 2018, online: <http://investors.urthecast.com/CorporateProfile.aspx?iid=4388192>.
[94] Marc Boucher, *Is Urthecast poised to turn the corner?*, SpaceQ, 15 Nov 2017, online: <http://spaceq.ca/is-urthecast-poised-to-turn-the-corner/>.
[95] Urthecast, *Diverse data offerings*, Urthecast, accessed 8 Mar 2018, online: <https://www.urthecast.com/data/>.

in constant communication to avoid accidents or illegal activity[96]. When ExactEarth's parent company, COM DEV, now part of Honeywell Aerospace, recognised in the mid-2000s that it was possible to pick up AIS signals from space, it developed the technology necessary to accurately and reliably monitor such signals, leading to the first S-AIS system. By detecting the AIS signals of ships from space, ExactEarth can determine with accuracy, the location and direction of vessels, allowing for a variety of tracking applications; when coupled with imagery, S-AIS allows ExactEarth to provide near-real-time positioning capabilities and determine, for example, whether certain ships are following their manifest (such as by broadcasting their destination but moving in a different direction) or whether certain ships are avoiding detection altogether (such as by locating a ship using remote sensing data but being unable to find a corresponding AIS signature).

ExactEarth does not launch or operate its own satellites; rather it piggybacks its sensors aboard other functioning satellites (such as the Iridium Next constellation). Using this method, it currently has 27 sensors operating within its ExactView RT service.[97] ExactEarth faces competition from other S-AIS service providers, such as ORBCOMM[98], SpaceQuest[99] and Spire[100] as well as a potential inter-governmental operation undertaken by France and India.[101]

Importantly, AIS signals are intended to be sent and received between vessels or between vessels and shore-based receivers, not vessels and space systems. The fact that satellite operators like ExactEarth are capable of detecting or "picking up" such signals by "listening in" from space complicates the regulation of such activity. The fact that AIS signals can be picked up from space and plotted on a map to provide detailed information to the operator of the space system raises questions related to whether the S-AIS activity is effectively "sensing the Earth" - if so, in Canada, the RSSSA would apply. On this basis, the government has required that ExactEarth operate under a remote sensing license even though ExactEarth argues its activities do not amount to remote

[96] Elizabeth Howell, *Improved Ship Tracking Key in ExactEarth's Strategic Alternative Search*, SpaceQ, 13 Mar 2018, online: <http://spaceq.ca/improved-ship-tracking-key-in-exactearths-strategic-alternative-search>.
[97] *Ibid*.
[98] ORBCOMM, *Networks: Satellite AIS*, ORBCOMM, accessed 14 Mar 2018, online: <https://www.orbcomm.com/en/networks/satellite-ais>.
[99] SpaceQuest, *Global Satellite AIS Data*, SpaceQuest, accessed 14 Mar 2018, online: < http://www.spacequest.com/s-ais/>.
[100] Spire, *Sense*, Spire, accessed 14 Mar 2018, online: <https://spire.com/data/maritime/>.
[101] Deyana Goh, *India & France's Joint Vision for Space Cooperation heavy on space exploration*, Space Tech Asia, 12 Mar 2018, online: <http://www.spacetechasia.com/india-frances-joint-vision-space-cooperation-heavy-space-exploration/> [*Goh*].

sensing since they do not have optical capabilities[102]; nevertheless, since 2010, ExactEarth has operated on the basis of a provisional licence (that is incrementally renewed by the Canadian government). The government's reasons for providing a provisional rather than full license remain unclear; the last publicly available information indicates that up until September 2015[103] ExactEarth was operating on a provisional license.

GHGSat

GHGSat is a private Canadian company focussed on using remote sensing technologies to monitor greenhouse gas, air quality gas and other gas emissions from any source in the world.[104] Operating out of Toronto and Montreal, GHGSat launched its GHGSAT-D in 2016, which orbits the Earth roughly 15 times a day in 90-minute intervals and uses it sensors to measure carbon dioxide and methane emissions.[105] Given GHGSAT-D's success, GHGSat is developing two new satellites, GHGSAT-C1 and C2, which will offer improved performance on the existing technology. Each of the three satellites are roughly the size of a microwave oven and are expected to operate for 5 years. GHGSAT is also in the process of developing specific sensors that it can attach to the bottom of aircraft (to acquire sensitive readings of greenhouse gas emissions during regularly scheduled flights) and deploying its sensors aboard other satellites to take advantage of existing infrastructure, including ground stations.[106] GHGSat's revenue model is particularly focussed on providing large polluters (oil and gas[107], mining, agriculture, waste management, etc.) with accurate information on the quantity and quality of their emissions, so as to facilitate the $50 billion carbon trading market.[108] GHGSat is licensed in Canada under the RSSSA and provides its clients with both the data collected by its space systems as well as the analysis of such data.

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[102] Ram Jakhu and Aram Kerkonian, *Second Independent Review of Canada's Remote Sensing Space Systems Act*, (2019) 42:1 J of Space L 1 [*Jakhu & Kerkonian*].
[103] ExactEarth, *Prospectus Dated 13 July 2015*, ExactEarth, 13 Jul 2015, online: <investors.exactearth.com/download/exactEarth+-+English+A&R+Prelim.pdf> at pp 60-61.
[104] GHGSat, *Who We Are: Company*, GHGSat, accessed 9 Mar 2018, online: <http://www.ghgsat.com/who-we-are/> [*GHGSat 1*].
[105] GHGSat, *A Small Satellite with Big Ambitions*, GHGSat, accessed 9 Mar 2018, online: <http://www.ghgsat.com/who-we-are/our-satellites/claire> [*GHGSat 2*].
[106] *GHGSat 1*, *supra* note 104.
[107] In January 2019, GHGSat noticed significant methane leaks from gas pipelines near Turkmenistan that had hitherto gone unnoticed. The Economist, *Using satellites to spot industry's methane leaks*, The Economist, 1 Feb 2020, online: <https://www.economist.com/science-and-technology/2020/02/01/using-satellites-to-spot-industrys-methane-leaks>.
[108] *GHGSat 2*, *supra* note 105.

Kepler Communications

Founded in 2015, Kepler Communications is based in Toronto and seeks to provide space-asset-to-space-asset connectivity in space, which it has described as an "Internet of space".[109] In layman's terms, since satellites currently only communicate within their own constellation and with their respective ground stations only a few times a day, Kepler intends to deploy a constellation of smallsats that are in constant contact with ground stations. By doing so, Kepler seeks to create an "on-orbit Internet" that would allow satellites owned and operated by other entities to communicate securely with its network and in this manner provide constant communication capabilities with Earth.[110] This way, regardless of the location or distance of a satellite from its own ground station, the satellite would be able to provide near-real time information to its operator; in effect, Kepler hopes to act as the medium through which data in space are communicated back to Earth, regardless of operator or orbit. Kepler envisions significant advantages with its system, offering existing and future space operators with a data-transfer service that does not require independent ground stations and increases information transfer times.

In 2018 Kepler launched its first satellite, KIPP, aboard a Chinese Long March 11 rocket[111] in 2018, a first for a Canadian space asset, and later launched its sister-satellite, CASE. Kepler's ultimate objective is to develop a 140-satellite constellation capable of providing coverage of the entire planet and has decided to manufacture the satellites in-house in its Toronto office space.[112] Such a manufacturing decision makes Kepler one of the few vertically-integrated space companies,

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[109] Kepler, *About Us*, Kepler Communications, accessed 8 Mar 2018, online: <http://www.keplercommunications.com/about>.

[110] Emily Jackson, *'Cellphone towers in space': Startup Kepler Communications plans first Canadian nanosatellite for telecom*, Financial Post, 16 Feb 2017, online: <http://business.financialpost.com/technology/cell-phone-towers-in-space-startup-kepler-communications-plans-first-canadian-nanosatellite-launch>.

[111] Although Keppler originally intended to launch aboard an Indian PSLV, launch delays forced it to use the Chinese service provider. Marc Boucher, *In a First, China Launches Canadian Satellite for Kepler Communications*, SpaceQ, 19 Jan 2018, online: <https://spaceq.ca/in-a-first-china-launches-canadian-satellite-for-kepler-communications/> [*Boucher 1*]. The opportunity to launch on a Chinese launch provider was possible because Canada has a "friendly nation status" with China that the United States does not. As such, strict International Traffic in Arms Regulations (ITAR) prevent American firms from contracting with Chinese launch providers. Although Canada's export controls largely mimic the US', there are some distinctions. Jeff Foust, *Smallsat launch providers face pricing pressure from Chinese vehicles*, Space News, 19 Mar 2018, online: <http://spacenews.com/smallsat-launch-providers-face-pricing-pressure-from-chinese-vehicles> [*Foust*].

[112] Marc Boucher, *Kepler Communications Goes In-House and Local to Manufacture Satellite Constellation*, SpaceQ, 28 Jan 2020, online: <https://spaceq.ca/kepler-communications-goes-in-house-and-local-to-manufacture-satellite-constellation/>; Caleb Henry, *Kepler decides to build its 140-satellite cubesat constellation in-house*, Space News, 29 Jan 2020, online: <https://spacenews.com/kepler-decides-to-build-its-140-satellite-cubesat-constellation-in-house/> [*Henry 1*].

as most companies hire outside firms to manufacture small satellite constellations.[113] Kepler's constellation is licensed in Canada by Innovation, Science and Economic Development.[114]

Future Space Activities

Although it remains unclear as to exactly how space activities will develop in the future, it is likely that rapid-paced development is inevitable. With an influx of private capital and a renewed interest from governments, the growth of space activities will likely continue into the foreseeable future. Although the nature of technological development is unpredictable, there are already signs that suggest some possibilities are more likely than others, especially when one considers the decreased cost of satellite development (due largely to the increased functionality of smallsats) and satellite launch (due largely to ridesharing, reusability and competition between launch providers). The decreased cost of undertaking space operations renders new projects feasible from a financial perspective and, when coupled with the human desire to explore and innovate, the advancement of capabilities in, on and from space becomes inevitable.

The most significant obstacle to engaging space has been the high cost of entry. Historically, the price point associated with launching an object into space (often quoted as USD $10,000 per kg) and the overall size of satellites (some weighing thousands of kgs) were prohibitive for all but the wealthiest; indeed, given the added cost of research and development, even mere experimentation of space systems was an expensive endeavour. As such, the first space projects were initiated by government space agencies with billion-dollar budgets because they were the only entities with the financial capital to undertake space activities. Individuals, small businesses and even larger corporations had to rely on governments (or, at the very least, government contracts) to engage with space in tangential ways. If a company with expertise in robotics wanted to implement a new Earth observation technology, it was almost always financially untenable unless they could secure a contract to implement their capabilities on an upcoming government satellite.

As a result, this high barrier of entry, coupled with a relatively high degree of other risks, inhibited innovation and made the commercialisation of such activities more difficult than in other industries. For most terrestrial activities, it is possible for an individual with a vision to develop a

[113] *Henry 1*, *supra* note 112.
[114] *Boucher 1*, *supra* note 111.

technology in their garage and test out a prototype in the environment where it would eventually prove useful, all at a relatively low cost. A successful technological demonstration makes securing investment and/or financing relatively straightforward and thereby leads to development and production on a larger scale. The difference with technologies designed for space (aside from the fact that technological components are highly specialised) is that even if one could build a component for relatively low cost, is impossible to demonstrate its utility without first convincing a national space agency or other large operator to risk their own significant investment and allow an unfinalised component to piggyback on their rocket or satellite. Of course, without a successful technological demonstration, it is extremely difficult to secure funding to further refine the technology or implement it on a large scale. As such, the technological progress of space activities from a commercial perspective has been slow and arduous.

Today, however, and even more so in the coming decades, the financial and human resources necessary to design, test and implement a new space technology or service are within the economic means of smaller entities, if not individuals. Whereas historically the idea of microsatellites (satellites weighing less than 100 kg) existed only in scholarly papers and conferences, Silicon Valley-esque start-ups have championed the use of small, low-cost satellites to demonstrate prototypes and secure capital - for $100,000, one can design a satellite capable of conducting experiments that used to require a $10,000,000 satellite. Coupling this reality with a reduced cost of accessing space (with some estimates pegging the cost of launching a cubesat at $250,000 and dropping[115]), "what if" propositions are possible. As the costs of both developing and launching satellites continue to tumble, the opportunities to test new ideas will increase, triggering an exponential growth of new space applications.

Emerging Space Applications

Given the reduced costs of engaging with space, many smaller commercial entities have been developing space technologies and space applications that are poised to revolutionise the way humanity uses outer space. Aside from all the opportunities for space science, which consistently advance human knowledge,[116] new opportunities and activities are constantly emerging. As was

[115] *Foust*, *supra* note 111.

[116] For example, experiments related to the study of materials that go into everyday rubber tires as well as studies on the behaviour of water in microgravity were just two industry-sponsored investigations that took place on the ISS. Goodyear, *Goodyear to study tire materials reaction in International Space Station*, SpaceRef, 24 Jul 2018, online:

the case with the invention of the Internet, where a novel medium existed for some time before its true ubiquity and utility became more clear[117], humanity's use of outer space will evolve in ways that cannot yet be comprehended. Notwithstanding this uncertainty, there are certain realistic possibilities of what is to come in both the upstream and downstream markets related to space activities. This trend toward the commercialisation (and, in some ways, democratisation of space[118]), has been dubbed "New Space".

Improved and Reusable Launch Capability

One of the driving forces of - and one of the likely conditions necessary to maintain the continued growth of - the commercial space market is the improvement of launch capabilities. The improvements will manifest themselves in different ways, particularly with regards to new launch locations, new launch technologies and an overall focus on reusability. Recognising the need for increased space launch capability, a number of independent actors have begun to occupy the space.[119] In the Canadian context, Maritime Launch Services is in the development stages of building a Canadian spaceport from which to launch space objects - while the details on its intended capability (in terms of lift capacity, market focus, scalability, reusability, etc.) have not yet solidified, it has extensively engaged with the local, provincial and federal governments for authorisation to carry out its activities, including environmental impact assessments.[120] In the US, aside from the various launch facilities along the southeast and southwest coasts, the re-opened Kodiak Launch Complex (now operated as the Pacific Spaceport Complex - Alaska) is positioned

<http://www.spaceref.com/news/viewpr.html?pid=52865>; Delta Faucet Company, *Delta Faucet Company Joins Forces with International Space Station U.S. National Laboratory to Investigate Water Activity in Microgravity*, SpaceRef, 24 Jul 2018, online: <http://www.spaceref.com/news/viewpr.html?pid=52866>.

[117] The Internet existed for years before its potential ubiquity became clear. No one could have expected the birth of social media, the sale of goods and services from anywhere to anywhere in the world, the limitless exchange of information or the hundreds of other disruptions it has caused.

[118] In a political sense, since space activities were often carried out by only the wealthiest of nations or the largest of corporations, very few entities had a say in what or how space activities were carried out. Now, with a reduction in cost and the commercialisation of such activities, many more entities are engaging with the domain of space. This increase in the number of participants can be appreciated as the democratising effect of New Space.

[119] Mike Safyan, *Rocket Launch Trends Roaring into the 2020s*, Planet, 30 Jan 2020, online: <https://www.planet.com/pulse/rocket-launch-trends-roaring-into-the-2020s>.

[120] Marc Boucher, *Maritime Launch Services Set to Submit Environmental Impact Assessment Report for Nova Scotia Spaceport*, SpaceQ, 12 Mar 2018, online: <http://spaceq.ca/maritime-launch-services-set-to-submit-environmental-assessment-report-for-nova-scotia-spaceport>. This gives hope to the many young Canadians developing the skills to design and build rockets but currently without a domestic site from where to launch them. Jamie Hunter, *University of Toronto Aerospace Team reaches new heights with latest fleet of vehicles*, U of T Engineering News, 17 Apr 2018, online: <http://news.engineering.utoronto.ca/utat-showcase-2018>.

to offer flexibility for commercial launches from northern latitudes.[121] Astra Space was scheduled to conduct a series of test launches of its dedicated smallsat launcher[122] in early 2020, but failed to meet the deadline established by the DARPA Launch Challenge[123].

In terms of new launch systems being developed by public entities, NASA is currently preparing its Space Launch System, which, together with the Orion spacecraft, will have the capability to take humans into deep space.[124] China's national space agency has established itself as a dependable launch provider and has been steadily increasing its launch cadence whilst lowering prices (in addition to many of its private commercial entities coming online and offering rates lower than other private providers[125])[126]; its Long March 5B rocket is intended to debut in the first half of 2020.[127] Commercially, SpaceX has led the charge, demonstrating its Falcon Heavy launch system (which is by far the most powerful currently operational rocket and second only to the historical Saturn V which took humans to the Moon) and is testing an even larger system, Starship, which it intends to use to take humanity to the Moon, Mars and beyond.[128] Both system architectures are designed to be reusable and, as its current Falcon 9 series has repeatedly demonstrated[129], will significantly reduce launch costs.[130] Blue Origin is developing a series of

[121] Associated Press, *1st commercial launch scheduled for Alaska Aerospace complex*, Associated Press, 20 Mar 2018, online: <http://www.newsobserver.com/news/technology/article205965589.html>.
[122] Jeff Foust, *Astra Space preparing for suborbital test launch*, Space News, 3 Apr 2018, online: <http://spacenews.com/astra-space-preparing-for-suborbital-test-launch>.
[123] Mike Wall, *Astra's bid to $12 million DARPA Launch Challenge comes up short*, Space.com, 3 Mar 2020, online: <https://www.space.com/astra-darpa-launch-challenge-failure.html>.
[124] Loren Grush, *NASA's future monster rocket is once again over budget and behind schedule*, The Verge, 10 Mar 2020, online: <https://www.theverge.com/2020/3/10/21173176/nasa-space-launch-system-inspector-general-audit-over-budget-schedule>.
[125] One such provider, of the seeming countless, is OneSpace. Andrew Jones, *OneSpace of China tests vertical assembly of rocket ahead of debut launch*, 19 Apr 2018, GB Times, online: <https://gbtimes.com/onespace-of-china-tests-vertical-assembly-of-rocket-ahead-of-debut-launch?cat=chinas-space-program>.
[126] *Foust*, *supra* note 111. Although some argue of unfair competition related to Chinese commercial launch providers receiving what can be characterised as State subsidies, there is no bilateral or multilateral agreements between nations (similar to those in aviation, for example) that prohibit such State support.
[127] Eric Berger, *Rocket Report: It takes three years to build an SLS? Long March 5B coming*, Ars Technica, 24 Jan 2020, online: <http://arstechnica.com/science/2020/01/rocket-report-it-takes-three-years-to-build-an-sls-long-march-5b-coming/>.
[128] SpaceX, *Falcon Heavy*, SpaceX, accessed 24 Apr 2018, online: <http://www.spacex.com/falcon-heavy>; SpaceX, *Making Life Multiplanetary*, SpaceX, accessed 24 Apr 2018, online: <http://www.spacex.com/mars> [*SpaceX*].
[129] SpaceX has landed the first stage of its Falcon 9 rocket at least 49 times. Eric Berger, *Rocket Report: Astra nearing first launch, Starship may soon roll to pad*, Ars Technica, 21 Feb 2020, online: <https://arstechnica.com/science/2020/02/rocket-report-astra-nearing-first-launch-starship-may-soon-roll-to-pad/> [*Berger*].
[130] *SpaceX*, *supra* note 128.

reusable rockets that will allow it to reach all of Earth's major orbits[131] as well as beyond[132]. Rocket Labs, operating mainly from New Zealand but headquartered in the US and now launching from Virginia[133], has developed its Electron Rocket as a dedicated smallsat launcher to launch commercial satellites to orbit and beyond.[134] A number of other entities are also engaged in developing traditional launch technologies, including the Canadian Reaction Dynamics and C6 Launch.

Non-traditional approaches to launch are also being developed by various entities. Virgin Galactic has demonstrated the capability of its aircraft-rocket combination, whereby SpaceShipTwo, a rocket capable of carrying passengers to space, is lifted airborne by WhiteKnightTwo, an airplane retrofitted to take off with a rocket under its belly, before igniting and making its way to space.[135] This process is anticipated to reduce some of the significant costs associated with escaping Earth's gravity well. Similarly, Stratolaunch is currently testing its aircraft/rocket hybrid system to provide launch and other capabilities[136] and Sierra Nevada is developing its Dream Chaser space plane to provide crew and cargo capabilities.[137] Other launch technologies include using high-altitude balloons, such as the balloon designed by SpaceRyde to ascend to the stratosphere before igniting its lightweight rocket and delivering its payload to the appropriate orbit[138], or the approach taken by SpinLaunch whereby a small rocket is catapulted to

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[131] Specifically, Blue Origin is attempting to compete with existing players United Launch Alliance and SpaceX and so its rockets must reach nine specific orbits so as to qualify for US Air Force launch contracts. Caleb Henry, *Blue Origin switches engines for New Glenn second stage*, Space News, 29 Mar 2018, online: <http://spacenews.com/blue-origin-switches-engines-for-new-glenn-second-stage/>.

[132] Calla Cofield, *Blue Origin's Reusable Rockets Will Help Support Humans on the Moon*, Space.com, 7 Apr 2017, online: <https://www.space.com/36369-blue-origin-will-make-lunar-deliveries.html>.

[133] Loren Grush, *Rocket Lab's second launch site is now complete, with its first mission set for next year*, The Verge, 12 Dec 2019, online: <https://www.theverge.com/2019/12/12/21012548/rocket-lab-wallops-virginia-launch-site-complex-2-electron>.

[134] Loren Grush, *Rocket Lab sets date for first commercial launch of its Electron rocket*, The Verge, 4 Apr 2018, online: <https://www.theverge.com/2018/4/4/17195686/rocket-lab-electron-commercial-launch-its-business-time-new-zealand>; Jeff Foust, *Rocket Lab sets date for first commercial launch*, Space News, 4 Apr 2018, online: <http://spacenews.com/rocket-lab-sets-date-for-first-commercial-launch>; *Berger*, *supra* note 129.

[135] Virgin Galactic, *Mission: What We Do*, Virgin Galactic, accessed 7 Apr 2018, online: <https://www.virgingalactic.com/mission/>.

[136] Jeff Foust, *Stratolaunch planning first aircraft flight this summer*, Space News, 16 Apr 2018, online: <https://spacenews.com/stratolaunch-planning-first-aircraft-flight-this-summer>; Sean O'Kane and Chris Welch, *World's biggest airplane takes flight for the first time ever*, The Verge, 13 Apr 2019, online: <https://www.theverge.com/transportation/2019/4/13/18309129/stratolaunch-worlds-biggest-airplane-first-flight-rockets>; Jeff Foust, *Stratolaunch confirms interest in launch services and hypersonic vehicles*, Space News, 21 Jan 2020, online: <https://spacenews.com/stratolaunch-confirms-interest-in-launch-services-and-hypersonic-vehicles/>.

[137] Amy Thompson, *Sierra Nevada eyes 2021 launch of Dream Chaser space plane*, Space.com, 16 Jan 2020, online: <https://www.space.com/sierra-nevada-dream-chaser-launch-2021.html>.

[138] Space Ryde, *How We Do It*, Space Ryde, accessed 21 Feb 2020, online: <https://www.spaceryde.com/>.

the edge of space by a giant centrifuge-like device before igniting - although the company remains secretive, it has raised over USD $80 million and envisions "launches" costing approximately USD $250,000.[139] Intending to take advantage of the cost saving measures offered by kinetic launch systems, Starfire Scientific is a Canadian company attempting to commercialise the HARP project's use of a large gun to launch objects into space.[140]

All of these technologies (both those in operation and those in development) will continue to advance the distribution of space assets into LEO, GEO and beyond. Both the nations providing space launches as well as the kinds of satellites that are being launched are evolving; China overtook Russia as the second-most frequent launching State in 2018 and overtook the US as the most frequent launching State in 2019.[141] Although the total number of active space objects to date is roughly 2,200[142], several operators have begun or are preparing to launch thousands of small satellites for a single constellation, greatly increasing the projected number of active satellites.

Space Traffic Management and Space Situational Awareness

The increasing number of launches will require increased coordination, both within a State and between States and since rockets often travel through both national airspace and international airspace[143], international space traffic management (STM) will prove increasingly necessary. With an increasing cadence of launches, there will be a need to incorporate airspace management issues within traditional aviation management operations. This will prove especially true once launch service providers become capable of regularly launching and landing multiple rockets multiple

[139] Ashlee Vance, *This Startup Got $40 Million to Build a Space Catapult*, Bloomberg Businessweek, 14 Jun 2018, online: <https://www.bloomberg.com/hyperdrive>; Mike Wall, *Stealth space startup SpinLaunch snares another $35 million from investors,* Space.com, 17 Jan 2020, online: <https://www.space.com/spinlaunch-launch-startup-investment-funding.html>.

[140] Starfire Scientific, *Launch almost anything into space!*, Starfire Scientific, accessed 21 Feb 2020, online: <https://starfirescientific.com/>.

[141] Erica Pandey et al, *The state of the space race in 1 chart*, Axios, 26 Jan 2018, online: <https://www.axios.com/the-state-of-the-space-race-in-1-chart-1516917901-0bf90c42-25c6-4c98-a29f-d000e43e342a.html>; Andrew Jones, *China to continue world-leading launch rate in 2020*, Space News, 3 Dec 2019, online: <https://spacenews.com/china-to-continue-world-leading-launch-rate-in-2020/>.

[142] Union of Concerned Scientists, *UCS Satellite Database*, Union of Concerned Scientists, 16 Dec 2019, online: <https://www.ucsusa.org/resources/satellite-database>.

[143] Of course, the long-debated question of where airspace ends and where outer space begins remains undefined - notwithstanding, the general consensus (albeit non-legally binding) is 100 km with Australia, Kazakhstan and Denmark concretising this altitude in their national legislations. *See* Chapter 7, *Comprehensive Regulation of Commercial Space Activities*.

times a day (whether providing Earth-to-Earth or Earth-to-space transportation services) and hybrid space vehicles co-exist in the airspace with regular airplanes.[144]

Launching and landing rockets is not as straightforward as organising a convoy of aircraft that intermittently arrive and land at a single airport - significant concerns arise when more than one launch is planned within 24 hours. In a future where both payloads and passengers are regularly making their journey to space, it will become likely that a quick succession of rocket launches will be necessary to access ideal orbital positions, avoid inclement weather or meet other specific deadlines. The combination can be such that multiple rockets take off successively, bringing about specific complexities. For example, Florida's Space Coast has indicated that it intends to conduct 48 launches a year, requiring more than one launch in a 24-hour period.[145] In preparation, they have identified a number of potential concerns. For example, most rockets are positioned on a launch pad more than 24 hours in advance of their launch, meaning that if two consecutive launches are to occur within a single day, one rocket will be placed on its launchpad as another takes off a mere few kilometers away. This exposes the second rocket to a potential launch failure of the first, which would bring about serious consequences if debris started raining down; additionally, the mere vibrations and pollutants resulting from the first launch could prove consequential for the payload or environmental conditions necessary for the second.[146] Adjusting to these kinds of characteristics will open up opportunities for new and innovative advances in the development, launch and operation of rockets and payloads.

With the increased launches and a proliferation of smaller satellites, there is no doubt there will be an increasing number of space objects in orbit. The approximately 2,200 currently operational space objects will likely quadruple in the coming years if all those seeking to launch and implement constellations are authorised to carry out such activities - many have already been approved by the US FCC. With thousands of operational objects in orbit around Earth - and millions more pieces of debris -, there will be a need to precisely monitor and coordinate such orbital movements so as to ensure satellites do not harmfully interfere or collide with one another. This concept of identifying and tracking operational space objects (as well as debris) is referred to

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[144] Chris Davenport, et al, *Gridlock in the sky*, The Washington Post, 12 Dec 2018, online: <https://www.washingtonpost.com/graphics/2018/business/spacex-falcon-heavy-launch-faa-air-traffic/>.
[145] Jeff Foust, *Efforts underway to ease Florida's Space Coast launch congestion*, 27 Mar 2018, online: <http://spacenews.com/efforts-underway-to-ease-floridas-space-coast-launch-congestion>.
[146] *Ibid*.

as space situational awareness (SSA). Publicly available information pertaining to SSA is currently carried out by the United States Air Force[147] (USAF) on a gratis basis and it provides space object operators with warnings once its monitoring systems detect a potential collision in space. Given this unilateral and voluntary tracking and notification system, there is much room for improvement. Although the USAF has plans to improve its current radar- and optical-based detection and tracking methods, a more thorough upgrade will be required.[148] President Trump's Space Policy Directive - 3 signalled that the US should renew its efforts to "lead in the management of space traffic and space debris"[149]; whether coincidentally or not, commercial applications of SSA are now coming online[150], as are the SSA capabilities of other States.[151]

Aside from ground-based surveillance methods, Aerospace Corp., a US federally funded research and development center, is advocating for the use of small, GPS transponders on all future space objects to allow for them to be tracked more easily.[152] The concept is similar to ADS-B in aviation or AIS in maritime, whereby a single transponder transmits the space object's location in a manner that can be picked up by existing GPS satellites (or other space assets outfitted with responders) to help track objects and prevent costly collision avoidance measures.[153] With the expected explosion of the number of space objects operating in space over the next decade, such a transponder-like system would allow for easier coordination between space operators, improved safety and more coordinated debris remediation efforts.

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[147] David Finkleman, *The Dilemma of Space Debris*, American Scientist, Vol 102, Jan-Feb 2014 at 31.
[148] Lockheed Martin, *How to Keep Space Safe: Space Fence*, Lockheed Martin, accessed 7 Apr 2018, online: <https://www.lockheedmartin.com/us/products/space-fence.html>.
[149] Marc Boucher, *U.S. Aims to Take Lead in Space Traffic Management with Space Policy Directive 3*, SpaceQ, 18 Jun 2018, online: <http://spaceq.ca/u-s-aims-to-take-lead-in-space-traffic-management-with-space-policy-directive-3>.
[150] SpaceRef, *AGI and Thoth Technology Announce World's First Commercial Deep Space Radar*, SpaceRef, 23 May 2018, online: <http://www.spaceref.com/news/viewpr.html?pid=52603>.
[151] For example, Canada Near-Earth Object Surveillance Satellite (NEOSSat) simultaneously tracks objects (such as operational satellites and space debris) in Earth's orbit as well as monitors the areas around Earth for potential asteroids. Canadian Space Agency, *NEOSSat: Canada's Sentinel in the Sky*, Government of Canada, 6 Jul 2018, online: <https://www.asc-csa.gc.ca/eng/satellites/neossat/default.asp>. Canada's Sapphire military satellite also monitor's Earth's orbits for space debris and provides the data to the USAF. Canadian Space Agency, *Legend*, Government of Canada, 19 Apr 2017, online: <https://www.asc-csa.gc.ca/eng/satellites/everyday-lives/legend.asp>.
[152] Amy Svitak, *Aerospace Corp. Proposes Smallsat GPS Transponder for Improved Space Traffic Management*, Space Intel Report, 7 Aug 2018, online: <https://www.spaceintelreport.com/aerospace-corp-proposes-smallsat-gps-transponder-for-improved-space-traffic-management>.
[153] *Ibid*.

Global Internet Coverage

The notion that all of planet Earth could be covered by commercially-provided high-bandwidth broadband Internet via satellites was first attempted by Teledesic in the 1990s but, given the extremely high costs, proved unsuccessful. Over the last decade, a number of other private actors have attempted to take up the challenge and the initial stages of such global Internet coverage are currently underway, including operations carried out by O3b (short for "Other 3 Billion")[154], OneWeb, SpaceX, Amazon and Telesat, with each company's respective constellations being at different development, deployment and regulatory-certification stages. In June 2017, OneWeb was approved to operate 720 satellites in LEO and in March 2018 it sought approval for another 1,260; it has further applied for authorisation to operate 2,560 satellites in medium Earth orbit (MEO).[155] In January 2020, OneWeb announced that it had signed a memorandum of understanding with the largest financial institution in Central Asia (the Astana International Financial Center, based in Kazakhstan), to accelerate the region's broadband connectivity using OneWeb's LEO constellation.[156] SpaceX's StarLink system was originally planned to include 4,425 satellites[157] but has since grown to 12,000 with many at a low altitude[158]. Amazon's Project Kuiper initiative is expected to require 3,236 satellites.[159] Telesat LEO, Telesat's foray into this field, is to comprise a total of 298 satellites in very low orbits, allowing for speeds and latency matching terrestrial fiber connections.[160] Yet another competitor in this domain, Methera, is designing a constellation of MEO satellites that, rather than blanket the entire Earth in coverage, will focus their bandwidth on select locations (such as specific towns and villages as opposed to entire countries).[161] In total, OneWeb's and SpaceX's proposed broadband

[154] Caleb Henry, *O3b MEO Constellation grows to 16 with latest Soyuz launch*, Space News, 9 Mar 2018, online: <http://spacenews.com/o3b-meo-constellation-grows-to-16-with-latest-soyuz-launch/>.
[155] Caleb Henry, *OnewWeb asks FCC to authorize 1,200 more satellites*, Space News, 20 Mar 2018, online: <http://spacenews.com/oneweb-asks-fcc-to-authorize-1200-more-satellites>.
[156] OneWeb, *OneWeb and Astana International Financial Centre sign partnership to accelerate connectivity in Kazakhstan*, SpaceRef, 28 Jan 2020, online: <http://www.spaceref.com/news/viewpr.html?pid=55178>.
[157] Tim Fernholz, *The US government okayed Elon Musk's plan to triple the number of satellites in orbit*, Quartz, 30 Mar 2018, online: <https://qz.com/1241550/the-us-government-okayed-elon-musks-plan-for-spacex-triple-the-satellites-in-orbit-to-sell-broadband-internet/>.
[158] Loren Grush, *FCC approves SpaceX's plans to fly internet-beaming satellites in a lower orbit*, The Verge, 27 Apr 2019, online: <https://www.theverge.com/2019/4/27/18519778/spacex-starlink-fcc-approval-satellite-internet-constellation-lower-orbit>.
[159] *Ibid*.
[160] Telesat, *supra* note 91.
[161] Caleb Henry, *MEO startup Methera plans "high density" HTS constellation*, Space News, 3 Aug 2018, online: <https://spacenews.com/meo-startup-methera-plans-high-density-hts-constellation>.

constellations alone will more than quintuple the total number of active satellites in operation today. Although the obvious questions about whether such large constellations can co-exist without physical and radio frequency interference remain valid until proven otherwise, so long as regulators (mainly the US FCC) continue to authorise such projects there will be no shortage of companies attempting to develop such technology.[162]

At the very least, offering satellite-based Internet coverage to the three billion people who currently do not have access will open up new markets to existing Internet-based enterprises as well as likely generate entirely new industries. Along the same vein, the continued use of space to examine and observe the Earth has resulted in enormous amounts of data and how to use this data in a manner that produces essential benefits and a steady revenue stream is still to be determined. With the various remote sensing space systems in operation, for example, the entire landmass of the Earth is being documented in detail more than once per day - discovering how to use this information will unlock new and exciting opportunities for industries that do not yet exist.[163] The use of artificial intelligence, machine learning and quantum computing to harness this information will become necessary and spur on new industries. One attempt to try and harness this information is the CSA's "smartEarth" funding initiative to support companies in their development of innovative solutions to process space-derived data for useful applications.[164] Providing such information to an additional three billion people (or to those who generally have access to the Internet but are in remote regions) can only lead to further innovation.

Human Settlement in Space

There are a number of important aspects related to human settlement in space, the least of which is how human biology will fare off-Earth; specific questions related to the effects of microgravity on long term biological maintenance and development, the effects of space radiation, various psychological concerns, etc. all remain unanswered. Indeed, identical twins and NASA

[162] Caleb Henry, *LEO and MEO broadband constellations mega source of consternation*, Space News, 13 Mar 2018, online: <http://spacenews.com/divining-what-the-stars-hold-in-store-for-broadband-megaconstellations/>.
[163] Skywatch, a company based in Waterloo, Ontario, through its EarthCache platform, offers customers Earth observation data that it aggregates from multiple sources totalling 225 satellites. In January 2020 it had 100 customers but expects that number to grow to 1,000 by the end of the year. Marc Boucher, *SkyWatch Raises $10 Million and Unveils TerraStream*, SpaceQ, 3 Jan 2020, online: <https://spaceq.ca/skywatch-raises-10-million-and-unveils-terrastream>; Marc Boucher, *If Data is the New Oil, is SkyWatch a Potential Unicorn?*, SpaceQ, 5 Feb 2020, online: <https://spaceq.ca/if-data-is-the-new-oil-is-skywatch-a-potential-unicorn>
[164] Canadian Space Agency, *About smartEarth*, Government of Canada, 30 Jan 2020, online: <https://www.asc-csa.gc.ca/eng/funding-programs/programs/smartearth/about.asp>.

astronauts Scott and Mark Kelly undertook an experiment to determine how a year in flight would affect Scott, while his brother remained on Earth.[165] After studying both brothers for some time, initial analyses suggest the year in space subtly changed Scott's DNA.[166] In a different vein, a group of students from the University of Toronto crowdfunded $400,000 to attempt to answer one question: how a helpful fungus useful to human digestion would survive and develop in the ISS' microgravity. Aside from the unique way in which the team generated its funding, the experiment is also distinct from those before it in that it will allow open-source access to the live-streamed data - anyone, from anywhere, can watch and use the information generated by the experiment in real-time to conduct studies and make conclusions.[167]

In terms of more practical settlement efforts, a number of companies are preparing for the inevitable survival of humans living extensively in space. Bigelow Aerospace, for example, has spent the last decade perfecting its inflatable space habitats in an effort to provide human-rated habitats in space. Since April 2016, its BEAM (Bigelow Expandable Activity Module) has been attached to the ISS, where it has undergone diagnostic tests to determine its resilience to the rigours of space (such as pressurisation, radiation, temperature fluctuation, etc.) and has demonstrated its capability as a human-supporting module for astronauts currently aboard the ISS as well as an onboard storage area for a number of other experiments.[168] Given its success to date, the BEAM module's operational lifespan aboard the ISS has been extended by NASA until at least 2020.[169] Bigelow seeks to develop more permanent space stations for continuous human habitation, for both in Earth's orbit as well as on the Moon and other celestial bodies.[170]

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[165] Susan Scutti, *Astronaut's gene expressions no longer same as his identical twin, NASA finds*, CNN, 15 Mar 2018, online: <https://www.cnn.com/2018/03/14/health/scott-kelly-dna-nasa-twins-study/index.html>.

[166] Although some of the information released was notable, it is extremely limited in its informative value at this stage and as the studies continue. Nadia Drake, *No, Scott Kelly's Year in Space Didn't Mutate His DNA*, National Geographic, 15 Mar 2018, online: <https://news.nationalgeographic.com/2018/03/scott-kelly-astronaut-space-station-dna-health-science/>.

[167] Katie Gwozdecky, *Finding New Ways to Keep Astronauts Healthy*, Research 2 Reality, 15 Mar 2018, online: <https://research2reality.com/space-quantum/finding-new-ways-to-keep-astronauts-healthy>.

[168] Kiernan McClelland, *Bigelow's Expandable Activity Module Operations Extended and Could be Used at a Future Deep Space Gateway*, SpaceQ, 15 Dec 2017, online: <http://spaceq.ca/bigelows-expandable-activity-module-operations-extended-and-could-be-used-at-a-future-deep-space-gateway/>.

[169] *Ibid*.

[170] Keith Cowing, *Bigelow and CASIS Are Working Together on ISS. NASA Really Doesn't Care*, NASA Watch, 20 Feb 2018, online: <http://nasawatch.com/archives/2018/02/bigelow-and-cas.html>.

Axiom Space, headed by a former NASA veteran in charge of managing the ISS, seeks to build and operate a luxurious hotel-like structure in LEO.[171] At $55 million USD for an eight day trip to space, the operation is clearly targeted to the ultrawealthy - the price includes a 15-week Earth-based training programme as well as a "living space" (in space) designed by the famous designer and architect Philippe Starck. Axiom Space is scheduled to receive customers in 2022.[172] Similarly, Orion Space announced plans that it would build, launch and ferry paying customers to an orbital hotel by 2022. Although many critics questioned its announcement because of a lack of details, it demonstrates the interest and desire of private entrepreneurs to create new projects and new applications for space. For just $9.5 million (far cheaper than the $35 million Guy Laliberté paid in 2009 to visit the ISS[173]), Orion Space intends to provide customers with a three-month training regimen, transportation and accommodation aboard a hotel with enough space to accommodate four guests and two crew members.[174]

In the same vein, United Launch Alliance (ULA) publicly announced its decades-long vision to create an "econosphere" (an in-space economy) that would be supported by space resource acquisition, space manufacturing and space habitation, utilising both near-Earth objects (such as asteroids) as well as the Moon.[175] ULA anticipates having 1,000 people living and working in cis-Lunar space by 2050, noting that the entire endeavour would require the efforts of hundreds of companies - ULA simply seeks to be the transportation company that ferries them from Earth to the Moon and anywhere in between.[176] Partnerships with companies such as Orion Space could prove fruitful in demonstrating the potential reality of such dreams, as smaller players begin to develop the individual components of what would be necessary for a full-fledged econosphere.

In terms of more permanent, long-term solutions, there are a number of entities (both public and private) seeking to develop space assets capable of sustainable human habitation. For example

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[171] Sheila Marikar, *The Rich are Planning to Leave this Wretched Planet,* The New York Times, 9 Jun 2018, online: <https://www.nytimes.com/2018/06/09/style/axiom-space-travel.html>.
[172] *Ibid*.
[173] Clara Moskowitz, *Circus Billionaire Says Space Trip Worth Every Penny*, Space.com, 6 Oct 2009, online: <https://www.space.com/7375-circus-billionaire-space-trip-worth-penny.html>.
[174] Alan Boyle, *Orion Space says it'll put space hotel in orbit by 2022, but some details are up in the air*, GeekWire, 5 Apr 2018, online: <https://www.geekwire.com/2018/looking-space-hotel-orion-span-says-itll-put-one-orbit-2022>.
[175] Chris Bergin, *ULA laying the foundations for an Econosphere in CisLunar space*, NASA Spaceflight.com, 22 Mar 2018, online: <https://www.nasaspaceflight.com/2018/03/ula-laying-foundations-econosphere-cislunar-space>.
[176] *Ibid*.

SpaceX seeks to settle Mars with upwards of 1 million people by 2060[177]. As well, certain segments of NASA are working to create safe and plentiful power supplies (such as nuclear fission[178]) to augment the existing use of solar arrays. It is worth noting that off-Earth settlements would increase global and interplanetary trade and economic development, affecting existing markets and livelihoods in unpredictable ways; the simple reality, however, is such that genuine efforts are being made to advance the capability of humans to live relatively comfortably in outer space.

Outer Space Resource Exploitation

The ultimate objective of space resource exploitation is to supplement (or, indeed, replace) humanity's dependency on terrestrial resources; successfully doing so will bring with it significant consequences. Given the quantity of resources available in outer space and the associated potential profits that can be made, private entities have expressed more interest than government agencies in developing the technology necessary to make this space activity a reality in the near future. Aside from mining resources on the Moon or Mars, prospectors also have their eyes set on near-Earth objects (NEOs - specifically, asteroids). It is not uncommon for a single asteroid to hold substantial reserves of precious metals (such as platinum, gold, cobalt, etc.) or water which, at today's prices, place their values in the billions of dollars.[179] Notwithstanding the financial motivation of private entities, national space agencies are testing technologies to determine the feasibility of interacting with NEOs. In 2016, NASA, in cooperation with ESA and CSA, undertook the OSIRIS-REx mission to partly study the asteroid Bennu in hopes of understanding the asteroid's scientific origins as well as attempt to investigate how an asteroid could be captured, redirected and exploited for its natural resources. Although not a direct predecessor of OSIRIS-

[177] Nadia Drake, *Elon Musk: A Million Humans Could Live on Mars by the 2060s*, National Geographic, 27 Sep 2016, online: <https://news.nationalgeographic.com/2016/09/elon-musk-spacex-exploring-mars-planets-space-science/>; Nadia Drake, *Elon Musk: In Seven Years, SpaceX Could Land Humans on Mars*, National Geographic, 29 Sep 2017, online: <https://news.nationalgeographic.com/2017/09/elon-musk-spacex-mars-moon-bfr-rockets-space-science/>.
[178] National Aeronautics and Space Administration, *Demonstration Proves Nuclear Fission System Can Provide Space Exploration Power*, Government of the United States of America, 2 May 2018, online: <https://www.nasa.gov/press-release/demonstration-proves-nuclear-fission-system-can-provide-space-exploration-power>.
[179] Elizabeth Howell, *"Trillion-Dollar Asteroid" Zooms by Earth as Scientists Watch*, Space.com, 28 July 2015, online: <http://www.space.com/30074-trillion-dollar-asteroid-2011-uw158-earth-flyby.html>.

Rex, in 2003, the Japanese Aerospace Exploration Agency (JAXA), in partnership with NASA, launched the Hayabusa spacecraft to an asteroid to recover and return to Earth a surface sample.[180]

Deep Space Industries (DSI), Planetary Resources and Moon Express are three of the better-known private entities working towards the commercial exploitation of the resources of outer space. For many years, these companies were working to establish the necessary capabilities to make space resource extraction possible and profitable. DSI, for example, focussed on developing the propulsion systems necessary to power their spacecraft to the appropriate NEOs in order to extract and harvest resources.[181] Simultaneously, however, DSI was selling this technology to third-parties as a means of maintaining financial health and testing its individual components before utilising them on their own missions. In this way, DSI had stated that it is much more a business geared at making the tools necessary for outer space resource exploitation than a company solely focussed on such exploitation.[182] In 2019 DSI was acquired by Bradford Space and seemingly shifted the company's focus from asteroid mining technologies to propulsion systems.[183]

Planetary Resources, on the other hand, seemed to have taken the more direct approach of investing significant sums early on, based on the lucrativeness of the potential reward, and maintaining a business plan focussed on generating revenues from the actual exploitation of outer space resources. Although it made technological progress in this regard, given the very long-term return on its investments technological setbacks had more pronounced consequences for the company.[184] Similar to DSI, in 2018, the company's human assets were purchased by the blockchain software technology company ConsenSys[185] and it seems the exploitation of space

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[180] Elizabeth Howell, *Hayabusa: Troubled Sample-Return Mission*, Space.com, 31 Mar 2018, online: <https://www.space.com/40156-hayabusa.html>.
[181] Marc Boucher, *As Revenues Increase Deep Space Industries Gears Up for First Asteroid Mission*, SpaceQ Podcast interviewing Grant Bonin, 15 Mar 2018, online: < http://spaceq.ca/as-revenues-increase-deep-space-industries-gears-up-for-first-asteroid-mission/>.
[182] *Ibid*.
[183] Alan Boyle, *Bradford Space Group buys Deep Space Industries, shifting focus from asteroid mining to propulsion*, GeekWire, 2 Jan 2019, online: <https://www.geekwire.com/2019/bradford-buys-deep-space-industries-shifting-focus-asteroid-mining-green-propulsion/>.
[184] Jeff Foust, *Planetary Resources revising plans after funding setback*, Space News, 12 Mar 2018, online: <http://spacenews.com/planetary-resources-revising-plans-after-funding-setback/>.
[185] Alan Boyle, *Why in the universe is a blockchain company buying the assets of a formerly high-flying asteroid miner?*, GeekWire, 31 Oct 2018, online: <https://www.geekwire.com/2018/consensys-blockchain-studio-acquires-planetary-resources-asteroid-mining-venture/>.

resources is no longer a part of the company's strategy[186]. Nevertheless, the allure of space mining and the significant rewards for successful commercial operators ensure that this space activity will remain a lucrative draw to the commercial space industry. In Canada, for example, Natural Resources Canada established in its 2019 Canadian Mines and Minerals Plan that space mining ought to be explored as a new frontier for development by Canada's existing terrestrial commercial mining companies.[187]

Although the space-mining bubble seems to have burst[188], other companies are working, in smaller steps, towards the same goals with specific players working to develop individual components that can be used in space mining rather full-fledged systems. For example, Deltion Innovations is a Canadian company based out of Sudbury, Ontario with a goal of making Canada a leader in space mining.[189] Indeed, the notion of mining for resources in outer space is not limited to commercial aspirations. The Colorado School of Mines, the world's top ranked university for mining studies[190], has developed the world's first degree-program in space resources with hopes of graduating students specialising in outer space resources utilisation.[191] The school anticipates a new, burgeoning space mining industry on the horizon and is preparing for the numerous opportunities it will bring. These are but two examples of how space activities can have important spin-off effects.

Solar Power Satellites

As the global demand for energy grows, the search for alternative energy sources has correspondingly increased. Since the 1970s, theoretical proposals have suggested placing satellites in orbit around the Earth with the principal function of collecting the sun's energy and transmitting

[186] ConsenSys seems to have used Planetary Resources' space-based expertise to develop a blockchain technology-driven application that uses amateur observers to track satellites. Alan Boyle, *Switching from asteroid mining to blockchain: ConsenSys Space unveils TruSat satellite tracker*, 21 Oct 2019, online: <https://www.geekwire.com/2019/morphing-planetary-resources-consensys-space-unveils-trusat-satellite-tracker/>.
[187] Natural Resources Canada, *The Canadian Minerals and Metals Plan*, Government of Canada, 2019 at pp 31-32.
[188] Atossa Araxia Abrahamian, *How the asteroid-mining bubble burst*, MIT Technology Review, 26 Jun 2019, online: <https://www.technologyreview.com/s/613758/asteroid-mining-bubble-burst-history/>.
[189] Marc Boucher, *Deltion Innovations Wants Canada to be a Leader in Space Mining*, SpaceQ interviewing Dale Boucher, 22 Mar 2018, online: <http://spaceq.ca/deltion-innovations-wants-canada-to-be-a-leader-in-space-mining>.
[190] QS Top Universities, *QS World University Rankings by Subject 2016 - Engineering - Mineral & Mining*, QS Limited, accessed 13 Apr 2019, online: <https://www.topuniversities.com/university-rankings/university-subject-rankings/2016/engineering-mining>.
[191] Dan Boyce, *Space Mining - Learning How To Fuel an Interplanetary Gas Station*, National Public Radio, 25 Sep 2018, online: <https://www.npr.org/2018/09/25/648917308/space-mining-learning-how-to-fuel-an-interplanetary-gas-station>.

it down to Earth via microwave frequencies, which would be picked up by large antenna fields (known as rectennae) and distributed through regular power grids. Though the idea of a solar power satellite system was first conceived by Peter Glazer in 1968,[192] it is now attracting the attention of military establishments[193] as well as private entities, particularly in the U.S. and Japan.[194] Although there are no clear front-runners in the public or private arenas regarding the development and implementation of such technology, Canada's geography may prove beneficial for establishing rectennae fields - given the potential health risks associated with receiving concentrated radio frequencies from space, Canada can leverage its large, unpopulated territory to establish receiving stations without fear of harming its citizens.[195]

On-Orbit Servicing

Although there are a number of planned smallsat constellations with expected satellite lifespans of five years or less, there remains a need for larger, more powerful satellites developed with the intention of operating for a decade or more. In fact, most GEO satellites are designed to last for ten years or more, with many in operation already having surpassed their expected retirement dates. Unfortunately, it is common that despite a satellite functioning appropriately, it runs out of propellant for station keeping or a single component deteriorates, significantly limiting the satellite's capabilities or forcing the termination of the mission. Proposals for on-orbit servicing (OOS) suggest solutions to such issues by using dedicated spacecraft capable of rendezvousing with operational-but-distressed satellites and providing station keeping services such as adding a new component, relocating a satellite, correcting an orbit or inclination, refuelling a satellite, etc. Aside from the environmental sustainability of outer space, there are economic reasons to pursue such technological development as well: for example, if an otherwise-functioning satellite that generated $10 million in annual revenue were to run out of propellant, and it were possible to refuel the satellite for $5 million to add an additional three years of operability, the $5 million investment would return $30 million in revenue, far less than the likely

[192] Peter Glaser, *The Future of Power from the Sun*, Intersociety Energy Conversion Engineering Conference (IECEC), IEEE publication 68C-21 - Energy, 1968, pp. 98-103.
[193] National Security Space Office, *Space-Based Solar Power As an Opportunity for Strategic Security: Phase 0, Architecture Feasibility Structure Study*, Interim Assessment, Government of the United States of America (10 Oct 2007).
[194] John Mankins, "The Case for Space Solar Power" (Virginia: Edition Publishing, 2014).
[195] Ram Jakhu et al, *Legal Aspects of Solar Power Satellites*, in Leslie Tennen & Patricia Sterns, eds, |Private Law, Public Law, Metalaw and Public Policy in Space", (Cham: Springer, 2016).

$100 million dollars it would cost to replace the satellite in its entirety. Offering such services to the established space community would create an entirely new space market.

Indeed, a number of private companies have proposed undertaking on-orbit servicing activities.[196] A UK-based company, Effective Space, seeks to send its spacecrafts (named SPACE DRONE) to rendezvous with two existing communication satellites (owned by a major satellite operator) to significantly extend their life.[197] Similarly, Orbital ATK has announced a new version of its "life extension vehicle" (namely, the mission extension pod) that could be attached to a satellite in GEO that has run out of fuel and provide it with station keeping services for up to five years - essentially, extending the life of an otherwise-functioning satellite for another half-decade.[198] In 2011, seemingly years ahead of the trend, MDA had contracted to provide similar services to Intelsat, but the deal was abandoned when other governmental and commercial operators did not commit to using the proposed technology.[199] Since then, MDA has been modifying its technology and may soon bring to market "robotic kits for on-orbit servicing" that could be sold to companies wanting to develop their own OOS operations.[200] Space Systems Laurel, a subsidiary of Maxar (the former parent company of MDA) is also developing an OOS system meant to refuel the US Landsat-7 Earth-observation satellite, extending its life and operational capability.[201]

In February 2020, SpaceLogistics[202], a subsidiary of Northrop Grumman, successfully demonstrated its Mission Extension Vehicle when it docked with Intelsat's existing IS-901 satellite to provide the propulsion and attitude correction manoeuvers necessary to extend the satellite's life; the manoeuvre marked the first time two satellites docked together in orbit.[203]

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[196] Sven Eenmaa, *Investment Perspectives: Conferring on On-Orbit Satellite Servicing*, ISS US National Laboratory, The Center for the Advancement of Science in Space, 15 Nov 2018, online: <https://www.issnationallab.org/blog/investment-perspectives-conferring-on-on-orbit-satellite-servicing/>.
[197] Effective Space, *Pioneering Last Mile Logistics in Space*, Effective Space, accessed on 12 Mar 2018, online: <https://www.effective.space/>.
[198] Jeff Foust, *Orbital ATK unveils new version of satellite servicing vehicle*, Space News, 14 Mar 2018, online: <http://spacenews.com/orbital-atk-unveils-new-version-of-satellite-servicing-vehicle/>.
[199] *Ibid*.
[200] Marc Boucher, MDA Marketing New Robotic Kits for On-Orbit Servicing, SpaceQ, 19 Apr 2018, online: <http://spaceq.ca/mda-marketing-new-robotic-kits-for-on-orbit-servicing>.
[201] Debra Werner, *Orbital ATK, SSL and others are gearing up to make house calls to ailing satellites*, Space News, 11 Jun 2018, online: <https://spacenews.com/orbital-atk-ssl-and-others-are-gearing-up-to-make-house-calls-to-ailing-satellites>.
[202] Northrop Grumman, *What is Space Logistics?*, Northrop Grumman, accessed 24 Feb 2020, online: <https://www.northropgrumman.com/space/space-logistics-services/>.
[203] Elizabeth Howell, *Two private satellites just docked in space in historic first for orbital servicing*, Space.com, 27 Feb 2020, online: <https://www.space.com/private-satellites-docking-success-northrop-grumman-mev-1.html>

Notwithstanding the significant potential benefits of such technologies, there are concerns related to their "dual-use" nature: if a servicing module has the technological capability to rendezvous and dock with another satellite, it most likely also has the capability to collide with or otherwise neutralise a target satellite. As a result, the secure control of, and encrypted communications with, such on-orbit servicing technologies are of paramount concern to States.

Debris Remediation

Variations of on-orbit servicing have also been proposed as a potential means by which to address the growing issue of space debris by using dedicated satellites to remediate unsalvageable space objects.[204] Although efforts are underway to decrease the creation of new debris through mitigation guidelines and standards, there remains a significant existing debris population that must be removed to ensure the continued sustainability of the outer space environment. Indeed, since even the most advanced and aggressive debris mitigation rules cannot stop the creation of all debris (and, in fact, are not 100% effective), debris remediation will remain an important and necessary space activity.

As a means of debris remediation, a European Space Agency (ESA) mission, led by the University of Surrey's Surrey Space Center and in partnership with ten private entities[205], designed and sent to the ISS its RemoveDEBRIS satellite which was launched from the Japanese ISS module in 2018.[206] The RemoveDEBRIS system is designed to test four different de-orbiting technologies, including a net system (which was successfully demonstrated)[207], a harpoon system, a laser guidance system and a sail system. Depending on the results of this mission, ESA plans to

[204] International Launch Services, *International Launch Services and Effective Space Announce the ILS Proton Breeze M Launch of Two Satellite-Servicing SPACE DRONE Spacecraft in 2020*, SpaceRef, 12 Mar 2018, online: <http://www.spaceref.com/news/viewpr.html?pid=52335>.
[205] Surrey Space Center, *RemoveDebris: Mission Overview*, University of Surrey, accessed 24 Feb 2020, online: <https://www.surrey.ac.uk/surrey-space-centre/missions/removedebris>.
[206] Tony Reichhardt, *SpaceX Cargo Ship Will Carry First Test of Space Debris Cleanup*, Air & Space Smithsonian, 30 Mar 2018, online: <https://www.airspacemag.com/daily-planet/first-test-space-debris-cleanup-about-get-under-way-180968631/>.
[207] Jake Parks, *Two Defunct Satellites Barely Miss Each Other Above Earth*, Discover, 29 Jan 2020, online: <https://www.discovermagazine.com/the-sciences/two-defunct-satellites-now-have-a-5-percent-chance-of-colliding-tonight>.

develop a much larger debris remediation system in hopes of deorbiting the 8,000+ kg Envisat Earth-observation satellite that has been defunct and in an uncontrollable LEO orbit since 2012.[208]

Astroscale is a private Japanese debris remediation company, based out of Singapore and the UK and founded in 2013, seeking to demonstrate its deorbiting capabilities in late 2020.[209] The proposed spacecraft, ELSA-d, will actively rendezvous with debris in space and magnetically engage the debris before deorbiting it. Astroscale's first satellite, the IDEA-OSG 1, was meant to measure sub-millimeter size debris in space for better identification and tracking; unfortunately, as a result of a launch vehicle failure, the satellite never reached its orbit.[210] Astroscale was awarded a USD $4.5 million grant from the Tokyo government's Innovation Tokyo Project to develop a road-map for the commercialisation of active debris removal as well as selection by JAXA that it remediate the spent upper stage of a Japanese rocket; Astroscale has until 2023 to demonstrate its inspection capabilities and, if successful, until 2026 to remove the debris.[211] Similarly, ESA has signed a contract with the Swiss company ClearSpace to deorbit a significant piece of a Vega rocket that has been in orbit since 2013.[212]

Cooperation Efforts

Although the origins of space activities were fueled by the tensions of the Cold War, quickly there emerged realisations related to the need and opportunities for cooperation in this new domain. The oldest and most influential body of cooperation related to space activities is the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS), established in 1959 to "govern the exploration and use of space for the benefit of all humanity: for peace, security and development."[213] UN COPUOS operates on a consensus model and has been the forum

[208] Tony Reichhardt, *SpaceX Cargo Ship Will Carry First Test of Space Debris Cleanup*, Air & Space Smithsonian, 30 Mar 2018, online: <https://www.airspacemag.com/daily-planet/first-test-space-debris-cleanup-about-get-under-way-180968631/>.
[209] Astroscale, *Astroscale - Creating a solution for orbital sustainability*, Astroscale, accessed 10 Apr 2019, online: <https://astroscale.com/>; Caleb Henry, *Astroscale wins first half of JAXA debris-removal mission*, Space News, 12 Feb 2020, online: <https://spacenews.com/astroscale-wins-first-half-of-jaxa-debris-removal-mission/> [*Henry 2*].
[210] Astroscale, *IDEA OSG 1*, Astroscale, accessed 10 Apr 2019, online: <https://astroscale.com/missions/idea-osg/>; Deyana Goh, *Astroscale & Spire satellites among those lost in Soyuz launch failure*, Space Tech Asia, 29 Nov 2017, online: <http://www.spacetechasia.com/satellites-aboard-soyuz-2-1b-including-idea-osg-1-fail-to-reach-the-target-orbit/>.
[211] *Henry 2*, *supra* note 201.
[212] Caleb Henry, *Swiss startup ClearSpace wins ESA contract to deorbit Vega rocket debris*, Space News, 9 Dec 2019, online: <https://spacenews.com/swiss-startup-clearspace-wins-esa-contract-to-deorbit-vega-rocket-debris/>.
[213] Office for Outer Space Affairs, *Committee on the Peaceful Uses of Outer Space*, United Nations, online: <https://www.unoosa.org/oosa/en/ourwork/copuos/index.html>.

through which the various space law treaties were negotiated and adopted by most space faring States. It continues to play a leading role in the development of standards, norms, guidelines and other forms of agreement related to space activities. In addition to UN COPUOS, there also exist international groups more focused on a single topic, such as the Inter-Agency Space Debris Coordination Committee, the International Asteroid Warning Network and the Space Mission Planning Advisory Group.

Space Exploration

There is a long history of States working together in space, evidenced not only by the ISS - which has highlighted the great potential awaiting international cooperation on significant space endeavours and which the partners have agreed to maintain until at least 2024[214] - but also by the creation of the International Space Exploration Coordination Group (ISECG)[215] in 2006 and the International Space Exploration Forum (ISEF)[216] in 2014. Soon after the conclusion of the ISEF-2[217], hosted in March 2018 by Japan and targeted at promoting international collaboration in space exploration by bringing together Ministers and other high-ranking government officials, the Japanese Space Exploration Agency (JAXA) and European Space Agency (ESA) released a joint press release indicating their continued commitment to working together on the Global Exploration Roadmap (a working document of the ISECG). Similarly, following ISEF-2, Roscosmos and the China National Space Administration reiterated their commitment to continue working together until 2022.[218]

The announcements made after ISEF-2 are emblematic of the manner in which space-based cooperation is increasing as national space agencies continue to realise the benefits of working

[214] President Obama extended funding for the ISS through to 2024, but President Trump is considering not renewing the US' financial contributions past 2024 in favour of privatisation. Loren Grush, *Trump administration wants to end NASA funding for the International Space Station by 2025*, The Verge, 24 Jan 2018, online: <https://www.theverge.com/2018/1/24/16930154/nasa-international-space-station-president-trump-budget-request-2025>. It remains unclear whether the US can privatise its contributions to the ISS. Nicole Mortillaro, *Why selling off the International Space Station would be a tricky mission for the U.S.*, CBC News, 4 Mar 2018, online: <http://www.cbc.ca/news/technology/international-space-station-commercialized-1.4543351>.

[215] International Space Exploration Coordination Group, *About ISEGC*, International Space Exploration Coordination Group, accessed 8 Dec 2016, online: <http://www.globalspaceexploration.org/wordpress/?page_id=50>

[216] Department of State, *International Space Exploration Forum*, Government of the United States of America, accessed 8 Dec 2016, online: <http://www.state.gov/e/oes/sat/isef2014/>

[217] International Space Exploration Forum-2, *Home*, International Space Exploration Forum-2, accessed on 10 Mar 2018, online: <http://www.isef2.jp/>

[218] Marcia Smith, *Today's Tidbits: March 4, 2018*, SpacePolicyOnline, 4 Mar 2018, online: <https://spacepolicyonline.com/news/todays-tidbits-march-4-2018>.

together. Indeed, they are demonstrative of a pattern rather than exceptions to the rule. For example, Canada has long been a "cooperating State" with ESA[219], a relationship that allows the CSA to contribute to non-mandatory ESA missions; the United Arab Emirates has signed a number of cooperating agreements and memoranda of understanding with various nations to help propel its space activities[220]; and France and India released a "Joint Vision for Space Cooperation" between their respective space agencies (France's CNES and India's ISRO).[221] Considering the real-world politics surrounding international relations, the fact that States with a long history of differences, such as the US and Russia, continue to work together in space (not only aboard the ISS but also by not placing sanctions on space-related Russian activities[222]) demonstrates the uniqueness of outer space activities and the desire for States to work together in this newest frontier.[223]

Europe is leading the way in overall cooperation amongst its member States through the ESA, pooling resources, talent and missions to further its pan-European objectives. Since its creation in 1975, the ESA has developed launch capabilities, an astronaut corps, multiple scientific missions, a series of state-of-the-art remote sensing spacecraft, a global navigation and positioning satellite program (both of the latter two under European Union funding) and various partnerships with other national space agencies.[224] Moving forward, the current Director General of ESA, Johann-Dietrich Wörner, sees even more opportunity for cooperation amongst ESA's member States (22 thus far), especially as more spacefaring nations demonstrate their capabilities and increasing numbers of private space entities come online.[225] ESA's continued partnership as a continent-wide space agency allows it to tackle projects of greater importance and greater

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[219] Canadian Space Agency, *Cooperation Agreement between Canada and the European Space Agency (ESA)*, Government of Canada, 11 Sep 2017, online: <http://www.asc-csa.gc.ca/eng/programs/esa/default.asp>.
[220] Trade Arabia, *UAE Space Agency South Australia sign cooperation deal*, Trade Arabia: Business News Information, 17 Feb 2018, online: <http://www.tradearabia.com/news/IND_336840.html>.
[221] *Goh*, *supra* note 101.
[222] Chris Brown, *Canadian astronaut set to head to International Space Station in December*, Canadian Broadcasting Corporation, 18 Aug 2018, online: <https://www.cbc.ca/news/technology/bad-feelings-between-canada-and-russia-don-t-matter-in-space-says-astronaut-david-saint-jacques-1.4789053>.
[223] Indeed, the statements made by the representatives of States negotiating Resolution 1874 and later the *Outer Space Treaty* demonstrate that all parties involved, from developed to developing, space faring to non-space faring, wanted the new environment of outer space to reflect an international cooperation that was often ignored or side-stepped on Earth. Erik Valters, *Perspectives in the Emerging Law of Satellite Communication*, (1970) 5 Stanford J Int'l Stud 53 at p 58.
[224] Elizabeth Howell, *European Space Agency: Facts & Information*, Space.com, 24 May 2016, online: <https://www.space.com/22562-european-space-agency.html>.
[225] Johann-Dietrich Worner, *A United Europe in Space*, The Parliament Magazine, 24 Jan 2019, online: <https://www.theparliamentmagazine.eu/articles/opinion/united-europe-space>.

complexity than any single member State alone. Indeed, Wörner's statement that "[c]ompetition is a driver, cooperation is an enabler"[226] is extremely apt given ESA's long-term success in various space projects internally as well as with allies.

Lunar and Near-Lunar Development

In a potentially significant initiative, fifteen national space agencies (including the CSA) have agreed to work together on the Lunar Orbital Platform-Gateway[227], an initiative that will use the lunar environment as a launchpad for deeper missions into space.[228] Although the initial stages of the LOP-G will be an orbiting station around the Moon (smaller than the ISS)[229], the gateway will be used as a location from which to access the Lunar surface as well as undertake long-duration missions that will require significant fuel, cargo, etc. by using the Moon's orbit as a storage depot.[230] Coincidentally, Director General Wörner has long expressed his vision of creating a multinational Moon Village[231], whereby States work together to establish a base on the Moon from which to conduct experiments, expand human knowledge and act as a refueling station for deeper missions.[232] If the LOP-G comes to fruition, it may be the first step in leading to an eventual Moon Village.

Along similar lines, the various space agencies currently participating in the ISS (CSA, NASA, ESA, JAXA and Roscosmos) released in 2018 a draft of their "interoperability standards" that would promote the compatibility of space systems designed by different operators (which

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[226] *Ibid*.

[227] President Trump's budgeting proposal for establishing a cislunar orbiting platform changed the name of the "Deep Space Gateway" to "Lunar Orbital Platform - Gateway". Philip Sloss, *Cislunar station gets thumbs up, new name in President's budget request*, NASA Spaceflight.com, 16 Mar 2018, online: <https://www.nasaspaceflight.com/2018/03/cislunar-station-new-name-presidents-budget/>.

[228] Bronwyn Beairsto, *Canada's Early Deep Space Gateway Plans*, SpaceQ, 21 Nov 2017, online: <http://spaceq.ca/canadas-early-deep-space-gateway-plans/>.

[229] Canada is expected to contribute a medical facility which would both allow CSA astronauts to visit the space platform and provide priceless experience in performing distance-based medicine, expertise that can be used in treating Canada's northern rural communities. Ivan Semeniuk, *Lost in space: Why Canada's diminishing role in the heavens is a problem*, The Globe and Mail, 13 Mar 2018, online: <https://www.theglobeandmail.com/canada/article-lost-in-space-why-canadas-diminishing-role-in-the-heavens-is-a/> [*Semeniuk*].

[230] Kathryn Hambleton, *Deep Space Gateway to Open Opportunities for Distant Destinations*, NASA, 6 Aug 2017, online: <https://www.nasa.gov/feature/deep-space-gateway-to-open-opportunities-for-distant-destinations>.

[231] European Space Agency, *Moon Village*, YouTube, 22 Mar 2016, online: <https://www.youtube.com/watch?v=amYK5voqLSk>.

[232] Richard Hollingham, *Should we build a village on the Moon?*, BBC: Future, 13 July 2015, online: <http://www.bbc.com/future/story/20150712-should-we-build-a-village-on-the-moon>.

could be used, for example, in the LOP-G or Moon Village).[233] Aside from publicly publishing their draft standards, they are actively seeking input from commercial operators who may one day be in a position to partner with space agencies in developing certain component parts.[234] This demonstrates the desire of national space agencies to work together and, more importantly, their desire to work with commercial operators. By releasing their draft and demonstrating a willingness to receive comments from industry, the national agencies are signalling their recognition of the vital role commercial space operators will play moving forward. The public release also seeks input from other nations not currently involved in developing these standards, which means it is possible States such as China, India, South Korea, Australia, the Ukraine or the United Arab Emirates may participate in further refining the interoperability of future space systems.[235]

Natural Disaster Response

The International Charter: Space and Major Disasters is an agreement between 17 members and several partners to provide Earth observation data to users in times of disaster.[236] Its services are rendered gratuitously by members and partners to organisations or entities requesting such information in times of crises and the data provides valuable information about a disaster that is not possible to obtain from the ground. Recognising the unique utility of satellite based systems in disaster zones, there have been propositions to create a UN Crisis Connectivity Charter that would discuss the role of private space operators in assisting local authorities deal with disasters - to date, several satellite operators have signed on.[237] Indeed, certain satellite operators are working with local and national governments to provide equipment that can be used in the event of natural disasters. In fact, Iridium saw a very significant spike in the usage of its telecommunication satellites from within Puerto Rico after Hurricane Maria made landfall and Eutelsat says that it has

[233] Marc Boucher, *International Space Station Members Release Draft Deep Space Exploration Standards*, SpaceQ, 6 Mar 2018, online: <http://spaceq.ca/international-space-station-members-release-draft-deep-space-exploration-standards> [*Boucher 2*].
[234] UNOOSA's recently released guidelines on how, as an organ of the United Nations, it can better work together with private actors in space represents a similar recognition. Office for Outer Space Affairs, *UNOOSA Partners with Industry and the Private Sector*, United Nations, accessed 12 Mar 2018, online: <http://www.unoosa.org/oosa/en/informationfor/industryandprivatesector/index.html>.
[235] *Boucher 2*, *supra* note 233.
[236] International Charter Space and Major Disasters, *About the Charter*, International Charter Space and Major Disasters, accessed 18 Mar 2020, online: <https://disasterscharter.org/web/guest/about-the-charter>.
[237] Caleb Henry, *7 Satellite Operators Sign UN'S Crisis Communications Charter*, Via Satellite, 15 Oct 2015, online: <https://www.satellitetoday.com/government-military/2015/10/15/7-satellite-operators-sign-uns-crisis-communications-charter/>.

developed small satellite ground terminals that can be installed in an hour to improve uploading information from within disaster zones.[238] The UN Crisis Connectivity Charter will encourage private satellite communications companies to work with the UN and non-governmental organisations during times of normalcy to explain how to use emergency satellite equipment when disaster strikes. At this point, there are discussions to store the equipment in Panama, the United Arab Emirates and Italy.[239]

Cooperation to Promote the Development of Space in Developing States

It is not only the most developed States that are seeing a surge (or resurgence) in space activities. In Africa, for example, there is great competition (and potential collaboration through the African Union's proposed African Space Agency, to be headquartered in Cairo[240]) to establish respected space programs. Angola, for example, launched the Angosat-1 aboard a Russian Zenit 3F rocket in December 2017 but, shortly after making contact, the Russian manufacturer lost communication with the satellite.[241] Nevertheless, Angosat-2 (with the same capabilities as its predecessor) is under construction with a launch date in 2020. Nearby, Ghana, Morocco and Algeria have all stepped up their efforts: Ghana launched Ghanasat-1 on a SpaceX Falcon 9 rocket, Morocco launched Mohammed-6A on an Arianespace Vega rocket and Algeria launched Alcomsat-1 on a Chinese Long March-3B rocket.[242] Therefore, over the span of a few months in late 2017, four different States within the African continent launched their respective satellites utilising four different launch providers from four different countries - clearly a sign of significant space development and diversification of partnerships.[243] Separately, Senegal agreed with CNES and the ArianeGroup to collaborate on the creation of a small satellite cluster within the country, promoting the development of local talent.[244] Further, Rwanda recently invested an undisclosed

[238] Debra Werner, *Satellite communications industry prepares response to future disasters*, Space News, 14 Mar 2018, online: <http://spacenews.com/satellite-communications-industry-prepares-response-to-future-disasters>.
[239] *Ibid*.
[240] Ministry of Foreign Affairs, *Egypt successfully wins bid to host African Space Agency*, Arab Republic of Egypt, 7 Feb 2019, online: <https://www.mfa.gov.eg/English/MediaCenter/News/Pages/BNJHGFD.aspx>.
[241] Jaroslaw Adamowski, *Angola eyes new satellite as African space race accelerates*, Space News, 12 Jun 2018, online: <https://spacenews.com/angola-eyes-new-satellite-as-african-space-race-accelerates>.
[242] *Ibid*.
[243] *Ibid*.
[244] Joseph Ibeh, *Senegal to Manufacture Small Satellites and Grow a Newspace Industry Cluster*, Space in Africa, 8 Mar 2019, online: < https://africanews.space/senegal-manufacture-small-satellites-grow-a-newspace-industry-cluster/>.

sum in a $1.25 billion USD funding round for OneWeb, potentially signifying a realisation of the interconnectedness between space and development.[245] In December 2019, Ethiopia launched its first remote sensing satellite (ETRSS-1) aboard a Chinese Long March-4B rocket, 75% of the cost of which was funded by China (including the cost of the satellite, the launch and the ground station).[246] The two States have agreed to construct a communications satellite that would provide commercial telecommunications and broadcasting services and Ethiopia signed an agreement with the French ArianeGroup to build a satellite manufacturing and testing facility in the country. Ethiopia's ETRSS-1 marks the 41st African satellite to be launched into space and the 11th African nation to have launched a satellite.[247]

Obstacles to International Cooperation

In December 2017, President Trump unveiled Space Policy Directive - 1[248] (a follow-up to President Obama's June 2010 directive) in which President Trump outlined the use of private and international partners to help the US expand across the solar system as well as placing a renewed focus on the Moon prior to sending humans to Mars (and skipping out on a human mission to an asteroid).[249] Although this shift of destination from one celestial body to another may seem inconsequential, it has had important consequences for NASA[250] and its international partners as well as commercial contractors and subcontractors: those that had been preparing for missions to asteroids or Mars during Obama's tenure now have to focus on the Moon (just as Obama's decision to visit Mars was a change in course from President Bush's desire to revisit the Moon).[251] President

[245] Space in Africa, *OneWeb raised $1.25 billion from Rwandan Govt and others; to mass-produce high-speed internet satellites*, Space in Africa, 18 Mar 2019, online: <https://africanews.space/oneweb-raises-1-25-billion-from-rwandan-govt-and-others-to-mass-produce-high-speed-internet-satellites/>.
[246] Joseph Ibeh, *Ethiopia Launches First Satellite Named ETRSS-1 From China*, Space in Africa, 21 Dec 2019, online: <https://africanews.space/ethiopia-launches-first-satellite-named-etrss-1-from-china>.
[247] *Ibid*.
[248] The White House, *Presidential Memorandum on Reinvigorating America's Human Space Exploration Program*, Government of the United States of America, 11 Dec 2017, online: <https://www.whitehouse.gov/presidential-actions/presidential-memorandum-reinvigorating-americas-human-space-exploration-program/>.
[249] Casey Dreir, *What changed with space directive #1?*, The Planetary Society, 30 Dec 2017, online: <http://www.planetary.org/blogs/casey-dreier/2017/1228-what-changed-in-space-directive-1.html> [*Drier*].
[250] Jen Rae Wang, *New Space Policy Directive Calls for Human Expansion Across Solar System*, NASA, 11 Dec 2017, online: <https://www.nasa.gov/press-release/new-space-policy-directive-calls-for-human-expansion-across-solar-system>.
[251] *Drier*, *supra* note 249.

Trump recently commented on the benefits of commercial space operators providing services as varied as launch capabilities or management of the ISS.[252]

Notwithstanding the international movement towards greater cooperation between nations and between public and private entities, and notwithstanding the literal language of Space Policy Directive - 1, the world's most significant player in space is feared to be moving away from a cooperative orientation towards one of isolationism and nationalism.[253] Along with putting "America first" (for example, the tariffs imposed on steel and aluminum caused serious consternation in the satellite manufacturing industry because of the increased development costs as well as the potential decrease in foreign entities willing to include American companies in international partnerships[254]), President Trump's National Space Strategy emphasises the objective of ensuring America and American operators conduct themselves in such a fashion in the space domain so as to ensure they retain their leading status.[255] In the space domain, the ability for such rhetoric to undermine cooperation cannot be overemphasised and viewing the development of space capabilities as zero-sum (in which one State's capabilities can only improve as another's decline) is counterproductive and false.

Future Canadian Space Activities

The continued growth and development of space and its associated activities, both globally and within Canada, will impact many Canadian interests. The manner in which Canada proceeds into the future will have consequences with respect to Canada's reputation as a space power, the continued development of the commercial space sector and the overall social influence and permeation of the zeitgeist of space activities.

[252] Jeff Foust, *Trump praises commercial space at Cabinet meeting*, SpaceNews, 9 Mar 2018, online: <http://spacenews.com/trump-praises-commercial-space-at-cabinet-meeting/>.
[253] Status Report, *President Donald J. Trump is Unveiling an America First National Space Strategy*, SpaceRef, 23 Mar 2018, online: <http://spaceref.com/news/viewsr.html?pid=51266>.
[254] Sandra Erwin, *U.S. satellite manufacturers to discuss impact of Trump's metal tariffs*, Space News, 10 Mar 2018, online: <http://spacenews.com/u-s-satellite-manufacturers-to-discuss-impact-of-trumps-metal-tariffs/>.
[255] The White House, *President Donald J. Trump is Unveiling an America First National Space Strategy*, Government of the United States of America, 23 Mar 2018, online: <https://www.whitehouse.gov/briefings-statements/president-donald-j-trump-unveiling-america-first-national-space-strategy/>.

Economic Focus and Policy Development

As with most new technological developments, space cannot continue to develop without the appropriate funding, vision and persistence of the government. After years of the CSA underspending its already reduced (when adjusted for inflation) budget[256], the Canadian space community was looking to the newly-elected 2015 Liberal government to follow the international trend of increasing support for the public and private development of space activities. Indeed, many industry representatives and groups were cautiously optimistic[257] of the future of Canada's space program given the then recently-elected government's various signs (for example, the Prime Minister repeatedly spoke about the benefits of science and space and appointed a former Canadian astronaut to be the next Governor General[258] in addition to the CSA launching a viral astronaut recruitment campaign[259]) that it had an interest in, and would prioritise, space. Visionaries continued to design new space technologies and applications with the hope that the government would provide the financial and legal infrastructure to support such growth. Unfortunately, the government did not make any significant announcements related to supporting the long-term growth of the space sector. The government's failure to explicitly allocate more funds to develop space - for example, by increasing the funding of the CSA, creating financial incentives to promote investment in private space companies, committing to purchasing from commercial entities rather than creating public systems, etc. - undermined the hopefulness of the Canadian space community.

Nevertheless, during this period, at least superficially, Canada seemed to be actively engaged in the space domain as evidenced by its upcoming and eventful 2018 and 2019. In August 2018, the NASA led and CSA supported OSIRIS-Rex spacecraft was planned to rendezvous with the asteroid Bennu in hopes of returning samples back to Earth.[260] Later on in 2018, MDA was to

[256] Marc Boucher, *The Canadian Space Agency has Underspent Its Budget for the Last 17 Years*, SpaceQ, 14 Feb 2018, online: <https://spaceq.ca/the-canadian-space-agency-has-underspent-its-budget-for-the-last-17-years/>.
[257] The Canadian Press, *Canadian space program scientists hoping for lift off in federal budget*, National Observer, 25 Feb 2018, online: <https://www.nationalobserver.com/2018/02/25/news/canadian-space-program-scientists-hoping-lift-federal-budget>.
[258] Governor General, *Governor General Julie Payette Biography*, Government of Canada, 23 Nov 2017, online: <https://www.gg.ca/document.aspx?id=16943>.
[259] The Canadian Press, *Canada's 2 newest astronauts named during Parliament Hill festivities*, Canadian Broadcasting Corporation, 1 Jul 2017, online: <http://www.cbc.ca/news/technology/two-new-canadian-astronauts-announced-canada-day-1.4187535>.
[260] Stephen Clark, *Asteroid missions on track to reach their destinations in 2018*, Spaceflight Now, 18 Jan 2018, online: <https://spaceflightnow.com/2018/01/18/asteroid-missions-on-track-to-reach-their-destinations-in-2018/>; Elizabeth Howell, *Asteroid Bennu: Target of Sample Return Mission*, Space.com, 12 Mar 2018, online: <https://www.space.com/39958-asteroid-bennu.html>.

launch the RADARSAT constellation aboard a SpaceX Falcon 9.[261] In November 2018, Canadian astronaut David St. Jacques was to fly aboard a Soyuz spacecraft to begin his six month mission aboard the ISS.[262] And finally, in 2019, the James Webb Space Telescope, another NASA led and CSA supported mission, was expected to launch into space.[263] While these upcoming milestones (many of which either slipped or were delayed) suggested a healthy Canadian space program, they were misleading: each of these projects was decades long in their preparation and, with the exception of the 2019-announced Lunar Gateway project, there were no new future missions or major collaborations currently planned.[264] To a certain extent the former Conservative government's reduction of the CSA's budget over its ten years in power was not a significant surprise and understandably limited Canada's ability to engage in new space projects[265]; however, given the Liberal government's expressed interest in supporting Canadian innovation, its overall underwhelming support of the Canadian space program was a surprise.

Historically, the biggest surprise of 2017/2018 was the lack of a long-term and specific space strategy. Without a vision or plan by the federal government in the form of well-planned and concrete steps to revitalise Canada's opportunities and activities in space, there was no anticipated way forward. Space science in particular requires detailed pathways with significant public funding so as to develop cutting-edge technologies that result in spin-off capabilities useful for commercialisation.[266] Indeed, many have called on the government to improve its policies and programs related to space[267], some have argued for a governmental recognition that space is necessary for future development[268], while others have expressed the need for a new national space

[261] *Semeniuk*, *supra* note 229.
[262] Canadian Space Agency, *Canadian Astronaut David St. Jacques' Mission*, Government of Canada, accessed 19 Mar 2018, online: <http://www.asc-csa.gc.ca/eng/missions/expedition58-59/default.asp>.
[263] Eric Berger, *James Webb Telescope sun shield snags, further launch delays likely*, Ars Technica, 28 Feb 2018, online: <https://arstechnica.com/science/2018/02/analysis-finds-james-webb-space-telescope-launch-likely-to-slip-again/>.
[264] *Semeniuk*, *supra* note 229.
[265] *Ibid*.
[266] *Ibid*.
[267] David Emerson, *Reaching Higher: Canada's Interest and Future in SPACE*, Volume 2, November 2012, at p 1, online: <http://aerospacereview.ca/eic/site/060.nsf/vwapj/Space-e-online.pdf/$file/Space-e-online.pdf>.
[268] "Those space sector players nimble enough to meet the aggressive schedules of these new explorers will reap substantial rewards. Companies and countries that do not will find themselves increasingly pushed to the margins. Survival requires innovation, focus and a long term vision. At the federal government level, Canada's long term vision has long since expired." Aerospace Industries Association of Canada, *The Future of Canada's Space Sector: An Engine of Innovation for Over Fifty Years*, Sep 2016, online: <http://aiac.ca/wp-content/uploads/2016/11/AIAC-Space-Submission-Sept-2016.pdf> at p 13.

strategy (rather than another high-level, aspirational space policy[269]) that has been lacking since 1974 (the last time the federal government produced a space strategy)[270]. By all accounts, it seemed in 2017 that the government was also interested in producing such a strategy, as the Minister of Innovation, Science and Economic Development's (ISED) office routinely stated it recognised the importance of space and was working on a clear approach forward for Canada in space.[271]

Unfortunately, the lack of progress in defining a new national space strategy by the government was viewed quite disconcertingly by Canada's space industry.[272] Originally announced in November 2016 by Industry, Science and Economic Development (ISED) that it would be undertaking consultations with the wider Canadian space community and that it would release a new space strategy in June 2017, that initial deadline was pushed back to fall 2017 given that the Space Advisory Board (SAB) was only formulated in April 2017.[273] After significant consultations, the SAB published its report in August 2017, documenting the views of stakeholders in how Canada could best frame a new national space strategy to benefit all Canadians.[274] The SAB produced six key recommendations for the government to implement: designate space as a national strategic asset; adopt new policies and regulations to capitalise on technological advances; conduct outreach activities to inspire Canadians; strengthen Canada's world-class space capabilities; maintain continuity in policies and funding; and work diligently to achieve these goals.[275] Throughout the fall of 2017, the space industry patiently waited for an announcement regarding a new space strategy that would incorporate the SAB's findings.[276] Such an announcement never materialised. Indeed, a panel of nine previous and current astronauts publicly

[269] Canadian Space Agency, *Canada's Space Policy Framework: Launching the Next Generation*, Government of Canada, 2014, online: <http://www.asc-csa.gc.ca/pdf/eng/publications/space-policy/canadas-space-policy-framework.pdf>.
[270] Graham Gibbs, *Rationale and Framework for a Canadian National Space Policy*, SpaceQ, 7 Sep 2017, online: <http://spaceq.ca/rationale-and-framework-for-a-canadian-national-space-policy/>.
[271] Marc Boucher, *New Canadian Space Strategy Delayed*, Space Q, 21 Jun 2017, online: <http://spaceq.ca/new-canadian-space-strategy-delayed/> [*Boucher 3*].
[272] Marc Boucher, *New Canadian Space Strategy Not Ready - Exclusive*, SpaceQ, 19 Mar 2018, online: <http://spaceq.ca/new-canadian-space-strategy-not-ready> [*Boucher 4*].
[273] *Boucher 3*, *supra* note 271.
[274] Space Advisory Board, *Consultations on Canada's future in space: What we heard*, Industry, Science and Economic Development Canada, Government of Canada, Aug 2017, online: <https://www.ic.gc.ca/eic/site/082.nsf/eng/03996.html>.
[275] Space Advisory Board, *Executive Summary*, Space Advisory Board, Aug 2017, online: <https://www.ic.gc.ca/eic/site/ad-ad.nsf/vwapj/SAB_Report_eng.pdf/$file/SAB_Report_eng.pdf>.
[276] Marc Boucher, *Who will champion the Canadian Space Program?*, SpaceQ, 26 Feb 2018, online: <http://spaceq.ca/who-will-champion-the-canadian-space-program>.

discussed the future of Canadian space (among other things) and all agreed that Canada must prioritise space to regain its standing as a nation committed to space excellence, understanding particularly the importance of commercialisation.[277]

Failing the release of an explicit new space strategy, the Canadian space community looked to the release of *Budget 2018*[278] in hopes of discovering financial allocations that would frame Canada's long-term objectives in space. Again, the Canadian space community was disappointed.[279] Aside from allocating historical levels of funding for research across all disciplines, emphasising the government's commitment to information, knowledge and science and an $11.5 million commitment to pursue regulatory reform in areas related to innovation and business development[280], *Budget 2018* failed to make any direct mention of space.[281]

Reactions from the space community were harsh, with many calling out a government that seemingly utilised the positive public relations value of space without contributing any financial support. In particular, the Chair of the SAB publicly stated that the new budget failed to recognise space as either a "national space asset" or dedicate explicit funds for space research and development.[282] The Aerospace Industries Association of Canada (AIAC) stated it was "very disappointed that the budget did not contain any long-term plan for Canada's future in space" and that countries around the world "are investing in their space programs and industries, making sure that they're ready to take advantage of all of the social and economic opportunities that space generates" whereas Canada was losing its position as a global leader in space.[283] The Canadian Space Commerce Association (CSCA) stated it was "disappointed that the Budget did not reflect

[277] Elizabeth Howell, *Space Strategy Needed to Set Canada's Goals, Astronauts Say*, SpaceQ, 24 Sep 2018, online: <http://www.spaceq.ca/space-strategy-needed-to-set-canadas-goals-astronauts-say>.
[278] Department of Finance, *Equality+Growth: A Strong Middle Class*, Government of Canada, 27 Feb 2018, online: <https://www.budget.gc.ca/2018/docs/plan/budget-2018-en.pdf> [*Budget 2018*].
[279] Robert Thirsk, *Thirsk: Why Canada Mustn't step back from space exploration*, The Ottawa Citizen, 19 Nov 2018, online: <https://ottawacitizen.com/opinion/columnists/thirsk-why-canada-mustnt-step-back-from-space-exploration>.
[280] *Budget 2018*, *supra* note 278 at p 118. While the language used in the budget does not specifically mention space, it does reference a need for targeted reviews of regulations that deal with emerging technologies. Given that almost all aspects of space are considered a part of emerging fields, Canada's space related regulations could fall within this ambit. Indeed, the 2017 independent review of the Canadian *Remote Sensing Space Systems Act*, undertaken by McGill University's Institute of Air and Space Law, made exactly this suggestion. *Jakhu & Kerkonian*, *supra* note 102.
[281] Kate Howells, *What does the 2018 Canadian federal budget mean for space?*, Planetary Society, 5 Mar 2018, online: <http://www.planetary.org/blogs/guest-blogs/2018/20180305-canadian-fed-budget-space.html>.
[282] Marc Boucher, *The Space Advisory Board Emails Stakeholders That It Was "Very Disappointed with Budget 2018"*, SpaceQ, 7 Mar 2018, online: <http://spaceq.ca/the-space-advisory-boards-emails-stakeholders-that-it-was-very-disappointed-with-budget-2018/>.
[283] *Boucher 4*, *supra* note 272.

the urgent need to develop a vision for Canada's long term space strategy" but remained hopeful: "While Budget 2018-2019 did not include what we expected, particularly after one year of collaborative active feedback and 10 years of deficient government space spending, we remain confident that a Strategy is forthcoming."[284] The Canadian Space Society (CSS) stated: "like many space advocates, [we] are disappointed with the lack of specific commitments to space in the most recent federal budget proposal."[285] Nevertheless, the CSS was determined to address these specific commitments and announced it would be forming a "Space Policy Committee" to conduct outreach and publish an annual position paper.[286]

From the private company's perspective, both MDA and Telesat welcomed the government's commitment to support LEO satellite constellations for rural telecommunications purposes but were also looking forward to an announcement regarding the necessary multi-billion dollar investments that would put Canada on the proper long-term trajectory.[287] The President of MDA highlighted the importance of commercial space by reiterating that "the economic benefits to Canada from the Canadian Space industry are measured in the billions of dollars, and thousands of high technology jobs, while the sector contributes strong socially responsible outcomes for Canada" in various domains. Similarly, the President of Telesat stated:

> With further investment and a long-term plan, the space sector can continue to play a vital role in the Canadian economy, spurring innovation, creating STEM jobs and contributing to economic growth. As such, we encourage the government to pursue and publish a long-term, funded national space policy for Canada as it recently did for the defence sector. This will ensure that this important sector can remain globally competitive, viable and relevant for the foreseeable future.[288]

Some smaller businesses confessed that the current budget did not directly impact their current business plans but considered the potential consequences of not having a clear direction for the future.[289]

Notwithstanding the first four years of the Liberal government's listless approach to space, in March 2019, the federal government published its new space strategy. The focus of the *2019 Strategy* was: to ensure Canada would remain a leading spacefaring nation; to inspire the next generation of Canadians; to utilise space to solve everyday challenges for Canadians; to harness

[284] *Ibid*.
[285] *Ibid*.
[286] *Ibid*. The Canadian Space Society never published such a paper.
[287] *Ibid*.
[288] *Ibid*.
[289] *Ibid*.

Canada's commercial space sector to grow the economy; and to use space-based data to ensure excellence in science, innovation and economic growth.[290] Although criticised for its lack of details and use of recycled and generic objectives[291], the strategy was well received by some[292], especially considering the significant commitment to invest more than $2 billion dollars into space related projects[293], a significant component of which will be dedicated to the LOP-G project. Although any attention to the space program can be considered positive and the new space strategy is a step in the right direction[294], it will take some time before its real-world effects to be known and understood. At the very least, some proponents argue that the government should acknowledge space assets are critical Canadian infrastructure rather than the current perspective that such tools are merely helpful and not necessary.[295]

Technological Growth

Technological advancement and innovation, in Canada or elsewhere, has a way of moving forward, regardless of lacklustre budgets or lacking long-term visions. Although financial guarantees do offer stimulus to the industry, entrepreneurs are constantly innovating on new and existing technologies, developing new methods of solving old problems or applying established technologies to new challenges. In Canada, for example, even though there is no publicly-backed financial funding for developing launch technologies or establishing a "space port", a number of Canadian entities are nevertheless actively pursuing opportunities in these fields. Maritime Launch Services is likely the most prominent in the public discourse, mainly because it seeks to bring indigenous launch capability to Canada by developing a spaceport in Canso, Nova Scotia. It has undergone various rounds of consultations with local, provincial and national parties,

[290] Canadian Space Agency, *Exploration, Imagination, Innovation: A New Space Strategy for Canada*, Government of Canada, 6 Mar 2019, online: <http://www.asc-csa.gc.ca/pdf/eng/publications/space-strategy-for-canada.pdf> [*2019 Strategy*].
[291] For a more detailed analysis of the *2019 Strategy* and its similarity to previous national space policy documents, *see* Chapter 4, *Canadian Space Policy*. For a discussion on the lack of details regarding the potential regulatory reforms discussed in the space strategy, *see* Aram Kerkonian, *Opinion: Finally, a New Canadian Space Strategy - But Wait, What Do We Do With This?*, SpaceQ, 25 Mar 2019, online: <http://spaceq.ca/opinion-finally-a-new-canadian-space-strategy-but-wait-what-do-we-do-with-this/>.
[292] Lucy Stojak, *Space Advisory Board Communications - March 2019*, Space Advisory Board, 29 March 2019, online: <http://www.ic.gc.ca/eic/site/082.nsf/eng/04016.html> [*Stojak*].
[293] Marc Boucher, *What Does the New Canadian Space Strategy Really Mean?*, SpaceQ, 7 Mar 2019, online: <http://spaceq.ca/what-does-the-new-canadian-space-strategy-really-mean/>.
[294] *Stojak*, *supra* note 292.
[295] James Careless, *2019: A Big Year for Canada's Space Industry*, Canadian Defence Review, 21 Jan 2020, online: <http://www.canadiandefencereview.com/Featured_content?blog/150>.

conducted environmental impact assessments as well as appearing before national budgetary committees making the case for space, generally, and launch capabilities, specifically.[296]

Although Maritime Launch Services is currently planning on using Ukrainian rocket components to launch their first orbital payloads to space[297], there is no reason they cannot switch to Canadian component providers in the long term. Indeed, Reaction Dynamics[298], Space Horizon[299] and C6 Launch[300] are three Canadian companies in the development stage of building orbital rockets. Other, non-traditional launch providers include Loonify Space[301], which intends to use large balloons to lift ultra-light rockets high into the stratosphere and then utilise the rocket to deliver smallsat payloads to their orbital destinations; there is no reason the Maritime Launch Services spaceport cannot accommodate such a novel approach to launch.

In addition to some of the better known private Canadian space operators mentioned above (namely, MDA, Telesat, UrtheCast, exactEarth, GHGSat and Kepler Communications), there are a number of other private actors attempting to operate satellite constellations as well. These include NorthStar[302] (a combination of Earth observation and space situational awareness), CB2.0 Communications[303] (a seeming space-to-Earth and space-to-space Internet connectivity provider), Helios Wire[304] (an Internet of Things provider leveraging blockchain technology), Wyvern[305] (Earth observation) and Aireon[306] (a space-based ADS-B system provider). With this many

[296] Marc Boucher, *Maritime Launch Services Takes its Vision to the Finance Committee in Person*, SpaceQ, 17 Oct 2018, online: <http://spaceq.ca/maritime-launch-services-takes-it-vision-to-the-finance-committee-in-person/>.
[297] Maritime Launch Services, *About MLS*, Maritime Launch Services, accessed 1 May 2019, online: <https://www.maritimelaunch.com/about-mls>.
[298] Reaction Dynamics, *Home Page*, Reaction Dynamics, accessed 1 May 2019, online: <https://www.reactiondynamics.space/>.
[299] Space Horizon, *Launch Vehicle 1*, Space Horizon, accessed 1 May 2019, online: <https://www.spacehorizon.ca>. Space Horizon is currently structured as a launch services company, liaising between launch providers and satellite operators. Nevertheless, Space Horizon's ultimate goal is to build and launch its own rockets and it is using its current position as a launch services company to develop relationships and build out a network that it can leverage in the future once its rockets are online. Marc Boucher, *Space Horizon Announces Small Satellite Launch Services Portfolio*, SpaceQ, 22 Jan 2019, online: <http://spaceq.ca/spacehorizon-announces-small-satellite-launch-services-portfolio>.
[300] C6 Launch, *Delivering the World to the Perfect Space*, C6 Launch, accessed 24 Feb 2020, online: <https://www.c6launch.ca/>.
[301] Loonify, *Home Page*, Loonify, accessed 1 May 2019, online: <https://www.loonify.space/>.
[302] NorthStar, *More About NorthStar*, NorthStar: About Us, accessed 10 Apr 2019, online: <https://www.northstar-data.com/>.
[303] CB2.0 Communications (Clarke Belt), *Internet for Everyone, Everything, Everywhere*, CB2.0 Communications, accessed 10 Apr 2019, online: <http://www.cb2sat.com/>.
[304] Helios Wire, *Democratizing IOT & Blockchain*, Helios Wire, accessed 10 Apr 2019, online: <https://helioswire.com/technology/>.
[305] Wyvern, *About*, Wyvern, accessed 10 Apr 2019, online: <https://helioswire.com/technology/>.
[306] Aireon, *Space Based ADS-B: Making Global Air Traffic Surveillance a Powerful Reality*, Aireon, accessed 10 Apr 2019, online: <https://aireon.com/>.

entrepreneurial Canadian space companies beginning to make their presence known, in an environment that has not gone out of its way to promote or provide financial or regulatory incentive to operate in space, one can argue that nurturing a talented pool of entrepreneurs would only yield more fruitful opportunities for Canadians.

Social Impact

The uniqueness that space offers is the capability to capture the imagination of youth and young-hearted alike. Indeed, during the height of the space race between the US and USSR, the entire world was engrossed in humanity's accomplishments in space. In Canada, although the general public awareness of space activities is low, Canadians are proud of its country's accomplishments.[307] Efforts are underway in the space community to disseminate information related to the benefits of space: the CSA has revamped its efforts in public outreach, especially for children and young adults (a program that was cut during the previous Conservative government), taking advantage of its astronaut recruitment campaign and the willingness of Canada's current and former astronauts to make visits around Canada[308]; Colonel Chris Hadfield single-handedly made space "cool" again and brought it into the mainstream by singing songs and performing experiments to captive audiences on YouTube; and the "Don't Let Go Canada" campaign was organised by a "group of concerned Canadians representing industry, academia and the space enthusiast community" to bring awareness to the general public about the importance and value of Canada's space activities and to urge the government to take appropriate action to protect and propel Canada's space industry in the decades to come[309]. With Canada's continued involvement in the ISS and its upcoming participation in the LOP-G mission, there will not be a shortage of high-profile opportunities for Canadians to re-engage with the world of space.

[307] Marc Boucher, *Canadians Largely Ignorant of Impact of Space Program But Proud of Accomplishments Says IPSOS Poll*, SpaceQ, 18 Sep 2018, online: <http://spaceq.ca/canadians-largely-ignorant-of-impact-of-space-program-but-proud-of-accomplishments-says-ipsos-poll/>.
[308] Canadian Space Agency, *Inspiring resources for young people*, Government of Canada, 2 Nov 2018, online: <http://www.asc-csa.gc.ca/eng/resources-young/default.asp>.
[309] Don't Let Go Canada, *Frequently Asked Questions*, Don't Let Go Canada, accessed 1 May 2019, online: <https://dontletgocanada.ca/faq>.

Regulatory Reform

Many of the concerns regarding the current legal framework applicable to space - separate and apart from a lack of a long-term space policy, space strategy or space vision -, are legitimate and will be explored more deeply in the remainder of this project, specifically in Chapter 4. Nevertheless, it is important to state, in a cursory sense, that although space activities have developed quickly over the last decade, especially in the commercial sector, Canada's most recent piece of legislation addressing space was in 2007. Given the various technological developments since then and the emerging new activities on the cusp of feasibility, Canada is in dire need of a proactive and progressive regulatory framework applicable to space. Indeed, this project seeks to provide the foundation for the development of such a modern regulatory framework.

Conclusion

Space is undergoing a transformation of epic proportions. Not only are priorities in space being transferred from public space agencies to private entities, but for years now the financial revenues generated by the space industry have been dominated by shareholders rather than taxpayers. This transition is only going to continue, globally and in Canada. Although national space agencies will continue to engage in cooperative intergovernmental projects, commercial operators will take advantage of the various new technologies and emerging space applications to change the very way humanity engages with its environments. To keep pace with such development, States will have to rethink their current legislative frameworks and modernise their methods of regulation - indeed, in Canada this ought to be a significant priority.

Chapter 3: International Regulation of Space Activities

Purpose and Outline

The purpose of this chapter is to provide a background to existing international space regulation in the form of its hard law and soft law instruments; doing so will demonstrate the various international obligations placed on States and discuss the various mechanisms by which specific issues are addressed internationally. The chapter begins with an exhortation of the five international space law treaties (beginning with the Outer Space Treaty and concluding with the Moon Agreement) as well as an examination of the International Telecommunication Union's and International Space Station's foundational instruments. The chapter then examines a select number of international soft law instruments (including principles, declarations and guidelines) related to space before offering insights into the future of international space regulation.

Current International Space Law

All human activities in outer space are governed by international space law[1], a subset of general international law. General international law is comprised of the laws that govern relationships between States, either formally through hard law (treaties, custom and certain general principles of law)[2] or informally by soft law (declarations, resolutions, guidelines, etc.). States are the only subjects of international law and are therefore the only entities that can create international law. States are bound only to laws to which they have consented (either explicitly in the case of treaties[3] or implicitly in the case of custom[4]). Failing to follow through on an international legal obligation will result in a State being found to have committed an internationally wrongful act[5] for which a State would then bear international responsibility.[6]

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[1] Ram Jakhu, *Sixty Years of Development of International Space Law*, Proceedings of the Symposium Celebrating the 90th Anniversary of the Cologne Institute of Air and Space Law, 2016 [*Jakhu*] at p 2.
[2] *Statute of the International Court of Justice*, 26 Jun 1945, 33 UNTS 993 at Art 38(1)(a-c).
[3] Treaty obligations are legally binding upon State parties. *Nuclear Tests Case* (Australia v France), 1974 ICJ 253 at p 268.
[4] Although customary international law often develops slowly through established State practice and the belief that such practice is obligatory (*opinio juris*), since universal application is not always necessary it can emerge instantly among involved parties. This nuanced view will play an important role in space law as new technologies/activities quickly develop into common practice among the relatively few spacefaring nations. Bin Cheng, "Studies in International Space Law" (New York: Oxford University Press, 1997) at pp 136-139 [*Cheng*]; Manfred Lachs, *Some Reflections on the State of the Law of Outer Space*, (1981) 9 J of Space L 3 at 8.
[5] International Law Commission, *Articles on Responsibility of States for Internationally Wrongful Acts with commentaries* (2001), United Nations, UN Doc A/56/10 at Art 2.
[6] For a more detailed exploration of the history and current status of international law, *see generally* Chapter 5, *The International Legal Order*.

Although Article III of the *Outer Space Treaty*[7] provides that space activities are to be carried out in accordance with international law, this does not include international law *in toto*.[8] Therefore, international space law is *lex specialis*[9] to general international law: where there is a conflict, international space law governs[10] and where there is a gap, general international law fills in. Both general international law and space law are constantly evolving by means of new or amended treaties, declarations, resolutions and other bilateral and multilateral instruments: for example, global and national politics affect the emergence of custom, economic downturns motivate greater regulation and social perturbations result in diversified human protection measures.

A common intuitive response when contemplating international space law is to seek out potential corollaries with the law of the sea. Although this response is natural and certain analogies can be drawn between the high seas and outer space (for example, their near-unimaginable size, the inability of States to make territorial claims, their legal accessibility to all people, etc.), their distinctions are significant and render futile any non-superficial comparison. Indeed, the single most important characteristic to consider when comparing the laws governing the seas and space is their historical roots. Maritime law is rooted deeply in customary international law, formed over many hundreds of years by generations of sailors and States. Indeed, even though maritime law was eventually crystallised in the United Nations *Convention on the Law of the Sea*[11], it very much reflects principles developed by peoples and States who had long ago stopped sailing the seas. Space law, however, was explicitly created by treaties in an environment largely void of directly-applicable customary principles. As a result, the parties that established the foundations of space law did so with an intentionality that was lacking when the principles of the sea were finally formalised in 1982. Indeed, a defining characteristic of space law (that is neither explicitly nor implicitly present in the law of the sea) is the humanistic belief that the exploration and use of outer space ought to benefit all people.[12] As a result, when contemplating the features of space

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[7] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies*, 27 Jan 1967, 610 UNTS 205 [*Outer Space Treaty*].
[8] Some subjects of international law are environment-specific and therefore do not apply to outer space. Manfred Lachs, "The Law of Outer Space" eds. Tanja Masson-Zwaan & Stephan Hobe (Leden: Nijhoff, 2010), at pp 13-14.
[9] *Jakhu*, *supra* note 1.
[10] There are exceptions: for example, if an international space law conflicts with a *jus cogens* principle it would not override the peremptory norm.
[11] *1982 Convention on the Law of the Sea*, 10 Dec 1982, 1833 UNTS 3.
[12] Erik Valters, *Perspectives in the Emerging Law of Satellite Communication*, (1970) 5 Stanford J of Int'l Studies 53 at p 58.

law or considering the potential contours of this growing domain, it is important to remain cognisant of its unique historical origins and the explicit intentions of its creators.[13]

Outer Space Treaty (1967)

The *Outer Space Treaty* crystalised and codified the provisions of the *1963 Declaration*[14] while also developing and including additional provisions. Article I addresses the exploration and use of outer space and provides that all States, regardless of their economic, social or scientific development are free to engage with the outer space environment. Article II addresses the principle of non-appropriation and provides that neither outer space nor any celestial body may be appropriated by any means. Article III addresses the desire that outer space activities maintain international peace and security and promote international cooperation and provides that all such activities be carried out in accordance with international law. Article IV addresses the peaceful manner in which outer space activities are to be carried out and provides prohibitions on specific kinds of activities that would defeat the peacefulness of outer space. Article V addresses the manner in which astronauts are to be returned to their appropriate States and provides the means by which such "envoys of mankind" are to be assisted in space. Article VI addresses the attribution of responsibility for activities in outer space and provides that a State bears such responsibility for the activities of its non-governmental entities. Article VII addresses liability for damage caused in outer space and provides that the launching State of a space object that causes damage will be liable. Article VIII addresses the registration of space objects once launched into space and provides that States on whose national registry a space object is registered shall retain jurisdiction and control of that space object. Article IX addresses the manner in which simultaneous space operations carried out by different States can proceed and provides that States must pay due regard to the interests of other States and enter into consultations with them to avoid harmful interference. Articles X through XVII address various cooperative, logistical and administrative matters related to operating in space.

[13] Nandasiri Jasentuliyana, "International Space Law and the United Nations" (The Hague: Kluwer Law International, 1999) at p 174. For a more general discussion on the motivations of the negotiating parties, see Aram Kerkonian, "The Legal Aspects of Permanent Human Settlement on Celestial Bodies", Master of Laws Thesis (Montreal: McGill University Libraries, 2018) at pp 31-32.

[14] General Assembly, *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, United Nations, Res 1962 (XIIX), 13 Dec 1963, UN Doc A/RES/18/1962.

As a whole, the *Outer Space Treaty* provides a legal framework through which States can conduct space operations while ensuring the international community's underlying objectives remain satisfied. By outlining that all States retain equal access to space regardless of their past, current or future abilities, by preventing some States from monopolising space and/or its resources, by ensuring space remains non-militaristic, by attributing responsibility and liability for both public and private space activities by way of a predictable formula and by incentivising jurisdiction and control over space objects through registration, the *Outer Space Treaty* manages to encapsulate all of the ideals associated with space operations in a legally binding treaty that every space-faring State has ratified.[15] For the past 53 years, the *Outer Space Treaty* has managed to ensure the peaceful, appropriate and sustainable use of outer space.

As the use of outer space continues to develop and as new technologies and activities that could not have been predicted by the drafters of the *Outer Space Treaty* blossom, there will be disagreement in what is permitted and what is prohibited. Indeed, there are already significant differences in opinion regarding the regulation of certain space activities and differing camps rely on alternative interpretations of the *Outer Space Treaty* to justify their position. As contemporary jurists apply a fifty-year old treaty to modern activities, it is important to remember the utility of revisiting the publicly-stated intentions of the State parties when negotiating, drafting and ultimately ratifying the *Outer Space Treaty*. Under international law, the intentions and objectives behind the language chosen by the drafters can play an important role in determining how a text ought to be interpreted and applied. Specifically, in situations where a strict application of the literal text leads "to a result that is manifestly absurd or unreasonable"[16], "[r]ecourse may be had to supplementary means of interpretation, including the preparatory work of the treaty and the circumstances of its conclusion."[17] Therefore, when discussing notions of whether Article II of the *Outer Space Treaty* prohibits space resource exploitation or whether Article VI truly applies to private entities, contextualising the *Outer Space Treaty* would satisfy the dual purpose of articulating the treaty's underlying principles and providing a useful background upon which to analyse its individual provisions.

[15] Currently, 109 of the 193 member States of the United Nations have ratified the *Outer Space Treaty*.
[16] *Vienna Convention on the Law of Treaties,* 23 May 1969, 1155 UNTS 311 at Art 32(b).
[17] *Ibid*.

Rescue and Return Agreement (1968)

Following on the heels of the *Outer Space Treaty*, the *Rescue Agreement*[18] sought to establish the legal regime applicable to the rescue and return of astronauts and space objects. The motivating force behind this treaty was the desire of the two major space powers of the time (the US and USSR) to prevent each other from acquiring their space technology in the event of an inadvertent landing in each other's territory. Given that these treaties were negotiated at the height of the Cold War (with fears related to surveillance, subterfuge and spying running high), the *Rescue Agreement* was meant to temper such concerns and provide comfort to both parties with the knowledge that neither space objects nor astronauts would be used as bargaining chips in potential diplomatic rifts.

With a mere six operative articles, the *Rescue Agreement* is concise. Generally, it provides a framework by establishing legal obligations to promote cooperation amongst contracting parties in the search, rescue and return of personnel of a spacecraft and space objects. Effectively, any contracting party that discovers or is made aware of personnel of a spacecraft in distress - whether in their territory or on the high seas - is to act expeditiously in rescuing and returning that individual back to the appropriate launching authority.[19] Importantly, the *Rescue Agreement* only refers to "astronauts" in its title and its preamble, opting instead to use the phrase "personnel of spacecraft" throughout the remainder of the document[20]; it neither defines "personnel of a spacecraft" nor "astronaut" and does not expand on the concept of "envoys of mankind" as expressed in the *Outer Space Treaty*.[21]

Since there are no clear definitions regarding the types of people who may go into space, it is difficult to determine who would be afforded the rather sweeping protections offered by the *Rescue Agreement*. Given the current era of commercialisation, the characterisation and classification of individuals going to space will prove crucial to ensuring legal obligations are met. Some commercial operators may choose to classify their patrons as "spaceflight participants", just as NASA currently does for non-astronauts (with the term astronaut usually reserved for highly-trained individuals with mission critical responsibilities), creating a potential gap in international

[18] *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched Into Outer Space*, 22 Apr 1968, 672 UNTS 119 [*Rescue Agreement*].
[19] Francis Lyall & Paul Larsen, "Space Law: A Treatise" (Surrey: Ashgate, 2009) at 140-141.
[20] Bin Cheng, "Studies in International Space Law" (Oxford Scholarship Online, 2012) at p 457.
[21] Francis Lyall, *Who is an astronaut? The inadequacy of current international law*, (2010) 66 Acta Astronautica 2.

coverage for a likely large group of travellers to space.[22] Without clear rules, it is unclear what incentives Virgin Galactic, for example, may have to characterise its patrons as "spaceflight participants" rather than "personnel of a spacecraft" and equally unclear what responsibilities other States would have if it decides to utilise the former moniker.

Liability Convention (1972)

The *Liability Convention*[23] expands on Article VII of the *Outer Space Treaty* by outlining the two forms of liability that may be attributable to a State given any damage caused by its space objects. Unlike in the *Outer Space Treaty*, the *Liability Convention* defines damage as a "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organisations".[24] Article I of the *Liability Convention* goes on to define a launching State as a State that (1) launches or (2) procures the launch of a space object or a State from whose (3) territory or (4) facility a space object is launched. This definition of launching State is especially important given that liability attaches not to the State of registry or to an appropriate State but rather the launching State. In association with Article V, which provides that more than one launching State can be jointly and severally liable, the *Liability Convention* demonstrates that all launching States (and only launching States) face liability for damage caused by a space object.

In circumstances where a State's space object causes damage on the surface of the Earth or to an aircraft in flight, Article II provides that the standard is absolute liability - that is, the fault requirement is automatically assumed to have been proven. The only manner in which a State may escape liability under Article II is if the injured party's damage resulted from its own (or a natural or juridical person it represents) gross negligence. In such circumstances, the State whose space object caused damage would be exonerated and not be held liable. For damage caused anywhere other than the surface of the Earth or to an aircraft in flight (namely, outer space), a State is liable for damage on the basis of fault. Although the *lex specialis Liability Convention* does not define "fault", general international law sets the general fault standard as one of reasonable

[22] *Ibid*.
[23] *Convention on International Liability for Damage Caused by Space Objects*, 29 Mar 1972, 961 UNTS 187 [*Liability Convention*].
[24] *Ibid* at Art I(a).

foreseeability.[25] Article XII provides that awards for damage "shall be determined in accordance with international law and the principles of justice and equity". The remainder of the *Liability Convention* addresses the administrative parameters in which a State may make a claim for damages and the manner in which a dispute would be settled. Although a Claims Commission (as envisioned by Article XVI) has never been formed, Canada did invoke the *Liability Convention* after the Soviet Union's Kosmos 954 satellite disintegrated upon re-entry, spreading radioactive debris over northern Canada in 1977; the USSR settled the claim for $3 million CAD.[26]

Registration Convention (1975)

The *Registration Convention*[27] quite clearly expands on Article VIII of the *Outer Space Treaty* but also furthers the *Outer Space Treaty*'s objectives of the peaceful use of outer space and international cooperation. It achieves the latter by ensuring that all space objects launched into space are registered in a public database so as to promote the dissemination of knowledge related to what kinds of space activities are being undertaken, in hopes of increasing transparency related to space operations[28] and avoiding potential misinterpretations related to the purpose or use of a satellite.

Article I of the *Registration Convention* defines a State of registry as "a launching State on whose registry a space object is carried". Therefore, a State of registry must also be a launching State (but not all launching States can be States of registry). Article II requires a launching State to register its launched space object in its national register and Article III (in association with Article IV) requires the Secretary General of the UN to maintain its own register of all space objects, once the launching State provides the necessary information. In instances where damage is caused to a State's space object by another space object, the injured State may use the registry databases to identify the State of registry of the space object that caused damage. If a State is unable to identify the State of registry of the space object that caused damage, it may enlist, as per

[25] *Corfu Channel Case* (United Kingdom v Albania), 1949 ICJ 4; *Gabčikovo-Nagymaros Projects Case* (Hungary v Slovakia), 1997 ICJ 7.
[26] Bryan Schwartz & Mark Berlin, *After the Fall: An Analysis of Canadian Legal Claims for Damage Caused by Cosmos 954*, (1982) 27 McGill L J 676 at 677.
[27] *Convention on Registration of Objects Launched into Outer Space*, 15 Sep 1976, 1023 UNTS 15 [*Registration Convention*].
[28] Ram Jakhu, et al, *Critical Issues Related to Registration of Space Objects and Transparency of Space Activities*, (2018) 143 Acta Astronautica 406 at pp 408-409 [*Jakhu et al*].

Article VI, the assistance of States with "space monitoring and tracking facilities" to provide it with information that may lead to such identification.

A recent study concluded that the increasing number of launches, especially in terms of military-related satellites, have not been registered in the appropriate registries in a timely fashion.[29] With the growing commercialisation of outer space and a seeming favouritism towards smallsat constellations, the need for registration will only increase. Of course, the rights and responsibilities of launching States and States of registry outlined in the RC apply to States regardless of the fact that the satellites are launched and operated by private companies - it will therefore become increasingly important for States to ensure their private entities comply with the requirements set out in the RC (as well as any subsequent resolutions[30] or declarations that have since potentially evolved into customary international law[31]).

Moon Agreement (1979)

The *Moon Agreement*[32] is the most recent of the five "space treaties" and the result of extensive negotiation by all UNCOPUOS member States; unlike its four predecessors, the *Moon Agreement* has not been widely ratified[33] and, as a result, its efficacy in regulating the outer space activities with which it is concerned has been questioned. Indeed, on a strictly legal basis, the *Moon Agreement* only governs the activities of the 18 States that have ratified it, since its principles have not developed into rules of customary international law. Nevertheless, some of the provisions in the *Moon Agreement* are representative of existing custom and some expand upon principles widely accepted in the other treaties.

The *Moon Agreement* concerns itself specifically with human activities on the Moon and other celestial bodies (Mars, asteroids, etc.). It seeks to establish a legal framework that directly addresses what kinds of activities are allowed on celestial bodies and how such activities are to be carried out. Like the other space treaties, the *Moon Agreement* desires to prevent international

[29] *Ibid* at 406.
[30] For example, General Assembly, *International co-operation in the peaceful uses of outer space*, United Nations, Res 1721 B (XVI), 1961, UN Doc A/RES/1721(XVI)B.
[31] *Jakhu et al*, *supra* note 28 at p 419.
[32] *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 5 Dec 1979, 1363 UNTS 21 [*Moon Agreement*].
[33] As of 1 January 2018, the *Moon Agreement* had a total of 18 ratifications and 4 signatures (compared with the 109 and 23, respectively, of the *Outer Space Treaty*). Committee on the Peaceful Uses of Outer Space, *Status of International Agreements relating to activities in outer space as at 1 January 2018*, Office for Outer Space Affairs, United Nations, 9 Apr 2018, UN Doc A/AC.105/C.2/2018/CRP.3 at p 10.

conflict[34] and promote international cooperation[35]. As a document, it is forward looking insofar as it addresses future human activities before they become possible - for example, it envisages the creation of manned and unmanned stations on celestial bodies[36] and the exploitation of the naturally occurring resources of such celestial bodies[37]. Regarding this later activity, the *Moon Agreement* is clear that its provisions are not conclusive on the issue but rather are to act as a guide in cementing the appropriate framework through which space resource exploitation may be regulated. It advocates for the creation of an international regime that would allow for the "orderly and safe development", the "rational management" and the "expansion of opportunities for use" of space resources. It further outlined the main purpose of the international regime to ensure the equitable sharing of the benefits derived from space resource exploitation, with particular emphasis to be placed on the needs of developing States.

With the relatively recent interest in space mining, and the seeming desire to ignore the wisdom of creating a regime (as offered by the *Moon Agreement*), the question of how space mining will progress remains open. Those with the near-term capability of conducting space mining operations devalue the need for international regulatory oversight (whatever that may look like), claiming such a framework would be overly burdensome and dissuade investment and technological advancement. Others, however, fear that an unregulated rush to space mining by those who can afford it (namely, developed countries and their well-funded private companies) would simply increase the global divide between haves and have-nots, which would be the opposite of what the *Moon Agreement* called for and intended.[38] A compromise will prove necessary in the near future.

Other Hard Law Instruments

Other than the traditional space law treaties, there are a number of other binding agreements related to space. The most significant are the ITU Convention and the ISS Agreement, but also include bilateral and multilateral agreements related to trade, defence, intellectual property, etc. As with all international agreements, such treaties are binding on State parties and an error of

[34] *Moon Agreement*, *supra* note 32 at Art 3.
[35] *Ibid* at Art 4.
[36] *Ibid* at Art 9.
[37] *Ibid* at Art 11.
[38] Dennis O'Brien, *Why it's a bad idea to weaken the Moon Treaty*, The Space Review, 5 Mar 2018, online: <http://www.thespacereview.com/article/3444/1>.

commission or omission results in a State being responsible for an internationally wrongful act. International agreements related directly to space law are unlikely in the future given the difficulty of reaching consensus in a highly politicised climate, especially considering the most recent space treaty, the *Moon Agreement*, still only has ratifications from a minority of spacefaring nations.

International Telecommunication Union Convention (1932)

The International Telecommunication Union (ITU) is the oldest specialised agency of the UN, established in 1865. It's major role is to convene international conferences in order to adopt international regulations that govern satellite orbits and radio frequencies and develop technical standards that ensure the interconnectivity of different radiocommunications networks.[39] The ITU's legal framework is founded on its Constitution and Convention[40], which are regularly amended at its plenipotentiary conferences held every four years. ITU Conferences are attended by nearly every State[41], with representatives of private operators invited to participate in a non-voting capacity. The ITU has been largely successful over its 150-year history in establishing standards for telegraph, radio, broadcast and mobile services and may have an increased role to play as space activities continue to develop into the future.

ISS Agreement (1998)

The legal basis for the ISS is found in the International Space Station Intergovernmental Agreement (IGA), signed on 29 January 1998, by fourteen governments representing five partners: the US, Canada, Russia, Japan and the "European Partner" (which includes 10 ESA member States). The IGA establishes the long-term cooperative framework for operating the ISS, with the US undertaking the lead role and, along with Russia, providing the foundational components of the space station, the European Partner and Japan providing components to significantly enhance

[39] International Telecommunication Union, *Overview of ITU's History*, International Telecommunications Union, accessed 20 Apr 2018, online: <http://search.itu.int/history/HistoryDigitalCollectionDocLibrary/12.28.71.en.pdf>.
[40] International Telecommunication Union, *Collection of the basic texts of the International Telecommunication Union adopted by the Plenipotentiary Conference. Edition 2015*, International Telecommunications Union, March 2015, online: <http://search.itu.int/history/HistoryDigitalCollectionDocLibrary/5.21.61.en.100.pdf>.
[41] As of 1 January 2018, 193 States had ratified the ITU Constitution and Convention. Committee on the Peaceful Uses of Outer Space, *Status of International Agreements relating to activities in outer space as at 1 January 2018*, Office for Outer Space Affairs, United Nations, 9 Apr 2018, A/AC.105/C.2/2018 /CRP.3 at p 10.

the space station and Canada providing an essential component.[42] Notwithstanding these original assignments, the ISS was appreciated as having an evolutionary character, with future improvements and additions being made as necessary. Importantly, Article 5 of the IGA recognises that the State parties who appropriately register their space objects shall retain jurisdiction and control over such objects (in accordance with Articles VIII of the *Outer Space Treaty* and Article II of the Registration Convention) as well as their nationals throughout the ISS.[43] Further, each of the representative space agencies (CSA, JAXA, Roscosmos and ESA) have an individual Memorandum of Understanding with NASA on a bilateral basis that lays out in detail the respective roles and responsibilities of each agency.

It is unclear how long the ISS will remain in operation under its current legal structure. Some individuals in the US, as the single largest financial contributor to the ISS' operations, have publicly discussed the future of Earth's largest scientific laboratory in space. Some argue in favour of privatisation[44] (granting operating rights to private entities in exchange for the upkeep costs) while others argue that it should remain an international, publicly-funded operation[45] (with continued contributions from various member States). In the meantime, China has expressed an opportunity for collaboration with any State willing to join its orbital space station, expected to come online in 2022.

Soft Law

There are a number of "soft law" instruments that address specific aspects of space and its associated activities without having the binding power of a treaty or customary international law. Nevertheless, given the relative ease (when compared to treaties) of creating soft law instruments,

[42] Department of State, *Space Station Agreement Between the United States of America and Other Governments*, Government of the United States of America, 29 Jan 1998, online: <https://www.state.gov/documents/organization/107683.pdf> at p 3.
[43] *Ibid* at p 5,
[44] Marina Koren, *What Should We Do About the International Space Station?*, The Atlantic, 6 Jun 2018, online: <https://www.theatlantic.com/science/archive/2018/06/trump-nasa-international-space-station-bridenstine/562076/>; Loren Grush, *Trump's plan to privatize the ISS by 2025 probably won't work, NASA Inspector General says*, The Verge, 16 May 2018, online: <https://www.theverge.com/2018/5/16/17362004/nasa-international-space-station-transition-private-space-industry-2025>.
[45] Doug Messier, *Senators Introduce Measure to Extend ISS from 2024 to 2030*, Parabolic Arc, 1 Mar 2019, online: <http://www.parabolicarc.com/2019/03/01/senators-introduce-measure-extend-iss-2024-2030/>; Stephen Clark, *NASA wrestles with what to do with International Space Station after 2024*, Spaceflight Now, 20 May 2018, online: <https://spaceflightnow.com/2018/05/20/nasa-wrestles-with-what-to-do-with-international-space-station-after-2024/>.

there is a trend towards generating such documents in hopes that States will voluntarily abide by their provisions even though they are not bound to them and a failure to follow them will not result in a violation of international law. The efficacy of such documents in actually bending States to act in a certain manner is up for debate - nevertheless, soft law represents a significant portion of the recent development related to the norms associated with space activities and ought to be appreciation in such a light.

Legal Principles Governing Activities in Outer Space (1963)

Although the *Outer Space Treaty* is commonly considered the first formal outer space law, it encapsulated a number of provisions already in existence. The *1963 Declaration*[46], for example, espoused numerous foundational principles[47] that undoubtedly coloured perceptions of what would and would not be governed in outer space: for example, it provides that the "the exploration and use of outer space… shall be carried out for the benefit and in the interests of all countries" in addition to establishing that outer space is not subject to any form of appropriation nor the sovereign jurisdiction of any State. Although not a treaty, the *1963 Declaration* encapsulated the desire of many States that outer space not fall victim to the same kinds of colonial and imperialist tendencies that befell the New World at the hands of Europeans centuries earlier (from which, many States still suffered). The geopolitical reality was also such that the US and USSR were the only two major spacefaring powers and their ideological differences forced them to compromise on issues related to space: as a result, the underlying principle that emerged from the *1963 Declaration* uncharacteristically conceptualised humanity as a single entity, and its provisions sought to reinforce this new, unitary recognition.

[46] General Assembly, *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space,* United Nations, Res 1962 (XIIX), 13 Dec 1963, UN Doc A/RES/18/1962; Stephan Hobe, *Historical Background*, in Stephan Hobe, et al, eds, "Cologne Commentary on Space Law: Volume I" (Luxembourg: Carl Heymanns Verlag, 2009) [*Hobe et al*] at p 13, para 40. For a discussion on the binding character of resolutions, declarations, treaties, etc. in international law, *see Cheng*, *supra* note 4 at pp 129-136.

[47] "The 1962 resolution, in nine operational paragraphs, contains the fundamental principles of exploration and use of outer space, which would form the basis for the main legally binding provisions of the Outer Space Treaty." *Hobe et al*, *supra* note 46 at p 23, para 10.

Remote Sensing Principles (1986)

The *Remote Sensing Principles*[48] were adopted by the UN General Assembly on 3 December 1986 having been put forth by the UNCOPUOS's Legal Sub-Committee. The motivating force behind the *Remote Sensing Principles* was to promote the international cooperation of space activities, such that an agreement directly addressing the rights and responsibilities of sensing and sensed States would strengthen the international community. In essence, the purpose of the *Remote Sensing Principles* was to bridge the gap between those States possessing remote sensing capabilities and those States that did not. First, there was a requirement that those with remote sensing capabilities would assist the international community by making their systems available in times of natural disaster[49] and sharing any data that may protect the natural environment[50]. Second, there is the right for any sensed State to acquire the data and analysed information gathered by the sensing State from that sensing State on a non-discriminatory and reasonable-cost basis.[51] Additionally, there is an ongoing requirement to take into special consideration the needs of developing States[52] and make available opportunities for participation to States without full scientific, technological or economic capability. Finally, and possibly most importantly, the *Remote Sensing Principles* reaffirmed the sovereignty of States over their territories, people and natural resources, such that remote sensing activities can only be conducted in a manner that respects this legal reality.[53]

Nuclear Power Sources Principles (1992)

The *Nuclear Power Sources Principles*[54] severely restrict the use of nuclear material as power sources for space objects given their hazardous nature. However, since nuclear power sources are well suited for certain specified activities (such as those that require long lasting and compact power sources), they are permitted in certain operations. Specifically, Principle 3(2) provides that nuclear power sources are acceptable in circumstances where a space object will be

[48] General Assembly, *Principles relating to remote sensing of the Earth from outer space*, United Nations, Res 41/65, 3 Dec 1986.
[49] *Ibid* at Prin XI.
[50] *Ibid* at Prin X.
[51] *Ibid* at Prin XII.
[52] *Ibid* at Prins II, IX and XII.
[53] *Ibid* at Prin IV.
[54] General Assembly, *Principles Relevant to the Use of Nuclear Power Sources in Outer Space*, United Nations, Res 47/68, 14 Dec 1992.

undertaking interplanetary missions, placed in a sufficiently high orbit around Earth or in a lower orbit if its retirement will take place in a sufficiently high orbit. The principles go on to further specify what kind of nuclear power sources are acceptable[55], the standards by which to ensure the nuclear power source is appropriately and safely constructed[56] and other guidelines related to the use of nuclear power sources[57]. Given the extremely hazardous consequences of misuse on Earth, there are significant hesitations about the use of nuclear power sources in space and the principles are a means of highlighting a State's responsibility[58] and liability[59] for any issues, reiterating Articles VI and VII of the *Outer Space Treaty*.

Space Benefits Declaration (1996)

The *Space Benefits Declaration*[60] was a long-awaited reaction and clarification[61] to the *Outer Space Treaty*'s Article I language regarding the use and exploration of outer space being "for the benefit and in the interests of all countries." Since Article I of the *Outer Space Treaty* did not make clear to what extent benefits would flow from activities conducted by one State to other States, nor did it specify what kinds of interests ought to be considered when carrying out space activities, there was political and philosophical disagreement as to the extent developed spacefaring States must pass on the benefits to, and act in the interests of, less developed non-spacefaring States. As with most international declarations, the final version does not make any requirements but instead offers provisions that suggest how spacefaring nations can take into consideration the interests of non-spacefaring nations.

At the heart of the Space Benefits Declaration is a clear desire for increased international cooperation in all things related to space, be it participation in the exploration and use of space[62], contributing to the development of incipient space programs[63], entering into partnerships between

[55] *Ibid* at Prin 3(2)(c).
[56] *Ibid* at Prin 3(2)(d-f).
[57] *Ibid* at Prins 4-7.
[58] *Ibid* at Prin 8.
[59] *Ibid* at Prin 9.
[60] General Assembly, *Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries*, United Nations, Res 51/122, 13 Dec 1996 [*Space Benefit Declaration*].
[61] Whether or not the *Space Benefits Declaration* actually clarified Article I's language regarding the "benefits and interests of all countries" is unclear.
[62] *Space Benefits Declaration*, supra note 60 at Prov 2.
[63] *Ibid* at Prov 3.

the national agencies and private companies of differently-developed States[64] or assisting with the allocation of technological or financial resources to help facilitate the exchange of expertise[65]. The extent to which these aspirational provisions have actually increased the benefits of space development and activities to developing countries is unclear; with the growing privatisation and democratisation of space, however, there has never been a more pertinent moment for those with space capabilities to uplift those without (whether through benefit sharing, mentorship or otherwise).

UN Debris Mitigation Guidelines (2007)

The UN *Debris Mitigation Guidelines*[66] were prompted by the Inter-Agency Space Debris Coordination Committee's (IADC) guidelines, themselves initiated in recognition of the potentially disastrous consequences of space debris. The *Debris Mitigation Guidelines* are non-binding recommendations intended to promote best-practices to limit the creation of new space debris by future space operations. Given the voluntary nature of these international guidelines, their efficacy is questionable, especially when considering that each country is responsible - if they so choose - for implementing the guidelines into their own domestic laws. Nevertheless, the *Debris Mitigation Guidelines* are promising if only because they are forward-looking: space debris is a clear hazard (and one that will only get worse with time if remediation efforts are not also implemented) and the international spacefaring community has agreed, in principle, that action will be necessary. The seven guidelines included in the *Debris Mitigation Guidelines* relate to the limitation and minimisation of debris during the normal operation of a space object, avoiding the accidental and intentional collision of space objects and dealing with the length of time an object will remain in orbit prior to de-orbiting in addition to the de-orbiting process itself.

[64] *Ibid* at Prov 4.
[65] *Ibid* at Prov 5.
[66] Committee on the Peaceful Uses of Outer Space, *Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space*, Office for Outer Space Affairs United Nations, 2010, online: <http://orbitaldebris.jsc.nasa.gov/library/Space%20Debris%20Mitigation%20Guidelines_COPUOS.pdf>. The basis for these guidelines were developed by the Inter-Agency Space Debris Coordination Committee (IADC), an intergovernmental forum for the global coordination of activities related to man-made and natural space debris.

UN Long-Term Sustainability Guidelines (2018)

In 2018, after years of discussion and negotiation, the UN COPUOS adopted a set of non-binding principles and norms related to the long-term sustainability of outer space. The *Long-Term Sustainability Guidelines*[67] established 21 general principles related to the policy and regulatory frameworks applicable to space activities (namely, the creation and maintenance of national space laws, the supervision of space activities, the appropriate use of radio frequency spectrum and the registration space objects), the safety of space operations (namely, the sharing of information related to space objects, debris and space weather), the promotion of international cooperation and capacity building (namely, the development of formal and informal mechanisms to cooperate in space) and the development of scientific and technical research (namely, the development of ways to support the long-term sustainable use of space). In sum, these 21 provisions amount to a recognisable effort to govern space in a manner that appreciates the growing complexities of space activities, given the increasing number of space objects, the increasing number of space-faring States and the increasing number of commercial operators.

Indeed, although the *Long-Term Sustainability Guidelines* explicitly provide that these provisions do not bind States, they nevertheless emphatically suggest their implementation at the national level (often by incorporating them into national space legislation) to ensure the sustainable development of space activities, whether public or commercial. These 21 guidelines, collectively, demonstrate a renewed approach to the global governance of space and explicitly provide for the amendment and expansion of these guidelines. Although the hope for treaty-making has diminished, there is a concerted effort to enumerate desired principles by way of norms, guidelines and principles that reflect the consensus of space faring nations to ensure that, although non-binding, the corpus of space law may continue to develop.

Future International Space Law

Although it is obvious what needs to be done to embolden international space law, it is unclear how this will play out. Treaties surrounding the mitigation and remediation of debris, an international regime related to the exploitation of space resources, and effective space traffic

[67] Committee on the Peaceful Uses of Outer Space, *Guidelines for the Long-term Sustainability of Outer Space Activities*, Office for Outer Space Affairs, United Nations, Jun 2018, UN Doc A/AC.105/2018/CRP.20. The *Long-Term Sustainability Guidelines* were adopted by the United Nations General Assembly in 2019.

management and space situational awareness are all required, but the constant refrain of "there is no political will" rebuffs any hope for optimism. What is likely to transpire is a pattern similar to that which surrounded the adoption of the *Debris Mitigation Guidelines* or the *Long-Term Sustainability Guidelines*, such that non-binding principles, implemented at a national or regional level will slowly become adopted by other space faring nations. The problem with such an approach, however, is that such guidelines are often half-measures that end up demotivating further action. For example, the United Nations *Debris Mitigation Guidelines* address some of the requirements that will be necessary to mitigate the future creation of debris but do not address debris remediation efforts, a component necessary to the sustainability of space. With general recognition and adoption of the *Debris Mitigation Guidelines*, however, there is less of an urgency to develop similar guidelines for remediation and even less urgency to enter into a new agreement, even though scientists and engineers are hard at work developing potential technological solutions[68].

The UNISPACE+50 event hosted by UNOOSA in June 2018 was a special segment of the 61st UNCOPUOS session meant to celebrate the 50 years that transpired since the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space while also establishing a Space2030 agenda to coincide with the UN Sustainable Development Goals.[69] Among its ambitious goals was to foster international cooperation in space activities, pay special attention to the needs and interests of future spacefaring and non-spacefaring nations alike and consider how to best maintain the sustainability of outer space with its increased use.[70] UNISPACE+50 did not develop any binding instruments related to any of its stated objectives, as there was no appetite for such measures by the States that were present; rather, States regurgitated their positions on the benefits of international cooperation, their desire to uplift developing nations and their belief on the necessity of ensuring sustainability without offering any new commitments or strategies as to how to achieve such goals.

[68] Nayef Al-Rodhan, *Why technological cooperation and increased cooperation regarding space debris are vital*, The Space Review, 26 Feb 2018, online: <http://thespacereview.com/article/3438/1>.
[69] Office for Outer Space Affairs, *Fifty years since the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space (1968 - 2018): UNISPACE+50*, United Nations, accessed 20 Mar 2018, online: <http://www.unoosa.org/oosa/en/ourwork/unispaceplus50/index.html>.
[70] *Ibid*.

Conclusion

International space law has existed for more than 50 years and has, over time, demonstrated its ability to effectively regulate outer space. As the broad statements of the first five space treaties continue to be challenged by the interpretive application of new technologies and novel activities, international lawmakers must decide whether they will allow the established legal regime to wither away or whether they will engage wholeheartedly in renewing its applicability. Currently, the prognosis of a reinvigorated international framework does not look good; political will for cooperation on the development of new binding laws seems to have faded. As a result, although the foundations of space law are as solid as they have ever been, the manner in which individual States decide to regulate new space applications will determine the overall growth of international space law. If States uniformly develop laws that uphold the underlying principles of the *1963 Declaration* (namely, that space be viewed and utilised as a domain capable of benefiting all people) it may succeed. However, if States develop disparate sets of national laws promoting self-interest, the dreams of the negotiating parties that space usher in an era characterised by sentiments of humanity may be lost.

Chapter 4: Canadian Regulation of Space Activities

Purpose and Outline

The purpose of this chapter is to provide a historical illustration of Canada's policy making related to space activities as well as an examination of contemporary Canadian laws related to space. The chapter begins with a brief discussion on the role of policy documents produced and published by the Canadian government before examining the most significant Canadian space policy documents published over the last fifty-plus years (from the *1967 Chapman Report* to the *2019 Strategy*). The chapter then highlights the observable trends, clear focusses and critical omissions discernable from a holistic examination of Canada's space policy documents. The chapter then examines existing Canadian space laws (both those that regulate specific space activities as well as those that are related to space activities) before providing a brief commentary on the successes, failures and potential opportunities for space law in Canada.

Governmental Policy Making

Before engaging in any vibrant discussion of Canada's space policy - whether historical or contemporary -, consideration must be given to the general notion of governmental policy development and implementation, with specific reference to the nuances of the Canadian context. Generally, policies are characterised both by the identification of an objective as well as the various approaches that may lead to successfully achieving that objective. Governments often implement various programs comprised of guidance mechanisms, such as laws or regulations, to ensure the overall objectives of a given policy are satisfied. The identified objectives are often informed by the values of the society in which they are to be implemented.

In Canada, with respect to any specific matter, the Canadian policy making cycle includes five stages: agenda setting, policy formation, decision-making, policy implementation and policy evaluation.[1] The agenda setting process includes identifying the overall objectives that are to be met.[2] The policy formation process includes conducting research and other methods of information gathering to determine the possible approaches to addressing the established objective.[3] The decision making process involves identifying the most suitable approaches (from among all those that are possible) and making a specific determination as to the one that shall be

[1] Alex Marland & Jared Wesley, "The Public Servant's Guide to Government in Canada" (Toronto: U of T Press, 2019) at pp 33-40.
[2] *Ibid* at pp 34-36.
[3] *Ibid* at p 37.

implemented.[4] The policy implementation phase involves expending government resources to carry out the determined approach.[5] The policy evaluation phase reflects on the entire process, specifically the implementation process, and contemporaneously provides insights into whether an approach is succeeding, how it can be improved or whether a new approach may be required.[6] Generally, this process of policy creation and implementation is how the government of Canada carries out its agenda.

Taking, for example, the issue of climate change, Canadian policy related to this topic may undergo the following processes. First, the government would identify the net reduction of Canada's carbon emissions as an objective. Second, the government would meet with scientists to understand the extent and primary causes of Canada's carbon emissions as well as with engineers to brainstorm applications that may reduce or reverse such emissions. Third, Canada may decide that the best way of reducing its net carbon emissions is by planting significant numbers of trees to absorb some of the carbon being released into the atmosphere. Fourth, the government may create a summer program that employs teams of students to plant trees in locations suitable for long-term growth. Fifth, the government may realise that within two years of planting trees, the trees are unable to withstand the seasonal droughts caused by climate change and, upon succumbing to the droughts, end up acting as kindling exacerbating the spread of forest fires, requiring the government to find a new location or consider a different approach.

Of course, given the limited human and financial resources available in any situation, the specific policies of all departments or issues cannot be implemented simultaneously. As a result, the government often engages in a planning exercise to prioritise and strategise, at an extremely broad level, the various competing interests.[7] In any planning session, issues and approaches are prioritised in relation to one another; some are perennial favourites, others receive only seasonal attention and some are postponed indefinitely. As will be demonstrated in this Chapter, with limited exception, Canada's space program has not been significantly prioritised.[8]

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[4] *Ibid*.
[5] *Ibid* at p 38.
[6] *Ibid*.
[7] For an explanation of the differences between planning, policies and programs, *see* Richard French, "How Ottawa Decides" (Toronto: James Lorimer & Company, 1984) at pp 1-2.
[8] Although the original priorities of the Canadian space program (as identified in the *Chapman Report*, *infra* note 12 and the *1968 Whitepaper*, *infra* note 49) led to significant advances in Canada's space science and telecommunications capabilities, since then, possibly with the exception of enacting the *Remote Sensing Space Systems Act, infra* note 276, the priority of Canada's space program has been relatively low when considered alongside other national interests.

Canadian Space Policy

Canadian space policy is best characterised by the government's approach to engaging with space - whether for research, exploration, commercial or other purposes - in a manner that fulfills the government's overall objective.[9] Space policy is often dictated by specific policy and strategy related instruments and documents that set out the specific way the government intends to satisfy its objectives: these can include laws and regulations, future-oriented plans, specific strategies and intermittent reviews. Canada's current space policy is not encapsulated in a single document and cannot be appropriately described in generic terms; therefore, it is not possible to understand Canada's current space regulatory framework without first examining its historical origins. Indeed, only after appreciating Canada's unique historical space-policy perspectives can the current regulatory framework be contextualised with respect to Canada's contemporary space policy objectives.

From the outset, Canada has sought to take a measured approach to space, recognising its limited financial and human resources when considering potential program options. Over time, this pragmatism has resulted in conscientious decisions on when to invest in domestic capabilities and when to rely on allies. For the most part, Canada has focussed on projects that are necessary to tackling the nations' unique geographical challenges while joining larger projects led by partner nations in ways that highlight existing Canadian expertise. Over the last fifty years, Canada's space policies have featured a prioritisation of opportunities that could develop commercial capabilities - with a view to improving the social and economic welfare of the country - rather than purely scientific endeavours.

Upper Atmosphere and Space Programs in Canada (Science Secretariat, 1967)

As detailed in Chapter 2, Canada has had a rich history of scientific research related to the Earth's upper atmosphere and space. Following the success of the Alouette-ISIS program (and coinciding with the pinnacle of American investment in, and development of, its space program),

[9] "In short, a national space policy provides a coherent vision for national military, civil, and commercial space actors who are competing for limited resources, within an international policy framework." John Siebert, *Canada's Space Policy Framework 2014: Industry Support in an International Policy Vacuum*, 665 in Ram Jakhu, ed, "Global Space Governance" (Montreal: CRASL, 2015) [*Siebert*] at p 669.

in May 1966[10] the Canadian Science Secretariat[11] commissioned a study related to the upper atmosphere and space[12]. The objective of the study was to better understand the scientific, educational, technological and economic interests and opportunities of the space domain from a Canadian perspective.[13] The study group consisted of John Chapman (a government scientist and bureaucrat), Peter Forsyth (an academic scientist), Philip Lapp (an industrialist) and Gordon Patterson (an academic scientist), who conducted numerous hearings across the country, met with various foreign space agencies and reviewed 122 briefs submitted by various stakeholders.[14]

The *Chapman Report*, as it is now referred, was the first significant government-initiated investigation into the opportunities afforded by space, spurred on by a realisation that all space programs, regardless of department or objectives, necessitated the use of very expensive infrastructure (for example, laboratories, rockets and ranges, manufacturing facilities, ground stations, etc.)[15]. This realisation prompted the question of whether it was worth investing in such expensive infrastructure or whether Canada ought to continue to rely on the expenditures and findings of other countries.[16] The *Chapman Report* further sought to investigate the manner in which Canada should build its domestic space capability, if it was concluded, in fact, that such domestic capability would be worthwhile. Uncontroversially, the *Chapman Report* recognised the importance of space for Canada, providing the following observation: "there seems no doubt that in the second century of Confederation the fabric of Canadian society will be held together by strands in space just as strongly as the railway and telegraph held together the scattered provinces in the last century".[17] This specific language is reproduced in many of Canada's following space policy documents, especially as the prediction continued to be proven correct.

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[10] Andrew Godefroy, "The Canadian Space Program: From Black Brant to the International Space Station" (Cham: Springer, 2017) [*Godefroy*] at p 80.
[11] The Science Secretariat was a branch of the Privy Council Office. Daniel Brassard, *Science and Technology: The New Federal Policy*, Government of Canada: Science and Technology Division, Apr 1996, online: <http://publications.gc.ca/Collection-R/LoPBdP/BP/bp414-e.htm#history>; John Kirton, *Canadian Space Policy*, (1990) 6:1 Space Policy 61 [*Kirton*] at p 62.
[12] The report arbitrarily assigned an altitude of 50 km as denoting the lower limit of the upper atmosphere. John Chapman, et al, *Upper Atmosphere and Space Programs in Canada*, Science Secretariat, Government of Canada, 1967 [*Chapman Report*] at p v.
[13] *Ibid*.
[14] *Godefroy*, *supra* note 10 at p 80; *Chapman Report*, *supra* note 12 at vii.
[15] *Chapman Report*, *supra* note 12 at p 3.
[16] *Ibid* at pp 3-4.
[17] *Ibid* at p 95.

The *Chapman Report* goes into significant depth describing its contemporaneous active governmental space programs as well as the ongoing space research activities of various Canadian companies and academic institutions. What emerges from the exhaustive itinerary of Canadian space activities is that although Canadians were involved in a number of different activities (whether research-oriented, development-oriented or implementation-oriented), each were carried out by independent actors. The *Chapman Report* noted that there was no single "agency or department of Government with overall responsibility for upper-atmosphere and space science in Canada"[18] and states explicitly that Canada lacks an equivalent to the US's NASA, France's CNES, Japan's National Space Activities Council or the British National Committee on Space Research.[19]

The *Chapman Report* recognised the shortcomings and potential missed-opportunities of not having a centralised organisation dedicated to space activities, especially in a country spread out over such a large geographical area.

> Space technology is so directly related to the needs of a large, sparsely populated country, that it cannot be ignored. In a free society, it will be used, and the role of the Government is to see that space technology is used in the best interests of Canada. It is therefore an inescapable conclusion that the elements of space technology vital to Canada must be under Canadian control.[20]

In addition to recognising the need for a centralised government agency to spearhead the space program for the benefit of all Canadians, the *Chapman Report* also recognised the role it would play in stimulating industry to develop the capacity and capability to operate independent of other nations. Just as the UK and France financed the growth of their domestic space programs largely to remain independent of growing US space dominance (which, at the time, was spending roughly 1% of its gross national product in an effort to put a human on the Moon)[21], the *Chapman Report* envisioned Canada increasing its domestic expenditure on space science and research. The suggestion that Canada increase its contributions from 0.032% to somewhere between 0.07% and 0.10% was made with the belief that doing so would ensure the independence of the Canadian space program and its competitiveness in global space activities.[22]

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[18] *Ibid* at p 65.
[19] *Ibid* at p 66.
[20] *Ibid* at p 95.
[21] *Ibid* at p 91.
[22] *Ibid* at p 92.

The *Chapman Report* understood, regardless of the financial stimulus, that Canada would never be able to compete in all forms of technological development with its competitors.[23] Nevertheless, a significant financial commitment would allow industry to develop at least some of the technologies necessary for space activities and then export those technologies abroad, thereby balancing its overall import/export profile related to space.

> A government policy that promotes the development of Canadian space technologies will allow for Canada to export to other markets and import what is necessary, thus creating a balance. Otherwise, all the necessary technologies will have to be imported, thwarting any growth in Canada of the space industry.[24]

Further, the *Chapman Report* quite presciently differentiated between science and technology, noting that although science is "open" and easily shared within the scientific community regardless of national borders, technological is "closed" and comprehensible only through experience and experimentation. Recognising that a space program would require a combination of science and technology, the *Chapman Report* believed Canada had an obligation to develop homegrown technology for the benefit of the country.[25]

Similarly, the *Chapman Report* recognised the inherent value of a space program as it related to developing and maintaining human capital. The *Chapman Report* commented on the reality that, at that time, many of Canada's brightest professionals were leaving the country for opportunities that were exciting and challenging.[26] Unlike other jurisdictions, Canada was not spending much money on military research programs which, in countries like the US, would often spin-off into cutting-edge non-military research and applications. As a result, Canadian researchers looking for exciting work often made their way to the US. The *Chapman Report* warned that if Canada did not provide opportunities to engage with similar kinds of challenging work, it would not be able to retain its homegrown talent. This realisation prompted the recommendation that Canada develop a centralised space program that would "heavily involve

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[23] For example, the *Chapman Report* realised that Canada would not, for at least a very long time, be in a position to develop a "large" launcher - the other nations with such capability were able to accomplish such a task because of their significant expenditures on military research. Nevertheless, Canada was in a position to develop a "small" launcher - indeed, the Black Brant family of rockets were, at that time, showing significant promise, the Churchill Rocket Research Range in Manitoba was a proven test ground and there seemed to be a significant market for small launch capabilities. *Ibid* at pp 105-106.

[24] *Ibid* at p 98.

[25] "Space technology is so directly related to the needs of a large, sparsely populated country, that it cannot be ignored. In a free society, it will be used, and the role of the Government is to see that space technology is used in the best interests of Canada. It is therefore an inescapable conclusion that the elements of space technology vital to Canada must be under Canadian control." *Ibid* at p 95.

[26] *Ibid* at p 94.

developmental and manufacturing activities"[27] to counteract this phenomenon (now commonly referred to as "brain drain").

Indeed, at the time of its publication, the *Chapman Report's* perspective on the benefits of the centralisation of space activities was not unique. Based on the briefs submitted prior to the drafting of the report, there seemed to be a general consensus in the Canadian space community that such centralisation was warranted.[28] Although there were different opinions on how such a centralisation of space activities should be implemented to most benefit Canada, the *Chapman Report* synthesised the various briefs submitted by government, industry and academia and concluded that the absence of a central agency had limited the creation or development of certain space-related opportunities.[29]

> The absence of a national mission-oriented agency with overall responsibility for upper-atmosphere and space activities in Canada has resulted in fragmented programs, divided responsibility, and serious omissions in planning. These deficiencies are bound to become more serious in the future and could lead to tragic consequences for Canada in loss of technological opportunity, and in gradual erosion of national control over natural resources and domestic communications.[30]

Although the financial impact of such fragmentation affected various government projects, the overall impact of these limitations was borne most significantly by industry and university researchers since they often required overlapping authority from various agencies (such as requiring approval from a funding agency to develop a technology as well as approval from a defence agency to sanction its use on an upcoming satellite) which took up valuable time and money.[31]

Although a centralised space agency would alleviate some of the concerns expressed by the space community at the time, it would not, on its own, address all of them. As a result, the *Chapman Report* recommended, in addition to the creation of a "central co-ordinating and contracting agency for space research and development"[32], a study into the feasibility of designing and creating a Canadian small-satellite launch vehicle[33], implementing major investments in space facilities as required by the overall space program and securing control of domestic communication

[27] *Ibid* at p 99.
[28] *Ibid* at p 101.
[29] *Ibid* at pp 101-102.
[30] *Ibid* at pp 109-110.
[31] *Ibid* at p 102.
[32] *Ibid* at p 110.
[33] *Kirton*, *supra* note 11 at p 62.

systems.[34] In prioritising these objectives, the *Chapman Report* also emphasised the inclusion of Canadian industry in all stages to balance the import requirements of technology with the export capabilities of a developing industry.[35] Lastly, the *Chapman Report* recognised the enduring benefit of space activities in spurring on growth in non-space industries and domains, and specifically recommended establishing a governmental program that would implement space-derived innovations in other fields.[36]

Report on A Space Program for Canada (Science Council of Canada, 1967)

On 16 January 1967[37], immediately prior to its publication, the *Chapman Report* was presented to the Science Council of Canada, an independent organisation created by federal statute to advise the government on science and technology policy[38]. Following the publication of the *Chapman Report*, Omond Solandt, on behalf of the Science Council of Canada, prepared and published his own report, directed to Prime Minister Lester B. Pearson, on the merits of a space program for Canada[39], encouraging, among other things, the creation of a centralised space agency.[40] Although not an official government report, the Science Council of Canada's publications were well-respected during its time[41], largely due to its broad composition of respected experts from across the Canadian scientific community.[42]

The *Solandt Report* considered the information presented in the Chapman Report and draws its own similar conclusions.

> Although significant contributions have been made by government and other Canadian organizations working in this field, a coordinated, expanded, and sustained national effort will be required if Canadian use of space is to be developed under Canadian leadership, to meet the needs of the Canadian economy.[43]

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[34] *Chapman Report*, *supra* note 12 at pp 109-113.
[35] *Ibid* at p 112.
[36] *Ibid* at p 113.
[37] *Ibid* at p iii.
[38] Leslie Millin & Guy Steed, *Science Council of Canada*, The Canadian Encyclopaedia, 16 Mar 2014, online: <https://www.thecanadianencyclopedia.ca/article/science-council-of-canada> [*Millin & Steed*].
[39] The Science Council of Canada's report was a more concise version of the *Chapman Report* and the document upon which Canada's future space activities were planned. *Godefroy*, *supra* note 10 at p 82.
[40] Omond Solandt, *A Space Program for Canada*, Science Council of Canada, Government of Canada, Jul 1967 [*Solandt Report*].
[41] The Science Council of Canada was shuttered in 1992 as a result of budgetary cutbacks. *Millin & Steed*, *supra* note 38.
[42] *Ibid*.
[43] *Solandt Report*, *supra* note 40 at p 5.

The *Solandt Report*, in calling for the creation of a centralised space agency noted that the agency's objectives should be focussed on developing space facilities, securing satellite communications, exploring natural resources, developing launch systems, promoting industrial development and supporting academic research programs.[44] To reach these ends, the *Solandt Report* advocated that Canada engage with the international community, join regional and international bodies and working groups, and avoid relying on a single partner for all of its space activities. In developing these international partnerships, however, it advised that Canada should contribute to the development of unlocking "the secrets and potentialities" of space rather than sitting idly by and waiting for others to sell to it the tools necessary to benefit from space.[45]

The *Solandt Report* also recognised the importance of the law related to space, both internationally and domestically. It was published at a time of great debate amongst space-faring nations on the principles and norms associated with the exploration and utilisation of space, and the *Solandt Report* recognised that those with the largest commitments to space research and development had the strongest voices.[46] Especially given the fact that Canada was "sandwiched between [the] two leading powers in space matters, Canada [had] a vital interest in the law that may become a major factor in her security and future development".[47] Developing the knowledge and capability to engage space would give Canada the authority to speak on issues of how others ought to operate within the domain of space. Regarding domestic law, the *Solandt Report* also noted that given the great opportunities for development, it may very well be the case that new laws would be required to not only support the facilities and services associated with space but also to ensure that the public would be protected from such developments as necessary.[48]

A Domestic Satellite Communication System for Canada (Minister of Industry, 1968)

In 1968, the Minister of Industry, Charles Drury, prepared a whitepaper based on the recommendations of a task force appointed by the government in 1967 "to study and advise on the question of satellite communications in the Canadian context"[49]. The *1968 Whitepaper* concluded

[44] *Ibid* at pp 9-14.
[45] *Ibid* at p 7.
[46] *Ibid* at p 14.
[47] *Ibid*.
[48] *Ibid*.
[49] Charles Drury, *A Whitepaper on A Domestic Satellite Communication System for Canada*, Ministry of Industry, Government of Canada, 1968 [*1968 Whitepaper*] at p 8.

"that a domestic satellite communication system is of vital importance for the growth, prosperity, and unity of Canada, and should be established as a matter of priority."[50] After providing a history of traditional and space-based communication systems, the *1968 Whitepaper* discussed Canada's achievements in satellite and communications technology, specifically as it related to the role played by the manufacturing and operations industries. Aside from contributing significantly to the Alouette-II and ISIS-A satellites, Canadian industry had also exported much of its technology to overseas players in their various projects, building the industrial knowledge base within Canada to undertake the design and development of other satellite systems.[51] With respect to launch, although the Black Brant family of rockets were successful as small commercial launch vehicles, they were unable to place large satellites into geosynchronous orbit; nevertheless, the *1968 Whitepaper* stated that so long as there was an economic basis to promote the development of such a large vehicle, there was no technical or competency-related reason why Canadian industry could not succeed in such an endeavour.[52]

After exploring the manner in which a new communication satellite network could be set-up in Canada, the *1968 Whitepaper* discussed the government's participation in, and the regulation of, such a new activity. "The relationship between domestic communication satellites and the national interest is of vital and unique importance. This must be made unmistakably clear."[53] Cognisant of the fact that the government (as the representative of the State) was the only Canadian entity capable of engaging the international community in matters related to space, its role would be important in any future domestic satellite communication system, regardless of whether the endeavour was public or private.[54] The *1968 Whitepaper*, however, noted the importance of controlling communication as "a basic element of national security" as well as a retention of sovereignty (especially over the North), thereby calling for impactful Canadian policy on the issue.[55] Further, given the role a satellite communications network would play in broadcasting national television services, the government had an interest in ensuring its applications would be

[50] *Ibid*.
[51] *Ibid* at p 26.
[52] *Ibid* at pp 28-30.
[53] *Ibid* at p 56.
[54] *Ibid*.
[55] *Ibid*.

in-line with national policies (such as the Canadian Broadcasting Corporation's provision of services in both French and English).[56]

The *1968 Whitepaper* then considered the specifics of regulation and recognised that the unique capability of satellite systems would require the government to play an active role in their development, ownership and operation. Since satellite systems are natural monopolies and, recognising that the unique manner in which satellites provide coverage (namely, that it is possible to communicate to any point within the satellite's area of operation for virtually the same cost), the government would have to remain vigilant and ensure all users would be treated fairly in terms of pricing.[57] The ability to maintain and serve the public interest as well as the use of satellite systems for defence purposes further required the integration of government in the ownership and operation of the system.[58] The *1968 Whitepaper* makes the above conclusions while explicitly recognising that as technological advances fundamentally change the nature of satellite systems, specific future policies may need to change as well.[59]

Regarding a satellite communication system specifically, the *1968 Whitepaper* outlined the different pieces of legislation that would regulate its various aspects including the *Railway Act* (for fixing prices) and the *Radio Act* (for transmitting and receiving stations). The *1968 Whitepaper* also recognised that there was no single piece of legislation to cover the communications activity specifically and that even some of the component parts of providing satellite communication services were not covered under existing legislation. Further, as technologies improved and applications developed, there would be a need for more detailed regulations and, at the time of publication, the government was "already enquiring into new legislation which [would] ensure the comprehensive regulation of tele-communication services, both terrestrial and satellite"[60]. This foresight recognised the complexities brought about by the use of space systems.

The *1968 Whitepaper* proposed the creation of a Crown corporation by special legislation "to develop, own and operate a domestic communications satellite system"[61], a solution that would allow the government to oversee the management of a national satellite communications system

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[56] *Ibid*.
[57] *Ibid* at p 58.
[58] *Ibid*.
[59] *Ibid*.
[60] *Ibid* at p 60.
[61] Graham Gibbs & W Mac Evans, *Part 2: A History of the Canadian Space Program - Policies & Lessons Learned Coping with Modest Budgets*, The Commercial Space Blog, 26 Mar 2017, online: <http://acuriousguy.blogspot.com/2017/03/part-2-history-of-canadian-space.html> [*Gibbs & Evans 2*].

while still incorporating private industry.[62] In this way, the private sector would have a role to play in building the satellite system and ground stations as well as take an ownership interest in the project.[63] Upon completion, the Crown corporation would operate competitively in the open market. By September 1969, the necessary legislation had been drafted, assented to and come into force and the Telesat Canada corporation came into existence, owned jointly by the federal government and telephone companies.[64]

The *1968 Whitepaper* concludes with an examination of the domain of space and its related activities from an international perspective, recognising the role of the *Outer Space Treaty*[65] (which had recently come into force) and the International Telecommunications Union. Specifically, the *1968 Whitepaper* notes that Canada's desire to place communications satellites in geosynchronous orbit would require Canada to engage with its international counterparts to ensure the orderly development of efficient telecommunications throughout the world.[66] The *1968 Whitepaper* also reflected on Canada's previous and future relationship with its INTELSAT partners on how to continually improve "the techniques and organisation of international communications by satellite"[67]. Notwithstanding a willingness to work with international partners to ensure the "efficient and fair exploitation" of the limited geosynchronous space resources (namely, frequencies and orbits), the *1968 Whitepaper* recognised the required "degree of urgency" in planning for a Canadian satellite communications system given the informal "first-come, first-served basis" upon which the international community recognised radio frequency use.[68]

Telesat Canada, therefore, was the successful manifestation of the government's desire to create the first wholly-owned and wholly-operated[69] domestic satellite telecommunications system; without significant political opposition and with much support from various

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[62] *Ibid*.
[63] *1968 Whitepaper*, *supra* note 49 at pp 44-50; *Godefroy*, *supra* note 10 at p 105.
[64] *Gibbs & Evans 2*, *supra* note 61.
[65] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies*, 27 Jan 1967, 610 UNTS 205 [*Outer Space Treaty*].
[66] *1968 Whitepaper,* supra note 58 at p 62.
[67] *Ibid*.
[68] *Ibid* at p 66.
[69] The decision that Canadians would build, own and operate the Telesat system was first introduced in the *1968 Whitepaper* and accepted without consideration. The Telesat satellite system was the first wholly-owned domestic satellite communications system in the geostationary orbit. The Soviet Union had similarly created its own domestic satellite communications system, but its satellites were not in the geostationary orbit. Charles Dalfen, *The Telesat Canada Domestic Communications Satellite System*, (1970) 5 Stanford J of Int'l Studies 84 [*Dalfen*] at p 85.

stakeholders[70], the majority Liberal government embarked on a process that would conclude with the enactment of the *Telesat Canada Act*[71] in 1969. Citing primarily Canada's large territory, sparse population, bilingual culture and a desire to develop the North, the creation of Telesat was portrayed as a cost-effective, technologically-advanced and culture-promoting system.[72] Indeed, the economic effects of developing and operating a system from within Canada would build on the country's growing industrial and technological competence and offer a leading product to the international marketplace.[73]

The decision to create a Crown corporation in partnership with, rather than exclusively by, businesses was contentious: the NDP believed the entire system should be owned and operated by the government whereas the Conservatives believed private industry would be best suited to carry out the task.[74] Indeed, even the private entities who were to participate as partners pushed for their complete ownership and operation of the Telesat system, advancing arguments based on their expertise and the long-term spillover benefits of their growing businesses.[75] Ultimately, however, the government chose to create a new Crown corporation, a decision that was motivated, in part, by two main factors: first, that the government's financial support would ensure that the undertaking of such a vital service was carried through to the end, regardless of any potential financial losses; and second, that the government's carriage of the project would ensure less-profitable communities (such as the North) would receive equitable access, with the added benefit of promoting industrial competition to continually develop and improve on space communications research.[76] This unique public-private partnership (through the legal vehicle of a Crown corporation) allowed the government to direct the activities of the entity while also splitting the rewards of such an undertaking with vital commercial partners. Over the following decades,

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[70] Although certain members of the NDP argued for exclusive ownership of Telesat to assure that profits would benefit the public rather than businesses and some members of the Conservative party lamented that no government-sponsored enterprise was ever built efficiently, the Liberals (holding 155 of the 264 seats in the House of Commons) managed to pass the bill without significant amendment. In fact, the support for the creation of Telesat, with its "great potential effect… on northern development, Canadian unity, scientific leadership, and on a cohesive inexpensively expandable communications network", was deemed a high national priority by all. *Ibid* at pp 86-87, 101.

[71] *Telesat Canada Act*, RS 1969, c T-4.

[72] *See generally Dalfen*, *supra* note 69.

[73] *Ibid* at pp 94-95. Additional benefits of developing the system in Canada included retaining the brightest young scientists and engineers seeking to work on exciting new projects and protecting the national security of Canada, of which one important element was communication.

[74] *Ibid* at pp 100-101.

[75] *Ibid* at pp 101-103.

[76] *Ibid* at pp 101-104. Discussions on whether the public corporation should own the space stations and the carriers should own the ground stations were also ultimately rejected on similar grounds.

Telesat would provide Canada with state-of-the-art telecommunication services across the country and develop an expertise in many space-related activities, exporting its services around the world.[77] Telesat was privatised in 1991.[78]

Similar to the motivations behind the creation of Telesat (namely, the flexibility, independence and security provided by the creation of a governmental entity), Teleglobe Canada was created as a Crown corporation by the *Teleglobe Canada Act*[79] in 1971 and was intended to provide Canada with international satellite communications capabilities. As a founding member of the international intergovernmental organisations Intelsat and Inmarsat, Teleglobe provided Canadians with content from overseas (mainly Europe) and delivered to the world programming from Canada. Intelsat's network of satellites allowed fixed point-to-point services and Inmarsat allowed for mobile services, including those used aboard naval vessels and on offshore sites, such as oil rigs.[80] By way of its membership in these international communications systems, Teleglobe offered connectivity services to and from Canada, including radio broadcast, telephone and data communications.[81] Teleglobe was privatised in 1987.[82]

The creation of Telesat and, to a lesser extent, Teleglobe, reflect the then-government's appreciation for the importance of satellite communications systems. The unifactory nature of such a sweeping communications system would allow Canadians to maintain and develop their collective culture across the vast geographical expanse of Canada's territory, including, especially, the North. The subsequent implementation of the satellite communications systems established and implemented by Telesat and Teleglobe (through its partnership with INTELSAT and INMARSAT) demonstrated the government's commitment to maintaining Canadian independence in the face of growing regional and global pressures. Indeed, by developing the world's-first domestic geostationary communications satellite system, Canada positioned itself ahead of its more-dominant and culturally-imposing southern neighbour, resisting the likely scenario of being influenced in its own decisions, had the US developed its own system before Canada.

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[77] Stephane Lessard, *Commercial Aspects of Satellite Applications in Canada*, (1990) 5 J of L & Tech 27 [*Lessard*] at pp 31-33.
[78] *Telesat Canada Reorganization and Divestiture Act*, SC 1991 c 52.
[79] *Teleglobe Canada Act*, RSC 1985 c T-6.
[80] *Lessard*, *supra* note 77 at p 30.
[81] *Ibid* at p 31.
[82] *Teleglobe Canada Reorganization and Divestiture Act*, SC 1987 c 12; Lessard at p 30.

Canadian Policy for Space (MOSST, 1974)

The Ministry of State for Science and Technology (MOSST) was created in 1971 following a number of national reviews of science policy that advocated for a united science portfolio within Canada.[83] Before MOSST, science policy was fragmented across governmental departments and proved ineffective in advising senior decision makers.[84] One consequence of such fragmentation was that the scientific and technological implications of Canada's various international activities and partnerships were often undervalued because governmental groups worked independently of each other in carrying out their activities and then provided Cabinet with disconnected advice.[85] The creation of MOSST was intended to embrace the wide-ranging scientific and technological know-how of various governmental entities and individuals, providing a coherent and cohesive organisation through which to develop a national policy and foster cooperative relationships with other nations.[86] Practically, however, MOSST's creation put into question the mandates and roles of other governmental entities that had earlier carried out their own scientific and technological responsibilities, causing some degree of conflict and confusion within government. One point of contention was MOSST's directive to unite Canadian perspectives and policies related to science and technology in such a way as to allow Canadian industry to compete on the international stage, a task previously carried out by External Affairs.[87] Eventually, however, interdepartmental conflict and confusion gave way to cooperation and more clear roles and mandates.[88]

In 1972, the Secretary of State for External Affairs, Mitchell Sharp, advocated for a new Canadian approach to its international affairs and, relatedly, its independence. Aware of the growing influence of Canada's southern neighbour and a renewed nationalism on both sides of the border, Sharp attempted to craft a policy that mutually respected but distanced itself from the US. Sharp considered three possible paths forward for Canada: maintaining the status quo, integrating more fully with the US or developing and implementing a long-term strategy that would prioritise

[83] Most clearly, the Lamontagne Committee (a Senate Special Committee on Science Policy) "advocated for the creation of a formal science portfolio within Cabinet". *Godefroy*, *supra* note 10 at p 115.
[84] *Ibid*.
[85] Jocelyn Ghent, *Canadian Participation in International Science and Technology*, Science Council of Canada, Background Study 44, 1979 at p 16-17 [*Ghent*].
[86] *Ibid* at p 18.
[87] Indeed, External Affairs particularly disliked the seeming overlap in responsibility and duplication of effort when attempting to engage international counterparts that had, until MOSST's creation, fallen within its purview. *Ibid* at p 117.
[88] *Ibid* at pp 16-20; *Godefroy*, *supra* note 10 at pp 117-118.

Canadian economic growth and improve relations with countries other than the US.[89] From the space perspective, an analogous conceptualisation was under consideration: was Canada to maintain the status quo (namely, a hitherto halfhearted engagement with space), more closer integrate with the US space program or develop and implement a long-term strategy to strengthen the Canadian economy and work more closely with foreign space programs. Sharp advocated for the third approach and this doctrine of the "Third Option" shaped a significant portion of Canadian foreign policy, leading to increased trade and other relations with varied countries. Notwithstanding the adoption of the Third Option, over the next several years, Canadian economic and other relations with the US actually increased and this stronger relationship extended to Canada's space program (largely due to the intensity of the Apollo program and the significant opportunities for Canadian companies). Simultaneously, however, during this time Canada did begin to develop its long-lasting partnerships with European countries (and, eventually, the European Space Agency), a direct result of Sharp's policy of partner diversification.[90]

It was during this time that the US was discussing and developing its post-Apollo space program by which many Canadian industrialists were excited.[91] Although many departments within the Canadian government took advantage of the unique developments offered by space, none had a mandate that prioritised space activities. Nevertheless, industry pushed the Canadian government to play a role in this new US-led opportunity and although the Interdepartmental Committee on Space (ICS)[92] considered the pleas of industry it could not determine which department ought to take the lead in its partnership with the US.[93] While the ICS deliberated its involvement, industry groups put together a research and development package that envisaged the creation of a remote manipulator system (RMS, or, as it is now known, Canadarm) which would qualify as a "mission critical" system for the US space program, placing Canada in an important

[89] This approach of consciously limiting the extent of US influence on Canada has come to be known as the "Third Option". The Third Option advocated for increased independence from the US in all aspects of Canada's political, economic and cultural spheres, which would have included Canada's space program. Norman Hiller, *Third Option*, The Canadian Encyclopedia, 13 Jul 2015, online: <https://www.thecanadianencyclopedia.ca/en/article/third-option>; Ciro Arevalo-Yepes & Sylvia Ospina, ed, "Global Perspectives on Regional Cooperation in Space: Policies, Governance & Legal Tools" (Paris: IAA, 2016) [*Arevalo-Yepes & Ospina*] at p 23.
[90] *Ibid* at pp 23, 38-39.
[91] *Ghent*, *supra* note 85 at p 48.
[92] The Interdepartmental Committee on Space reported to the Department of Communication and its mandate was to perform a primarily advisory role. It did not have control over its own budget nor did it have the responsibility to coordinate functions across government. *Ibid* at p 53.
[93] *Ibid* at pp 48-49.

partnership position.[94] Notwithstanding industry's clear desire to participate, no Canadian agency sought to take ownership of the program[95], frustrating industry[96]. Eventually the National Research Council took the lead and signed a Memorandum of Understanding with the US[97], but not before industry made clear their extreme dissatisfaction with the lacklustre commitment and multi-year process of gaining government backing.[98]

It is within this context that, in 1974, Jeanne Sauve, the Minister of State for Science and Technology, presented Canada's first space policy.[99] Given MOSST's mandate to unite domestic and international science and technology policy, the *1974 Policy*[100] established that Canada was to focus its activities on space applications rather than pure space science, "with a special emphasis on developing Canada's satellite communications".[101] Four pillars were put forth: first, that space applications had to contribute directly to national goals; second, space research had to move from government to industry[102]; third, that Canadian industry had to design, develop and construct Canada's satellite systems; and fourth, that Canada's space industry had to meet Canada's space needs (while relying on foreign launch providers).[103] The *1974 Policy* also recognised the growing international sphere of space actors and recommended that Canada continue its partnership with the US while also developing and strengthening its partnership with other space programs.[104] Unsurprisingly, given MOSST's directive to unite science and technology policy for industry (especially on the international market), the *1974 Policy* leaned heavily in favour of creating an environment in which industry could develop the expertise and experience necessary to export its products.

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[94] Graham Gibbs & W Mac Evans, *Part 5: A History of the Canadian Space Program - Policies & Lessons Learned Coping with Modest Budgets*, The Commercial Space Blog, 16 Apr 2017, online: <http://acuriousguy.blogspot.com/2017/04/part-5-history-of-canadian-space.html> [*Gibbs & Evans 5*]; *Ghent*, *supra* note 85 at p 48.
[95] *Gibbs & Evans 5*, *supra* note 94.
[96] *Godefroy*, *supra* note 10 at pp 149-150.
[97] *Gibbs & Evans 5*, *supra* note 94.
[98] *Ghent*, *supra* note 85 at pp 48-49.
[99] *Kirton*, *supra* note 11 at p 62.
[100] The author was unable to locate an original copy of the *1974 Policy* document and therefore has relied on the summary of the *1974 Policy* found in the *1981 Plan*, *infra* note 111 as well as secondary sources.
[101] *Godefroy*, *supra* note 10 at p 119; *Gibbs & Evans 5*, *supra* note 94.
[102] One way in which this was to be achieved was for Canada to act as the purchaser of services from industry. *Gibbs & Evans 5*, *supra* note 94.
[103] *Godefroy*, *supra* note 10 at p 119.
[104] *Kirton*, *supra* note 11 at p 63; *Gibbs & Evans 5*, *supra* note 94.

What the *1974 Policy* did not do was create a centralised agency as per the *Chapman Report's* recommendations; instead, it provided that the "utilization of space systems should be through activities proposed and budgeted by departments within their established mandates".[105] Acknowledging MOSST's mandate of unifying science and technology for the benefit of industry[106], the *1974 Policy* did exactly that - it clearly established that the government's priority ought to be the transfer of expertise, know-how and opportunity to industry.[107] Had an equivalent of the modern Canadian Space Agency been created instead of MOSST (or alongside MOSST), it is likely the *1974 Policy* would have been more balanced in its approach to the development of a Canadian space programme rather than focussing explicitly on categorising new projects squarely within the mandates of existing government departments.[108] Further, it likely would have led to the centralisation of space programs that had thus far caused considerable frustration to industry.[109] Nevertheless, this prioritisation of space applications developed by industry had the effect of developing Canada's space industry, even if it meant social and economic goals superseded the previous scientific goals of the Canadian space program.[110]

Canadian Space Program Plan (MOSST, 1981)

The 1981 Space Program Plan, as prepared by MOSST, came about as a result of the Canadian government's ICS reviewing proposals for space projects by the Department of Communications, the Department of Energy, Mines and Resources, the Department of Environment and the Department of Fisheries and Oceans.[111] The *1981 Plan* highlighted three major characteristics: first, it was multi-year; second, it aimed to diversify Canadian space competence and usage; and third, it provided considerable support to technological development for industry.[112] In providing a background to the Canadian space program, the *1981 Plan* noted

[105] *Gibbs & Evans 5*, *supra* note 94.
[106] Although, admittedly, this was not MOSST's only mandate, it is the one that is relevant to the current discussion.
[107] *Godefroy*, *supra* note 10 at p 120.
[108] For example, by assigning the remote manipulator system to NRC, the ICS broke the stranglehold the Department of Communications had on Canada's space assets. *Gibbs & Evans 5*, *supra* note 94.
[109] *Ghent*, *supra* note 85 at p 53.
[110] This change from scientific research to commercial application meant that Canada would not send a science satellite into space for over 30 years, instead focussing on developing commercial satellites. *Godefroy*, *supra* note 10 at p 120.
[111] Ministry of State for Science and Technology, *Background Paper: The Canadian Space Program Plan for 1981/82 - 1983/84*, Government of Canada, Apr 1981 [*1981 Plan*] at Foreward.
[112] *Ibid* at p 1.

the creation of a government/private sector commercial satellite communications corporation (namely, Telesat), the creation of a space manufacturing industry, the development of space-related expertise at multiple Canadian universities and establishing centres of expertise within government.[113]

The *1981 Plan* recognised the important role space had played in bringing economic and social benefits to Canada while simultaneously recognising that space activities simply would not be possible without government sponsored programs.[114] Specifically, the government had a role to play in recognising, with significant foresight, the value of new space services prior to the maturation of a commercial market for such services.[115] As a result, although the front-end costs of a healthy space program needed to be borne by government, the *1981 Plan* provided that they ought not be seen as a burden but rather an investment: indeed, the government's efforts in promoting a space industry ought to be part of a wider national policy.[116]

The *1981 Plan* discusses the roles played by the three government departments making up the majority of the Canadian space program and describes their budgets: the Department of Communications (DOC) with a space budget of $35 million; the National Research Council (NRC) with a space budget of $20 million; and the Department of Energy, Mines and Resources (EMR) with a space budget of $10 million.[117] Over the course of its space program, the DOC was responsible for basic research, technology and industry development, support of space activities in other departments (particularly the Department of National Defence (DND)) and operating various laboratories. The DOC's primary programs related to ISIS, the Communications Technology Satellites and certain portions of the ANIK series of satellites.[118] The NRC's programs included scientific rocket and balloon missions, the Canadarm, various projects with NASA as well as operating the Churchill Research Range and a separate balloon launching facility. Additionally, NRC was responsible for supporting the various space science facilities for use by both the government and university scientists.[119] EMR's primary space program revolved around

[113] *Ibid* at pp 1-2.
[114] *Ibid* at p 2.
[115] "The leading-edge nature of space technology means that applications are innovative, sometimes offering the capability to provide new services in advance of the recognition of a commercial market for these services." *Ibid* at p 3.
[116] *Ibid* at pp 3-4.
[117] *Ibid* at p 4.
[118] *Ibid*.
[119] *Ibid*.

remote sensing projects (as managed by the Canada Centre for Remote Sensing) by participating in the US LANDSAT and SEASAT missions as well as evaluating "Canadian needs for surveillance data from satellites". In this regard, EMR's space program was focussed more on data processing rather than space hardware development.[120]

In addition to the DOC, NRC and EMR, the DND, the Department of Transportation (DOT) and the Department of the Environment (DOE) all had operations of varying degrees related to space. For example, DND undertook research and development related to the military application of space technology (such as satellite navigation systems, search and rescue satellite systems and the use of ground stations for communication). Further, DOT assisted DND in its investigations related to the use of satellites for search and rescue operations and the DOE operated a "network for the reception and distribution of data from US meteorological satellites" for use in preparing weather forecasts and monitoring ice conditions.[121] Clearly, by 1981, various government departments were beginning to rely on the integration of space systems into satisfying their respective mandates.

The *1981 Plan* recounts the consequences of MOSST's *1974 Policy*, recognising its efficacy shortly after its implementation as well as its shortcomings in the years that followed. Specifically, the *1981 Plan* highlights the *1974 Policy's* promulgation that individual departments were in charge of determining and funding the various space systems upon which they relied. When the economy was strong and space technology applications were relatively straightforward, this process worked; however, when the economy slowed down, departmental budgets tightened and space projects no longer fit clearly within the mandate of a single government department, the *1974 Policy* was less effective.[122] In 1979, the ICS requested MOSST to analyse the effectiveness of the government's approach to space and, at the same time, the Air Industries Association of Canada (AIAC), the space industry's representative, conducted its own analysis on the same topic; both reports clearly showed the *1974 Policy's* siloed approach impeded the true potential benefits of space.[123] As a result, the Prime Minister assigned MOSST with a "leadership role with respect to space policy and development" and assigned it a leadership role with respect to space research,

[120] *Ibid*.
[121] *Ibid* at p 5.
[122] *Ibid* at pp 5-6.
[123] "The MOSST analysis and the AIAC submission clearly showed that, from the point of view of both the government and industry, there were weaknesses to the existing approach to space that limited the scope and benefits of the program." *Ibid* at p 6.

policy development, and coordination of space activities. As a result, ICS was transferred to MOSST from the DOC.[124]

The *1981 Plan*, therefore, provides two basic premises related to the space program: first, that the use of space contributes to the social, cultural and economic goals of the country; and second, that there are economic benefits associated with a strong space industry that is internationally competitive. As a result, the objectives of the *1981 Plan* were to simultaneously develop and improve existing technologies and "cash in on the commercial opportunities". Specifically, this meant Canada was to maintain and build on its existing strengths related to communications and space science while also significantly investing in the development of remote sensing.[125] The *1981 Plan* concludes with a breakdown of the existing ($195 million) and additional ($64 million) funding allocated to space, a recitation of why such expenditures are so important for a country like Canada and a statement that the plan will be updated annually to account for new opportunities.[126]

Canadian Space Program Plan (MOSST, 1982)

As mentioned in the *1981 Plan*, MOSST released an updated Canadian Space Program Plan in December 1981 for the years 1982/83, 1983/84 and 1984/85. The *1982 Plan* followed the November 1981 budget in which the government prioritised "the development and exploitation of advanced technology and high productivity goods and services, particularly with respect to major resource development activities".[127] Fulfilling the criteria for this area of priority, the space program received an addition $132 million for a total of $476 million over four years (1981/82 to 1984/85).[128] The additional funding was earmarked for Canada's participation in a European Space Agency that would create significant industry exposure, investigations into a new satellite system for increased mobile communications and projects harnessing the benefits of remote sensing satellites.

The *1982 Plan* reiterates the comments made in the *1981 Plan* related to the benefits afforded by space to Canada and provides an update on the government's commitment to developing new

[124] *Ibid*.
[125] *Ibid* at pp 6-7.
[126] *Ibid* at p 10.
[127] Ministry of State for Science and Technology, *Background Paper: The Canadian Space Program Plan for 1982/83 - 1984/85*, Government of Canada, Dec 1981 at c Foreword [*1982 Plan*].
[128] *Ibid* at p 1.

ways of using space data.[129] The *1982 Plan* also discusses the nature and ongoing benefits of having a "prime contractor" (at that time, Spar Aerospace Limited) to take full advantage of the economic benefits afforded by the global space sector.[130] A prime contractor is a single private entity tasked with overseeing and developing a project acquired through a government procurement process, with the responsibility of implementing the project. In many prime contractor agreements, the prime contractor commits to spending the funding within Canada (either on developing components itself or purchasing components from Canadian sub-contractors). Specifically, the *1982 Plan* lists the following four advantages of having a prime contractor:

> The benefits of such a capability are: (i) a high level and high quality of Canadian content is achieved in domestic programs; (ii) new technologies and proprietary products are generated in Canada leading to significant export sales; (iii) the possibility is opened for collaboration with foreign prime contractors for the exploitation of the expanding international market; and (iv) system level expertise is created which is essential to the development and maintenance of a sub-system design and manufacturing capability throughout the Canadian space industry.[131]

The concept of a prime contractor aligned with the government's "Make or Buy" program (such that the government would either make space components in-house or buy such components from Canadian companies) which was intended to ensure the government's significant investments in the space program would stay within Canada and boost the economy (rather than being spent in foreign jurisdictions), thereby developing industrial capacity and an opportunity for export.

In the 1980s, the notion of appointing a prime contractor for space projects was not a novel phenomenon: in the late 1950s, the Defence Research Board appointed Bristol Aircraft to act as the prime contractor for the new series of Black Brant rockets[132]; in the early 1960s, the Department of Defence selected RCA Victor as the prime contractor for the Alouette-2 and ISIS satellites[133]; in the mid-1970s, the government selected Hughes Aerospace as the prime contractor for the Anik series of satellites[134], the Department of Communication selected Spar Aerospace as

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[129] *Ibid* at pp 2-3.
[130] The *1974 Policy* emphasised that Canada's satellite systems be "designed, developed and constructed in Canada by Canadians, using Canadian components", leading to the development of the Prime Contractor Policy in 1976. *Gibbs & Evans 5*, *supra* note 94.
[131] *1982 Plan*, *supra* note 127 at p 4.
[132] *Godefroy*, *supra* note 10 at p 43.
[133] *Ibid* at p 83.
[134] *Ibid* at pp 126-128. Hughes Aerospace was an American firm and by making such a selection, the government was subject to criticism by both the opposition and the general population as the decision seemingly flew in the face of the government's own "Make or Buy" program meant to develop and rely on domestic space capabilities.

the prime contractor for the Communications Technology Satellites[135] and the National Research Council selected Spar Aerospace again as the prime contractor for the remote manipulator system (now known as the Canadarm)[136].[137] By 1982, Spar had successfully demonstrated the potential reach of Canadian industry when it won a sizeable contract to build Brasil's first communications satellite, Brasilsat-A1, beating out a politically well-connected French company.[138]

The *1982 Plan* commends Spar's technical competence since its selection as prime contractor in the 1970s and refers specifically to its successful demonstration of the Canadarm during Space Shuttle Columbia's second flight as a reason for continuing the program.[139] The *1982 Plan* also discusses Spar's role in designing and manufacturing the later-Anik series satellites, which would have significantly more Canadian content aboard the spacecraft when compared to its predecessors developed by the US Hughes Aerospace company.[140] Maintaining the prime contractor policy would thereby allow Canadian industry to benefit from the current, planned and future Canadian space program by ensuring projects were designed and developed in such a way as to generate substantial work for sub-contractors in addition to the prime contractor.[141]

The *1982 Plan* also discussed the benefits of international relationships related to space activities and defended the government's position to invest even more in its international partnerships, namely with the US and Europe. Recognising that all of the "government's major space projects had been conducted jointly with other nations", the *1982 Plan* highlighted the reduced costs and access to important technology as a basis for ensuring Canada's foreign policy remained committed to international space partnerships.[142] In economic terms, these relationships

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[135] *Ibid* at pp 123-125. The CTS (Communications Technology Satellites) would later be rebranded as Hermes.
[136] *Ibid* at pp 149-150.
[137] The government would later go on to select Spar Aerospace as the prime contractor for RADARSAT-1 and MDA as the prime contractor for RADARSAT-2. *Ibid* at pp 203, 271.
[138] Peter Newman, *Spar's soaring success in space*, Macleans, 22 Aug 1983, online: <https://archive.macleans.ca/article/1983/8/22/spars-soaring-success-in-space>; Steve Wise, *Space and National Development: Are Brazil and Argentina Examples?*, (1990) 12 Technology in Society 79 at p 83. Following the successful deployment and operation of Brasil's first set of telecommunication satellites - with which, by all accounts, Brasil was pleased - Spar was unable to secure the contract to develop the second set of telecommunication satellites as a result of diplomatic manoeuvres by the US.
[139] *1982 Plan*, *supra* note 127 at p 4.
[140] *Ibid*.
[141] *Ibid* at p 5.
[142] *Ibid* at p 5; *Gibbs & Evans 5*, *supra* note 94.

with other space faring nations provided Canadian industry with an opportunity "to develop beneficial commercial relationships" and remain a valuable player in the global space market.[143]

Interim Space Plan (MOSST, 1985)

The 1985/86 Interim Space Plan[144] was released by Tom Siddon, Minister of State for Science and Technology, and was intended to demonstrate the government's commitment to space notwithstanding the expiration of its previous *1982 Plan*.[145] Although the expectation was that the *1985 Interim Plan* would simply itemise Canada's continued funding for established space programs, it also formally announced the government's decision to participate in the US-led space station program, its intention to continue developing a new Earth imaging satellite and support for implementing a new commercial mobile communications satellite system.[146] In announcing its funding for the space program, the government increased its expenditure by 30% over the year before to total $195 million for all projects, a concrete demonstration of its commitment to space.[147] The *1985 Interim Plan* specifically references "the priority it attaches to the development of a viable space industry and the importance of satellite-based services to the economic development of the country" and an expectation that industry commit resources to realise the potentials afforded by space.[148] Notably, there was no mention of how the additional funding was to be spent with regard to the numerous government departments interested in, and working on, the various space projects nor did it make reference to the creation of a federal space coordinating body like a space agency.[149]

The *1985 Interim Plan* recognised that Canada's modest financial and human resources necessarily prevented it from being at the forefront of all space activities and technologies, thereby requiring the country to selectively focus "on a few areas where the probability of achieving substantial benefits" was the highest.[150] In recognising this need for selectivity, the Minister of State for Science and Technology promised to produce a Strategic Space Plan by the end of 1985

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[143] *1982 Plan*, *supra* note 127 at p 6.
[144] Ministry of State for Science and Technology, *Interim Space Plan 1985-1986*, Government of Canada, Mar 1985 [*1985 Interim Plan*] at p 1.
[145] *Godefroy*, *supra* note 10 at p 171.
[146] *Godefroy*, *supra* note 10 at p 171. The Earth imaging satellite would later be known as RADARSAT and the mobile communications satellite system would be known as MSAT.
[147] *1985 Interim Plan*, *supra* note 144 at p 2; *Godefroy*, *supra* note 10 at p 171.
[148] *1985 Interim Plan*, *supra* note 144 at p 2.
[149] Godefroy, *supra* note 10 at pp 171-172.
[150] *1985 Interim Plan*, *supra* note 144 at p 3.

which would identify the overall objectives and strategies related to the Canadian space program so that it could focus on the specific activities and technologies that would allow Canada to make a meaningful contribution to, and derive a meaningful benefit from, space.[151] The *1985 Interim Plan's* discussion related to Canada's participation in the space station program furthered this policy of financial prudence as it recognised the existence of a number of different proposals - each with their own varied potential - but would make a determination on "the relative cost/benefits" of each, given the overall program's limited means.[152]

Canadian Space Program: Long Term Initiatives (MOSST, 1986)

In 1986, MOSST released *The Canadian Space Program: New Initiatives*[153], its much anticipated strategic space plan. The *1986 Program*, now commonly referred to as the first Long Term Space Plan (LTSP I), outlined the goals of Canada's space program to include: building on an established expertise in "space technology engineering and application development"; maintaining international cooperation efforts; ensuring space technology generates significant economic and social benefits; and ensuring excellence in the scientific exploration of space.[154] As with the *1985 Interim Report*, the *1986 Program* recognised at the outset Canada's limited resources and its historic success in capably funding space activities with high rewards.[155]

The *1986 Program* listed five new priority areas that MOSST believed would result in the greatest return from an even larger space budget. The first program, related to communications, was to focus on MSAT which would provide domestic telecommunications via a commercial

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[151] *Ibid*.
[152] *Ibid*.
[153] Ministry of State for Science and Technology, *The Canadian Space Program: New Initiatives*, Government of Canada, May 1986 [*1986 Program*].
[154] *Ibid* at p 2; Kirton, *supra* note 11 at p 63. The 1986 Program was released a few months after the Space Shuttle Challenger disaster that took place in January 1986 and the lack of acknowledgement of such a significant event is curious. "For all the impressive accomplishments, however, Canadian space activities remain fundamentally dependent upon, and hence vulnerable to changes in, the space policy, programmes and power of the USA. ... Indeed, Canada's currently operative comprehensive space plan, announced five months after the Challenger disaster, represented an enormous act of faith in the capacity of US technology, government finances and political system to bring the USA back as the world's predominant space power. Yet in the subsequent three years all three of Canada's major projects have been the victims, through delays, cost escalations and project redefinitions, of technological, financial and political weaknesses in the US and, in the case of Radarsat, the UK. In particular, the effects on Canada's premier programme - Space Station participation - of weaknesses in US launch technology, military space programmes and international competitiveness in automation and robotics should stimulate a vigorous search for national and international supplements to a continental partnership with a space superpower now in trouble." Kirton, *supra* note at pp 70-71.
[155] *1986 Program*, *supra* note 153 at p 2.

communications satellite system for mobile users.[156] The second program, related to remote sensing, was to improve Canada's capacity to utilise remotely-sensed data, primarily through the RADARSAT program as well as in partnership with the European Space Agency.[157] The third program, related to the space station, centered on providing and operating Canadian hardware for use aboard the space station as well as creating a program that would allow non-space related industry to benefit from the weightless environment in space to develop commercial products.[158] The fourth program, related to space science, combined general research by government and academia, the development of scientific instruments by industry and the use of microgravity to develop new kinds of materials for advanced manufacturing.[159] The fifth program, related to astronauts, provided recognition of the important role played by humans in testing experiments and operating hardware with a view to supporting space experiments originating from industry, government and universities.[160]

Regarding the financial implications of such focusses, the *1986 Program* committed $824 million over the five years spanning 1986/87 to 1990/91, justifying such an increased expenditure on the need for increased space capability, the industrial benefits of having a robust space program, the national pride associated with accomplishments in space and the opportunity to compete with other world powers in demonstrating technical prowess.[161] Economically, the *1986 Program* expected its investment in space to create up to $8 billion in revenue over an undefined period of time and continue to employ thousands of people in high-tech positions.[162]

In many ways, the overall language associated with the *1986 Program's* objectives were in-line with the rationale and hopeful-message embedded within the *Chapman Report* over 20 years earlier:

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[156] *1986 Program*, *supra* note 153 at pp 3, 6; Kirton, *supra* note 11 at p 63.
[157] *1986 Program*, *supra* note 153 at pp 3-4, 6; Kirton, *supra* note 11 at p 63.
[158] *1986 Program*, *supra* note 153 at pp 3, 6-7.
[159] *Ibid* at pp 4, 7.
[160] *1986 Program*, *supra* note 153 at pp 4, 6-7; Kirton, *supra* note 11 at p 63. Prior to the US offer that two Canadian payload specialists participate on flights of its Space Shuttle (seen largely as a "thank you" for providing the highly successful and useful Canadarm), Canada did not have an astronaut corps nor did it envision the need for one. However, upon realising that by participating in significant space programs like the Shuttle missions, Canada would be in a position to participate in future large-scale programs upon which the Canadian space industry depended. As a result, in July 1983 the NRC recruited and prepared astronauts for flights aboard the Space Shuttle and this plan proved successful when the US formally invited Canada to participate in the International Space Station a few years later. *Gibbs & Evans 5*, *supra* note 94.
[161] *1986 Program*, *supra* note 153 at p 9.
[162] *Ibid* at p 10.

> This long-term program will ensure that Canadians continue to benefit economically and socially from the development and use of space technology. It will maintain Canada's hard-won international reputation for excellence in this frontier area of high technology. It will continue to instill pride in Canadians in our world-class achievements and will serve as a challenge and inspiration to our future scientists and engineers.[163]

Nevertheless, the *1986 Program* was silent as to how the new priorities and financial expenditures were to be spent and by whom, especially with respect to the creation of a national space agency. Indeed, unlike the *Chapman Report* 20 years earlier, there was no explicit mention of unifying Canada's space activities under a centralised or coordinating body; as was true for the previous three decades, Canada's space programs were implemented and coordinated through the administrative vehicle of the ICS.[164] Surprisingly, a few months after the announcement of this long-term plan, Prime Minister Mulroney announced the creation of a new "national space agency to manage the country's space program".[165] Whether the lack of reference to such a significant development in the *1986 Program* was a result of the government not wanting to spoil a significant public announcement or whether it was devised after the release of the report is not clear.

The Canadian Space Program - A New Horizon (CSA, 1994)

The newly created Canadian Space Agency released its first space program in 1994. The *1994 Program*[166], now commonly referred to as the second Long Term Space Plan (LTSP II), provided a vision for the Canadian space program as it prepared to enter the 21st century, aware of its past successes, contemporary needs and future opportunities. In prior decades, both space-based communications and remote sensing space systems were the technologies best suited to address Canada's unique geological and demographic challenges; moving forward, these technologies would remain the primary motivational force behind Canada's continued engagement with the space environment.

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[163] *Ibid* at p 2.
[164] *Godefroy*, *supra* note 10 at pp 171-172, 179.
[165] *Kirton*, *supra* note 11 at p 63. Notwithstanding the announcement in October 1986, it was not until after the 1989 election that re-elected Prime Minister Mulroney announced the creation of the Canadian Space Agency, to be located outside Montreal. The location of the headquarters was fiercely debated and its selection outside Montreal was harshly criticised - a number of government scientists and managers resigned rather than relocate from the national capital region in Ottawa to Montreal. *Kirton* at p 64. The political decision to locate the headquarters was meant to appease Lucien Bouchard, leader of the newly formed Bloc Quebecois party calling for sovereignty, at a time of significant federalist tension.
[166] Canadian Space Agency, *The Canadian Space Program: A New Horizon*, Government of Canada, 1994 *[1994 Program]*.

Faced with selecting from over $4 billion worth of proposals to determine the components of a new space program, the *1994 Program* identified specific principles that guided its decision-making: focusing on established Canadian strengths; contributing to economic growth; contributing to industry competitiveness overseas; contributing to advancing knowledge; leveraging private sector partnerships; contributing to increased government efficiency and effectiveness; balancing the distribution of funds; and ensuring flexible program content.[167] The *1994 Program* identified the following programs as priority areas: the International Space Station; Earth observation; satellite communications; space science; space technology development; the astronaut corps; and space awareness.[168]

Of the *1994 Program's* seven priority areas, the space technology development and space awareness programs were unique insofar as it was the first time they explicitly appeared in a government policy document (although the latter was presciently referenced generally as a significant benefit of the space program by the *Chapman Report*[169]). The space technology development program earmarked $26 million specifically to develop emerging space technologies to share development costs with industry, foster industry participation in cooperative ventures with foreign partners and support transferring technologies to non-space applications.[170] The space awareness program earmarked $13 million for activities that would promote the science and technology sectors generally through the perspective of space by leveraging its unique appeal - the inclusion of this priority area came at the behest of industry and research institutions concerned about future Canadian competitiveness in the STEM sectors.[171]

In describing the implementation of the Canadian space program, the *1994 Program* recognised that the complexity of the projects and the plurality of entities involved. To meet its various objectives, it developed a space policy framework that would: recognise space as strategically important to Canada; appoint the CSA as responsible for the coordination of all civilian space activities; create a Canadian Space Program Consultative Committee represented by

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[167] *Ibid* at p 3.
[168] *Ibid* at pp 5-12.
[169] *Chapman Report*, *supra* note 12 at p 94. The Chapman Report discusses the importance of a vibrant space program to inspire and provide challenging work to Canada's young and talented engineers and scientists.
[170] *1994 Program*, *supra* note 166 at p 10. This was the first policy document to discuss a space technology development program and a variation of this program remains in existence today. Marc Boucher, *1994 - The 1st Canadian Space Agency Plan: What's in Canada's Long Term Space Plans? Part 4*, SpaceQ, 9 Nov 2018, online: <http://www.spaceq.ca/1994-the-1st-canadian-space-agency-plan-whats-in-canadas-long-term-space-plans-part-4/>.
[171] *1994 Program*, *supra* note 166 at p 12.

all stakeholders in space; develop a process by which to evaluate the success of the various components of the Canadian space program; implement innovative and flexible financing mechanisms; build on areas of industrial and technical competency; coordinate with provincial governments to avoid space-related overlap; develop industry across all Canadian regions; exploit the strategic environment of space to protect national security and sovereignty; help federal departments leverage space to increase operational efficiency and effectiveness; and market the unique appeal of space to motivate youth to undertake careers in science and technology.[172]

The *1994 Program* opens with a discussion related to the pressures faced by the Canadian space program (given the cost increases of the International Space Station and a reduction in funding due to the completion of the MSAT and RADARSAT missions)[173] which required the government to recalibrate its spending. The newly-elected government flipped the traditional funding structure of Canada's space programs (historically, government departments would propose a new program and seek authorisation and funding) to a new method where the government would allot the CSA a certain predetermined budget and the CSA would have to decide which space programs to finance using that budget.[174] Notwithstanding this change in funding style, the *1994 Program* concluded with a funding summary apportioning $2.7 billion over a ten year period from 1994/95 and ending in 2003/04, focussing primarily on the space station (18%), RADARSAT (15%), Earth observation (13%), space technology (13%), satellite communications (12%), and space science (11%).[175] The *1994 Program* announced funding for RADARSAT-2, a next-gen satellite communications payload for Telesat and SciSat[176] and departed from the prime contractor policy of years prior, instead adopting a competitive procurement policy, first implemented with RADARSAT-2 (which was won by MacDonald Dettwiler and Associates).[177]

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[172] *Ibid* at pp 13-15.
[173] *Ibid* at p 2.
[174] Graham Gibbs and W Mac Evans, *Part 9: A History of the Canadian Space Program - Policies & Lessons Learned Coping with Modest Budgets*, The Commercial Space Blog, 15 May 2017, online: <http://acuriousguy.blogspot.com/2017/04/part-5-history-of-canadian-space.html>.
[175] *1994 Program*, *supra* note 166 at p 16.
[176] *Gibbs & Evans 5*, *supra* note 94.
[177] *Ibid*.

The Canadian Space Program: A New Era for Canada in Space (CSA, 1999)

At just ten years old and on the precipice of a new millennium, the CSA released a new policy document on the Canadian space program in July 1999. The *1999 Program*[178] picked up where the *1994 Program* left off, refining the government's commitments to space and focussing the Canadian space program on developing space science and technology to meet the needs of, and benefit, Canadians as well as to foster the development of an internationally-competitive space industry.[179] The *1999 Program* recounted Canada's storied history in space[180] before outlining the new global environment related to space. Specifically, the *1999 Program* identified two significant global shifts: first, the privatisation of traditional governmental space activities to commercial operators and second, the emergence of new geo-political space players and markets.[181]

As a response to these new global realities, the *1999 Program* outlined the following policy objectives of the Canadian space program: to maintain and expand Canadian expertise in traditional areas of activity (space science, telecommunications, Earth observation and robotics); to derive maximum social and economic benefit from Canada's activities in space (through new applications, growing industry and assisting with the participation of small and medium-sized enterprises); to foster regional development (by building on regional strengths and capabilities and sharing the economic benefits of space); and to develop and use Canada's space infrastructure (specifically, the various space assets and research laboratories).[182] These objectives were formed, in part, having realised the success of the public-private partnerships that had thus far shaped Canada's space industry - in 1999, the spin-offs from space were significant.[183]

To achieve these objectives, the *1999 Program* detailed its implementation strategy while recognising that the Canadian space program is:

> an important instrument for achieving the Government's objectives in research and development, science and technology, economic and industrial development, export expansion and employment, improved efficiency and effectiveness of government operations, and the maintenance of Canada's sovereignty in the new world economic order.[184]

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[178] Canadian Space Agency, *The Canadian Space Program: A New Era for Canada in Space*, Government of Canada, Jul 1999 [*1999 Program*].
[179] *Ibid* at pp 3-4.
[180] *Ibid* at pp 4-9.
[181] *Ibid* at p 9.
[182] *Ibid* at pp 10-11.
[183] *Godefroy*, *supra* note 10 at p 239.
[184] *1999 Program*, *supra* note 178 at p 10.

Focusing first on Canada's space expertise, the *1999 Program* determined that continued success would rely on continued specialisation in four main areas: space robotics, remote sensing, satellite communications and space science.[185] In an effort to generate the maximum benefit from space activities, it determined that the majority of public funds must continue to be spent on procuring services from industry, universities and research institutes of all sizes and from all locations, with the ultimate goal of privatising space activities as soon as they were commercially self-sustainable.[186] The *1999 Program* also provided that the government must ensure that the Canadian space program continued to work with its domestic (industry, university, provincial governments, etc.) and international (US, Europe, Japan, etc.) partners and continue building deeper and more diverse relationships. Such partnerships served not only the interests of the Canadian space program but were also in-line with the government's national unity and foreign policy interests.[187] Lastly, the Canadian space program was to continue nurturing a culture of science and provide world-class instruments for international space science missions to conduct studies that were otherwise outside the capabilities of a single nation.[188] In summary, the *1999 Program* maintained many of the conventional priorities of the Canadian space program and reiterated the rationale described in past governmental policy documents, albeit with more recent and poignant examples of success.

As a result, the *1999 Program* restructured the Canadian space program around five pillars: Earth and environment; space sciences; human presence in space; satellite communications and generic space technologies.[189] The "Earth and Environment" pillar would focus on enhancing "Canada's ability to understand, monitor, predict and protect the Earth and its environment" and maintain industry leadership.[190] The "Space Sciences" pillar would focus on using the space environment "to advance knowledge in materials as well as life sciences" and maintain industry expertise in scientific instrument development.[191] The "Human Presence in Space" pillar would focus on ensuring international participation of the astronaut corps, play a "meaningful and visible role in the International Space Station" and maintain a leadership role in robotics.[192] The "Satellite

[185] *Ibid* at p 11.
[186] *Ibid* at pp 11-12.
[187] *Ibid* at pp 12-13.
[188] *Ibid* at p 13.
[189] *Godefroy*, *supra* note 10 at p 238.
[190] *1999 Program*, *supra* note 178 at pp 15-16.
[191] *Ibid* at p 16.
[192] *Ibid* at pp 16-17.

Communications" pillar would focus on ensuring Canadians "have access to the world's most advanced satellite communication technologies" and increase industry's share of the world wide communications market.[193] Finally, the "Generic Space Technologies" pillar would focus on the commercialisation "of next generation technologies of strategic importance" to the Canadian space program.[194]

In addition to this restructuring, the *1999 Program* provided the CSA with its first stable budget of $300 million starting in 2002/03. This stability represented an acknowledgement that the CSA's role in steering the Canadian space program would be best served if it had the ability to adjust its programs to the rapidly evolving environment in which space activities took place - financial stability in the form of base funding would enhance its flexibility to respond to changing circumstances. In a similarly forward-thinking approach, the *1999 Report's* conclusion offers particularly poignant insights and statements related to the future that no other previous government policy document included: a recognition of the growing fragility of the Earth's environment and that humanity "may be spending the well-being of future generations for the sake of current consumption".[195] The report concludes with brief remarks on how space can play a role in assisting humanity in better understanding its effects on the natural environment and how, as humanity moves into the 21st Century, space exploration can open new frontiers.[196]

The Canadian Space Strategy: Serving and Inspiring the Nation (CSA, 2003)

In 2003, the CSA released a new Canadian space program framework to replace the *1994* and *1999 Programs* that, until that point, guided the government's engagement with space.[197] In its introductory comments, the *2003 Strategy* recognised that "[i]mproving the economic and social well being of Canadians has always been–and will remain–the central motivation" of a Canadian space program"[198] and that:

> [s]pace needs to be recognised as a national priority for Canada to continue to serve the needs of citizens, governments and industry in the decades to come and beyond. It is no longer an option for

[193] *Ibid* at p 17.
[194] *Ibid* at p 18.
[195] *Ibid* at pp 18-19.
[196] *Ibid* at pp 18-19.
[197] Canadian Space Agency, *The Canadian Space Strategy: Serving and Inspiring the Nation*, Government of Canada, Nov 2003 [*2003 Strategy*] at p 5.
[198] *Ibid* at p 9.

> us to question whether a space program has a place in our future, but whether we have a future without a space program.[199]

In this way, the *2003 Strategy* makes abundantly clear from the outset that the need for a Canadian space program was as important and relevant as ever. Such seemingly-obvious comments were likely included given the context in which the *2003 Strategy* was drafted, namely, following the Space Shuttle Columbia disaster. Although no Canadians were aboard the American-spacecraft during the accident, the ensuing consequences of a grounded US fleet, delayed launch opportunities and backlogged experiments meant Canada needed to reevaluate its priorities and prepare for a future of less predictable schedules.[200]

Without announcing any bold new initiatives[201], the *2003 Strategy* identified four main areas as the thrust of the Canadian space program: Earth observation; space science and exploration; satellite communications; and space awareness and learning.[202] As with every government policy document stretching back to the *1981 Plan*, Earth observation continued to play a crucial role in the Canadian space program given Canada's geographic landmass, plentiful and varied resources and incomparable coastline. The *2003 Strategy* included as its objective to maintain and expand Canada's leadership role in earth observation technologies "to obtain the timely, relevant and essential information [needed] to make judicious decisions".[203] The space science and exploration thrust prioritised "Canada's contribution to humankind's scientific knowledge, the exploration of our solar system and the Universe". To this end, the *2003 Strategy* included astronomy and the solar system as well as physical and life sciences as its targets.[204] Similarly, as with all space policy documents as far back as the *1968 Whitepaper*, the *2003 Strategy* reaffirmed satellite communications as a clear priority: it set as its objective the maintenance of Canada's leadership role in satellite communications and ensuring that "the most advanced products and services [were

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[199] Ibid at p 11.
[200] *Godefroy*, *supra* note 10 at pp 268-269. A similar realisation took place within the Canadian space community following the Space Shuttle Challenger disaster, when the majority of the US launch fleet was grounded for two-and-a-half years, highlighting the vulnerabilities of the Canadian space program (especially its astronaut corps) to external forces beyond its control. *Kirton*, *supra* note 11 at p 68.
[201] Marc Boucher, *2003 A New Strategy With No Long Term Space Plan: What's in Canada's Long Term Space Plan? Part 6*, SpaceQ, 12 Nov 2018, online: <http://spaceq.ca/2003-a-new-strategy-with-no-long-term-space-plan-whats-in-canadas-long-term-space-plans-part-6/>
[202] *2003 Strategy*, *supra* note 197 at 13.
[203] *Ibid*.
[204] *Ibid* at 15. This inclusion is the first time since the early days of Canada's space program that space science was featured in a predominant role.

available] to all Canadians, everywhere".[205] Finally, the *2003 Strategy* continued with the theme of "using space to captivate the imagination of Canadians, and stimulate young minds to pursue knowledge-intensive careers".[206] Uniquely, the *2003 Strategy* was the first space policy document to include specific "target results" with its priority descriptions, making extremely clear both the overall objectives of the space program as well as what success would look like.

The *2003 Strategy* concluded with a discussion on the importance of continued national and international partnerships[207] and what it described as the "essential building blocks" of any space faring nation. Specifically, the five basic capabilities are the specialised knowledge and workforce to generate scientific knowledge; the ability to use scientific knowledge to create new technologies; the skills needed to build and test new technologies; the capacity to launch; and the ability to operate space assets.[208] Notably, the *2003 Strategy* did not focus on industry as much as past government space policy documents. While it did mention on numerous occasions why industry was best suited to develop the advanced technologies needed for space and disseminate widely the benefits of space technology, it neither specifically discussed new government-led projects in which industry would play a leading role nor did it highlight opportunities cultivated specifically for industry to export its world-class capabilities.

Reaching Higher: Canada's Interests and Future in Space (Emerson, 2012)

In 2008, the CSA had prepared and internally presented to the government its new Long Term Space Plan.[209] Although the details of that space plan were never made public, the government of the day decided to neither release nor implement the plan for financial reasons (2008 being the start of the global financial crisis), a decision that incensed many members of the Canadian space community.[210] Instead, the government decided to conduct a review of Canada's aviation and space sectors and, in February 2012, formally announced the Aerospace and Space

[205] *Ibid* at 16.
[206] *Ibid* at 17.
[207] *Ibid* at pp 22-23.
[208] *Ibid* at p 19.
[209] Graham Gibbs, *Rationale and Framework for a Canadian National Space Policy*, SpaceQ, 7 Sep 2017, online: <http://spaceq.ca/rationale-and-framework-for-a-canadian-national-space-policy/>.
[210] Euroconsult, *International overview of space governance and policies for the Canadian Aerospace Review*, Euroconsult, 27 Jun 2012, online: <http://aerospacereview.ca/eic/site/060.nsf/vwapj/Euroconsult_study_for_Canadian_Aerospace_Review_-_Final_Report.pdf/> at p 59.

Review[211]. Led by David Emerson, the review was to conduct "a comprehensive review of all policies and programs related to the aerospace and space industries to develop a federal policy framework to maximize the competitiveness of this export-oriented sector and the resulting benefits to Canadians"[212]. In November 2012, after a ten month-long process, Emerson released the second of this two-part series, focusing on Canada's space sector.

The *Emerson Review* began with a discussion of Canada's history in space, its various accomplishments and accolades and an account of the role of space in everyday life.[213] It then discussed various global trends (a rebalancing of economic and geopolitical power, the need for increased resources, climate change, the decline of traditional military expenditures and a rise in new security threats, the digital revolution and an aging population) with a specific focus on how a robust space infrastructure could meet and take advantage of the opportunities presented by these challenges.[214] With respect to the general opportunities posed by space, the *Emerson Review* identified key instances where a strengthened Canadian space program could prove advantageous: protecting and developing the North; refining agricultural practices; studying transportation and urban planning; improving meteorology; delivering varied forms of information; addressing on-orbit concerns like debris and refueling; and utilising existing expertise in future activities like space mining.[215] However, the *Emerson Review* also identified a variety of challenges, namely: "inadequate clarity of purpose with respect to Canada's space program and its role in providing services and advancing national priorities"; limited private sector competition and reliance on public spending; national policies that prohibit foreign competition on the basis of "national security"; and a lack of indigenous launch capability.[216]

In light of these opportunities and challenges, the *Emerson Review* put forth numerous recommendations, including some general recommendations that applied equally to the aviation sector, such as: initiatives for collaboration among companies, researchers and academics; simplifying application and reporting procedures used by industry; negotiating specific beneficial

[211] David Emerson, *Reaching Higher: Canada's Interests and Future in Space*, Aerospace Review, Government of Canada, Vol 2, Nov 2012 [*Emerson Review*] at p 4.
[212] Public Works and Government Services Canada, *Budget 2011: The Next Phase of Canada's Economic Action Plan*, Government of Canada, 2011.
[213] *Emerson Review*, *supra* note 211 at pp 7-16.
[214] *Ibid* at pp 17-21.
[215] *Ibid* at pp 23-26.
[216] *Ibid* at p 26.

bilateral agreements; reviewing export and domestic control regimes; and promoting STEM education and careers across all federal programs.

The *Emerson Review* also put forth eight recommendations specific to the space sector as a means of ensuring the Canadian space program would remain relevant and excellent. First, it recommended that Canada establish its space priorities clearly and with direction from the highest levels of government after substantial and considerable consultation across all departments. Specifically, the Canadian space program would need 10-year, 5-year and annual priority plans with a clear outline of the responsibilities of various actors from which minimal deviation could be expected.[217] Second, it recommended creating an Advisory Council made up of representatives from industry, research and academia as well as representatives from the provinces, territories and federal departments of Canada. Specifically, the purpose of the Advisory Council would be to provide the Minister of Industry with a perspective on the Canadian space program's priorities that was representatively diverse and neutral.[218] Third, it recommended the creation of a Space Program Management Board that would oversee the various Canadian space projects and would ensure coherence and coordination in all federal space activities. Specifically, a program management board would ensure that major projects were planned and executed rigorously and that commitments by various players would be met.[219] These first three recommendations relate to improvements in the overall governance structure of the Canadian space program.

Fourth, the *Emerson Review* recommended predictable funding for the Canadian space program to ensure long-term projects would progress from concept to operation without financial impediments. Specifically, predictable funding would include stabilising the CSA's budget, ensuring large projects utilise multiple funding sources (rather than just the CSA, for example) and that international partnerships could be leveraged for cost-sharing opportunities.[220] Fifth and sixth, it recommended updating the government's procurement processes so that the project definition phase and the competitiveness of proposals, respectively, would be appropriate given the complexities of space operations. Specifically, it required identifying the scope of projects and

[217] *Ibid* at p 31.
[218] *Ibid* at p 32.
[219] *Ibid* at pp 33-34.
[220] *Ibid* at pp 34-36.

then selecting the proposals that were balanced in their price, responsive to outlined needs and bringing overall value to Canada.[221]

Seventh, it recommended increased support for technology development by way of an additional $10 million per year for three years for the CSA's technology development programs. Specifically, this increased funding would allow Canada to focus on research and development in areas that offer "the greatest potential to benefit the competitiveness of the industry and growth of the economy".[222] Eighth, it recommended "creating conditions that are conducive to the expansion of space-related commercial activity" in situations where financial risk was low and risk to public safety was non-existent. Specifically, given the increasing commercialisation of space from the global perspective, Canada ought to support industry desiring to commercialise existing and innovating space technologies and applications.[223] Included in the *Emerson Review's* examples of where more conducive conditions could be created, "[s]implifying regulatory regimes that cover high-altitude testing, suborbital and orbital launches, and human spaceflight", adopting open data policies related to non-sensitive remote sensing data and providing tax incentives to investors of space mining companies were all listed favourably.[224]

Overall, the *Emerson Review* provided a roadmap by which the Canadian space program could be improved, without substantially demanding increased budgetary or bureaucratic resources.[225] In its Executive Summary, it clearly stated: "The question is not whether Canada should be in space, but how public policies and programs can ensure that its presence there, and related activities on the ground, best serve the public interest and help the space sector thrive."[226] Indeed, in an effort to ensure that space activities continue to serve the public interest, regular reviews of Canada's space program must be undertaken to manage changes and plan for the future. Unfortunately, the nine-year gap between the *2003 Strategy* and the *Emerson Review* (and additional two year gap until the next policy document) highlights the government's seeming lack of prioritisation of the space portfolio.

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[221] *Ibid* at pp 38-40.
[222] *Ibid* at pp 41-42.
[223] *Ibid* at pp 43-44.
[224] *Ibid* at p 44.
[225] *Ibid* at p 2
[226] *Ibid*.

Space Policy Framework: Launching the Next Generation (CSA, 2014)

After more than a decade of Canada's space program being guided by the *2003 Strategy*, and two years after the *Emerson Review*, James Moore, the Minister of Industry, presented the CSA's new space policy framework in 2014.[227] In the Minister's Message, the *2014 Framework* is described as building on Canada's strengths and historic achievements to "inspire the next generation" and provide a comprehensive approach to Canada's future in space with continued commitment to exploration, commercialisation and development.[228] Recognising the importance of space, the *2014 Framework* was designed by the government to "strategically coordinate its priorities and commitments in space, and put its existing resources to best use".[229] The objective of this new framework was to meet the novel realities of space: namely, that space is "congested, contested and competitive"[230]. To this end, the *2014 Framework* would competitively position Canada and the Canadian space industry to take advantage of new customers and markets while recognising the danger posed by increasing space objects in orbit and the shift from a publicly-driven space environment to a commercially-driven one.[231]

The *2014 Framework* set out five "core principles" and four "areas of action" to address the new space reality. The core principles included: prioritising Canada's interests related to sovereignty, security and prosperity; positioning the private sector at the forefront of space activities; expanding international partnerships; continued excellence in recognised Canadian space specialties; and inspiring the future generation of Canadians to pursue STEM careers.[232] These core principles would be implemented by way of the following avenues: commercialisation; research and development; exploration; and stewardship, management and accountability. With respect to commercialisation, the government committed to using the private sector to satisfy its various essential obligations (such as providing national defence, weather forecasting, public safety, etc.) where possible, thereby supporting Canadian industry in a way that allows it to maintain international competitiveness by developing and testing new technologies that can later be taken to market.[233] The government also committed to increasing support for research and

[227] Canadian Space Agency, *Canada Space Policy Framework: Launching the Next Generation*, Government of Canada, 2014 [*2014 Framework*] at p 3.
[228] *Ibid*.
[229] *Ibid* at p 7.
[230] *Ibid* at p 8.
[231] *Ibid* at pp 8-9.
[232] *Ibid* at pp 9-10.
[233] *Ibid* at p 11.

development (especially in areas of competence like communications, optics and robotics) by ensuring national granting councils leverage their resources towards supporting space research.[234] With respect to the exploration of space, the government committed to continue investing in "advanced systems and scientific instruments" for use in major international endeavours and continuing to support the astronaut program.[235] Finally, the government committed to creating a Space Advisory Council that would represent "the full range of stakeholders in the public and private space domain" to ensure Canada's space program is coordinated rather than piecemeal.[236]

Notably, the *2014 Framework* did not announce any new Canadian space missions, did not provide any additional funding for existing programs nor did it increase the CSA's overall budget, even though it acknowledged that other space-faring nations recently made substantial investments in their national space programs to improve their competitiveness.[237] Instead, the *2014 Framework* implemented the "budget neutral recommendations" put forth in the *Emerson Review*.[238] Further, the *2014 Framework* failed to advance any significant vision related to the future of the Canadian space program that would amount to a national space policy.[239] While the *2014 Framework* stated that it would advance the national interest, it failed to clearly define the national interest as well as how the national interest would be met.

Report on Consultations (Space Advisory Board, 2017)

In early 2017, Navdeep Bains, the Minister of Innovation, Science and Economic Development (ISED) renewed the Space Advisory Board (SAB) and tasked it with conducting "outreach and consultations with stakeholders" related to Canada's space program so as to inform Canada's next space strategy.[240] In the spring of 2017, the SAB held consultations and roundtable discussions across Canada to "mobilize and gather bold ideas from stakeholders, as well as to discuss key questions on Canada's space program" and, in August 2017, the SAB published its

[234] *Ibid* at p 11.
[235] *Ibid* at p 12.
[236] *Ibid* at p 12.
[237] *Ibid* at p 8.
[238] Graham Gibbs and W Mac Evans, *Part 11: A History of the Canadian Space Program - Policies & Lessons Learned Coping with Modest Budgets*, The Commercial Space Blog, 28 May 2017, online: <http://acuriousguy.blogspot.com/2017/04/part-5-history-of-canadian-space.html>.
[239] John Siebert, *supra* note 9 at p 682.
[240] Space Advisory Board, *Consultations on Canada's Future in Space: What We Need*, Space Advisory Board, Aug 2017 [*SAB Report*] at p 1.

report.[241] The *SAB Report* was based on seven roundtable discussions and two webinars with members of industry, academia, space associations, investment groups, provincial governments, museums, and amateur and education groups.[242] It considered the varied suggestions of stakeholders and categorised the most prevalent into six specific themes: first, designating space as a national strategic asset; second, strengthening world-class Canadian capabilities; third, adopting new policies and regulations to capitalise on technological advancements; fourth, establishing continuity in policies and funding; fifth, creating outreach and education programs to inspire; and sixth, appreciating the urgency of the Canadian space program's situation.[243]

The *SAB Report* also provided two clear recommendations: designate space as a national strategic asset and maintain the SAB for future consultation and independent advice. By designating space as a national strategic asset, the government would signal its recognition of the importance of space in "providing unique solutions to many of the country's critical national needs", as was the case in the past with communication (for connecting rural areas) and remote imaging satellites (for monitoring coasts and resources).[244] Further, such a designation would trigger the adoption of a "whole-of-government approach" to space, which would require that the country's space strategy applies to all government organs[245]; doing so would have the added benefit of ensuring the Canadian space program would be primed for any future international opportunities as there would be a renewed emphasis on developing highly qualified personnel, new technologies and growing the overall industry.[246] The *SAB Report*'s recommendation that Canada update its policies and regulations was key to the subsequent inclusion of similar language in the government's ensuing space policy document. The *SAB Report* also recommended maintaining the SAB after the submission of its report to the Minister, given the important role of an independent body with connections to the rest of the space stakeholder community. Specifically, the SAB could provide government departments with general advice, maintain dialogue with various stakeholders in the community and generate metrics for evaluating the success of Canada's future space program.[247]

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[241] *Ibid* at p 3.
[242] *Ibid*.
[243] *Ibid* at p 2.
[244] *Ibid* at p 4.
[245] *Ibid* at p 5.
[246] *Ibid* at p 12.
[247] *Ibid* at pp 13-14.

Exploration, Innovation, Imagination: A New Space Strategy for Canada (ISED, 2019)

In March 2019, Minister Bains presented Canada's next space strategy with the intention of unlocking the potential of space and responding to the "realities of the new and evolving space environment".[248] The *2019 Strategy* acknowledged space as a strategic national asset, "requiring a whole-of-government effort to ensure that Canada can continue to rely on space to help meet national needs".[249] The *2019 Strategy* outlines a five-part vision to implement its plan of creating "the right conditions for the growth of the space sector": first, joining the Lunar Orbital Platform-Gateway (LOP-G); second, inspiring the next generation of Canadians; third, harnessing space to solve everyday challenges for Canadians; fourth, positioning industry to help grow the economy and create jobs; and fifth, acquiring and using space-based data to support science, innovation and economic growth.

Each of the *2019 Strategy's* five pillars are comprised of specific goals to support the overall objectives of the Canadian space program. In supporting the LOP-G, Canada would build the next-generation iteration of the Canadarm, leveraging its expertise in artificial intelligence and robotics to develop a system that would support the LOP-G's general operations and lead to commercial on-orbit servicing using similar technology.[250] Canada's participation in the LOP-G would allow for participation in otherwise-impossible scientific experiments and continued funding for the astronaut program would ensure Canada's "space ambassadors" are guaranteed flight opportunities.[251] In an effort to inspire the next generation, the CSA would create a "junior astronauts" program that illuminates the role of astronauts and instills excellence in youth. Further, the existing astronaut corps would visit schools, both physically and virtually, to "let kids experience the wonder of space first hand" and learn about Canada's space program.[252]

With respect to using space to solve everyday challenges for Canadians, the *2019 Strategy* committed financial resources to develop low-Earth orbit satellites that would support broadband connectivity to connect all Canadians, regardless of location as well as develop satellites that support quantum key distribution for more secure communications. Further, space assets would be used to monitor Canada's landmass and secure its borders, improve the provision of remote

[248] Innovation, Science and Economic Development Canada, *Exploration, Imagination, Innovation: A New Space Strategy for Canada*, Government of Canada, 2019 [*2019 Strategy*] at p 3.
[249] *Ibid* at p 9.
[250] *Ibid* at p 10.
[251] *Ibid* at p 11.
[252] *Ibid* at pp 12-13.

medicine and healthcare and grow nutritious food in otherwise harsh environments.[253] Recognising the role commercial space plays in growing the economy and creating jobs, the *2019 Strategy* committed to creating a modern regulatory framework that would be simpler and more clear while still maintaining "strategic oversight for national security and enabl[ing] commercial growth", recognising the importance of such reform as was proposed in the *SAB Report*. Simultaneously, the government would look to concretising and expanding its international partnerships with foreign space agencies as well as "supporting business-to-business exchanges to better showcase Canadian expertise to the world".[254] The *2019 Strategy* also committed additional funding for the development and demonstration of space technologies with future commercial applications as well as to initiatives linking academia and space companies to other industrial sectors to accelerate the adoption of new technologies.[255]

The *2019 Strategy* also placed particular emphasis on the importance and value of space-based data. To this end, it committed to collecting climate change data to understand and help mitigate against environmental changes and to studying the Earth from space to better understand the planet and the overall space environment through scientific missions.[256] Further, with the expected launch of the RADARSAT Constellation Mission, the *2019 Strategy* prioritised the gathering and use of Earth observation data to respond to climate change and security threats, while simultaneously committing to studying options for successor missions. Finally, the *2019 Strategy* committed the government to implementing open data policies with respect to data obtained from space for use by industry, government and Canadian researchers so that innovative new applications could be created and generate economic benefits.[257]

The *2019 Strategy* revitalised the Canadian space program by both announcing a new, large-scale mission in the form of the LOP-G as well as revising historically-consistent policy positions (such as those surrounding communications, Earth observation, industry development and youth engagement). The *2019 Strategy* also injected significant financial resources into Canada's space program, without which none of its commitments could be possible. The recognition that space is a national strategic asset - as recommended by the *SAB Report* - necessarily requires a whole-of-

[253] *Ibid* at pp 14-15.
[254] *Ibid* at p 16.
[255] *Ibid* at p 17.
[256] *Ibid* at pp 18-19.
[257] *Ibid*.

government approach to space, meaning individual space activities (whether carried out by the CSA, funded by granting agencies or overseen by regulators) would be unified in their overall goals and implementation measures: such cohesion in the Canadian space program is precisely what the *Chapman Report* called for more than five-decades prior.

Reviewing Canadian Space Policy

Although Canada's penchant for space policy documents stretches back more than five decades, starting with the *Chapman Report* in 1967, fifty-two years later, with the *2019 Strategy*, many of the initial observations, intentions and motivations remain the same. Canada has always been geographically large with a relatively small population dispersed across the country; Canada has the longest coastline in the world and borders three different oceans; Canada has vast and varied natural resources; and Canada has a culture that is diverse and distinct from its neighbour. Given all of these factors, space has a unique role to play - this was true fifty years ago and it remains true today. Leveraging the space environment provides Canada with a vehicle through which to reach many of its non-space-specific objectives in a manner that is often more effective and efficient. For example, communications and broadcast satellites allow for constant contact and the development of a common culture while Earth observation systems apply to resource management, agricultural efficiency, natural disaster response and territorial security - although each of these national objectives can be achieved without the use of space, their use offers unique advantages.

Without a high-level political organ through which to steer the Canadian space program, the individual actors within the Canadian government who individually guided Canada's space program from its earliest days to the present each made consequential decisions - whether consciously or unconsciously - that have led to the current reality. Given limited financial and human resources, certain decisions were made along the way: for example, space science largely gave way to commercialisable space applications and general space activities gave way to specialisation in a few specific activities. It is surprising, therefore, that without a top-down, consistent, long-term and comprehensive space policy Canada was able to accomplish the historic space-related feats for which it is known: the third country to have a domestically built satellite placed in space, the first domestic communications satellite, the first direct broadcast satellite and

the first synthetic aperture remote sensing satellite.[258] Just as today's Canadian space program is built upon the iterative policies of the past, tomorrow's space program will be built on decisions made today. Therefore, by looking back on the overall trends established in Canadian space policy, it is possible to identify the decisions that have led to Canada's current space program and illustrate the potential decisions that can be made to properly position Canada's future space program.

By and large, Canadian space policy has focussed on creating a Canadian space program that serves the economic and social needs of Canadians. It is perhaps the *Chapman Report's* distinction between "science and technology" that best captures the Canadian mentality towards space: science is useful and helpful but technology is commercialisable and exportable.[259] Although the shift from space science to space activities was not immediate, it is noticeable.[260] In fact, the very reason for the creation of MOSST - the eventual long-standing captain of the Canadian space program - was to improve Canada's ability to coordinate its messaging related to its science and technology exports when engaging with international partners since industrial development and accessing foreign markets were priorities.[261] Therefore, the *1974 Policy*, as well as every space policy document since, has highlighted the need for the Canadian space program to position itself in such a way as to involve industry, stimulate commercial applications of space and export the resulting technology. To this end, whether explicitly or implicitly, the majority of Canada's space program has been developing technologies that could be spun-off to commercial operators upon maturation. For example, the creation of a domestic communications satellite system (Telesat) and an international communications satellite system (Teleglobe) were initiated by the government and then privatised and, similarly, Canada's Earth observation program was initiated by the

[258] "Therefore, it should not be surprising that Canada became 'the third country to have a domestically built satellite in space (Alouette I research satellite launched in 1962), the first to have its own domestic communications satellite (Anik l satellite launched in 1972), the first to develop a direct broadcast satellite', and the first to operate a synthetic aperture radar (SAR) remote sensing satellite (Radarsat l, launched in 1995). lt should, however, be amazing that Canada managed to achieve all this without any specific, well-thought out, consistent long-term and comprehensive official space policy covering both military and civilian segments and extensive public financial (budgetary) commitments to space activities." *Arevalo-Yepes & Ospina*, *supra* note 89 at p 20.

[259] It is somewhat ironic that although John Chapman himself was a career scientist and a leader in developing many of Canada's earliest scientific satellites his namesake report would cause a shift away from science towards technology.

[260] Although the 1970s saw the most launches in Canadian history, many of which were scientific satellites, part of the reason for this may be the long lead-time needed to plan and launch space systems: the decisions for developing science satellites took place in the 1960s when science was still prioritised and were eventually launched in the 1970s during which time the policies devaluing such satellites had already started to shift.

[261] This was true not just for space exports but for science in general.

government and then sold to (RADARSAT-1) or developed by (RADARSAT-2[262]) private operators. Further the government's reliance on the prime contractor model ensured Canadian companies would receive most of the funding related to a specific project and help develop domestic industrial capacity.

This focus on the Canadian space program facilitating industrial growth was true even in situations where the government engaged foreign partners in larger space programs. Indeed, in certain policy documents such as the *1982 Plan*, there is an express desire for Canada to join international space activities to not only open new markets for commerce but to allow industry the opportunity to see and learn what other nations were doing in space. For example, Canada's development of the Canadarm for the Space Shuttle program was carried out so that Canadian engineers could learn about the inner workings of the Space Shuttle itself, beyond what was necessary to determine how to mount and operate the Canadarm. Such opportunities, for a country with limited resources like Canada, were considered exceptional for the benefit of industry and justified the often significant financial contributions the government made to international programs. To this end, however, Canada has undertaken few significant space programs individually; in almost all instances, Canada has had to partner with larger, more advanced space faring allies to provide industry with sizeable opportunities to develop capacity and internationally-recognised expertise.

Notwithstanding the near-singular focus on developing industrial capability, there is scant reference to the regulation of private space companies. Indeed, prior to the *2019 Strategy*, only the *1968 Whitepaper* on the creation of a domestic communications satellite system discusses the potential need for new laws or means by which to regulate a commercial entity. The likely reason for this is that nearly all commercial operations existed within the publicly-funded Canadian space program: the government would agree to fund a new project, different industrial contracts would be handed out, the components would be integrated and the government would operate the space system. There was never a need for the explicit regulation of private space companies since they rarely played a part in the operation of satellite systems and, even if they did, always did so while

[262] Admittedly, RADARSAT-2 was always intended to be built and operated by a private company, MDA, although significant financial contributions in the form of future data offsets were provided by the federal government.

being supervised. To a certain, limited extent, as technologies and applications matured and were commercialised, laws were put in place to regulate such activities.[263]

Such technologies and applications, however, almost always originated as a result of governmental programs (communications, broadcasting, remote sensing, etc.) and so industry did not independently initiate new and novel space activities or applications. As was explored in Chapter 2, however, this is changing. Private companies today are considering activities like on-orbit servicing or space resource exploitation even though there are no government programs leading the way in these fields (in fact, most governments do not seem interested in developing such programs). As a result, the government will not have the regulatory "head start" they possessed in previous eras by virtue of first developing, operating and understanding the technologies and activities that were eventually spun off to commercial entities. With no experience, governments will now be in a difficult position to regulate activities in which they are not experts. Although historically the role of government in Canada's space program was funding significant space projects completed in partnership with industry, the future role of government will be developing the legal and regulatory mechanisms that will allow private companies to fund and operate their own space activities.

An additional point that presents itself in some of Canada's space policy documents - and which will play an increasingly important role in the future - is the role of space in inspiring the next generation. First discussed as a cautionary tale, the *Chapman Report* highlighted the need for a robust Canadian space program to retain Canada's brightest young minds who, unable to find challenging and fulfilling work in Canada, were moving to the US. Unfortunately, Canada's successive space policy documents were silent on this issue and it was not until much industry consternation that the *1994 Framework* revived discussions surrounding the need for a talented younger generation. Indeed, both the *2014 Strategy*[264] and the *2019 Strategy* also maintained this pressure and placed a renewed emphasis on the need for using space to motivate impressionable students to pursue careers in science, technology, engineering or math, recognising that Canada's

[263] *See* the section below titled *Canadian Space Laws*.

[264] Surprisingly, the government cut much of the CSA's budget related to space education and outreach during the Harper government. Ivan Semeniuk, *Lost in space: Why Canada's diminishing role in the heavens is a problem*, The Globe and Mail, 13 Mar 2018, online: <http://www.theglobeandmail.com/canada/article-lost-in-space-why-canadas-diminishing-role-in-the-heavens-is-a>.

future space program depends on capable and competent Canadians receiving appropriate training at a young age.

As a general point, it is worth noting that in the 1960s, 1970s and 1980s, Canada's space policy documents were prepared and presented on behalf of a ministry (most often, MOSST). Starting with the *1994 Plan*, the CSA was the institution drafting and presenting Canada's space policy documents. The significance of the authorship of these documents is that when drafted at the ministerial level, the document can more authoritatively create a space policy that connects projects across government departments whereas when drafted by the CSA, the purview of the document is solely that which falls within the mandate of the CSA (namely, research and industry growth).[265] For example, it would be beyond the purview of a CSA space strategy or plan to discuss the space policies of the DND even if both were undertaking similar projects related to space situational awareness (the CSA from a peaceful perspective and the DND from a military perspective) leading to a waste of valuable resources. Of course, the best option would be for a national space policy that leverages the uses, advantages, needs and opportunities of different departments and unties them together to best utilise the finite resources apportioned to space.[266] Although the *2019 Strategy* was authored by ISED (likely with significant contribution from the CSA), as a ministerial level document it has the bureaucratic bandwidth to better coordinate with other government departments.

Further, with the exception of very discreet references, each of Canada's significant space policy documents have avoided or ignored questions related to the international governance of space. While such omissions may have been excusable in the past, when space was used by a handful of States and the number of space objects was limited, the modern reality is that there are now dozens of space faring nations and hundreds of commercial operators with thousands of active satellites. Any recent Canadian space policy document ought to include a discussion related to international space governance and, specifically, how Canada would engage the international community to establish an appropriate governance system. Indeed, aside from international

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[265] "Emerson's report echoes the critics who point to the absence of a Canadian national space policy. 'This lack of focus appears to go back at least a decade and has been manifested in weak planning, unstable budgets, and confusion about the respective roles of the CSA and those government departments that are major space users.' Emerson adds to the list of criticisms: 'there has not been sufficient clarity of purpose, lines of authority among public agencies have been blurred, and processes for procuring space assets and services have failed to adapt to new global realities and the commercial capacity of space firms.' There is a call to action, of sorts: 'Business as usual will not be enough.'" (citations omitted) *Siebert*, *supra* note 9 at p 669.

[266] *Ibid* at pp 669-672.

cooperation related to the LOP-G, the *2019 Strategy* does not consider space governance from a high-level perspective. It is likely that such an omission is the result of Canada's individualised departmental approach to space (whereby each government department deals with its own projects and within its own mandate), such that ISED, rather than GAC, was the author of the strategy. The reality is, however, that ISED cannot further the interests of the Canadian space industry without appropriate international space governance. Again, a national space policy would be the ideal policy vehicle through which to coordinate Canada's approach to international space governance and provide it with the administrative wherewithal to influence international space policy decision making.[267]

Indeed, without a coordinated national strategy on how to engage the global space domain, Canada may not have the organisational efficiency necessary to influence international space governance policies. Without such an influence, Canada may be subject to the leadership of other States, putting it in a position that undermines its ability to leverage its advantages. Historically, Canada accomplished the relatively impressive task of maintaining a friendly and productive relationship with its much larger and much more powerful American neighbour while sufficiently distancing itself so as not to be dictated to as if a 51st state. Such a delicate balance was achieved through strategic national investments, diversified international partnerships and resisting US pressure where appropriate.[268] As the space domain grows ever more complex, with an increasing number and diversity of space actors, if Canada desires to have a role in the shaping of global space policy, it will likely require sustaining a delicate balance between maintaining partnerships and advancing its own agenda; this will likely only be possible with a unified Canadian vision and strong domestic and international leadership.

Canadian Space Laws

As discussed in Chapter 3, as a State party to the *Outer Space Treaty*, Canada has an international obligation to authorise and continually supervise the activities of its non-

[267] "Because Canada has no clear statement of goals and intentions in outer space, it has missed opportunities to help shape the international space policy environment. A national space policy, linked to Canada's national strengths in space, is needed to deal with international competitors in the development of space capacities." *Ibid* at p 669.
[268] Of course, there were instances in which Canada was unable to - or chose not to - withstand US pressures, such as the bilateral agreement that led to the creation of the *Remote Sensing Space Systems Act* (as discussed below) or the implementation of strict export controls modelled on the US *International Traffic in Arms Regulations* (ITARs).

governmental entities in space.[269] Since the treaty does not define authorisation or supervision, nor does it provide examples of appropriate or inappropriate methods of carrying out these obligations, it is up to individual States to implement these responsibilities. Generally, most States satisfy the authorisation responsibility by requiring non-governmental entities undertaking space activities to acquire a licence before beginning their space operations. Similarly, in satisfying their supervision responsibilities, most States require continuous contact (in the form of annual reports, update requirements, on-site inspections, etc.) by non-governmental entities carrying out space activities to ensure they are satisfying the specific conditions provided in their licences.

Since there are no specific mechanisms by which a State has to implement its authorisation obligations, different jurisdictions have implemented this international obligation into their domestic legal system differently: most States have chosen to enact a single, comprehensive law that applies to all space activities whereas some States have chosen to enact multiple, specific laws that apply to a single space activity.[270] Canada has chosen the latter approach and therefore has enacted individual laws that apply to specific space activities.[271] In total, Canada has enacted five pieces of legislation that regulate specific activities: the *Radiocommunication Act*[272], the *Aeronautics Act*[273], the *Broadcasting Act*[274], the *Telecommunications Act*[275] and the *Remote Sensing Space Systems Act*[276]. As is discussed below, each of these laws regulate a specific kind of space activity and are applicable only to Canadians carrying-out such activities and to entities based in Canada.

The constitutional legitimacy of these laws is grounded in Canada's constitutional framework and provides that space activities fall within the jurisdiction of the federal government rather than the provincial governments. Canada's *Constitution Act, 1867*[277] provides in sections 91 and 92 a series of subjects over which the federal government and the provincial governments,

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[269] *Outer Space Treaty*, *supra* note 65 at Art 6. "The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty."
[270] Chapter 7 will examine more closely the regulatory frameworks of jurisdictions other than Canada.
[271] For a general overview, *see* Ram Jakhu, *Chapter 5: Regulation of Space Activities in Canada*, in Ram Jakhu, ed "National Regulation of Space Activities" (Cham: Springer, 2010) at 81.
[272] *Radiocommunication Act*, RSC 1985, c R-2.
[273] *Aeronautics Act*, RSC 1985, c A-2.
[274] *Broadcasting Act*, SC 1991, c 11.
[275] *Telecommunications Act*, SC 1993, c 38.
[276] *Remote Sensing Space Systems Act*, SC 2005, c 45.
[277] *Constitution Act, 1867*, (UK) 30 & 31 Victoria, c 3.

respectively, have the exclusive power and authority to individually and definitively legislate. Unsurprisingly, neither section 91 nor 92 explicitly provide for one level of government to oversee space activities. Nevertheless, section 91 includes language that grants authority to the federal government "to make laws for the peace, order, and good government of Canada… [related to] all matters not coming within the classes of subjects by this act assigned exclusively to the legislature of the provinces".[278] Therefore, as explained in a number of supreme court decisions addressing the jurisdictional question of non-enumerated matters[279], the federal government retains authority related to such matters in an effort to ensure the peace, order and good government of the country.[280] Indeed, in the passing of Canada's five space laws to date, provincial legislatures have not mounted constitutional challenges to the legislative authority of the federal government in overseeing these activities.[281]

In Canada, legislation is a government's way of communicating through a legal vehicle its overarching objectives related to a specific topic; as a result, the language used in legislation is often broad and general. This is true of Canada's space laws. Further, most Canadian laws also include subordinate legislation - what is often referred to as regulations - that are drafted using more specific and detailed language. By doing so, regulations allow the government to implement its overall objectives in a manner that is tailored specifically to the context under consideration. For example, a law on remote sensing would announce as its objective the protection of Canada's national interests and the promotion of industrial competitiveness whereas the remote sensing law's subordinate legislation would identify who can apply for a licence, what considerations may amount to an exception, what geographic areas can be sensed, how often an area may be sensed or how much indemnity insurance is required. Many of Canada's space laws have accompanying subordinate legislation.

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[278] *Ibid* at s 91.
[279] For example, *Re Aerial Navigation, AG Canada v AG Ontario*, [1932] 1 DLR 58 (aeronautics), *Re Regulation and Control of Radio Communication*, [1932] AC 304 (radiocommunications), *Capital Cities Communication Inc v Canada [Radio-television and Telecommunications Commission]*, [1978] 2 SCR 141 (broadcasting) and *Alberta Government Telephones v Canadian Radio-television and Telecommunications Commission*, [1989] 2 SCR 225 (telecommunications).
[280] Ram Jakhu, *Regulation of Space Activities in Canada*, (2005) 48 Proceedings on L of Outer Space 267 at p 269.
[281] *Ibid* at p 270.

Radiocommunication Act (1985)

Radiocommunication is the descriptive term for using radio waves (a subset of the overall electromagnetic spectrum[282]) to communicate between devices. Although radio waves extend out in all directions, they can be focussed to deliver the information they carry to a specific location and receiving equipment can be tuned to focus on receiving information from a particular source. However, a single wavelength can only be used to carry information at one time and in one direction otherwise there is interference; when multiple sources of information are using the same wavelength to communicate at the same time, signals become interfered.[283] Since the radiocommunication spectrum is a finite resource, it is managed both at the international level and the domestic level to ensure fair access and the non-interference of signals.[284] Internationally, radio spectrum is regulated by the International Telecommunications Union, an intergovernmental agency comprised of Member States (with non-voting affiliate status granted to non-governmental entities).[285] In Canada, radio spectrum is considered a public resource and so it is regulated by the government in the public interest.[286] As a result of carefully managing this useful resource, radiocommunication is ubiquitous in modern life, including its use in wireless phones, public internet, AM/FM radio, television, emergency services and satellite communication.

In Canada, the *Radiocommunication Act* and its subordinate legislation regulates the use of the radio spectrum. The term "radiocommunication" is defined as "any transmission, emission or reception of signs, signals, writing, images, sounds or intelligence of any nature by means of electromagnetic waves of frequencies lower than 3 000 GHz propagated in space without artificial guide"[287]. The term "artificial guide" has been interpreted to mean physical things (wires, cables, etc.) and so radiocommunication is often used synonymously with "wireless communication".[288] The *Radiocommunication Act* established the geographical scope of the act to within Canada as

[282] Generally, the electromagnetic spectrum is subdivided into the radio, infrared, visible, ultraviolet, x-ray and gamma ray spectrums. Ashley Campbell, *Introduction to the Electromagnetic Spectrum*, NASA, 27 Jun 2018, online: <https://www.nasa.gov/directorates/heo/scan/spectrum/overview/index.html>.
[283] *Ibid*.
[284] Sharon Babaian, "Radio Communication in Canada: An Historical and Technological Survey" (Ottawa: National Museum of Science and Technology, 1992) at p 108 [*Babaian*].
[285] International Telecommunication Network, *About ITU*, International Telecommunication Network, accessed 29 Oct 2019, online: <https://www.itu.int/en/about/Pages/default.aspx>.
[286] Monica Song, *Overview of the Radiocommunication Act, R.S.C. 1985, c R-2*, Broadcasting and Telecommunications Legislative Review Panel, Government of Canada, 5 Dec 2018, online: <http://www.ic.gc.ca/eic/site/110.nsf/eng/00007.html> [*Song*].
[287] *Radiocommunication Act*, *supra* note 272 at s 2.
[288] *Song*, *supra* note 286.

well as "on board" a variety of vessels, including Canadian-controlled spacecraft.[289] Further, the act prohibits the installation, operation or possession of a radio apparatus except in accordance with a "radio authorisation" (namely, a licence). The power to grant licences for radiocommunication is assigned to the Minister of ISED who also has the responsibility of planning the wireless spectrum, allocating spectrum for specific services and assigning spectrum to specific users.[290] The *Radiocommunication Act* also provides the consequences of violating the act's provisions, which may result in fines, penalties and/or imprisonment.[291]

Since nearly all satellite systems rely on radiocommunication to operate[292], it is imperative for any Canadian satellite system operator to acquire a licence under the *Radiocommunication Act* prior to launch. This is true regardless of the specific activity being undertaken by the satellite system (for example, whether conducting Earth observation, providing broadcast services, exploring deep space or even exploiting the resources of a celestial body) because satellite systems communicate with their ground stations (from where they receive various operational instructions) using radiocommunications. As a result, any Canadian space activity will likely require at least two licences prior to operation: a radiocommunication licence and a licence authorising a specific activity. With respect to acquiring a radiocommunication licence, ISED provides a general policy framework on its website[293] as well as detailed licensing procedures in its Client Procedures Circulars (CPCs) (which are updated as necessary), making clear the information required in an application and the evaluative criteria by which a licence is determined and ultimately granted or rejected.[294]

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[289] *Radiocommunication Act*, *supra* note 272 at s 3(3). The specific language includes "(b) any spacecraft that is under the direction or control of (i) Her Majesty in right of Canada or a province, (ii) a citizen or resident of Canada, or (iii) a corporation incorporated or resident in Canada…".

[290] *Song*, *supra* note 286. The Minister may also designate his powers to officials within. *Radiocommunication Act*, *supra* note 272 at s 3(4).

[291] *Ibid* at ss 9-15.

[292] Satellite communications by means of lasers, once a thing of fantasy, are quickly improving. Once their technical limitations (such as requiring a line of sight and only providing point to point connections) are solved, they may prove more useful than current radiocommunication systems as they are faster, provide more throughput, are smaller and use less energy. Sophia Chen, *How to Build a Space Communication System Out of Lasers*, Wired, 27 Feb 2018, online: <https://www.wired.com/story/how-to-build-a-space-communication-system-out-of-lasers/>. Further, SpaceX's StarLink constellation, Analytical Space, LEOLabs and BridgeSat are all investigating or incorporating optical-based communication systems in their satellites.

[293] Innovation, Science and Economic Development Canada, *RP-008 - Policy Framework for Fixed-Satellite Service (FSS) and Broadcasting-Satellite Service*, Issue 4, Government of Canada, Jun 2017, online: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01693.html>.

[294] Innovation, Science and Economic Development Canada, *CPC-2-6-02 - Licensing of Space Stations*, Government of Canada, Issue 4, Jun 2017, online: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01385.html>. For example, it

By and large, the regulatory framework related to radiocommunication, as established in the *Radiocommunication Act* and its subordinate legislation, effectively regulates the use of the radio spectrum, limiting interference and providing operators with access to a limited spectrum to conduct their operations. This is true of terrestrial operators (such as radio stations, television stations, mobile wireless carriers, amateur radio, etc.) as well as space-based operators. Nevertheless, the *Radiocommunication Act*, along with the *Broadcasting Act* and the *Telecommunications Act*, were reviewed by a governmentally-appointed independent panel in 2019 to ensure the laws remain appropriate and effective given technological changes and the development of novel applications.[295] Much of the discussions and concerns related to this review process stemmed from the imminent release of 5G services and the questions surrounding an increasing number of legislatively-exempt unlicensed devices.[296] Although the results of this review were published in January 2020 and advocated for the modernisation of their general regulatory frameworks, the discussions related to space activities were limited.[297]

Aeronautics Act (1985)

Canada does not have an indigenous launch capability. Although the costs and benefits of such a capability were discussed in the *Chapman Report* and very few subsequent governmental policy documents, Canada consistently postponed establishing a significant, long-term launch program, instead focusing on funding other programs and relying on allies for its launch needs. As a result, Canada was unable to provide industry with the opportunities necessary to develop capabilities related to launch. Nevertheless, there exist a handful of private Canadian entities working towards developing launch capability for use within Canada[298] and student teams from across the country have won international rocketry competitions[299]: the desire that Canada become

is made clear in a circular that licensees are required to implement debris mitigation measures as a condition of their licence.

[295] Innovation, Science and Economic Development Canada, *Broadcasting and Telecommunications Legislative Review*, Government of Canada, 26 Jun 2019, online: <https://www.ic.gc.ca/eic/site/110.nsf/eng/home>.

[296] Song, *supra* note 286.

[297] Janet Yale, et al, *Canada's Communications Future: Time to Act*, Broadcasting and Telecommunications Review Panel, Innovation, Science and Industry, Government of Canada, Jan 2020, online: <https://www.ic.gc.ca/eic/site/110.nsf/vwapj/BTLR_Eng-V3.pdf/$file/BTLR_Eng-V3.pdf>.

[298] For example, Reaction Dynamics, C6 Launch and SpaceHorizon are three Canadian companies working towards developing commercial launch vehicles.

[299] Nicole Mortillaro, *Why doesn't Canada have a rocket program?*, CBC News, 8 Feb 2018, online: <https://www.cbc.ca/news/technology/canada-space-race-rockets-1.4505847>. There is also a push for a domestic

a launching State, at least at the commercial level, is very real. The regulation of launch activities falls within the jurisdiction of Transport Canada as per the *Aeronautics Act* and although a regulatory framework exists, it is prohibitively limited in scope, content and overall guidance.

The *Aeronautics Act* governs launch activities in Canada by virtue of defining an aircraft as "any machine capable of deriving support in the atmosphere from reactions of the air, and includes a rocket".[300] Aside from this general inclusion of the word "rocket", the *Aeronautics Act's* only other reference to launch comes in the form of a clarification that the use and operation of rockets must also be in compliance with the provisions of the *Explosive Act*.[301] Although the *Explosives Act* itself does not make reference to a "rocket", the *Explosives Regulations*[302] do, differentiating between model and high-power rocket motors on the basis of their thrust capabilities.[303] Notably, the upper limit of the *Explosives Regulations*' application is 40,960 newton-seconds of thrust, significantly less than the thrust needed by even a smallsat launcher.[304] The *Canadian Aviation Regulations*[305] (*CARs*), being a subordinate legislation to the *Aeronautics Act*, provide additional details related to the use of rockets[306] in Canada, by first distinguishing between model rockets and non-model rockets (on the basis of their power output)[307] and then prohibiting the launch of all rockets (other than model rockets or fireworks) unless authorised by the Minister[308]. The *CARs* further clarify that the issuance of an authorisation for launch may only be granted by the Minister when it "is in the public interest and not likely to affect aviation safety".[309] Both the *Aeronautics Act* and the *CARs* are silent with respect to the basis upon which the Minister may determine if a launch is in the public interest.

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rocketry competition. Marc Boucher, *Launch Canada Challenge Moves Forward*, SpaceQ, 14 Feb 2019, online: <http://spaceq.ca/launch-canada-challenge-moves-forward>.

[300] *Aeronautics Act*, *supra* note 273 at s 3(1).

[301] *Ibid* at s 5.3.

[302] *Explosives Regulations*, SOR/2013-211.

[303] *Ibid* at s 318. Section 318 allows for any adult, whether licensed or unlicensed, to acquire and use a model rocket where the rocket motor does not exceed 160 newton-seconds of thrust. High-power rockets can also be used by any person, regardless of whether they carry a licence, and classifies such as motors capable of producing an impulse that is greater than 160 newton-seconds but not more than 40,960 newton-seconds.

[304] For reference, a SpaceX Falcon 9 rocket produces roughly 2 billion newton-seconds of thrust and the earlier Falcon 1 rocket produced roughly 150 million newton-seconds of thrust.

[305] *Canadian Aviation Regulations*, SOR/96-433 [*CARs*].

[306] A rocket is defined as "a projectile that contains its own propellant and that depends for its flight on a reaction set up by the release of a continuous jet of rapidly expanding gases". *Ibid* at s 101.01(1).

[307] *Ibid*.

[308] *Ibid* at s 602.43.

[309] *Ibid* at s 602.44.

Transport Canada's Canadian Launch Safety Office[310] has published two documents related to launch activities in Canada. The first is an 11-page document published in January 2000 that provides guidance related to the launch of a "high power rocket".[311] Importantly, the definition of a high power rocket in this document is limited to a rocket that does not exceed an impulse of 40,960 newton-seconds (in accordance with the *Explosives Regulations*); as such, the guidance and requirements established in this document would not apply to any commercial launch operator, as such rockets would far exceed 40,960 newton-seconds of thrust. The second is a one page application form requiring an applicant to provide specifics related to a proposed launch of a high power rocket as well as attest that the launch abides by the rules of a rocketry association.[312] Although this document is titled "Application for Authorization to Launch High Power and Advanced High Power Rocket(s)", there is no additional information related to what may qualify as an "advanced" high power rocket. Although it is possible that an advanced high power rocket would be one capable of producing more than 40,960 newton-seconds, it is unlikely since the laws and regulations that apply to launch activities do not consider rockets with thrust greater than 40,960 newton-seconds.[313] Aside from these two documents, the CLSO does not provide any additional information related to launching large rockets; indeed, the CLSO's website is no longer functioning.[314]

As such, Canada's regulatory framework related to launch activities does not provide appropriate guidance related to the launch of a rocket capable of producing more than 40,960 newton-seconds of thrust.[315] Although it is clear that model rockets can be launched without a licence and that high power rockets can be launched following an established licensing process, there is no information related to acquiring a licence for the launch of a rocket that exceeds the

[310] The Canadian Launch Safety Office (CLSO) is described as the office within Transport Canada "delegated with safety and regulatory oversight of all rocket launch activities in Canada". Canadian Launch Safety Office, *Requirements for Launching High Power Rockets in Canada*, Transport Canada, Government of Canada, 4 Jan 2000, online: <http://www.canadianrocketry.org/files/tc_hpr_reqs_jan00.pdf> at p 2.
[311] *Ibid* at pp 2-3.
[312] Transport Canada, *Application for Authorization to Launch High Power and Advanced High Power Rocket(s)*, Government of Canada, online: <https://www.tc.gc.ca/media/documents/ca-standards/26-0660.pdf>.
[313] Indeed, the upper limit of 40,960 newton-seconds is expressed in the *Explosives Regulations* and the *Aeronautics Act* explicitly gives supremacy to the *Explosives Act* and *Explosives Regulations* in instances where there may be a conflict. *Aeronautics Act*, *supra* note 273 at s 5.3.
[314] As of 27 Feb 2020, there is no discernable webpage dedicated to the CLSO nor are there any online references within Transport Canada's website (or any other departmental website) providing recent and relevant information related to launch.
[315] Such observations were made as far back as 1990. *Lessard*, *supra* note 77 at p 37.

high power rocket limit of 40,960 newton-seconds of thrust. The *Explosives Act* and *Explosives Regulations* do not apply to commercial launch systems (since any meaningful commercial system would exceed the upper limit of 40,960 newton-seconds of thrust) and although the *Aeronautics Act* and the *CARs* require authorisation prior to launch, there is no information on how to apply for or acquire such a licence. Without such regulatory clarity, Canadian commercial launch operations are untenable.

Further, Canada's regulatory framework related to launch activities does not specifically address considerations related to a spaceport. Although the *Aeronautics Act* has specific subordinate legislation related to each Canadian aerodrome[316] and each Canadian airport, there are no regulations related to spaceports. It is possible that in authorising a rocket launch, the Minister of Transport would take into consideration the specifics related to the location of the launch (thereby indirectly regulating a temporary spaceport), although it would likely prove more efficient to regulate permanent spaceports from which regularly-scheduled launches are likely to take place. For example, Maritime Launch Services (MLS) has expressed a desire to develop a spaceport in Canso, Nova Scotia and has discussed the various aspects of such a proposal with various provincial and federal regulators. However, Transport Canada has not publicly released any information regarding any specific requirements that may need to be met before acquiring a spaceport license; in fact, Transport Canada has not even hinted that it would licence a spaceport. Without specific regulations related to spaceports (or, at the very least, more robust regulations related to launch activities in general), MLS or any other prospective spaceport developer is in a legally precarious position.

Broadcasting Act (1991)

Broadcasting refers to the act of sending a message originating from a single source that is received by multiple end-users: in contrast to a telephone call that is "one to one", a broadcasting message is "one to many". The *Broadcasting Act* defines broadcasting as "any transmission of programs, whether or not encrypted, by radio waves or other means of telecommunication for

[316] An aerodrome is "any area of land, water (including the frozen surface thereof) or other supporting surface used, designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith". *CARs*, *supra* note 305 at s 3(1).

reception by the public by means of broadcasting receiving apparatus...".[317] Although this definition is the result of multiple historical amendments[318], the notion of regulating broadcasting activities has existed for over a century, beginning with the realisation that radiocommunications could be used to disseminate messages over long distances and wide areas.[319] Further, this definition clarifies that broadcasting is a type of telecommunications, whether done through radio waves or any other means.[320] The *Broadcasting Act* is Canada's legislative instrument through which broadcasting is regulated and applies to broadcasting undertakings carried on in Canada or on board any ship, vessel, aircraft of spacecraft.[321] The use of the word "undertakings" covers both broadcasting activities that originate in Canada as well as those that originate outside of Canada (including space) but are received in Canada.[322]

The *Broadcasting Act* establishes Canada's broadcasting policy. Among its various policy principles, it includes that the Canadian broadcasting system: shall be owned and controlled by Canadians; is to operate primarily in English and French; is essential to the maintenance and enhancement of national identity and cultural sovereignty; should safeguard, enrich and strengthen the cultural, political, social and economic fabric of Canada; and should be readily adaptable to scientific and technological change.[323] The Canadian Radio-television and Telecommunications Commission (CRTC)[324] is the entity designated with the jurisdiction to regulate and supervise all aspects of the Canadian broadcasting system, in accordance with the *Broadcasting Act's* policy

[317] *Broadcasting Act*, *supra* note 274 at s 2(1).
[318] Peter Grant, *The Broadcasting Act: Structure and Background*, Broadcasting and Telecommunications Legislative Review Panel, Government of Canada, 5 Dec 2018, online: <https://www.ic.gc.ca/eic/site/110.nsf/eng/00005.html> [*Grant*]. Broadcasting was first regulated explicitly with the creation of the Canadian Broadcasting Corporation in 1932 (which acted as the public broadcaster and regulator of all broadcasters), with amendments in 1958 (creating the Board of Broadcast Governors), 1968 (creating the Canadian Radio-television Commission) and 1975 (creating the Canadian Radio-television and Telecommunications Commission with oversight over both broadcasting and telecommunications). The most recent iteration of the *Broadcasting Act* was created in 1991.
[319] Babaian, *supra* note 284 at p 21; Mary Vipond, *The Beginnings of Public Broadcasting in Canada: The CRBC, 1932-1936*, (1994) 19:2 Can J of Comm 1, online <https://cjc-online.ca/index.php/journal/article/view/806/712>.
[320] *Grant*, *supra* note 318. "The first point to make is that broadcasting is defined to be a type of telecommunications. That's the broader term and broadcasting is a subset of telecommunications."
[321] *Broadcasting Act*, *supra* note 274 at s 4(2). The specific language includes: "(b) any spacecraft that is under the direction or control of (i) Her Majesty in right of Canada or a province, (ii) a citizen or resident of Canada, or (iii) a corporation incorporated or resident in Canada...".
[322] *Grant*, *supra* note 318.
[323] *Broadcasting Act*, *supra* note 274 at s 3(1). Most of the remaining provisions related to the policy objectives of Canada's broadcasting system relate specifically to the type of programming made available through broadcast.
[324] The CRTC was created by the *Canadian Radio-television and Telecommunications Commission Act*, RSC 1985, c C-22. The CRTC is a government entity entrusted with regulating telecommunications as well as all forms of broadcasting to ensure the protection and promotion of Canadian culture and identity.

objectives.[325] In carrying out its regulatory responsibilities, the CRTC has the power to grant licences and set specific conditions deemed necessary to meet the goals of Canada's broadcasting policies.[326]

Therefore, satellite systems intending to distribute information from one source signal over a wide-area to multiple users in Canada would be considered to be undertaking broadcasting activities as regulated by the *Broadcasting Act*. To perform such an undertaking from space, therefore, the operator would require a licence from the CRTC as well as a radiocommunication licence from the Minister of Industry. Currently, most space-based broadcasters provide either audio or video content in the form of satellite radio or satellite television services and, generally, the *Broadcasting Act* does a good job of regulating these space-based broadcasting activities.

In the future, it is expected that space-based Internet will also become a reality as multiple companies are developing the infrastructure to carry out such commercial services.[327] The intention of space-based Internet is to blanket certain geographical areas with connectivity to satellites and provide connections to the Internet, including access to broadcasting content. It is a live question as to whether such an activity would amount to a "broadcasting undertaking" as the space-based Internet service provider (ISP) is providing access to broadcasting content. The Supreme Court of Canada considered this question - albeit it from a terrestrial perspective - in 2012[328] and determined that ISPs did not engage in broadcasting undertakings simply by providing access to broadcasting content because they did not control the content requested by the end-user.[329] It is likely the same would be true when considered from a space-based perspective, as ISPs would still only be providing end-users with a conduit to the broadcasting content through the Internet, rather than predetermined content itself. In this way, their activities would align more with satellite phone services rather than broadcasting services.

Telecommunications Act (1993)

[325] *Broadcasting Act*, *supra* note 274 at s 5(1).
[326] *Ibid* at s 9.
[327] For example, Telesat, OneWeb, O2B, SpaceX and Amazon are all in the process of developing satellite-based Internet service.
[328] *Reference re Broadcasting Act*, 2012 SCC 4, [2012] 1 SCR 142.
[329] The Supreme Court of Canada ruled that the focus of the *Broadcasting Act* policy objectives were tied to content (rather than simple distribution or access to general content) and that ISPs do not play any part in the "selection, origination, or packaging" of content. As a result, ISPs were not carrying our broadcasting undertakings. *Reference re Broadcasting Act* at para 5.

The legislative precursors to the *Telecommunication Act*[330] regulated activities related to telegraphs and telephone rates as early as 1892.[331] In the late 1970s, the Canadian Radio and Television Commission, which was responsible for regulating broadcast, was granted authority to regulate telecommunications as well, prompting the change in name to the Canadian Radio-television and Telecommunications Commission (CRTC). Simultaneous to the decision to have the CRTC regulate both broadcast and telecommunications, the government proposed unifying the laws related to broadcasting and telecommunications into a single act. The proposal was unsuccessful, largely due to constitutional questions related to federal and provincial divisions of power.[332]

The most recent iteration of the *Telecommunications Act* was passed in 1993 and defined telecommunications as "the emission, transmission or reception of intelligence by any wire, cable, radio, optical or other electromagnetic system, or by any similar technical system".[333] The *Telecommunications Act* also recognises the essential role telecommunications play in the "maintenance of Canada's identity and sovereignty"[334] and provides a list of policy objectives, including: the facilitation of a telecommunications system that safeguards, enriches and strengthens the social and economic fabric of Canada and its regions; rendering reliable and affordable telecommunications services of high quality throughout Canada; enhancing the efficiency and competitiveness of Canadian telecommunications; promoting the ownership and control of Canadian carriers by Canadians; and stimulating research and development and encouraging innovation in the provision of telecommunications services.[335]

With respect to satellite-based telecommunications, the regulated activity entails the transmission of information from one point on Earth to another point on Earth via a satellite relay. Telecommunications can be used for private services (such as military communications, satellite cellular communications, etc.) or for public services (such as broadcasting public television channels). The use of a satellite as the relay, as opposed to physical wires or ground-based

[330] *Telecommunications Act*, *supra* note 275.
[331] Hank Intven, *An Overview of the Telecommunications Act*, Broadcasting and Telecommunications Legislative Review Panel, Government of Canada, 5 Dec 2018, online: <https://www.ic.gc.ca/eic/site/110.nsf/eng/00006.html> [*Intven*].
[332] The adoption of a single law to cover both broadcasting and telecommunications failed partly because of uncertainties about whether the provinces should play a role in the regulation of communications. *Ibid*.
[333] *Telecommunications Act*, *supra* note 275 at s 2(1).
[334] *Ibid* at s 7.
[335] *Ibid*.

antennae, does not alter the licensing requirements associated with providing telecommunications services. Since broadcasting services are considered a subset of telecommunications, a space-based operator that is using a single satellite to carry out both telecommunications and broadcasting services would need a separate licence for each activity.[336]

The *Telecommunications Act* prohibits a Canadian carrier from controlling the content or influencing the meaning or purpose of telecommunications carried by it for the public, ensuring carriers cannot prioritise certain information.[337] The *Telecommunications Act* also imbues the CRTC with the power to impose all telecommunications service providers to contribute to a fund used to support access to basic telecommunications services for all Canadians.[338] Although historically this fund was used to subsidise the cost of telephone service in remote Canadian locations, in 2006 it was extended by a policy change to provide broadband Internet as well.[339] It is possible the CRTC could use such funds to provide satellite-based Internet to remote regions of Canada when the technology matures.

Remote Sensing and Space Systems Act (2005)

The origins of the *Remote Sensing Space Systems Act* (*RSSSA*) are found in a 2000 bilateral agreement between Canada and the US[340] that ensured both States would control remote sensing activities once they were privatised to protect their shared national security and foreign policy interests.[341] Specifically, the agreement and subsequent *RSSSA* were created to prepare for Canada's planned development of RADARSAT-2 using a public-private partnership that would result in the satellite being owned by a private Canadian entity. In 2004, the government introduced Bill C-25, the *RSSSA* received Royal Assent in November 2005 and came into force in

[336] Section 4 of the *Telecommunications Act* provides that the act does not apply to broadcasting and section 4(4) of the *Broadcasting Act* provides that the act does not apply to telecommunications common carriers.
[337] *Telecommunications Act*, *supra* note 275 at s 36.
[338] *Ibid* at s 46.5.
[339] Intven, *supra* note 331.
[340] Global Affairs Canada, *Agreement Between the Government of Canada and the Government of the United States of America Concerning the Operation of Commercial Remote Sensing Satellite Systems*, CTS 2000 No 14, Government of Canada, 3 Mar 2014, online: <https://www.treaty-accord.gc.ca/text-texte.aspx?id=103522>.
[341] For a truly in-depth explanation of the origins of the *RSSSA*, *see* Thomas Gillon, *Remote Sensing Space Systems in Canada - New Legislation for a New Era*, (2008) 34 J of Space L 19 at pp 19-26 [*Gillon*]. For the regulatory principles that applied following the US bilateral agreement but prior to the enactment of the RSSSA, *see* Ram Jakhu, *Regulation of Space Activities in Canada*, (2005) 48 Proceedings on L of Outer Space 267 at p 276.

April 2007.[342] Neither the *RSSSA* nor its associated regulations[343] have been amended since coming into force.

The *RSSSA* defines a remote sensing satellite as "a satellite that is capable of sensing the surface of the Earth through the use of electromagnetic waves"[344] and prohibits the operation of such a system without a licence[345] granted by the Minister of Foreign Affairs[346] (MFA). This broad definition would capture all satellites with imaging capabilities, including satellites never intended to view Earth (such as deep-space telescopes[347]).[348] The *RSSSA* also distinguishes between "raw data" and "remote sensing product", where the former consists of the sensed data that has not been transformed in any way and the latter refers to any data or image that results from the transformation of raw data.[349] Although the distribution of both raw data and remote sensing products to third-parties (namely, clients) are possible, there are more limitations on distributing raw data: raw data cannot be distributed to third-parties without prior authorisation by the MFA whereas remote sensing products can be distributed unless prohibited by the MFA.[350] As a result, the licensing process and regulatory regime related to remote sensing does not restrict what can be sensed or imaged of Earth from space but rather restrict the distribution of the collected data.[351]

The requirement for a licence to operate remote sensing space system activities applies to Canadian citizens, permanent residents of Canada, Canadian corporations and persons having a "substantial connection to Canada"[352], an extremely broad application of the law.[353] In determining whether to grant a licence for remote sensing operations, the MFA must take into consideration "national security, the defence of Canada, the safety of Canadian Forces, Canada's

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[342] Ram Jakhu & Aram Kerkonian, *Second Independent Review of the Canada's Remote Sensing Space Systems Act*, (2019) 42:1 J of Space L 1 at pp 2-3 [*Jakhu & Kerkonian*].
[343] *Remote Sensing Space Systems Regulations*, SOR 2007/66.
[344] *RSSSA*, *supra* note 276 at s 2.
[345] *Ibid* at s 5.
[346] *Ibid* at ss 2, 5.
[347] For example, a satellite-based telescope like Hubble is intended to peer deep into the universe. Nevertheless, the Hubble could be turned around and used to sense the Earth, notwithstanding the fact that its sensors would be completely useless in sensing anything comprehendable. Yet still, the RSSSA would require a Canadian satellite like the Hubble Telescope to be licensed under the RSSSA.
[348] Bruce Mann, *First Licence Issued Under Canada's Remote Sensing Satellite Legislation*, (2008) 34 J of Space L 67 at p 72.
[349] *RSSSA*, *supra* note 276 at s 2.
[350] *Ibid* at s 8(4)(b).
[351] *Gillon*, *supra* note 341 at p 27. Nevertheless, a licence may contain a clear prohibition related to sensing a particular geographical location, such as a military installation.
[352] *RSSSA* at s 6.
[353] *Gillon*, *supra* note 341 at p 27.

conduct of international relations [and] Canada's international obligations".[354] The *RSSSA* allows the MFA to place conditions on a licence as well as cancel a licence if its conditions are not met or the circumstances upon which a licence were granted change.[355] Unique to Canada's space laws, the *RSSSA* also requires an adequate and satisfactory system disposal plan before a licence may be issued by the MFA[356], representing Canada's implementation of its non-binding international soft law obligations established in the Debris Mitigation Guidelines.

Further, the *RSSSA* also includes provisions related to an interruption of service ("shutter control")[357] or a prioritisation of access to data[358]. The MFA may order an interruption or the restriction of an otherwise acceptable remote sensing operation on the basis that continued operation would be "injurious to Canada's conduct of international relations or inconsistent with Canada's international obligations" or "injurious to the defence of Canada or the safety of Canadian forces".[359] Similarly, the MFA may request priority access to a licensed system if they believe on reasonable grounds that it is "desirable for the conduct of international relations or the performance of Canada's international obligations" and the Minister of Defence may request priority access to a licensed system if they believe on reasonable grounds that it is "desirable for the defence of Canada or the safety of Canadian Forces".[360] In acknowledgement of the significant imposition that an invocation of either shutter control or priority access would place on a remote sensing space system operator, the *RSSSA* only allows for such demands to be made by the MFA (in instances of shutter control) and the Minister or Deputy Minister (in instances of priority access) themselves, rather than through a delegate.[361] As such, only in the most serious of circumstances would such a request be made.

Generally, the *RSSSA* regulates activities involving the "sensing of the Earth".[362] The most common use of remote sensing involves imaging the Earth by means of electromagnetic waves – these can include visible wavelengths (such as taking traditional pictures) or non-visible wavelengths (such as synthetic aperture radar). Since space-based remote sensing is not possible

[354] *RSSSA*, *supra* note 276 at s 8(1).
[355] *Ibid* at s 12.
[356] *Ibid* at s 9(1).
[357] *Ibid* at s 14.
[358] *Ibid* at s 15.
[359] *Ibid* at ss 14(1).
[360] *Ibid* at ss 15(1), 15(2).
[361] *Ibid* at s 21; *Gillon*, *supra* note 341 at pp 29-31.
[362] This definition is rather elastic and has led to some confusion among private operators as to whether specific activities that do not actively image or monitor the Earth would fall within the purview of the law.

without ground stations to receive and process the information derived from satellites in space, the ground stations also form a part of a remote sensing space system and are a part of the licensing process. As a result, the *RSSSA* requires a licence for a ground station physically located within Canada (since it is technically part of a remote sensing space system that cannot be used without authorisation) even if the operator is non-Canadian and not based in Canada and the satellites which communicate with the ground station are licensed in a jurisdiction other than Canada. Further, this licensing requirement remains true even if the raw data from the satellite is merely ported to another facility on Earth (known as a "bent pipe ground station"). Given Canada's geographic position, the placement of ground stations in northern communities is extremely valuable to remote sensing operators. Indeed, the licensing of a specific bent pipe ground station in Inuvik made headlines in 2018 when it took more than two years to issue the ground station licence to the non-Canadian operators.[363] The incident also called into question the need for regulating bent pipe ground stations as rigorously as complete remote sensing space systems[364]; since the data are neither gathered by a Canadian operator nor are they processed and/or distributed from within Canada, the need for strict regulation may be overly-cautious.

These questions and others were examined during the most-recent legislatively mandated review of the *RSSSA*. As per section 45.1 of the *RSSSA*, an independent review was performed by McGill University's Institute of Air and Space Law in 2012[365] and again in 2017[366] to assess the *RSSSA's* "impact on technological development and on the implementation of Canada's international agreements and treaties".[367] In both instances, the reviewers articulated the successes and shortcomings of the act and its subordinate legislation, offering various recommendations on how to improve the regulatory framework to address the realities of modern space systems and

[363] The fact that the licensees remained patient throughout the lengthy process demonstrates the value of Canada's geographic location. Marc Boucher, *Planet and KSAT Licensing Issue Enters 22nd Month*, SpaceQ, 5 Mar 2018, online: <http://spaceq.ca/planet-and-ksat-licensing-issue-enters-22nd-month/>.

[364] Some have questioned the need for licensing bent-pipe ground stations through the *RSSSA*, arguing that since the "station would simply be a transfer point for moving data between two parts of the company… [t]he situation is analogous to the mid-20th century practice of U.S. commercial airliners refuelling in Newfoundland and Labrador while flying to Europe. Canada did not insist on licensing those aircraft; it relied on licenses issued by the United States." The reasoning suggests that Canada should rely on the remote sensing licences issued by other jurisdictions for bent-pipe ground stations located in Canada. Michael Byers, *Canada is losing the race for space*, The Globe and Mail: Opinion, 26 Feb 2018, online: <https://www.theglobeandmail.com/report-on-business/rob-commentary/canada-is-losing-the-race-for-space/article38114669/>.

[365] Ram Jakhu, at al, *Independent Review of the Remote Sensing Space Systems Act*, Institute of Air and Space Law, McGill University, 22 Mar 2012.

[366] *Jakhu & Kerkonian*, *supra* note 342 at pp 2-3.

[367] *RSSSA*, *supra* note 276 at s 45.1.

their uses. The *2017 Review* in particular presented 20 specific recommendations, including clarifying the scope and language of the *RSSSA*, improving the financial and technical resources of the regulatory office, incorporating requirements for indemnification and the creation of a general space law in Canada.

The recommendation related to the creation of a general space law in the *2017 Review* was made after reaching the conclusion that the *RSSSA* was being applied to applications beyond the law's intended scope simply because appropriate alternative legal instruments did not exist. The *2017 Review* made specific reference to satellite-automatic identification satellites (S-AIS)[368] as one space activity regulated under the *RSSSA* even though the activity of S-AIS does not conform strictly to "sensing of the Earth" nor the object and purpose of the act's restrictions (namely, to safeguard Canadian national interests). Further, with the advent of new and emerging space technologies and applications that utilise vision systems, it is possible that the *RSSSA* would technically apply and legally require licences from the MFA even though the activity has no intention of sensing the Earth. For example, on-orbit satellites that have vision systems to assist them in locating and/or docking with their target space objects could technically sense the Earth (even though it is likely any data generated by such an application of their vision systems would be useless) and would be required to obtain a remote sensing licence. Similarly, satellite systems intended to exploit the natural resources of celestial bodies other than Earth would likely also have vision systems that could be used to sense the Earth and would be required to obtain a remote sensing licence. Indeed, without an appropriate legal instrument through which to regulate such novel activities, Canadian regulators would have no choice but to use the *RSSSA* as their regulatory vehicle, even if it means acknowledging it is not the right tool for the job.

Canadian Laws Related to Space

Aside from the five laws discussed above that directly apply to specific space activities, Canadian law also consists of legislation and regulations that affect space activities without directly regulating them. The degree to which these laws would have an effect on commercial space operations will depend on the specific circumstances being considered.

[368] *Jakhu & Kerkonian*, *supra* note 342 at pp 7, 8, 22, 24-25.

Canadian Space Agency Act (1990)

Following decades of discussion, encouragement from industry and calls for the consolidation of Canada's space program under a coordinating body, in 1990, the government created the Canadian Space Agency (CSA). The enacting legislation, the *Canadian Space Agency Act*[369], established the CSA's objectives as promoting the peaceful use and development of space, advancing the knowledge of space through science and ensuring that space science and technology provide social and economic benefits for Canadians.[370] In carrying out these objectives, the act specifies that the CSA shall: assist in the coordination of Canada's space policies and programs; lead programs and projects related to research, development and application of space science and technology; promote the transfer of space technology to industry; and encourage the commercial exploitation of space.[371] Although the Minister of Industry has historically been the Minister responsible for the operations of the CSA, the act does not specify which Minister or what government department must have oversight over the CSA[372]; as such, a different Minister or department may be designated to oversee the CSA in the future.

The role of the CSA, therefore, is not regulatory in nature. Although the *Canadian Space Agency Act* requires the CSA to engage with industry, it does so with the intention of facilitating the development of space science, technology and applications. As a result, from a regulatory perspective, the CSA does not determine what kinds of activities private entities are permitted or prohibited from undertaking, nor does it issue licences permitting specific activities. Nevertheless, the CSA does issue funding for specific projects and provides opportunities for industry-led technological development that can later be commoditised on the commercial market. For example, if the CSA wants to develop a new Earth observation satellite, it may fund the development of imaging components by industry thereby inducing the development of imaging technology capabilities that can later be marketed globally.

[369] *Canadian Space Agency Act*, SC 1990, c 13;
[370] *Ibid* at s 5(1).
[371] *Ibid* at s 5(2).
[372] *Ibid* at s 2.

Civil International Space Station Agreement Implementation Act (1999)

The *Civil International Space Station Agreement Implementation Act*[373] (CISSAIA) is Canada's domestic enacting legislation to implement the multilateral *ISS Agreement*[374] of which Canada is a State party. The act itself simply incorporates the ISS Agreement (which is attached as a schedule to the CISSAIA) between Canada, the European members, Japan, Russia and the US. The various contributions of the member States are also attached as an annex to the CISSAIA. By virtue of its contribution to the ISS in the form of the Canadarm2, Dextre and various ground station elements, Canada has a specific share of the total utilisation of the ISS, as per its memorandum of understanding with the United States as the lead partner of the ISS[375]. Canada uses its time aboard the ISS to fly astronauts and conduct various scientific experiments. The act has no bearing on private activities, except to the extent that a private entity desires to conduct an experiment aboard the ISS or use it as a mobile launching station for a LEO-bound small satellite. Nevertheless, the act does not operate in any regulatory capacity over private space activities.

Criminal Code

The Canadian *Criminal Code* includes specific provisions related to criminal activities carried out aboard the ISS, on the way to the ISS or while returning back to Earth from the ISS.[376] In brief, the *Criminal Code* provides that for any action or omission that would constitute an indictable offence if committed in Canada is committed during a space flight, the offence is deemed to have been committed in Canada.[377] Interestingly, the language in the *Criminal Code* is specific to activities committed or omitted in relation to the ISS rather than in space generally. As a result, if a Canadian were to commit an action or omission that would otherwise be considered an indictable offence in Canada while in space that is not related to the ISS (such as aboard a flight to the Moon or in a commercial orbiting "space hotel"), the current provisions of the *Criminal Code* would not apply. As commercial space technologies and applications continue to mature, it

[373] *Civil International Space Station Agreement Implementation Act*, SC 1999, c 35.
[374] *Agreement Among the Government of Canada, Governments of Members States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station* being a Schedule to the *Civil International Space Station Agreement Implementation Act*.
[375] The United States has a Memorandum of Understanding with each of the ISS partner nations.
[376] *Criminal Code*, RSC 1985, c C-46 at s 7(2.34).
[377] *Ibid* at s 7(2.3).

may be prudent to expand the scope of the current space-related provisions of the *Criminal Code* to all activities in outer space.

Future Canadian Space Law

The future of Canadian space regulation remains unclear. As outlined above, Canada has five clear laws that address space, four of which are distinctly tied to specific space activities. The most recent Canadian space law came into force in 2007; since then, space technologies have changed and space applications have matured, especially in the commercial realm. Indeed, when the *RSSSA* was introduced to parliament, there were concerns related to the speed with which remote sensing technology was advancing. The Parliamentary Secretary to the MFA spoke of the need and utility of a law on remote sensing[378], highlighting three trends: first, the capability of private companies to develop the technology necessary to make remote sensing a viable activity; second, the development of the remote sensing industry as a whole and the likely transition from public to private operations; and third, the need to protect Canada's national security and foreign policy interests. In making these statements, the Parliamentary Secretary commented that "we must anticipate our needs, and act accordingly". The statements made in 2007 remain relevant and accurate more than ten years later, if only substituting the terms "remote sensing" with "general space activities". Indeed, the only thing that has changed since 2007 is the increasing speed with which new space technologies have developed and new space activities have become commercialized.

In its *2019 Strategy*, the federal government stated that it would review the regulatory framework related to space but did not provide additional details as to what the review would entail, what aspects of the framework it would review, when such a review could be expected and which departments may be involved. In September 2019, an independent organisation, SpaceQ Intel, organised a Space Regulatory Roundtable[379] with representatives from government, industry and academia during which time participants openly discussed the potential scope and substances of a review although no commitments were made. Although the government seems to recognise the need for regulatory reform, it remains an open question as to how far current and future

[378] Dan McTeague, *Edited Hansard: Number 129*, House of Commons, 38th Parliament, 1st Session, 30 Sep 2005, online: <http://www.ourcommons.ca/DocumentViewer/en/38-1/house/sitting-129/hansard> at 1010.
[379] Marc Boucher, *Notice of Interest - Space Regulatory Roundtable*, SpaceQ, 2 Aug 2019, online: <https://spaceq.ca/notice-of-interest-space-regulatory-roundtable/>.

administrations will go in creating a regulatory framework that keeps pace with the commercialisation of space.

For the Canadian space industry to remain internationally competitive and authoritative, the government ought to continue prioritising and investing in the development of its public and private space programs. The decision to join the LOP-G is a significant step towards providing industry with the opportunity to develop and apply new space-based capabilities that can later be spun-off into profitable enterprises. Similarly, Canada must remain vigilant of the globe's changing reality with respect to international space law and position itself to offer compelling and substantive arguments that benefit Canada, Canadians and all of humanity. As the *Solandt Report* stated quite clearly in 1967: "In the international discussion involved, those with the largest commitments will tend to speak with the strongest voice; but Canada may well play an important role in the process, provided she can speak with the authority that comes from knowledge and capability."[380] By strategically leveraging an appropriate regulatory framework, Canada can develop an effective commercial space industry and can speak with a strong voice.

Conclusion

Canada's more than a half-century involvement in outer space materialised out of scientific curiosity and existential realisation. Dating as far back as the *Chapman Report* in 1967, it is clear Canada was aware of the important role outer space and its related space systems could play in the development of the nation. Over the ensuing decades, the government attempted to establish, through a series of space policy documents, a coherent Canadian space program that could promote the varied interests of the country. Significant emphasis was placed on investing Canada's limited resources in technologies and applications that could bring significant benefits to Canadians while simultaneously allowing industry partners to commercialise and export their products to foreign markets. This intentional emphasis on commercialisation has been relatively successful, with Canada developing an international-reputation for excellence in various specialised fields and Canadian companies preparing to engage in previously-non-commercialised activities. However, given the limited capability of Canada's existing space laws to support new and emerging space activities, the government will need to establish a more robust space regulatory framework with a certain degree of haste.

[380] *Solandt Report*, *supra* note 40 at p 14.

Chapter 5: Theoretical Foundation of Canadian Space Regulation

Purpose and Outline

The purpose of this chapter is to establish the theoretical basis for undertaking the overall project as well as for implementing the recommended regulatory reforms. The chapter utilises a two-pronged theoretical approach related to, first, a State's obligation to its subjects and humanity (including the obligation to appropriately regulate certain activities) and second, to the benefits of regulating space activities in Canada. In effect, this chapter provides an explanation for why the creation of regulations related to space activities is both necessary and advantageous.

This chapter begins with the generally-accepted account of the Westphalian historical origins of the international legal order, followed by a description of the contemporary challenges posed by modern priorities, such as *jus cogens* principles and human rights. Specifically, this chapter highlights a paradox related to sovereignty, authority and consent that pressures the foundations of the international legal order before providing a potential response to this threat. Focusing on the theoretical underpinnings of the proposed response, this chapter then argues that a State's fiduciary responsibility to its people includes the responsibility to appropriately regulate certain activities (such as space activities). The chapter then examines the various nuances of regulation before addressing directly the various benefits of space regulation in Canada.

The International Legal Order

The international legal order is best described as the rules-based structure that undergirds the international community.[1] As is described below, the historical origins of the modern international legal order are relatively well-understood[2] and its effect has been relatively positive in providing international order[3]. Although the twin concepts of State sovereignty and sovereign

[1] Some distinguish between an international legal system and an international legal order, where the former "refers to the existence of a body of legal rules structured as a proper system" and the latter "is broader, presupposing the existence of a social basis …, legal subjects, and certain basic, if decentralized, functions". Gleider Hernandez, *Sources and the Systematicity of International Law: A Co-Constitutive Relationship?*, in Samantha Besson & Jean d'Aspremont, eds, "The Oxford Handbook of the Sources of Law" (Oxford: OUP, 2017) at p 605. Nevertheless, for the purpose of this chapter, it is sufficient to consider international law as the structure that provides the international community with the rules by which it operates, resulting in the international legal order or international legal system (which will be used interchangeably).

[2] That is not to say there is consensus amongst scholars on the origins or the manner in which the international legal order has come to be what it is today. *See generally* Bardo Fassbender & Anne Peters, eds, "The Oxford Handbook of the History of International Law" (Oxford: OUP, 2012).

[3] By and large, the modern international legal order has created a world that is more prosperous, more peaceful and more developed than any previous point in time in history. Stephen Stedman, *The Future of International Order, a Conversation with Prof. Stephen Stedman*, United Nations University, Interview by David Malone, 1 Dec 2016, online: <https://www.youtube.com/watch?v=9a70pWDO0mw>.

equality have led to significant improvements in a multitude of ways, they are neither without their shortcomings nor their challenges. Specifically, the overarching modern ambitions of the international legal order are to promote the humanistic principles that positively develop societies and, more importantly, people; nevertheless, as will be demonstrated, the manner in which these ambitions have been carried out by well-intentioned players has led to a potential undermining of the very system that has allowed such progress.

Origins and History

The international legal order is the result of an evolution of interactions starting with proto-States prior to the Treaty of Westphalia in 1648 to modern States today. Historically, most of Europe spent the middle ages in conflict as a result of religious and related disagreement. The *Treaty of Westphalia*, following the Thirty Years War[4], was a turning point insofar as the major continental parties agreed to refrain from involving themselves in their neighbour's domestic matters so as to be guaranteed that their neighbours would not get involved in their own matters.[5] This independence of internal affairs has since solidified into the bedrock of international law (and therefore, the international legal order) that is the foundation upon which all aspects of the current international reality depend.[6]

The theoretical framework of contemporary international law, therefore, rests on the twin concepts of State sovereignty (the belief that a sovereign holds absolute authority within their territory) and the equality of States (the belief that no State is more sovereign than any other).[7] Working in tandem, State sovereignty and the equality of States grant a sovereign an indelible right to manage their territory (and the subjects within their territory), free from the interference

[4] Derek Croxton, *The Peace of Westphalia of 1648 and the Origins of Sovereignty*, (1999) 21:3 The Int'l Hist R 569.
[5] Although this is the most dominant narrative and representative of the scholastic understanding of the foundations of the modern international legal order, some question the near-religious adherence to the belief that the *Treaty of Westphalia* was the starting point of sovereignty as it is deified today. Andreas Osiander, *Sovereignty, International Relations and the Westphalian Myth*, (2001) 55:2 Int'l Org 251. Nevertheless, even if the *Treaty of Westphalia* is not the foundation of the modern international legal order, the belief that it has sufficiently established the foundation of the modern international community ensures the twin principles that are commonly associated with the Westphalian system (sovereignty and equality of States) remain the relevant and driving forces of international relations today.
[6] Evan Criddle & Evan Fox-Decent, "Fiduciaries of Humanity: How International Law Constitutes Authority" (New York: OUP, 2016) [*Criddle & Fox-Decent 2016*] at pp 5-6.
[7] Hans Kelsen, *The Principle of Sovereign Equality of States as a Basis for International Organization*, (1944) 53:2 Yale L J 207; *Criddle & Fox-Decent 2016*, *supra* note 6 at p 5. For more nuanced conceptualisations of the theoretical framework of international law *see* Anne Orford & Florian Hoffman, eds, "The Oxford Handbook of the Theory of International Law" (Oxford: OUP, 2016) [*Orford & Hoffman*].

or intervention of any outside force (whether physical or legal).[8] As such, sovereigns can dictate whatever policies or practices they desire without fear of upsetting and inviting the ire of outside forces.[9]

Contemporary International Relations

Since one State cannot interfere with the domestic activities of another, States interact with one another is by voluntarily entering into agreements: in a word, by consenting[10]. When doing so explicitly, these agreements (often referred to as treaties or conventions) provide the exact framework and terms of reference for how two (or more) States ought to interact given a specific subject matter (whether trade, military alliance or otherwise).[11] By consensually entering into a binding treaty, a State is intentionally relinquishing a certain degree of its sovereignty (namely, the otherwise-justifiable right to act in contravention of the treaty)[12]; States willingly concede certain degrees of their sovereignty for various reasons, including the creation of reciprocal benefits, promoting cooperation on regional issues or even for moral reasons. Overtime, States have acted in certain ways related to specific subject matters without an explicit agreement mandating such action. As these mannerisms develop into a pattern that many (usually all) States follow, States are said to have implicitly agreed to act in this way. This concept has since developed into what is known as a principle of customary international law, such that States act a specific way in a given set of circumstances (State practice) and do so under the belief that they

[8] Hugo Grotius, "The Law of War and Peace", translated by Francis Kelsey, (Oxford: Clarendon Press, 1925) at p 102.
[9] *Criddle & Fox-Decent 2016*, *supra* note at p 7.
[10] Although the theoretical foundation of international law is based on "consent", often, "in practice, international legal rules are frequently formed, applied, and changed without such developments being the will of all the states concerned". Benedict Kingsbury, *The International Legal Order*, in Mark Tushnet & Peter Cane, eds, "The Oxford Handbook of Legal Studies" (Oxford: OUP, 2005) [*Kingsbury*] at p 274. Indeed, there are three prominent theoretical approaches to international law (Hobbesian realism, Grotian rationalism, and Kantian cosmopolitanism) "whose interplay captures much of the history of Western ideas about international politics. The three approaches ... can be mapped to three different views of the relations between theoretical inquiry in international law and the legal practice of relevant actors. A [Hobbesian] realist approach emphasizes consistency with practice as the criterion for assessing good theory, and in developing theory seeks to approximate the understandings or behavior of relevant decision-makers. A Grotian [rationalist] approach seeks to temper theory with practice, and practice with theory. ... A [Kantian] cosmopolitan approach holds out the possibility of remaking the world through theory: in a sense, theory is practice." *Kingsbury*, *supra* note 10 at p 273 (citations omitted).
[11] This generally-accepted view is considered a positivist interpretation of international law (whereby rules are created by States, without which general truths do not exist) rather than a naturalist interpretation (whereby laws simply codify existing natural and moral truths that exist irrespective of written rules).
[12] *SS Wimbledon Case* (United Kingdom vs Germany), 1923 PCIJ 15 at p 25.

have a legal obligation to do so when no such obligation yet exists (*opinio juris*). Although difficult to prove at the outset, rules of customary international law do exist and are well recognized.

Treaties and custom are primary sources of international law and binding on States.[13] In addition to treaties and custom, international law also considers "general principles of law" to be a primary source and considers "judicial decisions and the teachings of the most highly qualified publicists" to be a subsidiary means of determining the law.[14] When a State is bound by a source of law, the State has an obligation to follow through with that obligation or risk being found responsible for a violation of international law[15]; violating international law results in a variety of consequences for the offending party[16]. In short, States are "the main actors equally responsible for law-making and law-enforcement"[17] - they intentionally create the rules to which they are bound and they ensure other States follow the rules to which they have agreed.[18] It is on this "Statist" basis that the international legal order is built and continues to operate, since there is no central law-making authority.[19]

This framework of international law, understood in its most conservative and traditional form, allows States to manage their domestic affairs with theoretically unlimited latitude, allowing them to subscribe to norms and principles with which they agree and exclude themselves from norms or principles that, while other States may choose to adopt, they disagree.[20] For example, if the international community decides to enter into an agreement that requires the destruction of all nuclear weapons, one State may refrain from signing and ratifying that treaty and publicly announce their intention not to be bound – in this way, the State has not brought itself under the

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[13] *Statute of the International Court of Justice*, 26 Jun 1945, 59 Stat 1055 [*ICJ Statute*] at Art 38(1)(a-b). *See Orford & Hoffman*, *supra* note 7 at pp 5-6.
[14] *ICJ Statute*, *supra* note 13 at Art 38(1)(c-d).
[15] *Nuclear Tests* (Australia v France), 1974 ICJ 253 at p 268.
[16] Aside from the reputational damage associated with failing to uphold an obligation, States also subject themselves to more substantive consequences including reparations (restitution, compensation and/or satisfaction) as well as counter-measures. General Assembly, *Responsibility of States for Internationally Wrongful Acts*, United Nations, 8 Jan 2008, A/RES/62/61 at Arts 34, 49.
[17] Heike Krieger, *International Legal Order*, in Anke Draude, et al, eds, "The Oxford Handbook of Governance and Limited Statehood" (Oxford: OUP, 2018) [*Krieger*] at p 543.
[18] Some contend that the view of international law being solely the domain of States and their related practices is too narrow a conceptualisation of international law. *See generally* Doreen Lustig, *Governance Histories of International Law*, in Markus Dubber & Christopher Tomlins, eds, "The Oxford Handbook of Legal History" (Oxford: OUP, 2018).
[19] Jutta Brunnee, *Common Areas, Common Heritage, and Common Concerns*, in Daniel Bodansky, et al, "Oxford Handbook of International Environmental Law" (Oxford: OUP, 2008) [*Brunnee*] at p 551 (citations omitted).
[20] Willem Riphagen, *From Soft Law to Ius Cogens and Back*, (1987) 17 Victoria U of Wellington L R 81 at p 98.

ambit of a treaty obligation nor has it allowed itself to fall within the ambit of a rule of customary international law (should one develop). In doing so, other States must respect the decision of the non-participating State as it is an equally sovereign member of the international community.[21]

Further, principles that are aspirational rather than binding[22] do not have the weight of international law and a State's failure to adhere to such principles do not amount to a State's violation of international law. On this basis, one State cannot legally intervene and physically force (such as through military invasion) or influence (such as by placing sanctions) another State for failing to abide by such a norm. If such actions were allowed, the very basis of international law, namely State sovereignty and the freedom to decide how to interact with the rest of the international community, would erode.

A Paradox: *Jus Cogens* and Sovereignty

Notwithstanding international law's clear reverence for the role of State sovereignty and a prohibition on non-consensual imposition, there are, in fact, general principles of international law that are said to bind all States and from which no derogation is allowed.[23] This remains true whether a State has consented to being bound (either explicitly or implicitly) or not. The most notable categories of such seemingly extra-legal laws are *jus cogens* principles (characterized by the prohibitions on torture, slavery, piracy, genocide and wars of aggression[24]), human rights (to the extent that the relevant treaties have not been ratified by a State)[25] and emerging "common concerns" (for example, those respecting the environment)[26]. Given the international legal order's

[21] For an interesting analysis of sovereign equality with respect to States that enter into agreements (taking on additional responsibilities) as compared to those who do not, *see Krieger*, *supra* note 17 at pp 546-547.
[22] *Lex lata* (Latin for "the law as it is") and *lex ferenda* (Latin for "what the law should be") are often juxtaposed as what is binding in international law with what is merely aspirational.
[23] "Peremptory norms are usually conceived of as constituting part of the body of customary law applying to all states commonly referred to as 'general international law'." Daniel Costelloe, *Political Constructivism and Peremptory Norms*, (2011) 4:1 Washington U Jurisprudence R 1 at p 8. Regarding the notion of non-derogation: "A treaty is void if, at the time of its conclusion, it conflicts with a peremptory norm of general international law. For the purposes of the present Convention, a peremptory norm of general international law is a norm accepted and recognized by the international community of States as a whole as a norm from which no derogation is permitted and which can be modified only by a subsequent norm of general international law having the same character." *Vienna Convention on the Law of Treaties*, 23 May 1969, 1155 UNTS 331 at Art 53.
[24] *Case Concerning Military and Paramilitary Activities In and Against Nicaragua* (Nicaragua v the United States of America), 1986 ICJ 14 at pp 90-91.
[25] Andrea Bianchi, *Human Rights and the Magic of Jus Cogens*, (2008) 19:3 Euro J of Int'l L 491.
[26] *See generally Brunnee*, *supra* note 19; Frederiech Soltau, *Common Concern of Humankind*, in Kevin Gray, et al, eds, "The Oxford Handbook of International Climate Change Law" (Oxford: OUP, 2016). Whether or not derogation is permitted from these "common concern" issues remains to be seen.

ambition of promoting peace, order and development, it has adopted the responsibility of ensuring such progress takes place in all jurisdictions, regardless of sovereign restraints or hesitations of engaging in such progress.[27]

Nevertheless, regardless of how well-intentioned and appropriate such ideals may be, by the very definition of State sovereignty, a State cannot be forced to adhere to such principles without first consenting to them.[28] Yet, *jus cogens* principles apply[29], human rights are enforced and common concerns are considered as if imbued with an ineffable supremacy when, in a strictly legal sense, the very foundations of international law ought to exclude them from its framework (to the extent that a State's consent remains outstanding).[30] Since sovereignty provides a State with absolute authority over its territory, a State is theoretically free to determine whether slavery or genocide is appropriate within its territory and its sovereign equality with respect to the rest of the international community would prevent any outside force from interfering with that determination. Yet the reality is that, in States that have not ratified any of the human rights conventions and who deny subscribing to the customary principles related to human rights, instances of grave human rights abuses are viewed as unacceptable by the rest of the international community and subjected to interventions by other States to restrict the consequences of such abuses. Such interventions, which are often viewed as legally justifiable by the international community, undermine the very foundation of international law.[31] The resulting paradox is how a legitimate rule of international law can remain legitimate when it violates the very foundational principles upon which it relies for legitimacy.

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[27] For the purposes of this chapter, it is simply accepted that progressing peace, order and development are positive and worthy of pursuit.

[28] For a discussion on the sources and hierarchies of international law with respect to *jus cogens* norms, *see generally* Erika de Wet, *Sources and the Hierarchy of International Law: The Place of Peremptory Norms and Article 103 of the UN Charter within the Sources of International Law*, in Samantha Besson and Jean d'Aspremont, eds, "The Oxford Handbook of the Sources of International Law" (Oxford: OUP, 2017).

[29] Mark Janis, *The Nature of Jus Cogens*, (1987) 3 Connecticut J of Int'l L 359.

[30] Mary Ellen Turpel and Philippe Sands, *Peremptory International Law and Sovereignty: Some Questions*, (1998) 3 Connecticut J of Int'l Law 364 at p 365.

[31] For example, States have entered the territory of another State under the auspices of the "responsibility to protect", claiming that the invaded State has failed to uphold its obligations to its citizens and that the rest of the international community has a duty to ameliorate the situation. Similarly, such actions are taken when engaging with a "failed State" and have a detrimental effect on the concept of "absolute sovereignty". Gerry Simpson, *Something to do with States*, in Anne Orford & Florian Hoffman, eds, "The Oxford Handbook of the Theory of International Law" (Oxford: OUP, 2016) at p 576.

A Response: States as Fiduciaries of their People

A strict application of the conceptual foundation of international law (namely, that sovereignty is absolute and equal) with the modern reality of international practice (namely, that certain practices are universally prohibited) results in an intellectual chasm: how can a rule of international law bind an absolutely-sovereign State that does not wish to be bound. Addressing this paradox has resulted in a variety of nuanced conceptualisations of international law. Some scholars have suggested that since "the very notion of State sovereignty undermines popular sovereignty and human rights"[32] it ought to be replaced with a more refined approach. Others argue that relational accounts of State sovereignty, as predicated on democratic governance by the people, would ensure State sovereignty cannot be used as a shield to defend against egregious humanitarian violations.[33] Yet others defend the traditional conceptualization and argue that State sovereignty is paramount since it ensures the self-determination of people within their borders is respected and not interfered.[34] The likely point of convergence among these responses is that the strictly-traditional conceptualisation of a State simultaneously possessing absolute sovereignty (wielded through the mechanism of consent) and operating within the modern international legal framework is no longer functional.

One well-developed theory has approached this problem by arguing that although States are, in fact, sovereign, their sovereignty is derived from those whom they govern.[35] Understanding the unique relationship between the sovereign and its subjects (not just in democratic systems where a sovereign is clearly elected but also in situations of monarchical or even militaristic rule)[36] is vital to appreciating the nuanced theoretical perspective of a State's obligations. Originally developed as a theoretical underpinning for the curtailment of absolutist State power (which was

[32] *Criddle & Fox-Decent 2016*, *supra* note 6 at p 8, citing Louis Henkin, *That S- word: Sovereignty, Human Rights, and Globalization, Et Cetera*, (1999) 68 Fordham L Rev 1 and Elihu Lauterpacht, *Sovereignty – Myth or Reality*, (1997) 73 Int'l Aff 137.
[33] *Ibid* at p 11, citing Michael Reisman, *Sovereignty and Human Rights in Contemporary International Law*, (1990) 84 Am J Int'l L866, Thomas Franck, *The Emerging Right to Democratic Governance*, (1992) 86 Am J Int'l L 46 and Gregory Fox, *The Right to Political Participation in International Law*, (1992) 17 Yale J Int'l L 539.
[34] *Ibid* at p 8, citing Jeremy Rabkin, "The Case for Sovereignty: Why the World Should Welcome American Independence" (Washington DC: American Enterprise Institute Press, 2004).
[35] *Ibid* at p 46. Although a recent reconceptualization and postulation of the fiduciary theory of governance, the authors willingly admit that they are not the first to discuss this concept, making reference to the works of Plato, Aristotle, Cicero, Locke and others. *Ibid* at pp 13-14; Evan Criddle & Evan Fox-Decent, *Guardians of Legal Order: The Dual Commissions of Public Fiduciaries*, in Evan Criddle, et al, eds, "Fiduciary Government" (Cambridge: CUP, 2018) [*Criddle & Fox-Decent 2018*] at p 91.
[36] Theodore Rave, *Fiduciary Principles and the State*, in Evan Criddle, et al, eds, "The Oxford Handbook of Fiduciary Law" (Oxford: OUP, 2019) [*Rave*] at p 325.

later adopted and applied to the relationship between European empires and their vast colonies, at a significant cost to local indigenous peoples[37]), the fiduciary theory[38] provides that a State is in a position to exercise its sovereign power only because it is provided such authority by its people.[39] As a result, a State is obligated to act in a manner that fulfills its purpose, which is, namely, to carry out the functions of governance as per the interests of the people: international law, therefore, "constitutes States as purposeful institutions deployed in the service of humanity".[40] In this way, States derive their power from the very people to whom they are entrusted or, in another sense, States are in a fiduciary relationship with their people (without whom, the State has no power nor can it exist).[41]

Although the concept of one person acting as a fiduciary to another has deep historical roots[42], its conceptualisation is fairly-straightforward: in situations where a natural inequality exists between two parties, the party with greater advantages may be required to act in such a way as to benefit, and not inappropriately exploit, the interests of the disadvantaged party.[43] Fiduciary

[37] This latter application was, of course, much to the detriment of the colonised parties notwithstanding the ideological purity of the relationship that was projected as legal justification. *Criddle & Fox-Decent 2016*, *supra* note 6 at p 16; Evan Criddle, *Fiduciary Principles in International Law*, in Evan Criddle, et al, eds, "The Oxford Handbook of Fiduciary Law" (Oxford: OUP, 2019) [*Criddle*] at p 346. For the colonial origins and more-modern application of the fiduciary relationship to international mandates and trusteeships, *see generally Criddle*, *supra* note 37. For a discussion related to the challenges posed by indigenous peoples to the idea of sovereigns as trustees of humanity, *see* Evan Fox-Decent & Ian Dahlman, *Sovereignty as Trusteeship and Indigenous Peoples*, (2015) 16 Theoretical Inquiries in L 507.

[38] Some have criticised this application of a fiduciary theory to international law on the basis that all fiduciary relationships must be deliberate, conscientious and robust and that international law does not satisfy these characteristics. Ethan Leib & Stephen Galoob, *Fiduciary Political Theory: A Critique*, (2016) 125:7 Yale L J 1820. The critique is rebuked by Criddle and Fox-Decent on many bases, the most relevant to the current discussion being that not all well-established fiduciary relationships exhibit the three listed characteristics (thereby undermining their necessity) and that the criticizing authors' reliance on a single aspect of international human rights law inappropriately stereotypes all of international law. Evan Criddle & Evan Fox-Decent, *Keeping the Promise of Public Fiduciary Theory: A Reply to Leib and Galoob*, The Yale Law Journal Forum, 26 Oct 2016, online: <https://www.yalelawjournal.org/pdf/CriddleFoxDecentFinalPDF_4umqajnf.pdf>. For a more direct itemisation of the various critiques and responses to the fiduciary theory as applied to States, *see* Rave, *supra* note 36 at pp 325-327.

[39] *Criddle & Fox-Decent 2016*, *supra* note 6 at p 31. In some situations, the sovereign's power comes from its foreign nationals as well as nationals of other States. *See generally Criddle & Fox-Decent 2016*, *supra* note 6 at Chs 5-6. For a discussion on the applicability of a fiduciary theory to protect the interests of future generations, *see* Evan Fox-Decent, *New Frontiers in Public Fiduciary Law* in Evan Criddle, et al, eds, "The Oxford Handbook of Fiduciary Law" (Oxford: OUP, 2019) at pp 918-922.

[40] *Criddle & Fox-Decent 2016*, *supra* note 6 at p 51.

[41] In this way, the fiduciary theory is related to the Hobbesean social contract, whereby people willingly give up rights to a sovereign in exchange for protection from the otherwise-inevitable "state of nature". *Rave*, *supra* note 36 at pp 326-327 (citations omitted).

[42] Leonard Rotman, *Understanding Fiduciary Duties and Relationships Fiduciarity*, (2017) 62:4 McGill L J 975 at p 977 [*Rotman*].

[43] Fred Lawrence, *Chapter XXIII: The Fiduciary Relationship*, in "A Treatise on the Substantive Law of Equity Jurisprudence" (Albany: Matthew Bender and Co, 1929) at p 453.

relationships have been identified (or theoretically described) in a number of relationships, including those between parent and child[44], doctors and patients[45], lawyers and clients[46], trustors and trustees[47], employers and employees[48], business partners[49], franchisors and franchisees[50], distributors and manufacturers[51], directors and creditors[52], lenders and borrowers[53], coaches and players[54], the State and indigenous populations[55] and the State and refugees[56].[57] Fiduciary relationships may emerge in any situation in which one party must exercise their power for the benefit of another and may not derive any benefit themself unless explicitly permitted.[58] Importantly, beneficiaries are not expected to supervise or monitor the activities of their fiduciaries and beneficiaries carry no obligations towards their fiduciary; the responsibilities simply exist by virtue of the relationship.[59]

With respect to the terms of a fiduciary relationship between a State and its people, the same requirements of a fiduciary in the private law context apply: namely, eliminating conflicts of interest and not profiting from positions of authority. Similarly, the fundamental obligation of a fiduciary to ensure their subject benefits from the decisions it makes on their behalf also applies in the context of a State and its people. This normative conceptualisation of the role of the State

[44] Margaret Isabel Hall, *"Intuitive Fiduciaries": The Equitable Structure of Family Life*, (2002) 19:2 Can J of Fam L 345.
[45] Gabriel Lazaro-Munoz, *The Fiduciary Relationship Model for Managing Clinical Genomic "Incidental" Findings*, (2014) 42:4 J of L, Medicine and Ethics 576.
[46] Robert Tuttle, *The Fiduciary's Fiduciary: Legal Ethics in Fiduciary Representation*, (1994) 4 U of Ill L Rev 889.
[47] Robert Flannigan, *The Fiduciary Obligation*, (1989) 9:3 Oxford J of Legal Studies 285.
[48] Matthew Bodie, *Employment as Fiduciary Relationship*, (2017) 105:4 Georgetown L J 819.
[49] Leona Beane, *The Fiduciary Relationship of a Partner*, (1980) 5:3 J of Corporation L 483.
[50] Harold Brown, *Franchising - A Fiduciary Relationship*, (1971) 49:4 Texas L Rev 650.
[51] Uri Benoliel, *Rethinking the Distributor-Manufacturer Fiduciary Relationship: A Marketing Channels Perspective*, (2008) 45:1 Am Bus L J 187.
[52] Graham King, *Extending Fiduciary Principles to the Director-Creditor Relationship: A Canadian Perspective*, (2002) 29:2 Manitoba L J 243.
[53] Cecil Hunt, *The Price of Trust: An Examination of Fiduciary Duty and the Lender-Borrower Relationship*, (1994) 29:3 Wake Forest L Rev 719.
[54] Sara Young, *Does a Coach Owe Players a Fiduciary Duty? Examining the Relationship between Coach and Team*, (2009) 35:2 J of College and University L 475.
[55] Eugenia Allison Phipps, *Feds 200, Indians 0: The Burden of Proof in the Federal/Indian Fiduciary Relationship*, (2000) 53:5 Vanderbilt L Rev 1637; Evan Fox-Decent, *Fashioning Legal Authority from Power: The Crown-Native Fiduciary Relationship*, (2006) 4:1 New Zealand J of Pub Int'l L 91.
[56] Anna Lise Purkey, *Questioning Governance in Protracted Refugee Situations: The Fiduciary Nature of the State-Refugee Relationship*, (2014) 25:4 Int'l J of Refugee L 693.
[57] For a discussion on whether fiduciary relationships have been applied excessively broadly, *see Rotman*, *supra* note 42.
[58] Robert Muir, *Duties Arising Outside of the Fiduciary Relationship*, (1964) 3 Alberta L Rev 359; *Rotman*, *supra* note 42 at pp 990-991.
[59] *Rotman*, *supra* note 42 at p 991.

is predicated on a State acting in the interests and for the benefit of its nationals; indeed, as described above, "the relational character of sovereignty [is] a right belonging to the people that the state may exercise solely for their benefit"[60]. One of the more challenging aspects of defining the role of a State in its fiduciary relationship with its citizens is understanding, appreciating and defining a "benefit" or what amounts to the "interests of" the people. Often, in private law conceptualisations, a fiduciary is responsible for the interests of a single beneficiary amounting to a duty of loyalty and a duty of care, making the relationship relatively straightforward. In the public law sense of a State as a fiduciary of its people, the multiple, often competing, interests of the beneficiaries make the relationship more tricky and the enforcement of obligations difficult.[61] Nevertheless, the same principles apply: a State's fiduciary duty to its people is comprised of a duty of loyalty and a duty of care, albeit modified given the circumstances.[62]

The consequences of such a relationship are such that a State must therefore act in a manner that is appropriate to fulfill its duties as trustee of the people.[63] Traditionally, these duties amount to establishing appropriate rules and regulations, adjudicating disputes, providing for peace, prosperity and protection as well as ensuring the overall welfare of nationals; in short, "performing the governance functions that their people lack the legal capacity to undertake as private parties".[64] In situations where a State is unable – or, worse yet, unwilling – to carry out these basic functions, this fiduciary theory suggests that a State loses its legitimacy and no longer carries the power of the people just as, for example, an estate trustee would lose their position of privilege should they abuse their position to the detriment of the intended beneficiary.[65]

In a State's relationship with its people, different circumstances, different interests and different perspectives may result in completely different definitions of benefit or satisfaction of interests. Indeed, in many situations, satisfying the competing loyalties demanded of the fiduciary

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[60] *Criddle & Fox-Decent 2016*, *supra* note 6 at p 16.
[61] *Criddle*, *supra* note 37 at p 362.
[62] The various conceptualisations of loyalty include loyalty to the rule of law, to avoiding conflicts, to equitable treatment and as being conscientious. Similarly, the duty of care requires a duty of deference, of process and of deliberation. Rave, *supra* note 36 at pp 334-339.
[63] With respect to who qualifies to benefit from the relationship with the State, "all individuals within a state's jurisdiction—adults and children, nationals and non-nationals, loyalists and revolutionaries—are people entitled to be treated as beneficiaries of the state's fiduciary power." *Criddle & Fox-Decent 2016*, *supra* note 6 at p 29.
[64] *Ibid* at p 50.
[65] In some trust situations, such as estates, there are three distinct players: the trustor (who denotes what ought to happen), the trustee (who carries out the desires of the trustor) and the beneficiary (who is the recipient of the trustor's desires). When applying a fiduciary theory to the workings of a State, the people are both the trustor and the beneficiary whereas the State is the trustee.

will likely prove impossible.[66] Notwithstanding this challenge, solace may be taken in defining the kinds of actions that would most definitely not amount to acting for the benefit or in the interest of a State's people. Generally, a State wasting public resources, violating the rights of minority groups or engaging in backroom deals for self-enrichment would all be examples of a State acting contrary to its fiduciary responsibilities.[67] In a private law fiduciary relationship, the fiduciary is not to benefit from the relationship (outside of what is agreed upon as compensation for their role) and is not to entertain conflicting opportunities. Similarly, a State (or, more accurately, the public administration officials carrying out the activities of the State) is not to benefit from the authoritative power it claims as a result of its relationship with the people.[68]

Within this theoretical framework, although States retain authority over their territories (as necessitated by the Westphalian model), they cannot act in such a way that is not in the interests of, or does not benefit, their subjects since it is from these very subjects that they derive the sovereignty on which their authority relies.[69] As a result, the fiduciary theory is able to address the paradox of how a sovereign State can be bound by rules of international law to which it has not consented (such as *jus cogens* norms, human rights standards or obligations related to common concerns) since a State's sovereignty is derived from the very subjects to whom it owes a duty and any action that is not in the interest or to the benefit of those subjects would undermine that relationship and its corresponding sovereignty.[70] As a result, the imposition of principles of international law that are clearly beneficial to a State's people, without the State explicitly consenting, is not a limitation of a State's sovereignty but a reaffirmation of it. This theoretical approach, therefore, allows for a unification of sovereignty with *jus cogens* norms, human rights standards and obligations related to global common concerns by stipulating that even if a State has not explicitly consented to a rule or norm, it is intrinsically prohibited from violating said rule or norm as doing so would necessarily undermine the interests of its subjects and, therefore, undermine its own sovereign authority.[71]

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[66] *Rave*, *supra* note 36 at pp 335-336.
[67] *Criddle & Fox-Decent 2016*, *supra* note 6 at pp 37-38.
[68] *Ibid* at p 37.
[69] *Ibid* at p 42.
[70] *Ibid* at p 3.
[71] *Ibid* at p 50.

An Extension: States as Fiduciaries of Humanity

The theoretical underpinnings that support appreciating the fiduciary nature of the relationship between a State and its people can be extended to support a similar relationship between States and the rest of humanity.[72] Arguably, just as the relationship between a State and its people is built on principles that motivate the State (the fiduciary) to further the interests of its people (the beneficiaries), the relationship between States and humanity[73] can be explained on the basis of the same principles; namely, a responsibility to act in the interests and for the benefit of humanity. While it is true that a State does not have direct authority over those not within its traditional territory, a State's decisions and actions can still have significant global effects, thereby affecting humanity.[74] Similarly, although non-nationals do not imbue a State with its sovereign authority (by virtue of not being members of the fabled social contract), States are members of the international community and derive their collective authority from the people for whom the international community serves, namely, humanity.

The overarching objectives of the international community, therefore, are the improvement and betterment of humanity. To this end, the international community, as the legal construct imbued with the authority to dictate and moderate the interactions of States, must work to further the interests of, and benefit, humanity. The fiduciary relationship between the international community and humanity, therefore, emerges from the international community's responsibility to further the interests of humanity. Individual States, as one of a relatively select few members of the international community, therefore, have a cosmopolitan duty to ensure that the collective actions of the international community benefit humanity.[75] States do this by creating international norms that are beneficial to humanity by way of creating treaties and developing custom, as well as holding each other accountable to such normative standards.[76] Clearly, in collectively carrying out international programs, the goal of States must be the improvement of humanity. Less clear, but equally relevant, is that in carrying out unilateral activities, the goal of an individual State must

[72] In their book, Criddle and Fox-Decent extend the fiduciary relationship to refugees (non-citizens within their borders), by virtue of the State's unique position as a joint steward of Earth with all other States. *Ibid* at pp 266-267.
[73] This conceptualisation of humanity would include a State's own nationals as well as non-nationals.
[74] There exist certain international obligations (such as those owed *erga omnes*) that require a State to serve the interests of both its people and humanity. These cosmopolitan fiduciary duties resonate with the Charter's admonition that territorial administrators must exercise their power in a manner that respects "the interests and well-being of the rest of the world." *Criddle*, *supra* note 37 at pp 358-359 (citations omitted).
[75] *Criddle & Fox-Decent 2018*, *supra* note 35 at p 94.
[76] *Ibid* at p 91.

also be the improvement of humanity, even if specific legal obligations do not exist.[77] That is not to say that individual States must go out of their way to ensure their actions benefit humanity at the expense of their own people (which would seemingly violate their fiduciary obligations to their own people[78]); rather, in situations where benefit can arise for both a State's own people and all of humanity (or for humanity without cost to a State's own people), a State must act to further the interests of humanity.[79]

This theoretical approach to establishing a fiduciary relationship between States and humanity does not always undermine the fiduciary relationship between a State and its people.[80] Indeed, the global perspective strengthens the individual bonds between a State and its people as a State's global obligation to consider the interests of non-nationals is carried out on a reciprocal basis with all other States[81], thereby entrenching collective action on issues that are of concern to a State's people but that the State cannot tackle individually.[82] For example, just as a State can be said to have an obligation to ensure that its people have potable water, the international community has an obligation to ensure that all people have access to potable water. If a State relies on downstream river water, it cannot unilaterally ensure potable water for its people if its neighbour upstream is dumping pollutants into the river. As a result, by engaging the international community on a reciprocal basis and promoting that all people have access to potable water, the State would be satisfying its fiduciary obligations to both its own people and humanity. The same can be said of ensuring clean, breathable air or a stable climate.[83]

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[77] Eyal Benvenisti, *Sovereigns as Trustees of Humanity: On the Accountability of States to Foreign Stakeholders*, (2013) 107:2 Am J of Int'l L 295 [*Benvenisti*] at p 300.

[78] *Ibid* at pp 300-301. For an analysis of why a State upholding its fiduciary obligations to humanity in favour of its fiduciary obligations to its people is not necessarily improper, *see Criddle & Fox-Decent 2018*, *supra* note 35.

[79] For a discussion on the degree to which a State must go to satisfy its obligations to humanity, *see Benvenisti*, *supra* note 77 at pp 320-325.

[80] For a discussion on the obligations of a State when its national interests and international responsibilities conflict, *see Criddle & Fox-Decent 2018*, *supra* note 35.

[81] Cedric Ryngaert, *Cosmopolitan Jurisdiction and the National Interest*, in Stephen Allen, et al, "The Oxford Handbook of Jurisdiction in International Law" (Oxford: OUP, 2019) at pp 226-227. For a view that questions whether, in reality, States act on a reciprocal basis (based on a lack of clear universal enforcement mechanisms), *see Benvenisti*, *supra* note 77 at p 314. "The obligations in question are conditioned on the availability of higher political and judicial bodies that can ensure compliance with communitywide obligations. Until such institutional guarantees of equal voice and reciprocity are more fully developed at the global level, only lesser obligations can be expected to gain legitimacy."

[82] *Benvenisti*, *supra* note 77 at pp 300-301.

[83] Evan Fox-Decent, *From Fiduciary States to Joint Trusteeship of the Atmosphere: The Right to a Healthy Environment Through a Fiduciary Prism* in Ken Coghill, et al, eds, "Fiduciary Duty and the Atmospheric Trust" (New York: Routledge, 2016).

Examples of Fiduciary Practice

The contexts in which States carry out (or ought to carry out) their fiduciary obligations to humanity are quite diverse, including situations in which it may seem a State ought to prioritise the interests of its own people over those of non-nationals.[84] For example, one of the basic functions of a State is to provide its people with adequate infrastructure. If a border-community needed electricity, a State could not erect a polluting power plant, knowing that the pollutants from that power plant would likely cause environmental harm or health-related consequences to the people in the neighbouring State, regardless of how dire the circumstances of its own people.[85] Similarly, another basic function of the State is to provide protection to its people. During an armed conflict, therefore, a State may understandably seek to prioritise the protection of its own people but it could not do so in such a way as to unnecessarily inflict harm on civilians of the enemy State.[86] This is true because States have a fiduciary duty to not only their own people but to all of humanity. Indeed, even when a specific State is not itself engaged in conflict (or a party to ongoing humanitarian crises), it may choose to protect people who are not its nationals, under the non-binding principle of the "responsibility to protect".[87] In short, when States are "unable or unwilling to satisfy their sovereign responsibility to protect their people", the international community, as representatives of humanity, have a fiduciary duty to step in and offer such protection.[88]

States' fiduciary responsibilities toward humanity can be categorised into two distinct categories: first, those responsibilities that exist and are satisfied relatively well; and second, those responsibilities that exist but remain neglected or unsatisfied. Admittedly, most of the responsibilities that fall in the second category are more recent realisations (such as certain aspects related to environmental protection); nevertheless, some failures cannot be explained away by lack

[84] *Criddle & Fox-Decent 2016*, *supra* note 6 at p 163.
[85] *Trail Smelter Arbitration* (United States of America v Canada), (2006) III Reports of Int'l Arbitral Awards 1905; International Law Commission, *Draft Articles on Prevention of Transboundary Harm from Hazardous Activities, with commentaries*, United Nations, 2001, UN Doc A/56/10 at Arts 1, 3.
[86] *Criddle & Fox-Decent 2016*, *supra* note 6 at p 165.
[87] Importantly, the "responsibility to protect" is not a binding legal obligation on States; rather, "it clarifies and reinforces duties that states have already undertook under international human rights law, international humanitarian law and international criminal law". Olena Sihvo, *Responsibility to Protect: Clarifying the Nature of State Obligations*, (2014) 2 Helsinki L Rev 255 [*Sihvo*]. When States act under the guise of a "responsibility to protect" they are imposing on themselves an activity that is not required by law. *See* General Assembly, *The responsibility to protect*, United Nations, 7 Oct 2009, UN Doc A/Res/63/308.
[88] *Criddle & Fox-Decent 2016*, *supra* note 6 at pp 167-168. The "responsibility to protect" is not a binding legal obligation; rather a State's fiduciary duty to humanity is what motivates its action to protect non-nationals.

of understanding or opportunity (such as ongoing human rights violations or genocide). By and large, States make an effort (or portray that they are making efforts) towards addressing their fiduciary responsibilities. In terms of armed conflict, various treaties and protocols govern the acceptable uses of force, the methods of conducting warfare, the limitations on collateral damage and the treatment of enemy combatants. With respect to transboundary harm, States avoid blatant violations that cannot be defended on legal grounds.

As fiduciary responsibilities apply to environmental concerns, most States now recognise the anthropocentric effects of modern activities and the need to address them, although there is disagreement on who is to do what and how quickly. Indeed, environmental concerns are quickly becoming the most significant failures of States' individual and collective fiduciary responsibilities towards humanity; until global strategies are developed and implemented wholeheartedly, the international community can only be seen to have failed to act on behalf of the interests of humanity. Simply pursuing policies that prioritise the interests of a State's people is no longer sufficient.[89] Making matters more challenging, with respect to environmental problems, there are now a class of issues that neither fit squarely within the territorial authority of a single State nor within the "common areas" of States (for example, the high seas or Antarctica) nor beyond those things that fall within the "common heritage" of mankind (such as resources of the seabed). Indeed, a new class of "common concerns" that do not have a jurisdictional component still require international collaboration that can only be provided by States.[90]

In this way, since the significant common concerns of humanity can only be addressed by individual States acting collectively, States must satisfy their fiduciary responsibilities to humanity by working together to address these common concerns. For example, climate change is a common concern of humanity but a single State cannot implement changes to unilaterally address the issue

[89] *Gabcikovo-Nagymaros Project Case* (Hungary v Slovakia), 1997 ICJ 7, Separate Opinion of Justice Weeramantry at p 118. "We have entered an era of international law in which international law subserves not only the interests of individual States, but looks beyond them and their parochial concerns to the greater interests of humanity and planetary welfare. … International environmental law will need to proceed beyond weighing the rights and obligations of parties within a closed compartment of individual State self-interest, unrelated to the global concerns of humanity as a whole."

[90] *Brunnee*, *supra* note 19 at pp 552-553. Three concepts "have emerged to respond to collective environmental concerns: 'common areas', 'common heritage', and 'common concern'. The former are areas located beyond the jurisdiction of states, like the high seas, Antarctica, or outer space. The concept of common heritage of humankind describes the status of certain resources that lie beyond the jurisdiction of states, such as the non-living resources of the seabed. The concept of common concern of humankind, finally, relates to global environmental problems, like climate change or the conservation of biological diversity, that can only be resolved if states collaborate."

(such as how a State can unilaterally prevent transboundary harm); nor is climate change a common area over which a treaty can be used to regulate activities (such as how the United Nations Convention on the Law of the Sea[91] addresses the concerns associated with the domain of the sea); nor is climate change a particular resource that can be used for the common heritage of mankind whereby a regime can be implemented for fair and equal access. Since there is no law (nor can there be a law) that would prohibit climate change (for example, a law that provides a State violates international law when it commits climate change), States cannot be legally induced to address climate change. Rather than a prescriptive law, what is required is an international cooperative effort that attempts to tackle the multiple facets of climate change, as part of the international community's fiduciary responsibility to humanity.[92]

A State's fiduciary responsibilities to humanity are not stagnant, however. As new technologies develop and activities take root, the obligations of States will change; for example, new bioengineering technologies may allow for gene editing in humans, preventing babies from being born with certain genetic mutations. Those same gene editing tools, however, may be used for nefarious purposes as well. If such tools have the capacity to cause harm to others, it can be argued that States would have a fiduciary responsibility to humanity to regulate the use of such technologies to ensure they are protecting the interests of humanity.[93]

Evidence of Canada's Fiduciary Practice

Like all States, Canada has a fiduciary relationship not only with its people but also, as a member of the international community, all of humanity. In this way, when Canada acts (whether domestically, regionally or internationally), its actions must be such that they satisfy its fiduciary duties to its people as well as to humanity. Notwithstanding this responsibility, the reality is that not all States act as fiduciaries at all times, whether for their own people or humanity. Canada, for

[91] General Assembly, *1982 Convention on the Law of the Sea*, United Nations, 10 Dec 1982, 1833 UNTS 396.
[92] Frederiech Soltau, *Common Concern of Humankind*, in Kevin Gray, et al, "The Oxford Handbook of International Climate Change Law" (Oxford: OUP, 2016) at p 208. The "principle of humanity", as a principle recognised as foundational to humanitarian assistance, is described by the International Law Commission as "the cornerstone of the protection of persons in international law". Jane McAdam, *Climate Change-related Displacement of Persons*, in Kevin Gray, et al, "The Oxford Handbook of International Climate Change Law" at p 530, *citing* International Law Commission, *Draft articles on the protection of persons in the event of disasters, with commentaries*, United Nations, 2016, UN Doc A/71/10 at Art 6, paras 2-3.
[93] Rosemary Rayfuse, *Public International Law and the Regulation of Emerging Technologies*, in Roger Brownsword, et al, "The Oxford Handbook of Law, Regulation and Technology" (Oxford: OUP, 2017) at p 516.

example, has failed to act as a fiduciary of its own people as well as of humanity on countless occasions[94] and will likely continue to fail to live up to its obligations in the future as well. Indeed, historically, most States have failed to satisfy their fiduciary obligations quite often and, realistically, an expectation of perfect compliance in the future is impractical.[95] The desire, however, is that in the future, Canada and other States will more openly recognize their unique positions as one of only a very few number of representatives of the international community and their equally unique responsibilities as fiduciaries of humanity.

Focusing on more positive instances (notwithstanding their questionable origins[96]), there have been a number of significant moments in which Canada has acted as a fiduciary of humanity. For example, Canada's public promotion of human rights on the international stage[97], its furtherance of developing an international peacekeeping force[98], its recognition of international law and territorial sovereignty in Cuba despite US pressure to capitulate[99], its initiation of international search and rescue services provided by satellites[100], its ratification of the United

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[94] In the years between WWI and WWII, Canada attempted to limit the obligations of member States of the League of Nations to avoid having to provide interventionist assistance. Similarly, in the 1950s and 1960s, Canada was concerned only with international issues directly associated with its national interest. William Schabas, *Canada's Contribution to International Law*, Chapter 6 in Robert Bothwell, ed, "Canada Among Nations 2008: 100 Years of Canadian Foreign Policy" (Kingston: MQUP, 2009) [*Schabas*] at pp 145-146. With respect to more recent examples, consider findings of the Canadians Truth and Reconciliation Commission. Truth and Reconciliation Commission, *Honouring the Truth, Reconciling for the Future: Summary of the Final Report of the Truth and Reconciliation Commission of Canada*, Government of Canada, 2015, online: <http://nctr.ca/assets/reports/Final%20Reports/Executive_Summary_English_Web.pdf>.

[95] Notwithstanding, it is theoretically possible that, given the right impetus, people and their governments around the world suddenly view the global community not as 195+ distinct groups but rather as one collection of people with different layers of government. Just as Canada is the federal organisation of Canadians and Quebec is the provincial organisation of Quebecers and Montreal is the municipal organisation of Montrealais, Earth can be the global organisation of humans. When viewed in this way, many of the world's "global" issues would likely be more susceptible to collective solutions than if attempting to independently address a single problem 195+ different ways.

[96] Schabas, *supra* note 94 at p 154.

[97] Global Affairs Canada, *International human rights*, Government of Canada, 11 Jul 2018, online: <http://international.gc.ca/world-monde/issues_development-enjeux_developpement/human_rights-droits_homme/rights-droits.aspx?lang=eng>. *But see* Schabas, *supra* note 94 at pp 148-149. "... Ottawa's enthusiasm for human rights is a relatively recent phenomenon. … Canada's participation in the drafting of the Universal Declaration of Human Rights, which is the seminal statement of international human rights law, was at best indifferent and at times quite destructive. … It was really not until the 1980s that Canadian policy in the area of human rights matured, and Canadian leadership began to be recognised."

[98] Valerie Hauch, *Once Upon a City: Lester B. Pearson's peacekeeping legacy*, The Toronto Star, 7 Jun 2017, online: <https://www.thestar.com/yourtoronto/once-upon-a-city-archives/2017/06/07/once-upon-a-city-lester-b-pearsons-peacekeeping-legacy.html>. *But see Schabas*, *supra* note 94 at pp 145-146.

[99] Embassy of Canada to Cuba, *Canada - Cuba Relations*, Government of Canada, Feb 2013, online: <https://www.canadainternational.gc.ca/cuba/bilateral_relations_bilaterales/canada_cuba.aspx?lang=eng>.

[100] Ciro Arevalo-Yepes & Sylvia Ospina, ed, "Global Perspectives on Regional Cooperation in Space: Policies, Governance & Legal Tools" (Paris: IAA, 2016) at pp 25-26.

Nations Convention on the Law of the Sea (UNCLOS) and promotion of (and participation in) the International Seabed Authority[101], its leadership in creating and adopting the Ottawa Treaty limiting the use of landmines[102], its promotion of the "responsibility to protect"[103], its role in establishing the International Criminal Court (ICC)[104], its role in the creation of the Kimberley Process to suppress the sale of "conflict diamonds"[105], its position with respect to Israeli settlements in Palestine[106] and its commitment to multilateralism all demonstrate a State attempting to act outside of, or in addition to, the interests of its own people for the benefit of humanity.[107] Each of these actions (whether individual events or long-standing generational policies) have donned Canada with an international reputation for being a forthright, honest broker that is not singularly self-interested when it comes to important international matters.[108] As a result, Canada is looked up to as a model State by many nations and peoples, giving it a particularly useful platform from which to further advocate in favour of humanistic ideas and ideals.

The reason the above-listed examples of Canadian leadership demonstrate Canada's satisfaction of its responsibilities as a fiduciary of humanity is because most have served the interests of non-Canadians: fortunately for Canadians, Canada is not a country littered with landmines, it does not have a thriving conflict diamond industry nor are peacekeeping forces required. Nevertheless, by pushing for international agreement and agreements on these issues, humanity has benefited. Even in circumstances where Canada or Canadians benefit, the benefits

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[101] Fisheries and Oceans Canada, *Sovereignty and UNCLOS*, Government of Canada, 31 Aug 2018, online: <http://www.dfo-mpo.gc.ca/science/hydrography-hydrographie/UNCLOS/index-eng.html>.
[102] Global Affairs Canada, *Canada marks 20th anniversary of the Ottawa Treaty to ban landmines and announces further support*, Government of Canada, 4 Dec 2017, online: <https://www.canada.ca/en/global-affairs/news/2017/12/canada_marks_20thanniversaryoftheottawatreatytobanlandminesandan.html>.
[103] *Sihvo*, *supra* note 87 at 260.
[104] Global Affairs Canada, *Canada and the International Criminal Court*, Government of Canada, 19 Apr 2018, online: <http://www.international.gc.ca/world-monde/international_relations-relations_internationales/icc-cpi/index.aspx?lang=eng>; *Schabas*, *supra* note 94 at pp 150-151.
[105] Natural Resources Canada, *Kimberley Process for Rough Diamonds,* Government of Canada, 26 Mar 2018, online: <https://www.nrcan.gc.ca/mining-materials/resources/kimberley-process-rough-diamonds/8222>; *Schabas*, *supra* note 94 at p 152.
[106] Evan Dyer, *Canada reverses UN stance on Palestinians in break with U.S. over settlements*, CBC News, 20 Nov 2019, online: <https://www.cbc.ca/news/politics/un-palestinian-vote-canada-israel-us-1.5365637>.
[107] Of course, some may argue that Canada's decision to undertake these actions were calculated and ultimately done to benefit itself (which may have had the side-effect of benefiting others as well) rather than for humanitarian or humanistic purposes. This argument, however, fails to take into consideration that there were significant "personal" consequences to Canada in upholding some of these stances.
[108] *But see Schabas*, *supra* note 94 at p 145. Historically, Canada has not always been as internationally engaged and progressive as its reputation suggests. As Maxwell Cohen wrote contemporaneously: "Canadian internationalism in the interwar years was skin deep."

do not come at the expense of non-Canadians: for example, by promoting human rights that ensure equality in Canada, the human rights of other countries are not correspondingly worsened; by adopting UNCLOS and its regime related to mining resources from the seabed, Canadian entities (which, unlike most nations, have the technology to carry out such mining activities) may only exploit the seabed's resources in a manner that is not detrimental to humanity.

A State's Fiduciary Responsibility to Regulate

In acknowledging a State's fiduciary responsibility to act in the interest and for the benefit of its subjects and humanity, there are specific situations that require specific responses. Aside from simply ensuring the physical protection of people (for example, protecting nationals from a foreign invasion or protecting non-nationals from the grave human rights abuses of their own governments), there are occasions in which a State's role is less protective and more productive. In carrying out its governance functions, a State, taking into consideration its fiduciary responsibilities to its people and humanity, must act in a manner that allows for people to thrive. For example, although protecting its borders with a military presence is necessary, it is insufficient; it must also seek out peaceful and productive relationships with its neighbours. Simply promulgating against human rights abuses is insufficient; it must also actively work to stamp them out domestically and internationally. Denouncing unsustainable energy practices is only part of the solution; it must also invest in renewable energy solutions. In most instances, a State's actions are implemented by way of regulation – proscribing who, what and how a specific set of actions will be carried out to address a specific concern.

As will be discussed below, regulation can take many forms. In some situations, regulation may entail the State creating a set of guiding principles for how it will itself address an issue while in other situations regulation may entail the State establishing a framework through which non-State actors can become involved. Without regulation, there is no way for a State to make clear its intentions, objectives and methods: in the modern, globalised capitalist world, the State has an invaluable role in establishing objectives on behalf of its people, developing the methods by which it will achieve those objectives and ensuring that in achieving the objectives people benefit and no one is unduly harmed.

Ensuring appropriate regulation exists, is implemented and is enforced is one of the most basic duties of a State, especially in a society with a thriving competitive marketplace. Such

regulation ensures that the State is able to provide secure and equal freedom to all people, regardless of whether they are operating personally, in a partnership or through a corporation. From the perspective of a State satisfying its fiduciary obligations to ensure those within its governance structure benefit, regulation is the legal vehicle through which the State can ensure fair and appropriate rules are created so that the most creative, innovative and strategic entities are successful without causing undue harm to others. As such, appropriate regulation allows a State to dictate what is and is not acceptable with respect to a particular practice and allows for the maximization of the interests and benefits of a State's subjects.

Of course, the regulatory method will depend on the circumstances. A State may attempt to address food shortages by regulating the price of grain or prohibiting international exports. Similarly, when combatting domestic discrimination, the State may decide to draft anti-discrimination legislation or appoint an ombudsman or watchdog. The regulatory method will also depend on the context. A State may decide to bring domestic criminal charges against the officers of a mining corporation involved in human rights abuses abroad or it may confiscate the corporation's profits and invest them back in the communities where the abuses took place. The manner in which a State regulates is therefore dependent on the circumstances and context and can be used as a tool to benefit a State's own people as well as humanity.

The anticipated legal relationships, namely, between the international community, Canada and Canadians, is as follows: Canada, by virtue of Article I of the *Outer Space Treaty* (which imposes an *erga omnes* obligation on States to carry out their exploration and use of space for the benefit and in the interest of all countries), has an international obligation to the international community to authorise and supervise the space activities of its commercial operators; quite separately, by virtue of its fiduciary relationship with its people, Canada also has a duty to provide the means by which its commercial space operators can legally participate in space activities. Given the unique legal nature of outer space, Canada's international obligation to regulate is quite distinct from its fiduciary duty to regulate: one is owed to the international community and the other is owed to its nationals. For example, without a fiduciary duty to its people, Canada could satisfy its treaty obligation to the international community by quite simply prohibiting Canadian commercial operators from carrying out space activities; by doing so, Canada would ensure no commercial operator undertakes a space activity without authorisation. However, since Canada does have a fiduciary duty to its people, it must satisfy its international obligation in a manner that

also benefits its commercial operators (for example, by creating a regulatory framework that allows commercial operators to undertake space activities). That is not to say that there is only one specific regulatory approach (for example, the one proposed in this project's latter chapters) that would satisfy Canada's fiduciary duty to commercial operators, but simply that such a fiduciary duty exists, separate from Canada's international obligation. This dualist appreciation for Canada's need to regulate commercial space activities demonstrates that simply satisfying one condition is insufficient: Canada must both satisfy its international obligation to regulate and regulate in such a way that is in the interests of its people.

In providing the appropriate regulatory framework for a specific activity or industry, a State is ensuring that it provides the legal means by which private entities are able to engage in specific activities. As will be discussed below with respect to space, this regulation is vital since it allows commercial entities to participate in the global movement towards commercialisation and allows private entities the opportunities to benefit from engaging with this domain. Conversely, by failing to provide an appropriate domestic regulatory framework, private entities within a jurisdiction will be prevented from participating in the New Space race and, instead of benefitting from the opportunity, their interests will be harmed. As such, in certain circumstances like space, a State has a responsibility to regulate to ensure that it is providing its people with the opportunities to engage in a new domain and thereby benefit from their involvement.

Regulation

Regulation entails "the intentional use of authority to affect behaviour of a different party according to set standards, involving instruments of information-gathering and behaviour modification"[109]. This broad, all-encompassing definition is a relatively new phenomenon - historically, the concept of regulation existed largely within the domain of economics and, occasionally, borrowed by scholars of public administration[110], resulting in a more narrow definition that considered the specifics of these respective fields.[111] It is only more recently that

[109] Julia Black, *Decentring Regulation: Understanding the Role of Regulation and Self-Regulation in a 'Post-Regulatory' World*, (2001) 54 Current Legal Problems 103 [*Black*] at 142; Robert Baldwin, *Legislation and Rule-Making*, in Mark Tushnet & Peter Cane, "The Oxford Handbook of Legal Studies" (Oxford: OUP, 2005) [*Baldwin 2005*] at p 727.
[110] Robert Baldwin, et al, eds, "The Oxford Handbook of Regulation" (New York, OUP 2010) [*Baldwin 2010*] at p 4.
[111] *Black*, *supra* note 109 at p 129. Scholars have defined regulation in three distinct ways: "In the first, regulation is the promulgation of rules accompanied by mechanisms for monitoring and enforcement. The usual assumption is that government is the rule-maker, monitor, and enforcer, usually operating through a public agency. The second definition

regulation has "become a multi-disciplinary field, with substantial contributions to regulatory debates being made by political scientists, lawyers, sociologists, anthropologists, and others".[112] As a result, even though a single operative definition of regulation has been difficult to specify (given the highly dependent contexts in which it is applied), a more broad consideration of the term has allowed for more cross-disciplinary discussions.[113] Generally speaking, therefore, regulation can encompass legislation, subordinate legislation, policies, standards, guidelines and recommendations, etc.[114] Given the various vehicles and media through which regulation can take shape, when considering the question of "appropriate regulation" it is worth noting that the mechanisms employed to reach a desired regulatory objective can vary. Importantly, therefore, the appropriateness of the regulation or the regulatory approach will very much depend on the context and stated objectives of the process, the industry under consideration as well as the consequences of its implementation.

With respect to the regulation of space activities, therefore, this section of the chapter will consider the theoretical underpinnings of regulation, the methods by which regulation is implemented, the roles of various regulators and the practical implications of a regulatory regime. The regulation of space activities entails a number of unique considerations given the physical domain in which they are carried out, the established international regulatory framework, the nascence of the industry and the significant opportunities for positive impact in all aspects of human life. As will become clear, the regulation of space activities will require a concerted and consistent effort by government and a fine balance in the implementation of the various regulatory mechanisms.

The Theories of Regulation

Just as a definition of regulation is difficult to settle on, the accompanying theories that attempt to describe the role, rationale and motivation for regulation are equally particular.

keeps to the government as the 'regulator' but broadens the techniques that may be described as 'regulation' to include any form of direct state intervention in the economy, whatever form that intervention might take. In the third definition, regulation includes all mechanisms of social control or influence affecting behaviour from whatever source, whether intentional or not."

[112] *Baldwin 2010*, *supra* note 110 at p 4.

[113] *Ibid* at pp 11-12.

[114] Christine Parker & John Braithwaite, *Regulation*, in Mark Tushnet & Peter Cane, "The Oxford Handbook of Legal Studies" (Oxford: OUP, 2005) [*Parker & Braithwaite*] at p 119. For a discussion on how different kinds of regulation can be divided into primary, secondary and tertiary kinds of rules, *see Baldwin 2005*, *supra* note 109 at pp 727-728.

Generally, there are, at its core, two distinct theories related to regulation: the "public interest" theory and the "interest group" theory (often referred to as economic theory).[115] The public interest theory suggests that regulation is undertaken in pursuit of "public interest-related objectives"[116] by benevolent agents who are experts in their fields, trustworthy and disinterested of political aspiration. These regulators attempt to apply their objective knowledge as it relates to the regulated industry they oversee and help manage the interests that are not taken into consideration by purely "market forces".[117] From an economic perspective, most modern public economies have embraced the public interest theory of regulation and made it the cornerstone of their left-of-center policies.[118] Over the last 100 years, much of the regulation that has come to dominate Western society has relied on the public interest theory, thereby making this theory both a prescription of what governments ought to do and a description of what governments actually do[119]; nevertheless, amongst economists, the public interest theory has been largely discredited in favour of the interest group theory.[120]

The interest group theory suggests that rather than being motivated purely by the public interest, regulation is really a process that is driven by the specific concerns of interest groups who advocate for regulations that help maximise their economic interests (or, similarly, regulations that minimise limits to their economic potential). Since all actors are inherently self-serving, the interest group theory suggests that all actors involved in regulation seek to utilize regulation for their own benefit.[121] As a result, since regulation is specific, only those actors with significant interest in a matter engage in the regulatory process (often the specific industry being regulated) while less interested parties (the majority of citizens and other entities) do not.[122] To an extent,

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[115] Robert Baldwin, et al, "Understanding Regulation" (New York, Oxford University Press, 2012) [*Baldwin 2012*] at pp 40-41; Michael Hantke-Domas, *The Public Interest Theory of Regulation: Non-Existence or Misinterpretation?*, (2003) 15 European J of L and Economics 165 [*Hantke-Domas*] at p 165.
[116] *Baldwin 2012*, *supra* note 115 at p 40.
[117] *Ibid* at pp 40-41.
[118] Andrei Shleifer, *Understanding Regulation*, (2005) 11:4 European Financial Management 439 [*Shleifer*] at p 440.
[119] *Ibid* at pp 439-440; Michael Levine & Jennifer Forrence, *Regulatory Capture, Public Interest, and the Public Agenda: Toward a Synthesis*, (1990) 6 J of L, Econ and Org 167 [*Levine & Forrence*] at p 168. For a period in the 1970s and 1980s, the world of regulation was dominated by the Chicago School that completely dismissed the role and utility of regulation. *See* John Braithwaite, *The Regulatory State?*, in Sarah Binder, et al, eds, "The Oxford Handbook of Political Institutions" (Oxford: OUP, 2009) at pp 408-409 and Clifford Nowell & John Tschirhart, *Testing Theories of Regulatory Behavior*, (1993) 8 Rev of Industrial Organization 653 [*Nowell & Tschirhart*] at 653.
[120] Richard Posner, *Theories of Economic Regulation*, (1974) 5:2 The Bell J of Econ and Management Sci 335.
[121] *Levine & Forrence*, *supra* note 119 at p 169.
[122] *Badlwin 2012*, *supra* note 115 at p 43.

the public interest theory focuses more on the ideological merits of regulation whereas the interest group theory focuses more on the practical realities of regulation.[123]

For as long as the concept of regulation has existed, there have been arguments against regulation: some argue that regulation creates unnecessary "red-tape" and government bloat that hinder competitiveness and economic growth[124]; others argue that de-regulation is better than any kind of regulation; still others argue that all external regulation is never of an appropriate quality, even when "better regulation" is the objective, and therefore entities ought to "self-regulate". With respect to the public interest and interest group theories specifically, both have been heavily criticized. Critics of the public interest theory argue that, even from a theoretical perspective, the belief that experts can apply objective knowledge is not an accurate representation of the world since the natural elasticity of knowledge allows multiple experts to reach competing and/or contradictory interpretations of the same set of facts, which can lead to different conclusions with significant consequences. From a practical perspective, objective experts simply do not exist in the public domain and most that claim to be are largely ignorant or unqualified.[125] Further, it is plausible (and, more likely, possible) that regulators may succumb to opportunities for personal profit, desires to oversee increased portfolios or unknowingly fall victim to misleading industry campaigns[126], each of which would undermine their ability to uphold the "objective public interest"; the belief that regulators are infallible again fails to reflect the reality of human beings. As a result, because of potential objective inconsistencies and basic human tendencies, public interest theory regulation fails to deliver real world results that are actually in the public's interest.

Critics of the interest group theory argue that regulation carried out by those with vested interests necessarily leaves out the interests of everyone who is not involved (which is usually the majority of people). Since each individual instance of regulation applies only to a specific set of circumstances and, further, that only a very few number of actors are ever interested in an individual instance of regulation, most people are not involved in most instances of regulation. As

[123] For a thorough discussion on why regulators act in the public interest or, conversely, are "captured" by private interest groups, *see generally Levine and Forrence*, *supra* note 119 and Robert Katzmann, *Comments on Levine and Forrence, "Regulatory Capture, Public Interest, and the Public Agenda: Towards a Synthesis"*, (1990) 6 J of L, Econ and Org 199.
[124] For example, in 2015 the Conservative government of Canada introduced the *Red Tape Reduction Act*, SC 2015, c 12 which legislated that any new regulation imposed on a business must have a corresponding reduction in one existing regulation (a one-for-one rule). The law was motivated by the belief that there were too many regulations being applied to businesses and that these regulations were increasing the cost of doing business.
[125] *Shleifer*, *supra* note 118 at p 440;
[126] *Levine & Forrence*, *supra* note 119 at pp 169-170.

a result, those interested in a specific instance of regulation seek to ensure that the regulation benefits their position and can easily influence (appropriately or otherwise) the regulator to champion their cause. Since in most cases non-interested parties are not involved in the regulatory process, it is possible for the interests of the non-interested parties to be overlooked or, worse, undermined.[127] Separately, the industry group theory fails to take into account the reality that non-economic motives (such as "ideologies, policy goals, emotional identifications, personality limits, prejudices, and moral stances"[128]) are also at play in a regulatory scheme and that the explicit interests of the interested party may not be the only interests that ought to be taken into account. Ironically, one of the more fundamental objections to the interest group theory is that, contrary to the underlying principle that interested parties seek to maximise their own economic interests, quite often an entity with influence over a regulator may be seeking to fulfill its truly altruistic concerns.[129]

With respect to the theoretical underpinning of the regulatory framework related to space, both the public interest theory and the interest group theory will have a role to play and balancing the two will prove necessary yet challenging.[130] Canada ought to recognise that the regulatory framework must take into consideration the relative interests of the public, namely, their safety, security and overall well being. To this end, a regulatory framework related to space ought to ensure that sanctioned space activities do not physically harm people or the environment (for example, orbital launch vehicles ought not take place near urban centers or environmentally fragile ecosystems), do not risk or jeopardise national security interests (for example, remote sensing products ought not be sold to foreign adversaries) nor expose taxpayers to unnecessary or avoidable liabilities (for example, constellations in overpopulated orbits ought not be licensed).

Similarly, a regulatory framework related to space ought not ignore the specific interests of industry, since their interests are most directly captured by the regulations and they are its ultimate subjects. To this end, the regulatory framework ought not impose overly-onerous

[127] This is especially true in circumstances of complicated regulations or when regulating large industries. For example, regulating the use of specific plastics acceptable to be used in disposable water bottles has an undue effect on the interests of the consumers (being most people in a community) but likely these consumers are not aware of or knowledgeable enough to be involved in the regulatory process. A water bottling company would therefore push for flexible standards, in line with its economic interests, at the potential expense of the health of its consumers.
[128] *Baldwin 2012*, *supra* note 115 at p 46.
[129] *Ibid*. The interest group theory cannot account for an interested party advocating for regulations that are counter to their economic interests. One response may be that, long term, the altruistic efforts always serve a self-interested economic purpose.
[130] *Nowell & Tschirhart*, *supra* note 119 at 654.

requirements related to safety or security, ought to provide general guidance with respect to the kinds of space activities deemed acceptable and ought to allow space operators the legal latitude to innovate and experiment with reasonably-risky space activities. Indeed, since the overall growth of the commercial space sector is in the public interest (insofar as it has the potential to create new jobs, grow the economy, develop valuable technologies, generate important spin-off applications, etc.), an overly prohibitive regulatory framework that hinders innovation would undermine the very public interest the regulatory framework seeks to protect. As such, a balanced approach ought to be implemented.

The Methodologies of Regulation

The manner in which a specific industry or activity is regulated can have significant effects on the success of the industry and the consequences of the activity. Generally, there are two types of regulatory methodologies and they differ on the manner of their implementation: prescriptive regulation and performance-based regulation. Under a model of prescriptive regulation, the regulation establishes overall objectives and sets out how such objectives are to be met. Under a model of performance-based regulation, the regulation establishes the objective but does not stipulate how the objective is to be met; rather, the regulator utilises measurable (objective) outcomes to determine whether the objective has been met.[131] Therefore, the two methods of regulatory implementation differ in the means by which an overall objective is met: the prescriptive emphasises control and accountability while the performance-based approach emphasises flexibility and results.[132]

Different situations may be more suited to one type of regulation over another. In some situations, a regulator seeks to only ensure that a negative outcome does not materialise whereas in other situations the regulator is actively seeking a very specific outcome that can only be achieved by following prescribed steps - the use of one method over another may be able to more

[131] "Prescriptive regulations state or describe what must be done and how work is to be carried out. The prescriptive regulation approach emphasises a known degree of risk mitigation but can become dated… Performance-based regulations can provide flexibility in compliance because they focus on outcomes rather than on the precise factors to be controlled or the means of controlling them." Tony Dean, *Expert Advisory Panel on occupational health and safety*, Expert Advisory Panel, Minister of Labour, Government of Ontario, 2010, online: <https://www.ontario.ca/document/expert-advisory-panel-occupational-health-and-safety> .

[132] Peter May, *Performance-Based Regulation and Regulatory Regimes*, Presented at 13th World Conference on Earthquake Engineering (Vancouver, British Columbia), Paper Number 3254, 1-6 August 2004, available online: <https://www.iitk.ac.in/nicee/wcee/article/13_3254.pdf> [*May*] at p 11.

effectively deliver the desired outcome. For example, drunk driving demands prescriptive regulation (if a driver's blood-alcohol content is higher than a specific value, they are prohibited from driving) rather than performance-based regulation (if a driver can demonstrate, regardless of their blood-alcohol content, that they can drive safely, they may do so).[133] Conversely, it is more appropriate to implement performance-based regulation when attempting to manage carbon dioxide emissions from a factory (such that a factory is free to implement whatever techniques or technologies at its disposal to remain under a target quantity) rather than a prescriptive method (all factories must derive 50% of their energy from installed solar panels). There are of course advantages and disadvantages to each methodology, making the chosen regulatory system highly dependent on the situation and circumstances under consideration.

Regarding the regulation of space activities, a mixed approach will likely be necessary. Recalling that many new and emerging space activities are, by definition, being undertaken for the first time, operators will likely implement a multitude of novel approaches to tackling the same challenge. As a result, a prescriptive approach would prove unfeasible as it would require the regulator to determine how a given space activity is to be carried out when the space activity has not yet developed. Further, given the significant number of unknowns related to each new technology and space application (multiplied by the various novel approaches being implemented), a prescriptive approach that attempts to itemise distinct steps would hinder opportunities for innovation. Since innovative applications are, by definition, novel, it is unclear until after the demonstration and implementation of the application what the benchmark-objectives ought to be, let alone how to meet them; establishing arbitrary standards or objectives too early would likely limit the number of unique approaches that can be taken to tackle a novel issue.[134] Indeed, the financial costs associated with implementing the steps and standards outlined in a prescriptive approach are often higher long-term, as there is no room for innovation on alternative cost-saving measures.[135]

Nevertheless, a completely performance-based regulatory methodology may fail to capture the general objectives Canada seeks to satisfy by way of regulating private space activities, such

[133] In another vehicle-related example, a prescriptive regulation would require all cars to have seatbelts and airbags whereas a performance-based regulation would simply require that all passengers survive a head-on-collision at 40 km/h.
[134] Shubharthi Barua, et al, *Comparison of prescriptive and performance-based regulatory regimes in the USA and UK*, (2016) 44 J of Loss Prevention in the Process Industries 764 [*Barua*] at p 765.
[135] *Ibid*.

as limiting Canada's general liability for damage caused in space. Although in some industries performance-based regulation allows companies to innovate and determine, for their own purposes, an acceptable level of risk, space does not afford such a luxury.[136] The reality is that unlike many other industries, the true cost of risky space behaviour will be borne out not by the specific space actor itself (even if there are indemnification clauses built into their licenses) but by the State – serious damage caused in space will cost far more than what even the most financially-stable private companies can withstand (or what insurance policies may cover), making the State the ultimate financial backstop.[137] As a result, a primary objective of any form of space regulation ought to take into consideration that Canada will always remain responsible for the activities of, and liable for the damage caused by, private space operators. In determining regulation, therefore, extremely low standards (let alone complete freedom) in obtaining licenses may hurt the overall space industry as a single disastrous space anomaly could have public financial repercussions that affect the entire industry.[138]

Importantly, the prescriptive or performance-based methodologies are simply the tools utilised to achieve the regulatory objectives and therefore cannot, in and of themselves, be considered the entirety of the regulatory regime.[139] As a result, it is likely a combination of prescriptive and performance-based regulation will be necessary to effectively allow for the safe, orderly and effective development of private space activities. Canada ought to neither unintentionally hinder space-related innovation nor allow complete entrepreneurial freedom[140]; rather, a comprehensive regulatory regime would allow private entities to undertake novel approaches to tackling complicated challenges in space with an appropriate degree of risk. The

[136] For example, in the oil and gas sectors it is up to the individual company to determine what kinds of safeguards it wants to implement (where additional safeguards increase costs) versus the risk that an accident may occur (which would result in fines and increase costs). In the oil and gas industry, if a company fails to adequately evaluate its risks and causes damage, they will have to pay for the clean-up. It is unlikely, however, that the damage would be so significant that they do not have the financial resources to cover their expenses. In space, it is entirely possible that a small company could cause catastrophic damage that far exceeds their financial capacity.

[137] For example, if a start-up company launches a poorly constructed satellite that fails and destroys a module of the International Space Station, as per the *Outer Space Treaty* and the *Liability Convention*, the launching State would be liable. Even if the State had an indemnification agreement with the company, it is unlikely the company would have the financial capacity to cover the multi-billion dollar consequences of their actions.

[138] For example, if the government of Canada wants to promote innovation as much as possible and, as a result, licenses all applications it receives, it is possible Company Z receives a license, launches its poorly designed satellite into space and causes damage to a GPS satellite. As a result, Canada would be liable and the $100 million it would have otherwise spent on supporting the private industry will now be put towards satisfying the liability claim brought about by Company Z's space activities.

[139] *May*, *supra* note 132 at p 2.

[140] *Barua*, *supra* note 134 at p 765.

unique nature of the space industry, especially when compared to other industries, demands that Canada undertake a thoughtful regulatory approach to simultaneously safeguard the interests of private companies as well as those of the public.

The Role of the Regulator

In representative democracies, governments are established by individual members of society voting to install specific individuals to carry out the aspirations and intentions of the general community; governments are elected by the people and entrusted with running the country on behalf of the electorate. Instead of addressing each and every issue that occurs, governments pass regulations that apply to certain types of occurrences, streamlining decision making and problem solving. A significant portion of government activity entails overseeing the various activities that take place within its borders or are conducted by its citizens. By enacting legislation, producing subordinate legislation, creating standards, establishing policies, generating guidelines and introducing procedures, governments erect the frameworks within which specific activities are carried out: in a word, governments "regulate".

In Canada, as in many of the world's democracies, regulations are carried out and enforced by regulators. Regulators are often tasked with a specific mandate to oversee a particular regulated industry and, in carrying out their duties, utilise their discretion to simultaneously overcome obstacles and balance competing interests.[141] For every regulated industry there is a specific regulator, which can take the form of an individual, committee, board, tribunal, organisation, institution, agency, department, etc.[142] In their role as regulator, regulators can be many different things, including decision makers, adjudicators, compliance enforcers, educators, researchers, etc. depending on the regulated industry, the mandate and the specific objectives of regulation.[143]

In many instances, regulators operating in a democracy are required to make the most difficult decisions regarding how to oversee a specific regulated industry. Unlike legislators, who often draft legislation in broad strokes and utilize the law as an opportunity to pronounce grand

[141] "Across the world's democracies, regulators share at least four commonalities: (1) a delegated mission; (2) tremendous discretion combined with public accountability for the use of that discretion; (3) complex, dynamic problems; and (4) a typically diverse set of regulated firms with interests at odds (at least to some degree) with those of the regulator." Cary Coglianese, *The Challenge of Regulatory Excellence*, in Cary Coglianese, ed, "Achieving Regulatory Excellence" (Washington: Brookings Institute Press, 2016) at p 6.
[142] *Ibid* at p 3.
[143] *Ibid* at pp 3-4.

normative visions of the way the world ought to be, regulators are required to practically address competing (and sometimes contradictory) principles, balance conflicting interests and deal directly with industries or actors that do not always see the value of regulation.[144] Indeed, the viewpoints of the regulated and the regulator often contrast (mainly because the regulated act in self-interest and the regulator is expected to act in the public's interest) and make regulation extremely challenging.

Unsurprisingly, many of the world's regulated industries and regulated actors share similar characteristics: within a single regulated industry there can be a highly diverse crowd of regulated individuals and complex organizations, making a specific approach difficult; the regulated often engage in complicated work that leverages advanced technologies (that may, in and of themselves, be subject to regulation) requiring regulators to have a specific skill set and deep knowledge of the industry; the regulated are constantly innovating by virtue of operating in a competitive market that rewards innovation; the regulated are often led by strategic thinkers who may see regulation as an obstacle worth avoiding; and the regulated are often undertaking activities that generate social value (such as providing lines of credit or developing useful products) and so regulators must ensure compliance with regulations does not also prevent socially-valuable activities.[145] The role of the regulator, therefore, is extremely challenging – not only are regulators required to possess a significant level of competence, but they must be willing to undertake largely thankless[146] work for a fraction of the resources available to the regulated[147]. Nevertheless, without appropriate regulators, currently-regulated industries would be free to operate without oversight and the interests of average citizens would not be safeguarded, completely undermining the public interest model of regulation.

Needless to say, the role of the regulator with respect to space activities will be extremely challenging. Space regulators will be overseeing: an industry composed of large, sophisticated commercial entities as well as small, inexperienced start-ups; applications that can only be tested and proven in their final operating environment; technology that is cutting edge and developed

[144] "Regulatory problems are almost by definition problems that markets cannot solve. They also are often the problems that legislatures cannot solve either, whether for lack of expertise or lack of will." *Ibid* at p 6.
[145] *Ibid* at pp 7-8.
[146] The people who benefit from the work of regulators rarely realize the amount of hard work that goes into safe-keeping their interests and therefore do not express appreciation. Further, the regulated are constantly criticizing the regulator since, in their eyes, they impede their ability to generate increased earnings.
[147] Individual regulators likely earn less than their private industry counterparts and institutional regulators are never as well-funded as their private interest counterparts.

exclusively for space; activities that have the potential to disrupt other industries; and an environment that can bring significant positive or negative change to society. As a result, Canada will likely require the most qualified and highly-competent regulators to understand, license and supervise the new technologies and novel space applications that characterise the commercialisation of space. This will likely demand a pool of regulators who are intelligent, flexible, dynamic and willing to undergo constant training to remain aware of ever-changing technologies and even-keeled in their deliberations; this will likely require a sizeable workforce and significant resources. Irrespective of the methodological implementation of the regulatory framework, regulators will have to be comfortable supervising operators who may disagree with their decisions to ensure the overall objectives of the regulatory regime are being met in an appropriate fashion.[148]

The Practicalities of Regulation

Irrespective of the normative or methodological underpinnings of regulation, the reality is that regulation exists in a number of different spheres and is often implemented for various reasons.[149] Most consistently, however, regulation is implemented on the basis of economic concerns: either to regulate the economy or to regulate specific industries or activities for economic purposes. Even within "the economics of regulation", there are subsets and schools of thought, broadly described as economic regulation, social regulation, competition regulation and legal regulation.[150] Each has impacts on the economics of an issue, such as directly considering future investment in an industry (economic regulation) or the costs or benefits associated with the introduction of a new right (social regulation).

When regulators are creating regulations, they consider the economic opportunities or consequences associated with the creation or implementation of a specific regulation. For example, a regulation that requires all mining companies with revenues of more than $500 million to submit a detailed quarterly report to an oversight committee imposes administrative burdens (in

[148] Marc Lassagne et al, *Prescriptive and Risk-Based Approaches to Regulation: The Case of FPSOs in Deepwater Gulf of Mexico*, Presented at 2001 Offshore Technology Conference (Houston, Texas), OTC 12950, 30 Apr-3 May 2001, available online: <https://www.researchgate.net/publication/254517624_Prescriptive_and_Risk-Based_Approaches_to_Regulation_The_Case_of_FPSOs_inDeepwater_Gulf_of_Mexico> at p 4.
[149] "It should be stressed, however, that in any one sector or industry the case for regulating may well be based not on a single but on a combination of rationales…" *Baldwin 2012*, *supra* note 115 at p 23.
[150] Cento Veljanovski, *Economic Approaches to Regulation*, in Robert Baldwin, et al, eds, "The Oxford Handbook of Regulation" (New York, OUP 2010) at p 18 [*Veljanovski*].

terms of producing lengthy reports four times a year) that may affect operational efficiency and investor confidence. As a result, regulators may choose not to implement such a regulation in hopes of maintaining the health of the mining sector or, as a compromise, may require bi-annual reports instead of quarterly reports. Nevertheless, in some situations, regulators may choose to impose onerous regulations on a specific entity if it means protecting the economy more generally. For example, regulation may be created for the purpose of preventing or breaking-up monopolies, incorporating the costs of externalities, levelling access to information or services, ensuring fair competition, balancing bargaining power, managing scarcity and rationing of resources, coordinating long-term planning, realizing public good, furthering social development and harmony or protecting specific rights.[151]

Notwithstanding the clear connection between regulation and economic consequences, there is a separate school of thought committed to exploring the value of regulation beyond simple economic terms, arguing that "the frame of reference of the market is too narrow to encompass properly a range of social and political values which are established in liberal democracies and can be seen as constitutional in nature."[152] Although this literal application of the public interest theory (which brings within its scope a range of social, political and moral values) is less developed than traditional market economic theories, this regulatory perspective nevertheless provides insight into why certain regulations are implemented even though they are seemingly uneconomic. For example, environmental regulations often set aside the economic consequences of implementing a specific standard (for example, one that requires polluters to discard their toxic waste appropriately, which would have short-term economic consequences on a polluting company in favour of protecting the health of citizens living downstream from a waste facility) in hopes of achieving or favouring a different value (in this example, the health of people and the planet versus the profit of a company).[153] Similarly, States often enact legislation on the basis of "national security" (which can have tremendous negative economic consequences on private entities but are viewed, generally, as acceptable) or on things much more mundane, like requiring seat belts for vehicle safety. [154]

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[151] *Baldwin 2012*, *supra* note 115 at pp 15-23.
[152] Mike Feintuck, *Regulatory Rationales Beyond the Economic: In Search of the Public Interest*, in Robert Baldwin, et al, eds, "The Oxford Handbook of Regulation" (New York, OUP 2010) at p 39.
[153] *Ibid* at pp 46-47.
[154] *Baldwin 2012*, *supra* note 115 at p 23.

Appreciating the value of regulation is important when considering the manner in which it can be implemented to not only help direct economic growth but also be used as a tool to safeguard and promote the interests of all people. In certain circumstances, regulation is the only method by which to foster growth in a specific industry while simultaneously ensuring the overall interests of citizens are safeguarded. Indeed, when it comes to the regulation of space activities, aside from the international legal obligation to regulate, one must question the purpose of the regulation. Is it simply to promote the economic interests of industry and Canada or are there additional, non-economic reasons for regulation such as the social benefits of increased connectivity in remote locations. By clearly outlining the purposes of regulation, the practical impacts can be more easily implemented and measured to ensure the overall objectives are being met.

The Benefits of Space Regulation

Regulation for regulation's sake is inappropriate. Similarly, deregulation for deregulation's sake is also inappropriate. Regulation is appropriate when it serves an identifiable objective and when regulation is the best means by which to reach that objective. With respect to commercial space activities, the objective ought to be the development of the commercial space industry and the maintenance of public interests. If regulation can effectively balance these interests, it is warranted.[155] As this section will demonstrate, a number of stakeholders benefit from regulating space activities: commercial entities, public and private institutions as well as Canada itself.

Benefits for Private Entities

With respect to private space activities, regulation brings with it various benefits to commercial operators. Specifically, appropriate regulation evens the playing field (thereby promoting competition), clarifies governmental expectations (thereby promoting operational efficiencies) and legitimises activities (thereby promoting investor confidence). In combination, an appropriate regulatory framework would provide consistency, clarity and credibility to private space operators, the necessary consequences of a regulatory system that seeks to encourage the development of commercial space activities.

[155] This justification for the regulation of space activities is independent from the obligation under international law to authorise and supervise space activities. In concert, regulation is both necessary and effective.

Regulatory Consistency Promotes Competition

One of the advantages brought about by the regulation of a specific industry is the creation of a level playing field for all entities, regardless of size, complexity, age or disposition. Without regulation, certain entities (usually the larger, more established and profitable entities) can unfairly leverage their existing positions to prohibit new entrants or to stifle competition. Since regulations apply uniformly to all participants, the introduction of specific regulations can be used to even the opportunities presented by an industry. Therefore, regulation in a competitive marketplace (the foundation of the form of capitalism prevalent in most developed States and space-faring nations) allows for the unhindered advancement of innovation by all participants, regardless of individual characteristics. When innovators have an opportunity – irrespective of past pedigree, name recognition or industry clout – to compete on a level playing field with all other innovators, capitalism thrives. However, when unequal advantages allow for certain innovators to stifle or overbear on competitors (whether through undue influence, excessive lobbying, monopolisation, etc.), the benefits afforded by a free market are nullified. Regulation, therefore, is the legal means by which to ensure all participants in a given field play by the same rules, giving local start-ups the same opportunities for unbridled success as multinational corporations.

Given the challenges and complexities of conducting space operations, a level playing field is the only way in which non-established individuals and companies will have a chance to participate in the growing commercial sphere. In many jurisdictions there exist a handful of private companies that established themselves by working on projects with national space agencies, often as exclusive partners.[156] These historical relationships allowed these established actors to develop competencies in a variety of space activities, well before the emergence of New Space. Today, therefore, these pre-New Space private companies have a significant advantage in the form of institutional knowledge, experienced personnel, developed networks, etc. that, unless the playing field is leveled by appropriate regulation, can be abused for their benefit and to the detriment of start-ups. Of course, pre-New Space entities are not to be disadvantaged by virtue of their past successes - rather, appropriate regulation would simply ensure the opportunities afforded by the commercialisation of space will remain open to all participants so as to allow for the competitiveness of the market and increase the likelihood of long-term innovation. Further, since

[156] For example, MDA and Telesat in Canada and United Launch Alliance (a partnership between Lockheed Martin and Boeing) in the US.

regulation promotes competition, an appropriate regulatory framework would benefit private entities operating in the space domain by ensuring innovation drives private space operators to develop new technologies and applications that push boundaries and open new markets.

Regulatory Clarity Promotes Efficiency

Regulation also provides innovators with the peace of mind that their activities will be sanctioned by the government once they apply for a license. In industries that require special permission to operate, knowing that there is a pathway to approval is extremely important.[157] Appropriate regulation would not only establish what is an acceptable type of activity, but it would describe the different methods by which one may attain approval to conduct such an activity. As with most regulated industries, simply stating that one is going to operate in the industry is not sufficient to garner a license – it must be demonstrated that the activity will follow certain prescribed guidelines, implement appropriate safeguards, provide necessary oversight, undertake ongoing training, establish specific record keeping, etc. Without regulation, however, none of these requirements are known ahead of time and cannot be planned for or incorporated in the design and development phases of the new activity. As well, it would provide regulators with a rubric against which to assess the quality of an application and determine whether a specific proposed activity can be justifiably licensed.

In space, the need for such clarity in regulation is even more pronounced. Given the long lead times necessary to plan, design, develop and eventually implement a space activity, having as much regulatory information as early as possible allows for prudent decision making and increased operational efficiency.[158] In extreme examples, it can mean the difference between success and failure. Taking the example of on-orbit servicing, a specific activity currently being considered

[157] This is much more pronounced in space than it would be in, for example, the children's toy industry. Since all space activities must be licensed, knowing how to attain a license (and what would be the requirements for such a licence) is beneficial to know early on.

[158] In some instances, the Canadian government has recognised some of the inherent difficulties of planning a space system many years in advance. For example, when applying for a license for a fixed-Earth station: "The Department recognizes that in some cases, considerable planning is involved prior to the establishment of an earth station, and that an applicant may wish to seek assurance from the Department in advance that a licence can be issued or to be informed of the conditions under which such a licence would be issued. To this end, an applicant may request an approval in principle with respect to the licensing of a proposed earth station…". Industry Canada, *Client Procedures Circular-2-6-01 - Procedure for the Submission of Applications to License Fixed Earth Stations and to Approve the Use of Foreign Satellites*, Government of Canada, 10 Apr 2015, online: <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01940.html>.

by commercial operators[159], if operators foresee that the development of the necessary technology would likely take a decade, the operators would want to know from the outset that such an activity is permitted before undertaking ten years of research and development. Without regulatory clarity, an operator may spend a decade preparing the technology only to discover upon application to the government for a license that Canada's official position is that on-orbit servicing would violate its international obligations and therefore will not license such an activity. The company would have wasted ten years and significant sums of money pursuing an activity the government ought to have made clear it would not license.[160] However, had Canada rigorously developed a regulatory regime ten years prior, it would have been faced with the question of whether it would license on-orbit servicing and made clear its position through its regulation, thereby providing guidance to commercial operators considering on-orbit servicing activities. A semblance of regulatory consistency would provide operators with clearly defined expectations, by whom and by when, allowing for more effective planning at the operator level.[161] Indeed, for commercial operators conducting a variety of space activities, investing sums of money into an activity that will not be licensed is inefficient as that money could have been invested in an activity that would be licensed.

Regulation would also provide innovators with information as to which government body would oversee their activities. As was discussed in Chapter 4, since Canada, like most States, does not have a Department of Space or equivalent, existing space activities are regulated by different governmental departments or agencies with mandates that are relatively appropriate for overseeing a specific activity. With emerging space activities, however, it is likely that proposed new technologies and novel applications will not fit squarely within the existing mandates of existing governmental bodies, challenging operators to determine from whom to seek guidance and permission. Considering again the example of on-orbit servicing, it is unclear which current government department or agency would have the appropriate mandate to oversee such activities and thereby act as regulator: it is possible Global Affairs Canada would have authority under the

[159] Substituting on-orbit servicing with launch activities will yield the same conclusions. In fact, given that there are a number of Canadian commercial entities working towards launch capabilities without any guidance or regulatory clarity from the government, their situation is even more precarious than those preparing for on-orbit servicing activities.

[160] Of course, government policies change and although it is possible an activity is sanctioned in 2019 only to be prohibited in 2029, that is a far less likely scenario than an activity being prohibited in 2029 after not providing any guidance as to its permissibility in 2019.

[161] Ram Jakhu & Aram Kerkonian, *Second Independent Review of the Remote Sensing Space Systems Act*, (2019) 44:2 J of Space L 1.

Remote Sensing Space Systems Act (since the servicing module would likely utilise cameras that have the capability to sense to Earth), Innovation, Science and Economic Development Canada would have authority under the *Radiocommunication Act* (since the operator would need to communicate with the servicing module) or the Department of National Defence would have authority (given the potential dual-use of a servicing module).[162]

As a result, in situations similar to that described above, it is unclear which governmental body an innovator is to approach to ask questions, receive clarification and forge relationships. Indeed, given the uniqueness of many of the technological applications being developed for space, it is possible more than one governmental body, in their current forms, may seek oversight over emerging technologies, further complicating matters. Appropriate space regulation would allow everyone involved to know which space activities are to be regulated, by which bodies they are to be regulated and how they are to be regulated. This would provide innovators with the opportunities early-on in their endeavours to build the necessary relationships and networks with government bodies to streamline administrative and bureaucratic processes down the line, thereby increasing operational efficiencies. Indeed, in a domain as competitive and global as commercial space, reaching the market with an operational product is extremely important and any time wasted navigating a confusing regulatory process would have significant negative effects on the viability of a successful commercial enterprise.

Regulatory Legitimacy Promotes Confidence

Although all investors operate differently[163] and there are a number of factors that determine the likelihood of investment, appropriate regulation provides investors with peace of mind and confidence that the money they invest in a particular activity has a realistic prospect of return. Activities, generally, can be categorised as being either legal, illegal or alegal: legal activities are permitted (but may come with specific proscriptions on when an activity cannot be carried out), illegal activities are prohibited (but may come with specific proscriptions on when an activity can be carried out) and alegal activities are neither permitted nor prohibited.[164] When an otherwise

[162] For a discussion of the various Canadian laws applicable to space activities as well as the various government departments that oversee space activities, *see* Chapter 4, *Canadian Space Laws*.
[163] For example, some investors approach their investments more cautiously with long-term gain while others seek to participate in riskier, short-term ventures.
[164] One way of understanding the distinction between alegal, legal and illegal is to use the example of possessing marijuana. If a law makes possession of marijuana illegal, any person who possesses marijuana will be violating the

alegal activity is regulated, it becomes either legal or illegal; the mere process of regulating therefore provides clarity as to whether the activity is legally permissible or legally prohibited. Knowing a specific activity is permitted grants an activity legal legitimacy and provides investors with confidence and long-term financial foreseeability.[165]

Using the example of the ridesharing company Uber illustrates this point well: if Uber had approached each municipality in which it planned to offer ride-sharing services and attained the necessary agreements for it to operate before seeking financial investment, investors would have viewed its enterprise as legal and therefore protected by law. Uber, however, decided instead to begin its ride-sharing services without first obtaining municipal legal protections and thereby, for most of its first years in business, operated in an alegal environment. This meant that, at any time, Uber could have been deemed illegal or, conversely, legal.[166] Indeed, by straddling this grey-zone of legal uncertainty, investors were hesitant to invest in the long-term viability of the company, given that cities could ban the service with the stroke of a pen.[167] Had Uber waited for municipalities to first pass laws that would allow for ridesharing services such as Uber, investors would have been more confident in investing money since they would have known Uber's operations were legal and therefore protected by law.

As has been repeatedly discussed in this and preceding chapters, and has been true for decades, space is extremely complex and exceedingly expensive with long timelines necessary for researching, developing, implementing and, ultimately, gaining market access for a new space application.[168] As a result, the financial costs of engaging in space activities are highly risky and

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law. If a law makes possession of marijuana legal, then there are specific proscriptions by which possession may take place (for example, possession if only for medicinal use or if bought from a specific dispensary). If there is neither a law making the possession of marijuana illegal or legal, possession of marijuana can be said to be alegal – there are neither sanctions for possessing marijuana nor are there guarantees that such possession is protected.

[165] Parker & Braithwaite, *supra* note 114 at p 131-132.

[166] Harriet Taylor, *Uber and Lyft are getting pushback from municipalities all over the US*, CNBC, 2 Sep 2016, online: <https://www.cnbc.com/2016/09/02/uber-and-lyft-are-getting-pushback-from-municipalities-all-over-the-us.html>; Dominic Rushe & Edward Helmore, *Uber warns it 'may not achieve profitability' as it aims for $100bn valuation*, The Guardian, 11 Apr 2019, online: <https://www.theguardian.com/technology/2019/apr/11/uber-to-share-intimate-details-about-company-ahead-of-going-public>.

[167] The Uber example, although appropriate in demonstrating the difference between investor confidence with a legal or alegal model, ultimately is a bad example in terms of supporting the argument being advanced given its seeming success by spearheading the ride-sharing industry without first obtaining appropriate legal protections.

[168] "Stimulation and development of these potential markets often requires pre-operational demonstrations, not only to show prospective customers the capabilities of a new system, but to aggregate customer demand and to establish the economics of the new service. As a result, space programs have gestation periods from five to ten years (between original concept and production of the first flight unit) with high front-end costs. This creates relatively long payback periods for recovery of investments. All of these factors combine to make space development a very risky undertaking for normal commercial investment until such time as the technology is proven and the market developed. These are

require significant confidence from investors to believe in a person, product and/or company before committing large sums of money. Regulation of such activities would, at the very least, provide investors with the confidence that the kinds of activities in which they are investing are legally protected. Of course, that is not to say that a particular company's approach to an activity is protected but rather than the general activity itself is permitted by the State. Using the example of space mining, a law permitting space mining would signal to investors that a private entity seeking to engage in space mining activities could be licensed to do so. Attaining the actual license would depend on how the private entity proposes to undertake its space mining activities: for example, a company that seeks to mine resources using the galactic-equivalent of dynamite rather than precision harvesting may not ultimately be successful in attaining a license.

By passing appropriate laws - even broad laws - regarding a specific or all space activities, the government would signal to innovators and investors alike that it sees the long-term value of space activities. As a result, appropriate regulation of space activities would provide investors with the necessary confidence that there will be some level of legal stability regarding a specific activity and that it would be worth investing early-on for a larger return. Although, regulation, in and of itself, is not going to convince an investor to commit large sums of money to a space mining start-up, all things being equal, a space mining start-up with legal legitimacy is more likely to attract investors than a space mining start-up without legal legitimacy. In fact, if the government were to make clear in its regulatory framework that it would not support private space mining efforts, this would dissuade investors from putting money into such companies from the outset, rather than investing early on and then realising on the eve of launch that the government will not provide the appropriate licences.

Additionally, permitting a commercial activity by means of regulation would allow other entities to develop and invest in corollary or subsidiary activities in anticipation that a specific space activity, protected by law, is forthcoming; such spin-off enterprises would further stimulate the economy and provide investors with other unique opportunities to invest capital. For example, if an activity like space mining is legitimised through legal protections, entities may begin to develop technologies that would support humans living in space (to support the individuals

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some of the reasons why it has been necessary for governments to take a leading role in technology and market development." Ministry of State for Science and Technology, *Background Paper: The Canadian Space Program Plan for 1981/82 - 1983/84*, Government of Canada, Apr 1981 at p 3.

involved in space mining operations), resource refinery operations in space (to refine the resources extracted by the space mining operations) or even transportation to space (to move the necessary materials between Earth and space). These spin-off industries would anticipatorily begin their operations even before any resources are extracted, given the legal legitimacy afforded by regulation and the expectation that such activities are forthcoming.

Benefits for Institutions

Aside from the benefits regulation brings to companies, a well-established legal framework also benefits academic and educational institutions. Regulation allows the government to specify, aside from the broad principles and standards applicable to general actors, the specific exceptions or qualifications that may apply to researchers, instructors, etc. in specific circumstances. Certain regulated industries require participants to obtain licenses, follow record-keeping obligations, pay various fees, etc.; however, it is entirely within the rights of the regulator to waive such requirements for groups of entities that would benefit from necessary exemptions. For example, academic institutions may not have to file annual reports if they publish the findings of their studies in certain journals; scientists may not have to obtain a license to conduct launch experiments if they do so in unpopulated northern communities set aside for such activities; professors may not have to pay fees associated with retrieving archived space data if to be used for teaching purposes. The benefits of regulation are such that specific policies can be implemented with clarity and consistency and targeted to specific audiences rather than everyone seeking to operate in a legally opaque environment.

In the context of space activities, academic institutions, aside from teaching and inspiring the next generation of engineers, entrepreneurs, etc., often conduct extremely valuable research into flight dynamics, chemical reactions, material science, human health, etc., that get passed down, often at low or no cost, to private industry. Harnessing the creativity and research conducted by academics is valuable for the overall state of space and reducing the barriers (such as licensing fees or arduous application procedures) would help stimulate the continued growth and valuable contribution of academics. Also, as with private industry, a regulatory framework specific to space would provide academics with insight into governmental priorities and allow for focused research into parallel issues, simultaneously supporting the government's space-related vision while contributing to the development of a national knowledge base. As was demonstrated in Chapter

4, many of Canada's "firsts" in space were the result of academic input and leadership – ensuring the continued participation of such individuals and entities is invaluable to a thriving space industry.

Benefits for Canada

As was demonstrated in Chapter 4, Canada's current regulatory framework related to space is lacklustre and, as will be demonstrated in Chapter 7, lags behind the frameworks of other States. It currently consists of five activity-specific laws that can only regulate the specific activities that fall within their scope, thus making any non-enumerated activities generally un-licensable. The two consequences of such a reality are, first, that budding Canadian entrepreneurs are forced to relocate to jurisdictions that do regulate the specific activities with which they are involved and thereby offer legal protections and assurances and second, that entrepreneurs from jurisdictions outside of Canada have no incentive to relocate to Canada.

The concern related to Canadians and Canadian entities leaving Canada is such that Canada's space industry is currently undergoing a significant brain drain, whereby young and talented individuals are seeking employment opportunities outside of Canada.[169] While many head south of the border to work with some of the larger and more recognizable space companies, others relocate and begin their entrepreneurial activities there as well. The consequence of this phenomenon is not only a loss of educated, high-earning taxpayers but a cumulative effect that has repercussions into the future; without a sizeable Canadian space industry, recognition of the various valuable opportunities is diminished. The innate excitement and interest young people have for space makes it an easy way to convince students to focus their education on science, technology, engineering and mathematics (STEM) subjects, which would result in increased numbers of qualified technical specialists in all industries. Having an appropriate regulatory framework would make it clear that Canada values space activities, that specific activities are not only permitted but prioritised and that enterprising and entrepreneurial Canadians can undertake cutting-edge space activities from within Canada.

[169] Ivan Semeniuk, *Lost in space: Why Canada's diminishing role in the heavens is a problem*, The Globe and Mail, 13 Mar 2018, online: <https://www.theglobeandmail.com/canada/article-lost-in-space-why-canadas-diminishing-role-in-the-heavens-is-a/>. For discussions on the historical and current realities of "brain drain" in the space sector, *see* Chapter 4, *Reviewing Canadian Space Policy*.

The concern related to not incentivising the relocation of foreign entities to Canada also prevents an opportunity for reflection on how a regulatory framework can reverse course. Aside from the valuable financial investments the relocation of foreign entities would bring to Canada, it would also create local jobs for specialists and non-specialists alike. This, added with the prestige of having a burgeoning private space industry, would make Canada a hub for such activities. Regulatory frameworks can incentivise the relocation of such companies in a number of ways. The first and most obvious would be financial incentives, such as tax breaks, favourable loans and significant public investment. Another draw would be a stable regulatory environment – companies appreciate when a legal system is fair, foreseeable and functional. This is evidenced by the fact that Deep Space Industries and Planetary Resources, incorporated and generally satisfied with the progressive regulatory regime in the US nevertheless moved a significant portion of their operations to Luxembourg when the land-locked nation announced an even more progressive regime (with significant investment opportunities), thus demonstrating that private entities seek out jurisdictions that do the most to protect their interests.[170] It is within Canada's power to create such a legal regime applicable to space whereby specific activities are explicitly permitted, authorisation and supervision are both diligent and appropriate and growth across industries is encouraged. An effective regulatory regime would allow Canada to maintain its homegrown talent and incentivise the relocation of foreign entities to within its jurisdiction.

Space Regulation as Satisfaction of Canada's Fiduciary Duties

The international community, as the singular representative of the collection of all sovereign States, has a fiduciary relationship with humanity. As a result, a number of topics that may otherwise seem localised must be perceived by implementing a global perspective: space activities are one such domain. Although individual space activities - whether public or private - are to be regulated at the local domestic level, the consequences of such activities are global. As a result, as States design, promote and implement national space regulations, they must do so not only with a view to promoting local interests but to also ensure that the resulting activities are beneficial to

[170] Andrew Zaleski, *Luxembourg leads the trillion-dollar race to become the Silicon Valley of asteroid Mining*, CNBC, 16 Apr 2018, online: <https://www.cnbc.com/2018/04/16/luxembourg-vies-to-become-the-silicon-valley-of-asteroid-mining.html>. Even though both companies have since encountered significant difficulties, the very fact that they relocated from a legally progressive jurisdiction to an even more progressive jurisdiction demonstrates the kind of "legal forum shopping" that private entities may seek.

humanity. Indeed, the *Outer Space Treaty*[171] remarked as such in its opening provisions: "the exploration and use of outer space… shall be carried out for the benefit and in the interests of all countries"[172]. Space activities take place in a unique domain, free from the traditional territoriality, sovereignty or jurisdiction of any single State and, as a result, activities in this joint environment must be conscientiously carried out with a view to providing benefits to all countries. Aside from ensuring that public space programs are designed to derive benefit for humanity, States must also ensure their regulatory regimes applicable to private space activities protect and promote the interests of humanity. States have a fiduciary duty to pass laws and amend regulations that keep pace with innovation and novel space activities to ensure they are satisfying their obligations to humanity.

As expressed in Chapter 2, the space domain - with its recent and expected growth - offers unique opportunities for the development of a private space industry and the associated benefits of commercialization. As also explained in Chapter 3, as a space-faring nation, Canada has an international obligation to ensure that any of its space activities (whether carried out publicly or privately) must be authorised and supervised. Unlike other domains, where a private entity that wants to engage in a specific field simply requires ingenuity, capital and perseverance (for example, creating a new children's toy), in the space domain a private entity must first receive authorisation from its national regulator before being allowed to carry out an activity. As a result, a State must put in place the regulatory structure that would allow for such entrepreneurial development; failing to establish this structure would not just amount to a lapse in governmental foresight (such as failing to see the opportunity to invest in artificial intelligence as a potential growing industry) but rather a clear obstacle that prevents private space actors from operating in space.

Since States have a fiduciary duty to ensure that their actions benefit their people, failing to take advantage of an opportunity as potentially lucrative as space development and, simultaneously, failing to anticipate the clear trends of global progress, would amount to a violation of its fiduciary duty. Ensuring that such space opportunities are available and accessible to those Canadians (whether corporate or human) who are interested in pursuing them is a

[171] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies*, 27 Jan 1967, 610 UNTS 205 [*Outer Space Treaty*].
[172] *Ibid* at Art I.

reasonable responsibility of the State: indeed, the State has a duty to act in the interests of its citizens and providing the legal avenue by which, and the regulatory framework through which, to take advantage of worldwide space developments is necessarily part of its responsibilities. A State failing to pursue opportunities related to commercial space development, or deciding to curtail such development, would amount to prohibiting such opportunities, the consequences of which would be the economical languish and global non-competitiveness of Canada's space industry (both of which are against the interests of Canadians). By establishing a regulatory regime that allows for private space activities, the State would be creating an environment in which citizens can engage the global marketplace and derive benefit from their entrepreneurial efforts, thus satisfying the State's fiduciary duty to its citizens. This particular manifestation of a State's duty, however, extends only to that State's subjects, not to all of humanity.

There are, however, ways in which a State can additively satisfy its fiduciary duty to humanity as it relates to the commercialization and privatization of space. The first would be to push, internationally, for an agenda that seeks to cement the rights and privileges of humanity in a binding agreement (such as the *Moon Agreement*). This method ensures that all space faring States recognize their responsibilities to all of humanity and that the exploration and use of outer space, while allowed, is not anarchic and that specific measures are taken to ensure the long-term interests of humanity are safeguarded. By pushing for the codification of such principles, a State would be fulfilling its fiduciary duty to humanity to ensure that the exploration, use and eventual exploitation of space benefit all people. Unfortunately, the likelihood of most space faring nations ratifying the *Moon Agreement* or some other new treaty is limited - the current international political climate is simply inhospitable to such a development even though it may be necessary.

A second option would be for an individual State with significant international clout to unilaterally move towards incorporating such humanistic principles into its own domestic space policies. Without a significant multilateral agreement on space over the previous forty years, it is likely that international space law will be developed by way of harmonised national space legislation. To this end, no statement would be more powerful than a domestic law that recognizes certain humanistic principles and encapsulates them in a legal framework aimed towards ensuring space will benefit all of humanity indefinitely into the future; Canada has such an opportunity.

Unlike other States that have recently moved in the opposite direction (such as the US[173] and Luxembourg[174] with their recent, non-humanistic space resource exploitation laws[175]), Canada can provide the international community with a model that is appropriate and acceptable from a 21st century humanistic perspective. Indeed, from a theoretical perspective, the US and Luxembourgish laws reflect an interest group approach to regulation whereas the opportunities presented to Canada allow for a public interest approach to the potential regulation of space activities.

The reality is that since the enactment of the US Commercial Space Launch Competitiveness Act, only Luxembourg has followed suit and passed a law of its own; more than one-hundred and ninety other countries have yet to act. Prior to the United Arab Emirates (UAE) passing its first comprehensive space law, there were signals that it, too, would enact a space mining law and it seemed that States would be moving in the direction spearheaded by the US.[176] The counter-argument, however, is that Luxembourg and the UAE only have one reference point in how to develop a space-mining law, and that is the US model. It is entirely rational to propose a counter-model that would guarantee certain private rights while also guaranteeing long-term humanistic principles. Indeed, most established space laws in most jurisdictions[177] address only the regulation of their nationals in relatively specific space activities. Indeed, when most of these laws were drafted, the overarching concern was to protect a State against liability for damage caused in space by a private entity rather than to envision how future space activities could benefit humanity.

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[173] House of Representatives 2262, *U.S. Commercial Space Launch Competitiveness Act*, 114th Congress, Government of the United States of America, 2015.

[174] Grand Duchy of Luxembourg, *Law of 20 July 2017 on the Exploration and Use of Space Resources*, Law No 674.

[175] Such criticisms of the US and Luxembourgish laws are often responded to as being shallow since the laws themselves have not been implemented: since no entity has attempted to exploit space resources, claim ownership over them or make a profit by selling them, criticising the laws as anti-humanistic are considered presumptuous. While this is true, the criticisms still stand. Regulations are not enacted purely for show; they are intended to be implemented. Although neither law has been implemented so far, the consequences of implementing such a law can be anticipated. The fact that both laws focus on the ownership and profitability of resources rather than the manner in which such resources can be used to advance human interests is indicative of the manner in which they intend to be implemented. Indeed, neither law mentions the humanistic principles upon which the international space law regime is built and neither law references specific ways in which sanctioned resource exploitation would benefit humanity.

[176] The UAE enacted a space law in February 2020 and is of a comprehensive nature rather than one limited to the regulation of space mining activities.

[177] For a thorough discussion on the legal regimes of leading and emerging space jurisdictions, *see* Chapter 7, *Comprehensive Regulation of Commercial Space Activities*.

The reality is that eventually, whether two, twenty or two hundred years from now, all States will be involved in space operations and all States will have enacted relevant space laws. However, if the only model legal framework available for future space-faring nations is that of the US, it is logical that the US model will be the system States decide to replicate. Indeed, in a seeming attempt to mold the future domestic space laws of other jurisdictions, Luxembourg partnered in 2019 with the United Nations Office for Outer Space Affairs to provide "tailored capacity building to facilitate [the] drafting of national space legislation and/or national space policies in line with international space law".[178] Given Luxembourg's public comments on its interpretation of debated international space law, its actions could be seen as a way of developing international consensus on controversial issues that benefit its own specific interests rather than those of humanity.

There is no reason Canada could not also adopt a similar strategy, first with its domestic regulatory framework and later with like-minded emerging States. If a State such as Canada were to take up the mantle of humanism and develop a regulatory model that is both protective of private profit and progressive in humanistic terms, it is possible that other States would follow suit and adopt laws that are equally forward-looking and respectful of their fiduciary duties to humanity. Even if additional countries adopt laws that are similar in tone to the US' and Luxembourg's, a chorus of smaller countries that recognize the benefits of space (but are not in a powerful enough position to make an individual imprint) will find in Canada's law a model that can protect the long-term interests of their citizens as well as humanity. By creating such a model, Canada would not only be satisfying its fiduciary duty to its own citizens but also to humanity. Such a Canadian space law would further protect the interests of humanity by giving like-minded States a model space regulatory framework, based in public interest theory, that can be adopted for their specific purposes. Creating such a framework that both protects long-term human interests as well private profits, of course, will require diligent regulation; nevertheless, this public interest approach is both possible and feasible.

Conclusion

[178] Office for Outer Space Affairs, *United Nations Office for Outer Space Affairs signed an agreement with the Government of Luxembourg to launch new "Space Law for New Space Actors" project*, United Nations, United Nations Information Service, 13 Nov 2019, UNIS/OS/523, online: <http://www.unis.unvienna.org/unis/en/pressrels/2019/unisos523.html>.

As a sovereign State, Canada is subject to, and a subject of, international law. Among other things, this means that Canada has a fiduciary duty to its subjects as well as humanity. In satisfying its fiduciary duty, Canada must regulate appropriately to provide its subjects with opportunities that are in their interests and to their benefit, while also ensuring that such regulations do not undermine the similar interests and benefits of humanity (of which Canada has a rich history). In undertaking its regulatory activities, especially those related to space, Canada ought to recognise the role of an appropriate regulatory framework and ensure that it takes a proactive approach to sustaining and supporting opportunities for its private entities. Doing so, regardless of the methodology it chooses to implement, would provide private industry, academic institutions and the country itself with a prosperous commercial space sector.

Chapter 6: Insights into the Canadian Space Regulatory Framework

Purpose and Outline

The purpose of this chapter is to unearth the sentiments of members of the Canadian space community concerning the overarching legal framework that governs their activities in an effort to propose the best possible solutions in the ensuing chapters of this project. The objective, specifically, is to elucidate the community's explicit understanding and appreciation of Canada's current space regulatory framework, whether - from the perspective of those to whom it applies - it is successful and what suggestions may be offered to improve the system. Further, the chapter would serve to highlight any potential differences between the responses of representatives from the different groups that make up the Canadian space community (such as industry, government and academia/non-profits/consultancies).

The chapter will begin with a discussion related to the methodology employed in gathering the empirical data used to address the insights being sought as well as provide background information with respect to the questionnaire and its various processes. The chapter will then introduce the questionnaire generally before shifting to the individual questions, where it will provide insights into their intended purpose, summarise the information generated and analyse the specific responses. The chapter will then undertake a more high-level analysis of the information generated by the questionnaire and draw conclusions as to the current state and appreciation of the Canadian space regulatory framework. The chapter will conclude with statements related to the Canadian space community's general sentiments towards the existing space regulatory framework and offer comments on the consequences of such perspectives.

Background

The empirical component of this chapter is meant to balance the generally-theoretical discussions undertaken in the remainder of this research project. Although much of the analysis and conclusions drawn in the previous and subsequent chapters are logically sound, well-reasoned and based in fact, this chapter's empirical exploration is meant to ensure the accuracy of the research question, the appropriateness of the investigations and the utility of the proposed solution. By undertaking an empirical research component, this project ensures that the current "on-the-ground" understandings, beliefs and insights of members of the Canadian space community are reflected in the overall project so as to not offer solutions that are either irrelevant or inherently unworkable.

Additionally, given that the intended audience members of this project are Canadian government policy makers, there is considerable value in aggregating the general views of community members to demonstrate consensus on the need for action, the desired outcomes and potential methods of reaching such outcomes. By compiling this information and drawing appropriate conclusions, policy makers can be confident that the recommendations made in the final chapters of this project are grounded in reality and factually representative of the communities they serve. Of course, this chapter's empirical explorations should not be used in place of proper and thorough consultations with the Canadian space community prior to implementing any of the ensuing suggested recommendations.

Questionnaire Drafting Process

The final questionnaire circulated to participants was the result of numerous iterations. The overarching desire was to create a questionnaire that elicited honest, forthcoming and useful responses without being daunting in length or breadth; as a result, the questionnaire had to balance the topics queried, the types of questions, its overall length, invitations for in-depth responses and approachability. The final iteration seemed to be an acceptable compromise of these various factors, skewing more heavily towards easily-answerable questions as opposed to time-consuming ones. Further, the questionnaire was intentionally designed to be quasi-anonymous and non-attributable (such that only the researcher would know the identity of the questionnaire's respondents) so as to invite candid and honest feedback from respondents without causing concerns related to public identification.

The questionnaire was drafted by the research project's author, overseen by the author's faculty supervisor and approved by the university. The questionnaire was created using Google Forms, a free online resource.

Research Ethics Board Process

All McGill University research projects involving human subjects require the prior approval of the Research Ethics Board. Since this project's questionnaire involved human subjects answering questions, the questionnaire required approval of the Research Ethics Board prior to dissemination to ensure appropriate consent was being sought and that participant privacy would be managed appropriately. All research participants were made aware that although upon

submitting their responses through Google Forms their identity would be known to the researcher, none of the information they provided would be attributed to them in any subsequent discussion of the research findings.

In October 2019, the questionnaire received approval from McGill University's Research Ethics Board (Record Number 138-0819).

Dissemination Process

In October 2019, upon receiving approval from the Research Ethics Board, the questionnaire was sent directly to approximately 40 members of the Canadian space community using a generic e-mail message. The recipients were all "blind carbon copied" (bcc'ed) to avoid individuals knowing who else was invited to participate in the research study. In the ensuing four weeks, an additional approximately 15 members of the Canadian space community were also invited using the same generic e-mail message. Five weeks after the initial invitation e-mail was sent, individual follow-up e-mails were sent to select recipients to remind them to complete the questionnaire. The link to the questionnaire, along with brief invitational language, were circulated in the Canadian Space Society's weekly Gazette (distributed via e-mail) as well as on the Canadian Aeronautics and Space Institute's website.

In all instances, invitees were asked to share the link to the questionnaire, as well as the accompanying invitation, widely within their networks. The deadline for submitting questionnaires was originally set for 30 November 2019 but was extended for two weeks to 15 December 2019 to provide interested participants with more time to respond. The extended deadline garnered an additional six responses. In total, 23 individuals responded to the questionnaire. However, one respondent submitted their response past the 15 December 2019 deadline so their responses were excluded. Therefore, the responses from a total of 22 respondents form the entirety of the information presented in this chapter.

Methodological Limitations

Notwithstanding the expected contributions of the methodological kind of research undertaken in this chapter, there are certain intrinsic limitations worth noting. For example, the medium through which the community members' insights were gathered makes it impossible to follow-up on a respondent's noteworthy answer; surprising or otherwise interesting responses

cannot immediately be clarified or further discussed, resulting in either underexplored insights or missed opportunities for more robust contributions. Similarly, the quasi-anonymity may result in respondents providing less-than-truthful or, more likely, unintentionally biased responses that the questionnaire and resulting data cannot distinguish. Further, the manner in which the questions have been drafted (regardless of their final form) may not be entirely clear to respondents, may assume knowledge that respondents do not possess, may imply certain responses or may fail to capture the contextual discrepancies between respondents. Although no single methodological evidence gathering approach is perfect, the data generated through this particular study is meant to augment the project's other evidence rather than stand on its own; as such, the limitations identified here are not fatal to the study's utility.

Questionnaire: Insights into Canada's Regulatory Framework Related to Space

Preliminary Comments

The questionnaire is titled "Insights into Canada's Regulatory Framework Related to Space", consists of 72 questions and divided into seven sections. The sections are as follows:

1. General Information
2. Canada's Space Policy
3. Canada's Space Regulatory Framework
4. Application of Canada's Space Regulatory Framework
5. Future of Space Regulation in Canada
6. Future Activities
7. New Canadian Space Law

Each section consisted of a different combination of question types, including "select the best answer" (17 questions), check-boxes (10 questions), "rate from 1-10" (7 questions), short answer (24 questions) and long answer (14 questions). A copy of a blank questionnaire is included as Appendix I of this project.

Invited participants were told in the invitational e-mail, the individual follow-up e-mails as well as in the questionnaire's instructions that they were not required to answer every question; nevertheless, it was made clear that more detailed responses were preferred. Acknowledging that most members of the Canadian space community are extremely busy, the questionnaire was

intentionally created so that the substantive questions took the form of the easier-to-complete questions ("select the best answer", check boxes and "rate from 1-10", collectively) whereas the short answer and long answer text fields were largely reserved for "briefly explain your choice above" or "if you have any comments for the researcher, include them here", respectively. Indeed, as expected, most participants answered nearly all of the easier-to-complete questions, some of the short answer questions and only a few of the long answer questions.

When discussing the answers to the "rate from 1-10" questions below, the analysis presents the range of scores, the mean scores and the mode scores for each question. The range of scores represents the lowest and highest scores selected by participants, the mode represents the score selected most often by participants and the mean represents the average after adding all of the scores and then dividing by the number of scores. This information is provided to help elucidate the results as a single metric often does not accurately portray the full spectrum of perspectives presented by respondents. When discussing the results, the language of "less than adequate", "adequate" and "more than adequate" is used to describe the ranges of 1-3, 4-6 and 7-10, respectively.

With respect to the representation of the number of responses to a particular question, numerical digits are used throughout this chapter for the purposes of consistency, even though it is customary in academia to spell out numbers from 1-9.

Analysis of Individual Questions

1. General Information

Respondents were presented with four introductory questions to establish background information that would serve to better gauge the perspectives of each individual respondent as well as the space-related fields in which they or their organisation were involved. In total, there were 22 respondents that self-classified into three groups: 8 from industry, 6 from government and 8 from academia/non-profits/consultancies. Although some respondents had affiliations with more than one group (for example, one respondent represented both industry and a not-for-profit while another represented government and academia), for the purposes of simplicity their answers were only assigned to the group with which they were most involved.

With respect to the space-related fields represented by respondents, the results were as follows: 12 for "remote sensing and Earth observation", 8 for "launch and related services", 8 for

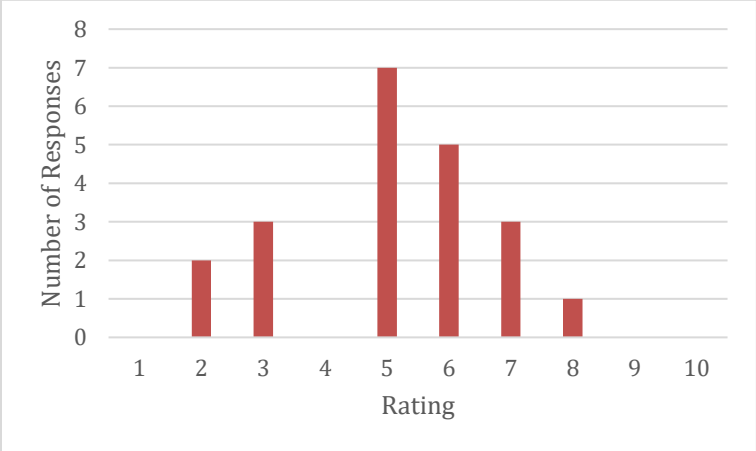
"space science", 7 for "national defence", 7 for "manufacturing", 6 each for "space to Earth Internet" and "satellite to satellite communication", 5 for "telecommunication" and 3 for "broadcasting". When asked which space-related fields respondents anticipate becoming active in, of which they are not currently active, the most common responses were "national defence" (6), "launch and related activities" (6) and "space situational awareness" (5). Unsurprisingly, many respondents were involved in multiple space-related fields and anticipated becoming involved in multiple future fields.

2. Canada's Space Policy

This section of the questionnaire contained a number of questions intended to generate insights regarding Canada's existing space policy. Participants were instructed to consider the current global realities of national space programs, commercial development and investment in the space sector while taking stock of likely future growth in these domains.

Generally, how would you rate Canada's current position regarding outer space?

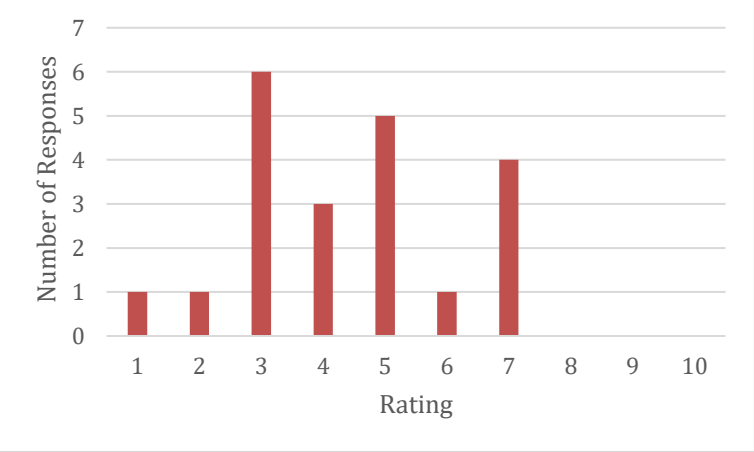
This question was intended to solicit responses regarding the general state of things related to space, as perceived by members of the Canadian space community. Participants were specifically asked to consider the overall state of the space industry, investment in public and private projects, public commitments to space, the public's perception of space, Canada's international cooperation with respect to space as well as Canada's international leadership in this domain.



With respect to the responses to this "rate from 1-10" question, the scores ranged from 2 to 8, with a mode of 5 (7 selections) and a mean of 5.1. The results signify that, generally, respondents view Canada's current position regarding outer space as adequate. Interestingly, in both the industry group and the government group there were those that scored Canada's current position much higher or lower than the average. These significant swings may signify the varied perspectives within groups as the representatives within each group were quite varied.

How would you rate the role of government in promoting Canada's current position regarding outer space?

This question was intended to solicit responses related specifically to the role of government in promoting Canada's position regarding outer space. The expectation was that the responses to this question, when compared to the previous question, would elucidate the Canadian space community's view on the success or failure of the government in promoting space. If the responses to this question were significantly higher or lower than the previous question, it would signify that respondents believed the government had attempted to improve the current position of space in Canada without much success or that the government had not attempted to improve the current position of space in Canada, respectively.

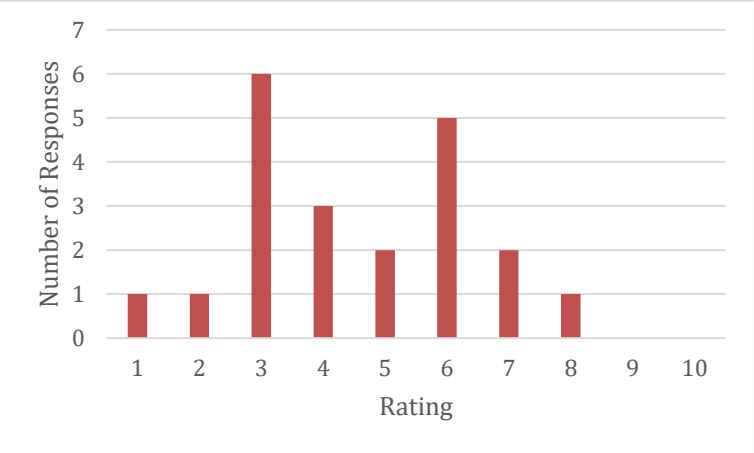


With respect to the responses to this "rate from 1-10" question, the scores ranged from 1 to 7, with a mode of 3 (6 selections) and a mean of 4.4. Given that the average is only 0.7 less than in the previous question, it is difficult to draw the specific kinds of conclusions described above. Interestingly, of the 21 respondents that answered this question, only two scored this question higher than the previous question, with the remainder either choosing the same score or lower. As

a general conclusion, therefore, it may be the case that respondents believe the government is doing an adequate or slightly less than adequate job in promoting Canada's position in space.

How would you rate the development of Canada's governmental space programs?

This question was intended to solicit responses related to Canada's public space program, such as the missions and projects undertaken by the Canadian Space Agency (CSA), since in many jurisdictions, including Canada, industry relies on large publicly-funded and publicly-led projects to support its own space research, development and application.

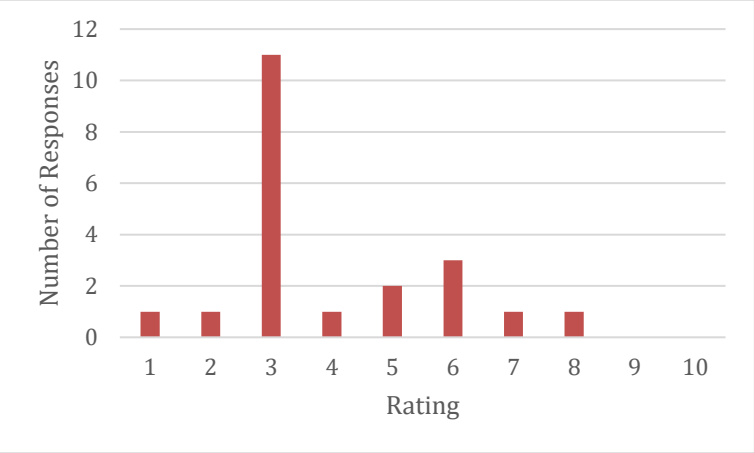


With respect to the responses to this "rate from 1-10" question, the scores ranged from 1 to 8, with a mode of 3 (6 selections) and a mean of 4.5. Again, the responses skewed towards being adequate with an even spread of scores between all three groups, signifying a general lack of cohesion within groups. It is possible that individual space-activity biases resulted in the wide spectrum. For example, if Canada developed a space activity led by government department X and supported by industry group A, representatives of X and A would rate the government's space program highly while representatives of government department Y and industry group B that do not have a specific space activity would rate the Canadian space program lower. Nevertheless, it is difficult to draw clear conclusions from this question alone.

How would you rate the government's investment in the Canadian space sector?

This question was intended to solicit responses related to the investment (whether financial, human resources, technological, etc.) made by the government in Canada's space sector to determine the effectiveness of such funding. Although individual budgets allocate specific

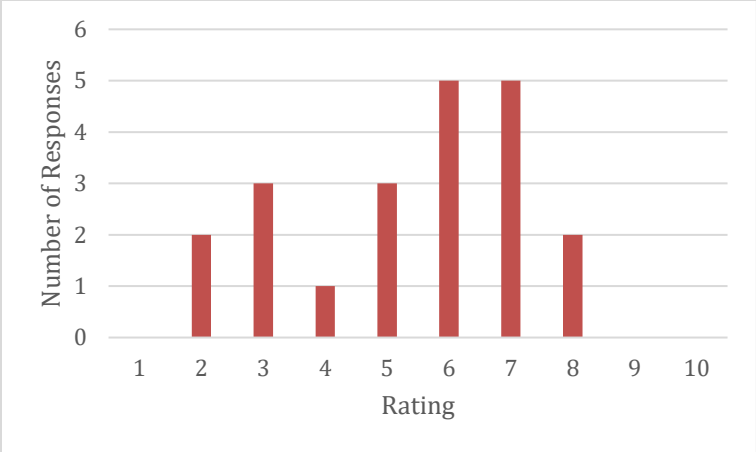
amounts of money to specific programs, agencies or departments, it is difficult to gauge the utility or effectiveness of such financial investments in a general sense without contextualisation. The expectation was that respondents, as members of the space community, would be better able to gauge the positive or negative effects of such investment.



With respect to the responses to this "rate from 1-10" question, the scores ranged from 1 to 8, with a mode of 3 (11 selections) and a mean of 4.0. Although the mean response suggests an adequate amount of investment in the Canadian space sector, the fact that more than half of respondents agreed that the investment was less than adequate (rating it at 3) suggests a different picture; indeed, the two highest scores (7 and 8) were produced by representatives of government. The mean rating produced by industry respondents was 3.7, suggesting a less than adequate appreciation for the investments made by the Canadian government into space by this particularly investment-sensitive group.

How would you rate the development of Canada's commercial space industry?

This question was intended to solicit responses related to the state and health of the Canadian commercial space industry, specifically because of its growing importance within Canada as well as globally. The question assumes that a well-developed commercial space industry allows for a competitive presence of Canadian space technology in future space activities and development today (while public legacy operators remain significant players) is necessary to ensure a strong position tomorrow (where private operators lead space activities).



With respect to the responses to this "rate from 1-10" question, the scores ranged from 2 to 8, with a mode of 6 and 7 (5 selections each) and a mean of 5.4. In contrast to the previous question, it seems participants generally see the development of the Canadian commercial space industry as more productive than the investments being made by the government. Nevertheless, an adequate average may not bode well for the future of the Canadian space sector: given the global commercialisation of space and the trend towards private operators overtaking public legacy operators, a more robust space industry may be required to ensure continued Canadian competitiveness in the space marketplace and increase the reliance on national rather than foreign operators.

Briefly, what were the most important factors you considered in determining your various ratings above?

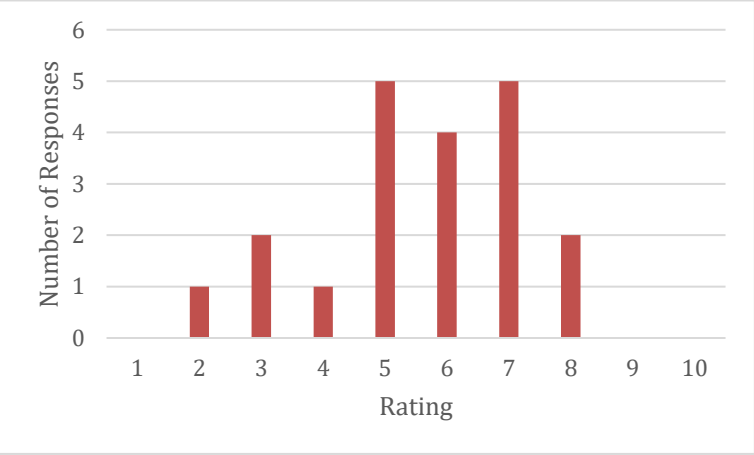
This question was intended to solicit comments on the kinds of things respondents considered when providing answers to the series of "rate from 1-10" questions above. A few themes emerged from the participants' comments: that Canada was playing "catch-up" with the rest of the world as a result of limited investment; that there was a lack of governmental leadership; that there was a lack of diversity with respect to the space programs on which the government focussed; and that industry was being neglected or not taken seriously. Further, many respondents claimed that the lack of a "champion" within the government to help prioritise space meant that Canada could never become a significant player on the global stage.

The overarching general conclusion that can be drawn from this series of questions is that members of the Canadian space community, by and large, view the Canadian space sector as

adequate, slightly skewing towards less than adequate. There is clearly no suggestion that there is any area of the Canadian space sector (whether public or private development, investment, future planning, etc.) that is more than adequate. The responses and comments make clear that if Canada desires to be competitive with respect to space activities on the global stage, it will require more than that which is currently devoted to space. It is not possible to draw from the responses and comments, however, whether this will specifically require increased development of national space projects, increased investments in space, more governmental support for industry, increased leadership by industry, improved strategic documents or any number of combinations.

How would you rate Canada's recent Space Strategy?

This question was intended to solicit responses related to the space strategy that was released by Innovation, Science and Economic Development Canada (ISED) in 2019 to determine how members of the Canadian space community perceived the document and its vision for Canada. Given the broad and sweeping statements made in the space strategy, without providing many supporting details, the community's perception was intended to provide insights into how the strategy may be implemented, whether it could be implemented successfully, where it may have overvalued or undervalued specific issues and how it was generally understood by its intended audience.



With respect to the responses to this "rate from 1-10" question, the scores ranged from 2 to 8, with a mode of 5 and 7 (5 selections each) and a mean of 5.6. The scores were relatively consistent with 14 of the 20 responses rating the strategy as either a 5, 6 or 7, signifying that most participants found the space strategy as adequate or more than adequate. The follow-up to this

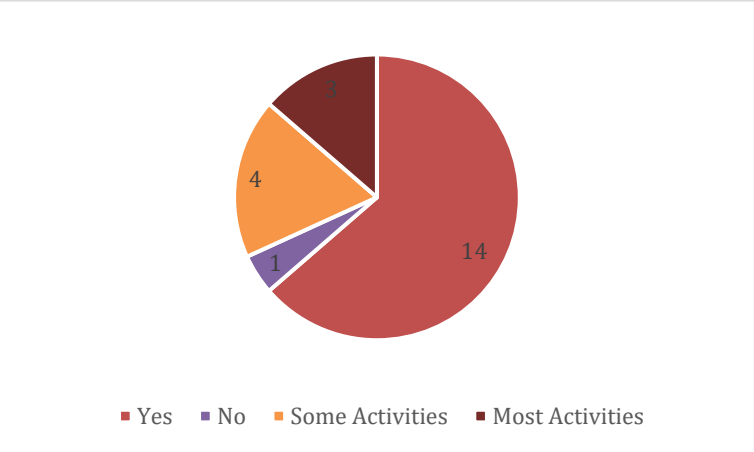
question specifically asked participants what would have made them rate the strategy higher and most responded that it was missing an implementation plan, that it did not prioritise the commercialisation of space, that it provided too few details, did not include a long-term budgetary plan and that it simply rehashed old strategies and policies. One participant criticised the strategy as merely being a "vision document" that tied together otherwise unrelated commitments that had been entered into because of a lack of a "coherent strategic approach". Importantly, one industry participant was unaware of the space strategy in its entirety. Given the particularly critical comments, it is surprising that respondents still rated the space strategy as highly as they did.

3. Canada's Space Regulatory Framework

This section of the questionnaire contained a number of questions intended to generate insights regarding Canada's space regulatory framework, specifically the perceptions of the Canadian space community with respect to the existing regulatory framework. Participants were instructed to consider regulation as "the overall legal framework (laws, rules, standards, circulars, directives, etc.) that govern space activities".

Should Canada regulate commercial space activities?

This question was intended to determine the views of members of the Canadian space community with respect to the regulation of private activities. Traditionally, when private entities are asked whether their activities should be regulated by government, the standard response is negative (at most, the response is "minimally"). Nevertheless, with respect to those who are in charge of regulation (namely, government officials and representatives) or those in a neutral position (namely outside observers and academics), there is a general belief that at least some degree of regulation is needed. Notwithstanding, most people engaged in the space sector are aware of the nuanced features of space activities as dictated by the laws of physics and other forces; therefore, the response to this question posed to members of the Canadian space community (when compared to another community, for example toy manufacturers) would likely skew towards more-than-average regulation.



Of the 22 responses to this question, 14 participants said "Yes" commercial space activities should be regulated, 3 said "Most Activities" should be regulated, 4 said "Some Activities" should be regulated and 1 said "No" commercial space activities should not be regulated. Unsurprisingly, all government representatives responded that commercial space activities must be regulated; surprisingly, 6 out of 8 industry representatives agreed that their space activities should be regulated (with the remaining one saying "Most Activities" and the other saying "No"). When considered in its totality, therefore, an overwhelming number of respondents agreed that at least "Some Activities" ought to be regulated (21 out of 22 responses). In the supplementary comments to this question provided by some respondents, most commented that Canada needed to regulate commercial space activities to remain compliant with its international obligations whereas others provided that regulation allows for the creation of a sustainable and safe space environment and that it was necessary to compete in the international marketplace.

Are you aware of any obligations (international or otherwise) that require Canada to regulate commercial space activities?

This question was intended to determine the perspectives of the Canadian space community with respect to whether Canada had an obligation to regulate commercial space activities. Since it was expected in the previous question that most members of industry would respond with "no" or "some activities", the purpose of this question was to determine whether there were differences in respondents' views with what Canada must do versus what it may do. For example, if most industry respondents voted "No" in the above question and voted "No" in this question, it would demonstrate that those respondents were not aware of Canada's international obligations requiring it to "authorise and supervise" space activities; it is possible that if they were made aware of

Canada's international obligation, they would change their answer to the first question. Conversely, if industry participants said "Yes" to whether Canada ought to regulate and "No" to whether Canada must regulate, it would suggest industry saw some benefit in being regulated even though they believed regulation was not mandatory. Overall, however, if most industry participants selected "Yes" to this question, it would not produce any statistically relevant results.

All 22 respondents selected "Yes" and agreed that Canada has an obligation to regulate space activities; this was not the anticipated response. With respect to comparing the responses from this question with the first question, given the first question's similarly-surprising results, there are two relevant conclusions that may be drawn: the first is that 7 respondents believed that while Canada has an obligation to regulate commercial space activities, the obligation is not absolute; the second is that one respondent believed Canada had an obligation to regulate commercial space activities but, nevertheless, believed it ought not regulate such activities. More interestingly, however, is that all 22 respondents were aware of Canada's obligation to regulate commercial space activities, signifying widespread knowledge within the community of Canada's international space law obligations (or, conversely, that some members mistakenly believe Canada has an obligation to regulate commercial space activities aside from those set out in international space law).

What specific interests should Canada attempt to balance by way of regulating commercial space activities?

This question was intended to determine what members of the Canadian space community believed the regulation of commercial space should achieve as well as what interests ought to be balanced by carrying out such regulation. Having sought responses in the previous two questions related to whether Canada ought and whether Canada must regulate, this question sought responses that would provide the content of such regulation.

Since multiple selections were appropriate for this question, there were a total of 105 responses from the 22 participants: 18 for "safety", 17 each for "security" and "international commercial competitiveness", 15 for "innovation", 14 for "commercial development" and 12 for "international leadership". The results demonstrate that most people believe the primary responsibility of commercial space regulation is ensuring safety, security and international commercial competitiveness. Interestingly, only 10 respondents believed "international

harmonisation" was a worthwhile interest of regulation, suggesting that it was possible for Canadian commercial space activity regulations to be different than those in other jurisdictions while remaining competitive. Similarly, only half of the respondents believed that Canada's regulations should seek to establish a leadership role in the international community.

The follow-on question requested respondents to provide comments with respect to what specific objectives, if any, Canadian space regulation should seek to achieve. Of the 15 comments submitted in response to this question, 14 provided that ensuring industrial competitiveness (with 10 specifically using the word "competitive") ought to be a specific objective of regulation. Most also provided that such competitiveness should be balanced with safety and security, but the overwhelming consensus was that a regulatory framework should be accessible, clear and flexible to allow for the innovation and growth of the Canadian space industry. These responses can be categorised into the following groups: 6 industry, 4 from government and 4 from academia/non-profits/consultancies, demonstrating a consistent perspective with respect to the suggested objectives of regulation across all groups.

Are you aware of the number of existing Canadian laws that apply to space activities?

This question was intended to determine, to what extent, members of the Canadian space community were aware of the kinds of laws that would apply to space technologies. Since Canada does not have a single, comprehensive space law it is often difficult for non-specialists to remain apprised of the existing laws that apply to space activities. The correct response would have been either "5-6", "6-7" or "8-9". The reason for three correct responses was because the question was drafted broadly and so participants could have provided responses limited to those laws that specifically regulate space activities (namely, the *Radiocommunication Act*, the *Aeronautics Act*, the *Broadcasting Act*, the *Telecommunication Act* and the *Remote Sensing Space Systems Act*) or also included those that may apply to undertaking certain space activities (the *Export and Import Permits Act* and the *Defence Production Act*) or general non-industry-related space laws (namely, the *International Space Station Implementation Act* and the *Canadian Space Agency Act*). Although it is possible that any number of Canadian laws could apply to a given space activity when considered from a very nuanced perspective, the general reality is such that only a handful of laws apply.

Of the 21 responses to this question, only 7 responded accurately, none of whom were representatives of industry. Even though the result is not completely surprising, the reality is that those members of the Canadian space community to whom the laws were designed to apply are seemingly unaware of their existence. This may be explained by a lack of regulatory outreach (to make clear to the space community what regulations exist and what regulations would apply to which activities) or an indifference by industry (in the sense that they are only concerned with the regulations that apply to their specific activities). The latter is likely more responsible for the misguided responses to this question since, when asked to list the Canadian space laws of which respondents were aware, most only listed the laws that apply to the space activities in which they are engaged. Nevertheless, a general understanding of the space regulatory framework would likely be more appropriate and the government ought to play a significant role in shaping and bringing awareness to the regulatory framework. Indeed, one participant's admission that they were unaware of the difference "between law and policy" is likely a reality (at least in the specific differences between law and policy) in a larger sample of the Canadian space community population.

Are you aware of which government departments are involved in regulating space activities?

This question was meant to determine, in line with the previous question, whether members of the Canadian space community were aware of the various government departments that play a role in the regulation of space activities. Given the fragmented reality of the Canadian space regulatory framework, there are currently four government departments that oversee space activities (namely, ISED, Global Affairs Canada (GAC), Transport Canada (TC) and the Department of National Defence (DND)) as well as a handful that may be consulted (such as Environment and Climate Change Canada), may be interested in (such as Natural Resources Canada and Fisheries and Oceans Canada) or may be regulating in the future (such as Health Canada).

Of the 22 responses provided, only 11 respondents were able to list at least three of the four main regulatory agencies (ISED, GAC, TC and DND). This suggests that half of the respondents representing the Canadian space community were unable to identify at least three of the regulatory bodies with oversight of space activities in Canada. Again, the conclusions drawn in the previous question (lack of governmental outreach and industry disinterest in non-regulatory agencies)

would also likely apply to this case, except in a more general sense. Whereas in the previous question it was mostly industry that was unaware of the laws that regulate their activities, in this question the non-correct answers were provided by members of all three groups.

4. The Application of Canada's Space Regulatory Framework

The questions in this section were directed more towards industry respondents than the other two groups and attempt to evaluate the overall application and effectiveness of the Canadian space regulatory framework in practice. Participants were specifically asked to consider both their positive and negative experience when interacting with Canada's space regulatory frameworks and keep in mind instances in which regulation was absent but could have proven useful.

Are you and/or your organisation currently regulated by one or more of Canada's space laws?

The purpose of this question was to determine which respondents were currently engaged in regulated space activities. The question provided respondents with an opportunity to select between "Yes", "No", "Does Not Apply" or "Other".

Of the 22 responses, 10 responded "Yes": 7 from industry, 2 from academia/non-profits/consultancies and 1 from government. On its own, this question does not offer sufficient information to draw any meaningful conclusions except to say that less than half of the respondents, as members of the Canadian space community, are regulated by Canadian space laws suggesting that for every space operator undertaking a space activity, there are just as many in supporting roles.

Do you believe the Canadian space laws that apply to your organisation are working effectively?

The purpose of this question was to determine whether the laws currently regulating space activities are, in the view of those being regulated, working effectively. Respondents were asked to consider the overall objective of the law (such as safety, security or international compliance), how the law's real world effects impacted the respondent's activity, whether the laws objectives were relevant or appropriate and whether the law was having its intended effects. This question provided respondents with an opportunity to select between "Yes", "No" and "Does Not Apply".

Of the 21 responses, 10 responded "No" while the other 11 responded "Does Not Apply". Those who responded "No" were the same twelve that responded "Yes" to the previous question.

Therefore, each and every respondent whose space activities are currently regulated agreed that the regulations are not working effectively. Respondents who selected "No" were invited to discuss why they believed the laws were ineffective: respondents commented that current regulations are outdated and ineffective, that they need to be modernised, that they are being misapplied and that they are not clear in their language or interpretation. Although the general tone of the response was expected, it was not expected that every single respondent that is regulated by a Canadian space law would agree that they are ineffective.

Do you believe the Canadian space laws that apply to your organisation can be improved?

The purpose of this question was to determine whether members of the Canadian space community that are currently regulated by Canada's space laws believed those laws could be improved and, if so, how. Respondents were specifically asked to consider whether the law is clear, effective, forward-looking, etc. and how it may be changed to address these considerations. This question provided respondents with an opportunity to select between "Yes", "No" and "Does Not Apply".

Of the 21 responses, 11 selected "Yes" and 10 selected "Does Not Apply". In comparison to the question above, one government representative who had selected "Does Not Apply" in the previous question nevertheless selected "Yes" in the current question signifying that even though their activities were not being regulated, they recognised that there was room for improvement. Again, the respondents were unanimous in their decision that Canada's space laws could be improved. In the follow-up question asking participants who selected "Yes" to briefly elaborate on how Canada's space laws could be improved, respondents commented that laws needed to be modernised, that the laws should be further developed, that the scope of certain laws needs to be refined and that the implementation of licenses needs to be conducted more efficiently. Some also suggested the need for a general, comprehensive space law similar to those adopted in other countries may improve the current regulatory framework. Overall, it can be concluded that those members of the Canadian space community who are regulated by a Canadian space law believe they are being regulated ineffectively and that there is a way in which such regulation can be improved.

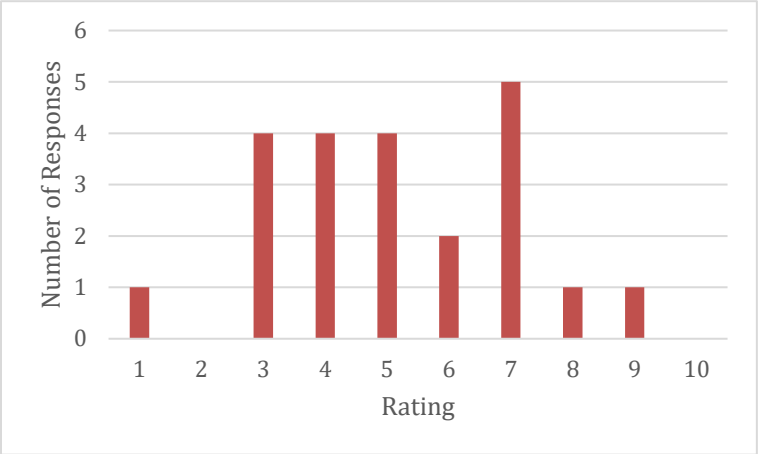
Has it always been clear which government department (or who within a department) you should approach regarding your space activities?

The purpose of this question was to determine whether members of the Canadian space community currently undertaking space activities were aware of the different departments that would have oversight, since in Canada, the space regulatory framework is dispersed amongst many different departments. This question provided respondents with an opportunity to select between "Yes", "No" and "Other".

Of the 20 responses, 9 selected "Yes" and 7 selected "No" with the remainder selecting "Other". The responses suggest that although some members of the space community are unaware of the laws that may apply to their activities or believe that the laws do not apply effectively, they nevertheless are generally aware of the government department which should be overseeing their activities. In the comments provided in response to the supplementary question, respondents provided that it is often a difficult process to determine which department oversees their activity, often relying on word of mouth through community networks (as there is no clear government publication or online presence demonstrating the appropriate information), or how different government departments interface to make regulatory decisions.

How would you rate the relationship between commercial space operators and government regulators?

The purpose of this question was to determine how operators and regulators viewed their relationship given that their perspectives and objectives were likely at odds. In answering the question, respondents were asked to consider the ease of access to government services, the speed of delivery of government services, the clarity and flexibility of the expectations, the willingness to comply with requirements and the overall working relationship.



With respect to the responses to this "rate from 1-10" question, the scores ranged from 1 to 9, with a mode of 7 (5 selections) and a mean of 5.3. Interestingly, the ratings from industry spanned the entire spectrum (from 1 to 9) whereas those of government and academia/non-profits/consultancies were clustered together (most were from 4 to 7). Overall, the ratings suggest that the relationship between operators and the government is adequate: regulation is being carried out in a manner that is acceptable but not overly enthusiastic. In providing comments in response to the opportunity to briefly describe the relationship between operators and regulators, respondents commented that some departments (usually the more mature departments) were seen as doing a good job while others had room for improvement, that the process of regulatory change is too slow (with some recognising that the potential disconnect may be between civil servants seeking to improve the regulatory regime but politicians either not aware or not interested in such changes), that even though regulators seemed interested in helping promote industry activities the amount of support is insufficient (although it is unclear if the interest or resources are insufficient) and that in some cases the current state of the law simply does not allow for responsive regulator action.

Have you ever experienced delays with a license application process?

This question was meant to determine whether members of the space community carrying out space activities had ever experienced delays with respect to a licence application administered through existing regulatory processes.

Of the 6 responses from industry participants, 5 said that they had experienced some delay in the licence application process and one responded that they were completely unable to apply for

a licence for the activity they sought to undertake. In the comments provided by respondents, some reflected on the delays being caused by legitimate security reasons while others provided that small errors were used to exceed the applicable service standard and that licence requests were generally deferred until a pressing deadline approached.

Are your space activities currently regulated in another country?

This question was meant to determine whether members of the space community carrying out space activities in Canada had experiences with the regulatory regimes of other jurisdictions. The underlying purpose of this question was to determine whether, in their experiences, respondents were aware of different regulatory regimes and how they viewed Canada's in comparison.

Of the 20 responses, 8 respondents provided that their activities were regulated in a jurisdiction other than Canada. In their follow-up comments, respondents provided that they were regulated, largely, in the US. Although it was expected that respondents would comment on the regulatory differences in the various jurisdictions, unfortunately respondents used the supplementary question to list the different jurisdictions in which their activities could be regulated. As a result, significant determinations cannot be drawn from the answers presented in this question.

5. The Future of Space Regulation in Canada

This section of the questionnaire sought to generate insights related to the future of Canadian space regulation in hopes of determining whether there is room for improvement within Canada's space regulatory framework and, if so, what members of the Canadian space community believed would be the best strategy to do so.

Generally, do you believe Canada's space regulatory framework can be improved?

This question was intended to determine whether members of the Canadian space community believed the existing Canadian regulatory framework applicable to space could be improved. The objective of the question was to determine whether, given the experiences of respondents (as extracted in the previous section), they believed the regulatory framework that applied to their activities could be improved.

The original anticipation was that a small majority of respondents would answer in the affirmative. However, based on the responses to the questions in the previous section, it is no surprise that each and every one of the 22 responses to this specific question answered in the affirmative. This overwhelming consensus demonstrates that members of the Canadian space community, whether representing industry, government or academia/non-profits/consultancies, all recognise that there is a need to improve the Canadian space regulatory framework. Based on the responses provided in the follow-up question seeking comments, it is clear that respondents believe different approaches may be most appropriate: for example, some believe that the current system works relatively well but can still be improved, others believe there are gaps that need to be addressed and still others believe that the entire regulatory framework must be reconceptualised.

The main conclusion to be drawn from this question is that all members of the Canadian space community, regardless of position, orientation, representation or perspective, believe the current regulatory model can be improved. Although the suggestions range from modernising existing legislation to creating new laws for new activities, all respondents believe the existing regulations overseeing space activities can be improved to better serve the interests of the space community.

In order for Canada to improve its space regulatory framework, do you believe the government ought to:

This question was intended to determine what members of the Canadian space community believed would amount to appropriate regulatory improvement with respect to existing and potential new space laws. The objective of the question was to determine, based on the previous responses as to whether Canada could improve its existing laws, how Canada should go about making the necessary improvements to the space regulatory framework. Respondents were asked to select from a number of options in determining how Canada ought to improve its space regulatory framework, which included: “Repeal all existing space laws”, “Repeal some existing space laws”, “Amend all existing space laws”, “Amend some existing space laws”, “Enact specific laws for new activities before they become feasible”, “Enact specific laws for new activities after they become feasible”, “Create a new single law that could regulate all space activities”, “Do Nothing” and “Other”.

Since participants were allowed to select multiple choices, a total of 44 selections were made by the 21 respondents: 12 believed Canada's space regulatory framework could be improved by amending some existing space laws, 11 believed that Canada ought to enact specific laws for new space activities before they become feasible and 9 believed Canada ought to enact a new single space law to regulate all space activities. Further, 6 respondents believed Canada ought to amend all of its existing space laws, 2 believed some existing laws should be repealed, 2 more believed new specific laws should be enacted, while 1 believed the government ought to do nothing and another believed regulators should be staffed with qualified personnel and be accountable for their decisions.

The general conclusions to be drawn from this question is that most members of the Canadian space community believe that the best way to improve the Canadian space regulatory framework would be by amending existing laws in addition to creating new ones. The follow-up comments make clear that some space laws need more work than others and that, generally, existing laws, as they are drafted, are not flexible enough to adapt to the developments of technology and the evolving nature of space applications. Many participants commented (regardless of whether they selected to amend existing laws or enact new ones) that space laws needed to be flexible to remain applicable to new or unforeseen space activities.

Respondents also commented on the benefits of enacting a single comprehensive space law, including that the law would act to highlight and refocus the country's space priorities, centralise the regulation of space activities under a single framework, reduce the existing disorder of the current multi-departmental approach to space (when the law is enacted in conjunction with the creation of a high-level federal committee or department related to space), be "the most efficient way to deal with the large number of new [emerging] space activities", bring Canada's regulatory framework in line with those of its allies (such that the trend is the creation of comprehensive national space laws) and most effectively implement Canada's international obligations and national interests. Additionally, whether through amending existing laws or enacting new laws, the government ought to positively "affirm that the space activities they regulate are desirable and that the government has a vested interest in doing what it can to facilitate them, so long as they do not unduly jeopardize public safety".

Interestingly, almost all industry representatives selected "Amend some existing space laws", and the comments provided in the follow-up question suggest they are most concerned

about the laws that regulate their specific activities (for example, the *RSSSA* was identified as a law needing amendment by Earth observation companies and the *Aeronautics Act* by launch companies). Nevertheless, the responses from industry participants often contained more than one selection, with the majority also selecting "Enact specific laws for new activities before they become feasible". Importantly, this latter selection suggests that industry respondents are aware of the need and benefits of regulation and that for novel space activities, industry desires appropriate regulation rather than no regulation.

6. The Future of Space Activities

This section of the questionnaire sought to generate insights related to the expectations of members of the Canadian space community on the future of space activities as well as the ability and/or capability of existing Canadian regulatory bodies to oversee the regulation of specific future activities.

Which of the following space activities do you believe will become reality (whether in Canada or abroad) within the next 0-5 years, 5-10 years and 10-20 years?

This question was intended to determine what kinds of space activities members of the Canadian space community believed would be feasible and practical enough to become reality in the future. The questionnaire used the same "select all that apply" format in three different questions asking respondents to consider the short-term (0-5 years), mid-term (5-10 years) and long-term (10-20 years) future of space activities. The responses to all three questions are presented here collectively. Respondents were asked to select from the following list: "Canadian Launch Capability", "Canadian Launch Capability - Reusable", "Space Tourism - Sub-Orbital", "Space Tourism - Orbital", "Space Tourism - Lunar, Martian or other celestial body", "Space Settlement", "On-Orbit Servicing", "Space Debris Remediation", "Space Manufacturing", "Space Mining", "Solar Power Distribution" and "Other". Of the respondents who completed the survey, 21 answered the first and second questions and 19 answered the third question. Unfortunately, it is not possible to decipher from the questionnaire responses which participants selected the same space activity more than once (for example, if a respondent had selected "Canadian Launch Capability" as a short-term reality, they may have also selected it as a mid-term and long-term

reality as well). Nevertheless, the conclusions drawn are general enough given the consensus of responses to reflect the realistic perspectives of respondents.

In the short-term (0-5 years), there were 80 selections with 18 respondents selecting "Space Debris Remediation", 15 selecting "On-Orbit Servicing", 12 selecting "Space Tourism - Sub-Orbital" and 11 selecting "Canadian Launch Capability". Fewer than 10 respondents also selected "Space Tourism - Orbital", "Space Manufacturing", "Space Mining" and "Solar Power Distribution". In the mid-term (5-10 years), there were 101 selections, 13 respondents selecting "On-Orbit Servicing" and "Space Manufacturing", 12 selecting "Space Debris Remediation" and 11 each selecting "Canadian Launch Capability", "Space Tourism - Sub-Orbital" and "Space Mining", and 10 selecting "Canadian Launch Capability - Reusable". Fewer than 10 respondents also selected "Space Tourism - Orbital", "Space Tourism - Lunar, Martian and other celestial body", "Space Settlement" and "Solar Power Distribution". In the long-term (10-20 years), there were 89 selection, with 11 respondents selecting "Space Tourism - Orbital", 10 each selecting "Space Tourism - Sub-Orbital", "Space Debris Remediation" and "Space Manufacturing", 9 selecting "On-Orbit Servicing" and "Space Mining" and 8 selecting "Canadian Launch Capability" and "Canadian Launch Capability - Orbital". Fewer than 5 respondents also selected "Space Tourism - Lunar, Martian or other celestial body", "Solar Power Distribution" and "Space Settlement".

It is clear from the responses that most participants believe that within the next five, ten and twenty years a number of new space activities will become reality. This includes Canadian launch capability (whether expendable or reusable), servicing existing space objects, cleaning up and maintaining the space environment and placing humans in space for tourism and settlement purposes. Since public space programs take many years to develop and Canada has not officially announced any programs that would address some or all of the future space activities considered in this section (with the exception of the Lunar Orbital Platform-Gateway project), it must be assumed that when such activities are carried out in Canada, they will be done so largely (if not exclusively) by private industry. Activities carried out by private actors must be regulated and in Canada the existing regulatory framework would not appropriately regulate most of these activities.

Do you believe appropriate government departments currently exist to oversee the above space activities?

This question was intended to determine whether members of the Canadian space community believed appropriate departments existed within the Canadian government to oversee the future space activities considered in the question above. The objective of the question was to determine whether participants believed any of the four existing departments that regulate space activities (namely, ISED, GAC, TC or DND) would capably or appropriately regulate future space activities. In answering this question, respondents were asked to consider the existing mandates of specific departments, the consequence of an activity straddling the mandates of multiple departments and the consequences of an activity not conforming to the mandates of any department.

Of the 21 responses, 12 answered "No", 4 answered "Maybe" and 5 answered "Yes". In a general sense, the fact that more than half of the respondents answered "No" suggests either that an appropriate government department does not currently exist to oversee future space activities or that of the existing departments, none are suitable in their current forms to oversee future space activities (this distinction is discussed further in the following question). Either way, the reality is that most members of the Canadian space community that participated in the questionnaire do not believe there exists an appropriate government department to appropriately oversee future space activities. In the comments that accompany the follow-up question requesting respondents to briefly explain their response to this question, they included reflections that existing governmental mandates do not extend to future space activities, that the government is focussed more on the consequences of space on Earth rather the overall activities themselves, that the CSA's mandate and role is unclear and that international coordination on the specific activity would provide clarity with respect to the kind of necessary domestic regulatory framework. It is worth noting that all three respondent groups provided mixed responses, although the majority of industry representatives selected "No" and the majority of government representatives selected "Yes" or "Maybe".

Do you believe the creation of a "Department of Space" would be appropriate or effective in the regulation of new and emerging space activities?

This question was intended to determine whether members of the Canadian space community believed that the creation of a specific federal department to oversee space activities (the suggested Department of Space) would be appropriate or effective. The objective was to elicit responses in the follow-up question that could justify a determination one way or another. In answering this question, respondents were asked to consider how a new government department would interact with other government departments, whether it would offset regulatory burdens from unspecialised departments, whether it would increase or decrease regulatory bureaucracy, the relationship it would form with industry and the role it would play in publicly promoting space activities.

Of the 21 responses to this question, 5 said “Yes”, 8 said “Maybe” and 8 said “No”. As with the previous question, the distribution of answers within a specific group were mixed, with industry, government and academic/non-profits/consultancies all splitting in their answers. Without devaluing the “Yes” and “No” responses, it is notable that more than a third of respondents selected “Maybe”, indicating that they believed there could exist a reality in which the creation of a new Department of Space would be suitable. With respect to the follow-up comments accompanying this question, most respondents (especially those that selected “No” or “Maybe”) feared that the creation of a new federal department would simply add to the existing bureaucracy and increase the challenge of undertaking space activities from within Canada. The respondents selecting “Yes” and those who selected “Maybe” but leaning towards “Yes” were much more vocal and included in their reasons for the creation of a Department of Space the fact that it would provide a renewed focus on space, increase coordination among existing government departments on the various space activities they oversee, provide a single contact point for domestic operators and international partners and provide a comprehensive regulatory body to replace the patchwork currently in place.

One issue that is raised by this question (but will not be answered here or elsewhere in this project) that is worth noting is related to the oft-cited discussions between the functionalist versus spatialist approaches to the regulation of space (namely, is it more appropriate to regulate the specific activity or the physical domain in which the activity takes place). In Canada, the question of a Department of Space faces the same concerns: at the domestic level, ought specific space

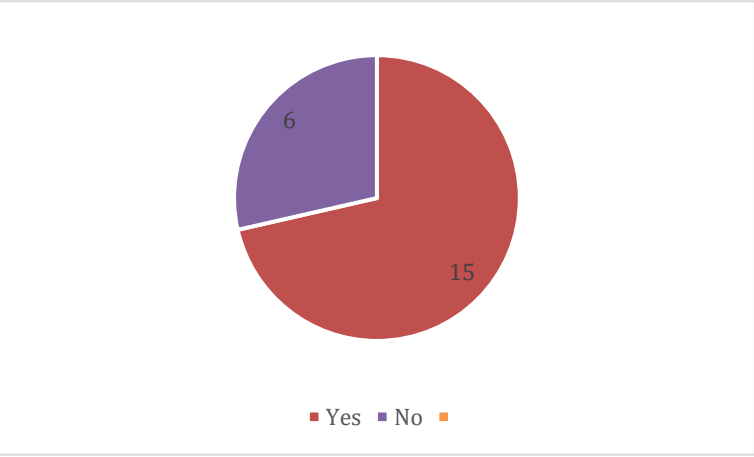
activities be regulated within the departments that regulate their terrestrial counterparts (for example, communications, mining, transportation, etc.) or by a department that regulates the environment in which the space activities exist (for example, the Department of Fisheries and Oceans for certain maritime activities).

7. A New Canadian Space Law

This section of the questionnaire sought to generate insights related to the creation of a new, comprehensive space law or new, activity-specific space laws as well as the effects of specific kinds of regulatory changes.

Do you believe a new, comprehensive space law would improve Canada's regulation of existing and emerging space activities?

This question was intended to determine whether members of the Canadian space community believed the creation of a single domestic space law would improve the regulation of space activities in Canada. The question required participants to consider two issues: first, whether a new comprehensive law would improve the regulation of existing (traditional) activities and second, whether a new comprehensive law would improve the regulation of future (emerging) activities.



Of the 21 responses, 15 selected "Yes" while 6 selected "No". More than two-thirds of respondents, therefore, agreed that a new comprehensive Canadian space law would improve the regulation of existing and emerging space activities when compared with the current regulatory system. Of those selecting "No", there were 3 from academia/non-profits/consultancies, 2

responses from industry and 1 from government. It is worth noting, therefore, that the majority of industry representatives, the majority of government representatives and the majority of representatives of academia/non-profits/consultancies all agree that a comprehensive space law would serve to improve Canada's regulation of space activities.

In the follow-up question, respondents justified their "Yes" selections by commenting that the creation of a comprehensive space law would help rebalance the existing law's treatment of commercial incentivisation versus national security, signal the government's thorough support for space activities, reduce the current fractured system with one that is easier to navigate for business and one that is more consistently interpreted by multiple parties, establish a regulatory system that envisions future activities and create a progressive framework that invites investment and relocation of foreign space businesses to Canada. Respondents justified their position related to selecting "No" by providing that a comprehensive space law could never be truly comprehensive (since there are too many factors related to space for a single law to take into account), that amending existing legislation and expanding the scope of existing agencies could sufficiently improve the framework and that less regulation is preferable since less "red tape" allows for the faster development of industry.

Do you believe multiple new space laws (each specific to one space activity) would improve Canada's regulation of emerging space activities?

This question was intended to determine whether members of the Canadian space community believed multiple, activity specific laws would improve the regulation of emerging space activities. In conjunction with the responses to the previous question, the responses from this question would illustrate whether members of the Canadian space community simply want new laws to move away from the existing, non-functional framework or whether they had specific beliefs with respect to whether one new law would be superior to multiple new laws.

Of the 21 responses, 11 selected "No", 7 selected "Yes" and 3 chose a mixed approach (a comprehensive law and specific laws). The responses indicate that the majority of respondents believe activity specific space laws would not improve Canada's regulation of emerging space activities and, when considered in conjunction with the previous question, indicates that respondents prefer a comprehensive approach rather than a piecemeal one. In the comments justifying their selections, respondents provided that a comprehensive law could be sufficiently

broad to cover general space activities whereas specific space activities would be subject to different, specific regulations, that a single law would be easier to manage and navigate, that a patchwork of laws would create gaps for activities that cannot yet be imagined (and therefore regulated) and that most space entities are conducting multiple space activities requiring regulatory consistency across activities. Respondents in favour of multiple space laws commented that some space activities have too many variables to be managed by a general law (such as activities that start on Earth and end in space) and that, in the short term, specific laws may be necessary to provide regulatory guidance as it is anticipated that a comprehensive law would take longer to enact and come into force.

Would a new law(s) be better if it was/they were reactionary or proactive?

This question was intended to determine whether members of the Canadian space community believed the nature of a space law should be to regulate proactively or reactionarily. In answering this question, respondents were asked to consider that in the context of this question, "reactionary" meant a law that is created to address an activity that has been demonstrated or is nearly-ready for demonstration and "proactive" meant a law that would oversee new space activities that are still very early in the conceptualisation stages. The objective of this question was to elucidate whether, in the opinion of those engaged with space on a daily basis, regulation should respond to technological development or should provide guidelines that oversee technological development.

Of the 20 responses, 16 articulated that space laws must be “proactive”, while 2 articulated a “reactionary” approach and 2 more said a “mixed” approach was appropriate (namely, reactionary at first and proactive after the law catches up with existing technology). The overwhelming majority of respondents, therefore, concluded that a new Canadian space law should be proactive in its regulatory function rather than reactive. This means that most members of the Canadian space community believe there is at least some benefit to a law that anticipates technological development and provides regulatory guidance to developers and operators of such technology. This response is somewhat surprising given that space activities are highly technical endeavours and it is often difficult for drafters of a law to anticipate the kinds of technological changes that will result in the future. The single most likely motivating force behind the Canadian space community’s desire for such a methodological approach to regulation, therefore, is that they

believe it is better to know what is and is not allowed before undertaking expensive and time consuming technological development programs rather than undertaking such costly programs only to find out they are prohibited after the fact.

If tomorrow, the government announced that it would be creating a new space law(s), how would you react?

This question was intended to determine whether members of the Canadian space community would appreciate the impending arrival of a new law and the manner in which they would embrace such a regulatory development. In answering this question, respondents were asked to consider the effects of a new law in terms of providing legal certainty to certain activities, promoting or hindering investment, increasing oversight, clarifying rules and complicating existing business practices. Importantly, the question was framed in such a way as to suggest that the government would be creating a new space law (in the future) rather than the government announcing it had created a new law. The distinction (namely, the government announcing its intention to do something rather than announcing an already completed action) is subtle but important. It is likely that had the question reflected the latter interpretation, the responses would have been very different.

The responses to this question could be summed up as "cautiously optimistic". Except for two respondents who questioned the likelihood of such a reality, respondents generally were enthusiastic about the idea that the government would be putting forth a new law but concerned as to the nature of the law and the manner in which it would be created. Most respondents qualified their enthusiasm by commenting that they desired to engage with the government on the creation of a law and hoped that appropriate industry consultations would take place prior to any final enactment. The overall sense is that the creation of a new law has the potential to be extremely positive for Canada's space sector although there is a clear awareness that a misguided or inappropriate law could have significant negative consequences. A general conclusion, therefore, is that even though a new law is necessary, a poorly drafted law could prove just as harmful as the current ineffective framework.

What message might the government's creation of a new space law(s) send to the commercial space industry?

This question was intended to determine what kind of message members of the Canadian space community would receive by the government's announcement that it is creating a new space law. The objective of this question was to elucidate the kinds of interpretations community members would make upon hearing that a new law was forthcoming.

Of the 16 respondents to answer this question, each one believed that the message would be positive. The most common description was that it would send the message that Canada was "open for business" and that the government would be taking the new space economy seriously. Specifically, respondents provided that it would demonstrate that the government actually considers space to be a "strategic national asset" as provided in the recent space strategy, that it would signify a likely infusion of long-term funding, that the government is "serious about its international obligations as well as making Canadian space industry a priority" and that it has the potential to be "one of the most powerful statements of support for the space sector that any Canadian government has ever made" and that Canada will "at last become internationally competitive". One respondent cautioned, however, that even though the law had the potential to create positive change if the laws are "relaxed", if the laws become "more stringent" then the worst case scenario would be that industry would relocate out of Canada. The fact that this concern tempers the enthusiasm of the other responses is legitimate and must be considered appropriately when discussing the very real possibility that a new space law could have significant harmful effects on industry if drafted and/or implemented poorly.

What kinds of things ought a new, comprehensive space law cover?

This question was intended to determine what members of the Canadian space community believed would be appropriate topics for a new, comprehensive space law to include. Participants were asked to select all of the following that they believed were appropriate: "Ownership Specifications", "Financing for Projects", "Insurance for Activities", "Liability for Damage", "Registration of Space Objects", "Debris Mitigation", "Environmental Safety", "Import/Export Controls", "Licensing Costs", "Fines/Sanctions for Violation", "Public Outreach and Educational Initiatives", "All of the Above" and "Other". The objective of this question was to determine what

community members believed ought to be the basic elements or topics considered by a comprehensive space law.

A total of 138 selections were made by 20 respondents, with 15 respondents each selecting "Registration of Space Objects" and "Debris Mitigation", 14 selecting "Environmental Safety", 13 selecting "Liability for Damage", 11 each selecting "Insurance for Activities", "Licensing Costs" and "Fines/Sanctions for Violations" and 10 selecting "Ownership Specifications". Less than ten selections were made for the remaining topics, although, notably, 5 respondents selected "All of the Above". The distribution of responses suggests that there is no generally accepted expectation among community members as to what topics or elements of a space law should be included in a comprehensive Canadian space law. Nevertheless, the selections above with high response rates seem to suggest that community members are interested in ensuring and maintaining the safe and sustainable use of space and that the costs of space activities (whether stemming from licensing, damage or insurance implications) ought to be presented into a new space law. Finally, the fact that there were so many overall responses should not be surprising considering a comprehensive space law must, by its very nature, comprehensively cover a variety of topics.

What recommendations would you have for the drafters of such a law?

This question was intended to determine the kinds of recommendations members of the Canadian space community would have for a hypothetical drafter of a new space law. The objective was to elucidate concerns and potential hesitations by community members on things to avoid or things to ensure are carried out.

There were 14 responses made to this question and, generally, the comments reiterated positions previously made in other parts of the questionnaire (such as engage and listen to industry and remain proactive and not overly prescriptive). Specifically, however, two respondents offered that the law should remain general in language and provide only the principles or policy objectives of the law and allow specific regulations to more directly address the details of a specific topic or activity. In this way, the regulatory framework would remain flexible and could easily adapt to the fast changing environment of space activities. Additionally, two respondents suggested specific topics that should not be included in the comprehensive space law (namely, insurance and export controls) and another provided that Canada should look to existing regulatory frameworks in other commonwealth jurisdictions when drafting its own.

The expectation was that respondents to this question would provide concrete recommendations (such as consider the launch regulations of Country X and adapt accordingly or including both liability and insurance provisions is superfluous) rather than general statements (such as consult with industry and stakeholders). The reason general rather than specific comments were provided by respondents is likely due to the fact that the question was formed vaguely (discussing concepts rather than specific provisions) and that this being one of the last questions of a questionnaire that was long and time-consuming, respondents were likely not to provide detailed comments and suggestions. Nevertheless, the recommendations provided are useful in terms of the general considerations a drafter should keep in mind when preparing a comprehensive space law.

Are you aware of any existing foreign national space laws upon which a new Canadian space law ought to be modelled?

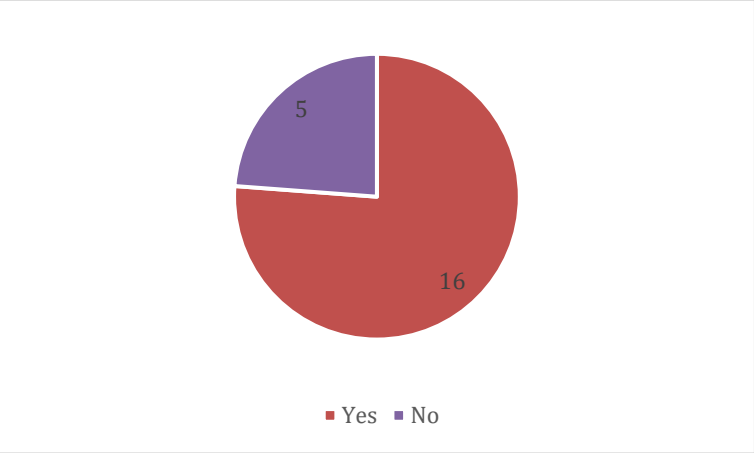
This question was intended to gauge the knowledge of members of the Canadian space community with respect to the space laws of other jurisdictions. The objective was to determine how many community members were aware of regulatory frameworks other than Canada's and whether any of the other frameworks had elements appropriate to be adopted by a new comprehensive Canadian space law. It should be noted that the question likely could have been drafted more clearly as it can be interpreted two ways (first, whether a respondent is aware of existing foreign national space laws and second, whether the respondent is aware of any of foreign national space laws upon which the Canadian law could be modelled). It is possible, therefore, that a respondent is aware of foreign national space laws but does not consider any of them appropriate as a model for a Canadian law - unfortunately, the answers to this question do not allow for distinguishing between the two responses.

Of the 21 responses, 15 respondents said they were aware of other regulatory frameworks and 6 said they were not. In the comments provided in the follow-up question, 13 responses were provided and of those that listed a specific jurisdiction, most listed Australia, the UK and the US as possible model frameworks, two listed Germany and one listed New Zealand. Although the follow-up question asked participants to list the country and the relevant space law, in all but one instance respondents only provided the country. The limited conclusion that may be drawn from the responses to this question suggest that most members of the Canadian space community are

aware of the space regulatory frameworks of only a few countries (when compared with the 23 that exist and are considered in Chapter 7 of this project and none of the 13 most recent national space laws enacted over the last 15 years) and only at a cursory level.

Should Canada take an international leadership role in the regulation of space activities?

This question was intended to determine whether members of the Canadian space community saw any benefit to Canada taking a leadership role in the regulation of space activities from an international perspective. The objective was to elucidate responses related to how community members felt about international regulation, Canada's role on the international stage and whether space regulation had an international component.



Of the 21 responses, 16 said "Yes" and 5 said "No". It is worth noting that 2 of those who selected "No" did so on the basis that Canada's internal regulatory framework is inadequate and therefore inappropriate for it to lead on the international stage. The near-unanimous majority, therefore, believe that Canada should take an international leadership role in the regulation of space activities and justified their position on the basis of Canada's historical role in coordinating international initiatives at the United Nations level and its reputation as an "honest broker", that Canada may be able to leverage international standards to benefit its interests, that it would help Canadian companies to have a government with an international presence in the sector, that it would allow Canada to determine its own agenda free of American influence and that since space is an international domain Canada should play an active role in aligning international standards to ensure level jurisdictional playing fields.

Although it is not surprising that some see the benefits of Canada playing a leadership role on the international stage, the overwhelming support for such an idea is somewhat surprising given that the three respondent groups can have differing opinions on questions such as the role of government. Nevertheless, the near-consensus is a positive sign for the Canadian space sector and demonstrates an appetite for international engagement and leadership.

Should Canada pursue new (or reinvigorate old) international opportunities for treaty making?

This question was intended to determine whether members of the Canadian space community saw significant benefit in engaging the international community on treaty-related space matters. The objective was to elucidate the tension between community members who wanted to engage with the international community on matters related to space but not in a treaty-making manner given the complexities and long timelines demanded by such processes.

Of the 17 responses, 9 selected "Yes", 7 selected "No" and 1 was unsure. Although this nearly even split was more expected than the one-sided responses to the preceding question, when considering both questions together the responses suggest that although most community members are in favour of international leadership, they do not favour binding international treaties. Based on the comments provided in the follow-up question, most respondents hesitate to see the benefits of international treaty making considering the significant political will that must be expended to make meaningful gains and the lack of global appetite in the process; rather, some respondents suggested Canada implement robust national space laws and lead by example. Other respondents still maintain the benefits of a level playing field (which can only be ensured through treaty rather than soft law) and foresee the need for new treaties as space activities continue to evolve in the future.

General Analysis of Themes Emerging from Questionnaire Responses

Whereas the previous section of this chapter considered the responses to the individual questions of the questionnaire in isolation (albeit with some limited carryover), this section of the chapter will provide more holistic analyses that consider the general overarching themes that emerged from the responses. Although these high-level insights will be based on the information presented in the responses, by their very nature they will also tease out conclusions that were not necessarily made explicit by any one respondent. Nevertheless, after careful consideration of all

of the responses, including what was not said by respondents, the following analysis is a representative reflection of the sentiments of the Canadian space community with respect to the Canadian space regulatory framework.

Preliminary Comments

Before drawing any sweeping conclusions, it must be noted that the extent of the generalisations that can be made based on the responses to the questionnaire are somewhat limited. The Canadian space community represents far more than the 22 members who completed the questionnaire and, undoubtedly, their views may be different than those expressed by the 22 members who did participate in this research. As a result, it is possible that had more members of the Canadian space community participated in the questionnaire, the results would have been different and the emergent conclusions would have also been different.

Notwithstanding this concern, there are two main reasons why the questionnaire responses ought to be considered, at least at a cursory level, as representative of the Canadian space community: the diverse sample of respondents and the limited pool of entities interested in policy-related questions. First, since there was a nearly-equal distribution of respondents from industry, government and academia/non-profits/consultancies, the overall community was well-represented by its constituent parts. Had, for example, the majority of responses been from government representatives with only a few industry representatives participating, the results generated from the submitted responses may have skewed more in favour of governmental perspectives. Nevertheless, this justification is mitigated by the fact that there were some questions in which members of a specific group provided very different responses suggesting group-cohesion may not be as real as one may originally suspect.

Second, the reality is that although the general Canadian space community is sizeable, there are, comparatively, not very many entities engaging in or regulating specific space activities. In total, there are likely less than 50 or so Canadian entities actively participating in space activities (for example, undertaking launch activities, performing remote sensing, providing telecommunication, etc. or the different offices that regulate such activities) and so those that are directly affected by the regulation of space activities are relatively few. The majority of the rest of the Canadian space community would be made up of the different component and sub-component providers, the financiers, the third-party users, etc. who would not, directly, be engaged

or interested in discussions related to the regulation of space activities. Nevertheless, this justification may also be mitigated by the fact that all of those other non-direct actors are still subject to space regulations and would feel the harms of ineffective, and the benefits of effective, regulation.

Recognising that there are potential representative concerns related to applying the conclusions that may be drawn from the responses to the questionnaire to the entirety of the Canadian space community, there still remains significant value in generalising the themes that emerge from the submitted responses. Although these themes represent the cumulative responses of the participants, they rely more on the comments provided by respondents to the short and long answer questions that sought justification for the easier-to-complete questions rather than the specific scores or selections made in the easier-to-complete questions. These text-based answers provide more insight into the perspectives of respondents and allow for more clear generalisations to be drawn.

Uninspiring State of the Canadian Space Sector

One of the first conclusions to draw from the responses to the questionnaire is that members of the Canadian space community recognise the state of space in Canada and Canada's position in the global landscape as simply adequate: it is neither terrible nor terrific. Importantly, the government's failure to prioritise space, its lack of significant financial investment in the sector and its inability to provide leadership are the reason for a meandering Canadian commercial space industry. Government neglect of the space file has resulted in industry playing a never-ending game of catch-up with no hope of ever overtaking its competitors. Indeed, the most recent high-level strategy document meant to provide a vision for the future of space in Canada is best characterised as underwhelming: it lacks significant long-term financial commitments, restates prior objectives and is void of meaningful detail. To improve the current state of space in Canada and prepare it for the future, members of the Canadian space community believe a governmental champion of space is needed: only through the internal promotion of the benefits of space will the government prioritise the space sector, design truly long-term visionary documents and provide appropriate financial commitments.

Dismal View of the Canadian Space Regulatory Framework

By and large, there is an understanding in the Canadian space community that space activities are regulated, that regulation is necessary and that regulation serves a specific purpose. Although the specific technicalities related to regulation are not uniform, there is consensus that regulation has a role to play in a healthy space sector. Ideally, according to respondents, regulation should ensure safety, sustainability and industrial competitiveness; while it is unclear which would take precedence in a situation of conflict, these three ideals are the expected foundational elements of a space regulatory framework and that they must be implemented in an accessible, clear and flexible manner. This is true notwithstanding the fact that the Canadian space community could not accurately identify the specific instruments of Canadian space law nor the governmental agencies charged with its implementation. It seems in Canada, the subjects of space law are only aware of the specific legal instruments related directly to their activity and the specific departments charged with overseeing their activity; general awareness of other specific laws, the overall legal framework applicable to space and the organisational elements involved in creating the framework is lacking.

Notwithstanding the significance of the above statements, however, the single most important conclusion to be drawn from the submitted responses is that Canada's existing space regulatory framework is ineffective. Of those who are subject to the specific facets of Canadian space law, none believe they are being regulated effectively. As a justification of their experiences, respondents commented on a number of the existing framework's failings. Whether it is a result of poor drafting, poor implementation, antiquated rules, a lack of competency, a combination of these features or otherwise, the existing system is uniformly failing those to whom it is supposed to be guiding. Based on these responses, it is appropriate to conclude that the Canadian space regulatory framework is not satisfying its most important function of ensuring the space activities of Canadians are safe, sustainable and industrially competitive.

Desire to Improve the Canadian Space Regulatory Framework

The relatively dismal outlook with respect to the effectiveness of the current Canadian space regulatory framework is mitigated by the fact that each and every respondent agreed that the current regulatory framework could be improved. This is a positive revelation because it was possible, even likely, that at least some members of the space community would believe that the

regulations were ineffective and that there was no hope for improvement. The desire to improve the system demonstrates that members of the space community are not against regulation - as may be the case in other industries - but rather they desire an effective regulatory framework. The most likely suggestion on how to improve the regulatory framework was to amend existing laws and create new ones - no one truly believed that repealing all existing space legislation would be an appropriate remedy to the currently ineffective system.

The desire for improved regulation, rather than more limited or no regulation, extends also to new and emerging future space activities as well. The Canadian space community is aware that the next five to twenty years will bring about significant change to its domain and desires a regulatory framework and governmental response that would enable appropriate engagement with this changing global reality. In fact, members of the space community in Canada are also aware of the current fragmented approach to regulating space activities and note that for many future activities existing departmental mandates will simply prove ineffective: there will either be double regulation, overlapping oversight or legislative lacunae in the regulation of these new activities. It is difficult today, even with relatively straightforward space activities, to determine the appropriate department or regulatory agency that has oversight over a specific space activity; the fear is that with more complicated and advanced future activities, this difficulty will be magnified. Ideally, operators of space activities (as well as the government regulators tasked with ensuring compliance) desire clear laws that provide comprehensive guidance and reduce bureaucratic complications. An improvement on the current system, therefore, would first clarify and then streamline the regulatory processes all participants agree is necessary to the proper functioning of the Canadian space sector.

Lack of Consensus on How to Improve the Canadian Space Regulatory Framework

The significant obstacle to overcome, therefore, is how to improve the current regulatory framework. Unfortunately, the same consensus that recognised the need and opportunity for improvement does not exist with respect to how such improvements can be made. Indeed, members of the space community offered very few concrete suggestions on how to make improvements, how to implement such improvements or even how to determine whether improvements had been made. The questionnaire's suggestions with respect to the opportunities to effect legal change were accepted but without any sense of conviction or unanimity. For

example, many respondents provided that it would be advisable to amend existing laws: however, in the majority of cases, they did not identify which laws needed to be amended and, in instances where such identification was made, they did not provide what aspect of the law should be improved or how a specific amendment would amount to an improvement.

Further, most respondents only provided limited feedback on the legislative instruments that directly impacted their space activities rather than commenting on the entire regulatory framework. The likely reason for such a narrow focus is that most members of the Canadian space community are not required to know - or interested in knowing - the specific details about the entire regulatory system to successfully undertake their activities. In many instances, even the regulators of a specific space activity are unaware of the legal instruments or legal system that apply to other space activities; although they are relatively well-versed in the mechanics of their enabling statute and subordinate legislation, their knowledge of the rest of the space law framework and their appreciation for the way their regulatory activities fit into the broader picture of general space activity regulation in Canada is limited. As a result, the suggestions on how to improve any aspect of the regulatory system other than the aspect of which they are actively engaged (and even then, without substantive recommendations) are non-existent.

In such a specialised and siloed regulatory environment, where both space operators and government regulators rarely coordinate with their counterparts associated with space activities other than their own, this lack of general awareness is unsurprising. One suggestion that was advocated for - although, again, without any semblance of consensus from the entire community - is for the creation of either a Department of Space, an interdepartmental committee on space or a high-level space-focused position in the federal cabinet. The hope is that this new entity would spearhead - or at least coordinate - improvements to Canada's space regulatory framework and ensure that the different arms of the Canadian space sector function in line with a singular vision. Although this desire is justifiable and practical, whether it translates into reality is questionable.

General Preference for a Comprehensive Canadian Space Law

When members of the Canadian space community were asked whether they believed a single comprehensive new space law or multiple activity-specific space laws would improve Canada's future regulation of space activities, they overwhelmingly supported the single comprehensive law option. Although some advocated for enacting activity-specific laws to more quickly address

changing realities and more specifically regulate highly-technical activities, more often than not members of the community believed a comprehensive law, if enacted appropriately, could address both of these concerns adequately. In addition, a comprehensive law would avoid further exacerbating the piecemeal approach that currently exists, where separate activities are regulated through separate legislative instruments.

Specifically, the benefits of a comprehensive space law also include an opportunity to reevaluate the constant struggle that exists when regulating space activities: safety and security versus commercial incentivisation. The inference is that a piecemeal approach would require legislators to consider this delicate balance each time a new space law is to come into existence, increasing the likelihood of non-uniformity in Canada's approach to space activity regulation. With a single comprehensive law, as commented on by some respondents, the balance can be determined once and implemented uniformly across all activities. Additionally, by having one legal "entry point", a single comprehensive law would make the Canadian space regulatory system easier to navigate for operators and ensure all activities can be regulated; with a piecemeal approach, there is the potential that some emerging activities fall into regulatory gaps, rendering them non-licenseable and, therefore, non-operable.

One significant concern with a comprehensive space law is that it would take too long to create and be overly broad. The reality is, however, that all laws, whether specific or comprehensive, can fall victim to such legislative ills. Although the bureaucratic machinery of government often operates at a set speed, more specific laws do not necessarily equate to quicker implementation; in fact, it is possible that an extremely specific law would involve considerable detail and require more development time than a more general but comprehensive law. Given the concern that in the short-term Canada's existing laws will not suffice, it may be prudent to undertake a lengthy legislative process once rather than a slightly-shorter-but-still-long process each time a new space activity becomes feasible. Indeed, from the responses generated by the questionnaire, it seems the single most important role of a space law (whether comprehensive or specific) is that it provides appropriate guidance to operators and regulators; the creation process of a new law, although important, is not paramount.

Finally, it is surprising that the questionnaire generated near-consensus results with respect to whether a new space law should be reactive or proactive. In a domain as highly technical and evolutive as space, it was expected that the community (or at least representatives of industry)

would prefer reactive laws such that only after a specific activity had matured and proven feasible would a regulatory framework be developed. Unexpectedly, however, almost the entire Canadian space community desired that future space laws be proactive, such that even before an activity had demonstrated its potential feasibility, the law would be in place to appropriately regulate the activity. One possible explanation for this surprising result is that the space community recognises the necessity of regulation and that no activity may be undertaken without prior authorisation. As a result, knowing the kinds of acceptable activities (or methods of acceptably carrying out such activities) prior to expending considerable sums of financial and technical resources would be better than only finding out after developing the capability to undertake an activity (or method by which to undertake the activity) that such an activity (or method) is unacceptable. The significant follow-up question is: to what extent do members of the space community believe legislators can design a proactive law that anticipates future developments (technical or otherwise) and manages to regulate them appropriately? From reading and considering the various responses to the questionnaire, there is a sense that the desire for proactive legislation is theoretical and aspirational rather than what is realistically expected.

Potential Effect of a New Comprehensive Canadian Space Law

The Canadian space community yearns for an improved space regulatory framework and this is evidenced by their reaction to a hypothetical government announcement of a new space law. The overwhelming response to such a proposed regulatory improvement was that it would signify, at long last, that Canada is taking space seriously. Whether, as various respondents anticipate, it means Canada is "open for business", that space is now considered to be a "national strategic asset" or a sign of impending long-term financial support, the community believes a new space law is clearly a step in the right direction. Although the content of the law would significantly affect its long-term reputation, the optics of its mere introduction would play favourably with the Canadian space community as it would demonstrate that Canada is prepared to engage the new space environment in an internationally competitive manner.

Nevertheless, the Canadian space community's enthusiasm for a new space law ought not be overstated. There is a palpable sense of cautious optimism, highlighted by years of legislative neglect and regulatory disarray. Although the community retains hope that a new law would bring much needed improvements to the regulatory system, there remains a fear that unilateral decision

making by legislators removed from the everyday nuances of space operation, resulting from a lack of appropriate and heartfelt consultations with industry, would end up creating a new but-still-ineffective space regulatory system: calling something by a new name does not change what it is. Since the desire is that a new space law would improve on the existing system, there must first be an introspective analysis of what does and does not work with the existing framework before improvements can be made by introducing a new law; candidly, the Canadian space community seems hesitant that such a meticulous evaluation will take place.

Canadian Leadership in International Space-Related Issues

The Canadian space community is largely in favour of Canada taking a leadership role in international space-related issues although significantly less supportive of it taking on such a role through promotion of international treaty making. The community generally believes there are benefits to Canada being a leader on the international stage with respect to space, most notably as it would be in the nation's overall interests. Specifically, it is inferred that Canada would benefit from a stronger and more engaged commercial space sector that results in national economic growth while simultaneously ensuring international standards lead to the sustainable development of space over the long-term. The latter would be accomplished by Canada repatriating its historical role of coordinating international initiatives and leveraging its reputation as an honest broker. However, the Canadian space community is less enthused about Canada wasting its international political capital on pursuing international treaties related to space, especially given the fact that there is no global appetite for such instruments. Rather, Canada should lead by example and enact a robust and trendsetting domestic space regulatory system that can be emulated in other jurisdictions, thereby influencing international space law in a more grassroots manner.

Conclusion

The responses generated by this questionnaire have allowed for a number of conclusions to be drawn that are representative of the Canadian space community's perspectives with respect to Canada's space regulatory framework. In short, community members whose activities align directly with one or more areas of the space regulatory framework believe it is ineffective but retain hope that improvements can be made. Generally, the community believes the existing regulatory system will be improved more favourably by the enactment of a single comprehensive space law than it does the enactment of multiple activity-specific laws; nevertheless, regardless of

the legislative approach taken, appropriate consultations and industry engagement are necessary to ensure the final legislative decision is appropriate and effective. Although a new approach is welcome, a poorly drafted comprehensive space law or inaccurate activity-specific space laws can have the same stymying effect of the existing regulatory framework.

Chapter 7: National Regulation of Space Activities

Purpose and Outline

The purpose of this chapter is to demonstrate the obligation requiring, the benefits accrued by and the consequences of enacting a comprehensive national space law. To this end, the chapter seeks to provide a comparative analysis of the domestic space laws of various jurisdictions to identify their main characteristics, derive commonalities and determine the ideal features of a national space law. Appendix II is a synthesis of the resulting information and analysis.

The chapter begins with a brief discussion on a space-faring State's responsibility to authorise and continually supervise space activities as well as why such obligations often result in the creation of domestic space-specific laws. The chapter then examines the comprehensive space laws of 23 jurisdictions, followed by discussions on the non-comprehensive regulatory features of an additional 6 jurisdictions. The chapter concludes by analysing the 13 common characteristics shared by nearly all comprehensive national space laws and identifies the ideal forms of each feature for adoption in subsequent space laws.

Comprehensive Regulation of Commercial Space Activities

Although Article 1 of the *Outer Space Treaty*[1] provides States with the freedom to explore and use outer space, subsequent provisions of the treaty temper this freedom by imposing certain restrictions and responsibilities. Article VI saddles State parties with "international responsibility" for activities carried out in space as well as for ensuring that such activities are carried out in conformity with the other provisions of the treaty. Article VI also provides that the outer space activities of non-governmental entities shall require "authorization and continuing supervision by the appropriate State".[2] The historical relevance of such specific language is its reflection of a compromise borne out of the differing opinions of the Union of Soviet Socialist Republics (USSR) and the United States of America (USA) on whether non-governmental entities should be allowed to operate in space. The USSR was firmly of the opinion that only States should be allowed to

[1] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies*, 27 Jan 1967, 610 UNTS 205 [*Outer Space Treaty*].

[2] *Ibid* at Art VI. Although authorisation and supervision are listed as obligations, the *Outer Space Treaty* does not specify how such obligations are to be implemented by States. Rather, individual States are to determine, independently and as appropriate given their national circumstances, how to implement the authorisation and supervision requirements. It is not uncommon in international law for a treaty to establish obligations but leave to State parties the mechanisms by which to implement their obligations. For example, in the landmark 2015 *Paris Agreement* on climate change, the agreement itself merely established broad goals while States were required to independently determine and implement measures to reach their goals (thereafter communicating their successes to the other State parties). *See Paris Agreement*, 12 Dec 2015, UN Doc FCCC/CP/2015/L.9/Rev/1 at Art 4(2).

operate in space whereas the USA, already in 1967, had ambitions that commercial entities to undertake space activities. Although the United Kingdom (UK) proposed a linguistic compromise, which both the USSR and USA rejected in their own subsequent proposals, the USSR proposed the language that stands today, namely that non-governmental entities may carry out activities in space but that States would be responsible for such activities and these activities would be authorised and continually supervised.[3]

Article VI requires an appropriate State to provide authorisation to, and continually supervise, non-governmental entities operating in space. Neither Article VI nor any other provision in the *Outer Space Treaty* (nor any subsequent space treaty) define "authorisation" or "supervision". Although these terms and their corresponding obligations have been interpreted by individual States, and different jurisdictions have taken different approaches to satisfying these requirements[4], fundamentally, all States seem to agree that authorisation requires express permission from a government authority (often concretised in the form of a licence) and that continual supervision requires private operators to maintain open lines of communication with regulators. The *Outer Space Treaty* is also silent with respect to the criteria a State should consider in determining whether a private entity's space activity should be authorised, providing little guidance on what would amount to an acceptable level of "authorisation" (or even "supervision"): for example, it is unclear whether a State satisfies its international obligations by simply "authorising" each and every application it receives (the "rubber stamp" model) or whether it must exercise some discretion related to the safety, security, real prospect of success, etc. of the proposed activity. The same concerns are raised with respect to the degree of "continuing supervision" required of a State: it is unclear whether a State requires investigators and auditors to ensure activities are carried out safely or whether self-reporting requirements are sufficient. Although these questions are not answered directly by the *Outer Space Treaty*, States seem to be heading in the same general direction.

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[3] Michael Gerhard, *Article VI*, in Stephan Hobe, et al, eds, "Cologne Commentary on Space Law: Volume I" (Carl Heymanns Verlag: Luxembourg, 2009) at pp 105-106, paras 3-10. The USSR believed this was an appropriate compromise given its belief that, in the long term, launch capabilities would be run by States, giving them practical control over all space activities. Although private entities currently provide launch services, they still require authorisation and supervision.

[4] For a discussion on whether a State has to enact domestic legislation to fulfill its authorisation obligations, see Valerie Kayser, *Commercial Exploitation of Space: Developing Domestic Regulation*, (1992) XVII Annals of Air & Space L 190.

To the extent that authorisation is carried out at the domestic level by individual States, there are two possible models of space regulation: in the first, States enact a comprehensive space law that applies to all private space activities and then develops specific regulations and appoints specific government organs to implement the authorisation and supervision of specific types of activities, as necessary; in the second, State legislatures constantly enact activity-specific laws to address new and emerging space activities, whereby the space regulatory framework applies in silos to individual activities rather than general space activities. In the first model, the legislature has less of a hands-on role and simply develops the overarching legal framework whereafter regulators choose how exactly to implement the law, while in the second model, the legislature is much more hands-on and constantly prepares legislation to oversee new space activities as they become reality. Each has their advantages and disadvantages and often the model implemented has more to do with the general legal system of the State than anything else.

To date, a significant majority of States have chosen to enact comprehensive domestic legislation related to the regulation of private entities operating in space.[5] These include Norway[6] in 1969, Sweden[7] in 1982, the USA[8] in 1984, the UK[9] in 1986, Argentina[10] in 1991, Russia[11] and South Africa[12] in 1993, Ukraine[13] in 1996, Hong Kong[14] in 1997, Australia[15] in 1998, Belgium[16] and South Korea[17] in 2005, the Netherlands[18] in 2007, France[19] in 2008, Nigeria[20] in 2010,

[5] The following list does not include domestic legislation enacted to create national space agencies or other space-related governmental organisations but rather those laws that establish a regulatory framework to oversee private space activities.
[6] *Act on Launching Objects from Norwegian Territory etc. into Outer Space* (1969).
[7] *Space Activities Act* (1982).
[8] *Commercial Space Launch Act of 1984* and *Land Remote Sensing Commercialization Act of 1984* (1984). In 2009, the US compiled most of its various laws related to space activities into Title 51 of the US Code.
[9] *Outer Space Act 1986* (1986). This law has since been superseded, in part, by the *Space Industry Act* (2018) whereby the 1986 law governs UK space activities overseas and the 2018 law governs domestic UK space activities.
[10] *National Decree No 995/91* (1991). Argentina also passed *National Decree No. 252/96* (1996) regarding the creation of a national registry.
[11] *Law on Space Activities* (1993). Russia also enacted the *Law on Licensing Certain Space Activities* (2001).
[12] *Space Affairs Act* (1993).
[13] *Ordinance on Space Activities* (1996).
[14] *Outer Space Ordinance* (1996).
[15] *Space Activities Act* (1998). This law was significantly amended in 2018 and renamed the *Space (Launches and Returns) Act*.
[16] *Law on the Activities of Launching, Flight Operation or Guidance of Space Objects* (2005). Belgium amended this law by a law of the same name in 2013.
[17] *Space Development Promotion Act* (2005). South Korea also enacted the *Space Liability Act* (2007).
[18] *Space Activities Act* (2007).
[19] *Space Operations Act* (2008).
[20] *National Space Research and Development Act* (2010).

Austria[21] in 2011, Kazakhstan[22] in 2012, Indonesia[23] in 2013, Denmark[24] in 2016, New Zealand[25] and Japan[26] in 2017, Finland[27] in 2018, Portugal[28] in 2019 and the United Arab Emirates[29] in 2020. Therefore, this list of space-regulating States includes both established and emerging space-faring jurisdictions. The chronological order in which they are presented in this chapter is representative of a specific State's recognition for the need to regulate private space activities rather than signifying overall stature in space achievements (for example, even at the time of its enactment of the *Space Activities Act* in 1982, Sweden was far behind Russia in terms of having a space pedigree even though Russia's *Law on Space Activities* was not enacted until 1993). There exist also a number of space-faring States that have not enacted a national domestic space law (such as Brasil, China, Germany and India), some of which are included and discussed in the penultimate section of this chapter.

Among the States listed above, there are a handful of jurisdictions that are relatively well developed, established as space-faring nations and home to a thriving commercial space industry. By and large, these States have a history of regulating private space activities in a manner that focuses on balancing support for industry and protecting other national interests. In many cases these States claim to be defenders of the free market and bastions of capitalism and so their laws are meant to reflect such an economically focussed outlook. Notwithstanding this theoretical similarity, each State has taken a slightly different approach to how they implement their space regulatory framework, depending largely on their unique circumstances and objectives.

Similarly, and likely in response to the growing commercialisation of space, many States not traditionally associated with having an established space program have enacted laws in an effort to create a space regulatory framework for their jurisdictions. As demonstrated below, different jurisdictions have different motivations for establishing their regulatory frameworks related to space: some seek to foster a domestic commercial space industry or encourage the relocation of established space companies to their jurisdiction while others, faced with the

[21] *Outer Space Act* (2011).
[22] *Law on Space Activities* (2012).
[23] *Indonesian Space Act* (2013).
[24] *Outer Space Act* (2016).
[25] *Outer Space and High-Altitude Activities Act* (2017).
[26] *Space Activities Act* (2017).
[27] *Act on Space Activities* (2018).
[28] *Decree Law No 16/2019* (2019).
[29] Law No 12/2019 *on the Regulation of the Space Sector* (2020).

realisation that homegrown private entities are prepared to operate in space, seek to provide the regulatory approval necessary to allow such activities. Notwithstanding the different motivations, the overall legislative response of States is likely guided by the realisation of the significant economic opportunities presented by private enterprise operating in the space domain and the desire of States to capitalise on such opportunities in a manner that satisfies their international regulatory obligations.

Although no two national space laws are the same, a pattern of similarity is evident with respect to laws enacted in the 2010s. One reason for such similarity may be that States have tried to incorporate the recommendations established in the 2013 UN General Assembly Resolution[30] related to national space legislation. Following on from a draft model space law produced in UN COPUOS, the *National Space Law Recommendations*[31] established the common characteristics national regulators may consider implementing, such as the scope of the law, its applicability, the national authorisation and supervision mechanisms, the creation of a space object registry as well as liability and indemnification for damage.[32] Further, it is likely that when deciding to enact a national space law, States look to peers with similar space-faring experiences and capabilities and adopt measures already implemented; by doing so, States ensure that their regulations are relatively ordinary and therefore do not expose them to unforeseen economic, legal or other risks. Unfortunately, this approach all but guarantees that their national space law does not stand out and reduces the likelihood of incentivising private industry to relocate to their jurisdiction.

With respect to the ensuing discussions on individual national space laws, the focus is on presenting the single, overarching domestic space law of each jurisdiction rather than the specific regulations that flow from such a law. Although in some instances explicit discussions about regulations or related laws take place, given the scope of this chapter, such discussions are the exceptions rather than the rule. Indeed, the very function of a comprehensive space law is to create the skeletal outline of the legislative framework rather than provide the details and nuances of how

[30] General Assembly, *Recommendations on national legislation relevant to the peaceful exploration and use of outer space*, United Nations, UN Doc A/RES/68/74, 11 Dec 2013.
[31] Committee on the Peaceful Uses of Outer Space, *Draft model law on national space legislation and explanatory notes*, United Nations, UN Doc A/AC.105/C.2/2013/CRP.6, 26 Mar 2013.
[32] In furtherance of this objective, the United Nations Office for Outer Space Affairs recently launched a program, in partnership with the government of Luxembourg, to assist emerging States with the drafting of national space laws. Office for Outer Space Affairs, *United Nations Office for Outer Space Affairs signed an agreement with the Government of Luxembourg to launch new "Space Law for New Space Actors" project*, United Nations, Press Release, UNIS/OS/523, 13 Nov 2019, online: <http://www.unis.unvienna.org/unis/en/pressrels/2019/unisos523.html>.

regulation will be implemented on a day-to-day basis. Although, generally, most of a country's laws share this feature, it is particularly important in the context of national space laws given the extremely evolutive nature of the activities they oversee: technological developments require that regulators are nimble in their authorising and supervising roles, and subordinate legislation (which comprise the more detailed aspects of a regulatory framework not discussed in this chapter) is better suited to address any fast-paced developments. As such, the discussions and analysis that follow are not meant to evaluate the efficacy of a particular State's national regulatory framework but determine whether the skeletal structure of their national space law (that supports the regulatory framework) is well designed.

Norway (1969)

The first, and shortest, domestic space law was enacted by Norway in 1969.[33] Quite succinctly, it provides that it is forbidden to launch any object into space from Norwegian territory (including external territories), Norwegian vessels or aircraft without prior authorisation from the Norwegian Ministry of Trade and Industry.[34] Additionally, Norwegian nationals cannot launch objects into outer space from areas that are not subject to the sovereignty of any State without prior approval.[35] Given its specificity and brevity, the *Norwegian Space Law* does not apply to any space activities other than launch[36], does not explicitly require registration or insurance, does not discuss questions of liability or indemnification and does not discuss the possible consequences of failing to abide by the established law. However, the *Norwegian Space Law* does provide that the Ministry may issue regulations related to the launch of objects into space.[37] The lack of discussions on the above mentioned issues are unsurprising given that the *Norwegian Space Law* predated the *Liability Convention* (1972) and the *Registration Convention* (1975).[38]

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[33] *Act on launching objects from Norwegian territory etc. into outer space*, No 38, 13 Jun 1969 [*Norwegian Space Law*].
[34] *Ibid* at s 1. The *Norwegian Space Law* itself only refers to the "Ministry", however, this has been identified as the Ministry of Trade and Industry. Frans von der Dunk & Alte Nikolaisen, *Vikings First in National Space Law: Other Europeans to Follow*, (2001) 44 Colloquium on the Law of Outer Space 111 at pp 112, 115 [*von der Dunk & Nikolaisen*].
[35] *Norwegian Space Law*, *supra* note 33 at s 1.
[36] For example, telecommunications, satellite navigation, remote sensing, on-orbit servicing, resource exploitation, etc.
[37] *Norwegian Space Law*, *supra* note 33 at s 2.
[38] Interestingly, the *Norwegian Space Law* came into force two weeks prior to Norway's ratification of the *Outer Space Treaty*. *von der Dunk & Nikolaisen*, *supra* note 24 at p 114.

The Norwegian Space Agency (NOSA) is responsible for organising Norwegian space activities, mainly with respect to ESA and the European Union, as well as for the coordination of national space activities.[39] NOSA is currently preparing a new space strategy as well as an update to Norway's domestic space regulatory framework.[40] Specifically, in a report published in 2017[41], NOSA recognised the *Norwegian Space Law*'s lack of provisions related to authorisation and supervision procedures, as well as issues related to liability and insurance.[42]

Sweden (1982)

In 1982, Sweden enacted its domestic space law[43], with an accompanying decree[44]. The *Swedish Space Law* applies to all activities in outer space, as well as launches and the manoeuvring of space objects in space.[45] A licence is required for all space activities taking place in Sweden or by Swedish nationals (both natural and juridical persons) outside of Sweden.[46] The licence is granted by the Swedish National Space Agency (SNSA)[47] and may have specific conditions attached to it as deemed appropriate.[48] Licence holders are subject to inspection and a licence may be withdrawn.[49] The SNSA exercises control over licensed space activities[50] and maintains the national registry of space objects for which Sweden is the launching State[51]. Undertaking a space

[39] Norwegian Space Agency, *Norwegian Space Agency*, Government of Norway, accessed 3 Dec 2019, online: <https://www.regjeringen.no/en/dep/nfd/organisation/etater-og-virksomheter-under-narings--og-fiskeridepartementet/Subordinate-agencies-and-institutions/norwegian-space-centre/id435114/>. Prior to 2019, the Norwegian Space Agency was known, in English, as the Norwegian Space Centre.

[40] OECD iLibrary, *The Space Economy in Figures: Norway*, Organisation for Economic Cooperation and Development, accessed 3 Dec 2019, online: <https://www.oecd-ilibrary.org/sites/c9916723-en/index.html?itemId=/content/component/c9916723-en&mimeType=text/html>.

[41] The author could not find a copy of this report in English (or any other language).

[42] Ministry of Economic Affairs and Employment, *Government proposal to Parliament for the approval and implementation of the Convention on Registration of Objects Launched into Outer Space and for the Act on Space Activities and the Act on the Amendment of Section 2 of the Lost and Found Objects Act*, Background Information, Government of Finland, accessed 30 Nov 2019, online: <https://tem.fi/documents/1410877/3227301/Government+Proposal+157-2017/21eb1c15-dc28-42bb-9180-a4c4ad4adc42/Government+Proposal+157-2017.pdf> at 16.

[43] *Act on Space Activities*, 18 Nov 1982 [*Swedish Space Law*].

[44] *Decree on Space Activities, 1982* [*Swedish Space Decree*].

[45] *Swedish Space Law*, *supra* note 43 at s 1. Importantly, receiving signals or information from space objects and launching sounding rockets are not designated as space activities.

[46] *Ibid* at s 2.

[47] *Swedish Space Decree*, *supra* note 44 at s 1. The *Swedish Space Law* refers to the National Board for Space Activities (NBSA), the predecessor of the SNSA. In 2018, the NBSA changed to the SNSA.

[48] *Swedish Space Law*, *supra* note 43 at s 3.

[49] *Ibid* at ss 3-4.

[50] *Swedish Space Decree*, *supra* note 44 *at s 2.*

[51] *Ibid* at s 4. In situations where there are more than one launching States, Sweden will only register the space object if such a registration has been agreed to between the concerned States.

activity without a licence or operating in violation of the conditions of licence can result in a prison sentence of up to one year.[52] In situations where Sweden is found liable for damage caused by the space activities of licensed operators, the State is to be reimbursed unless there are "special reasons" to prevent this.[53]

In May 2018, the Swedish government announced its first space strategy, recognising the important growing role of space activities and to respond to the opportunities and challenges posed by new technological capabilities.[54] As part of its strategy, it intends to review the *Swedish Space Law*[55] and update it to attract private equity and international customers.[56] It is therefore possible that amendments to the existing *Swedish Space Law* will be made in the near future.

United States of America (1984)

After quickly falling behind the accomplishments of the USSR at the start of the space race, the US set for itself the goal of becoming the global leader in space[57] and, after concerted effort, accomplished this task with its safe landing and return of humans from the Moon. Although accomplished with a contemporaneously oft-criticised expenditure of public funds, in hindsight, both the vision and resulting successes of American space leadership cannot be overstated. For many years, the US utilised and viewed space primarily as a means of developing and maintaining its geopolitical leadership, national security interests and promoting the development of science

[52] *Swedish Space Law*, *supra* note 43 at s 5.
[53] *Ibid* at s 6.
[54] Swedish National Space Agency, *The Strategy of the Swedish National Space Agency*, Ministry of Education and Research, Government of Sweden, 2018, accessed 3 Dec 2019, online: <httpsp://www.rymdstyrelsen.se/contentassets/3d8de30dbebb406c8f375c267ed04fe8/rymdstrategi-eng_web.pdf> at p 4.
[55] Ministry of Education and Research, *Government launches new space strategy*, Government of Sweden, 9 May 2018, online: <https://www.government.se/press-releases/2018/05/government-launches-new-space-strategy/>.
[56] "Another significant change in the world is that a number of European countries have updated their national space legislation, especially in order to attract private equity to the space sector. An updated Swedish Act on Space Activities would increase the potential to attract private equity to Swedish space activities, having, for example, an impact on the opportunities to attract international customers to Esrange. This lack of an updated Act on Space Activities has a negative impact on the Swedish National Space Agency's stakeholders, complicates the Agency's work and may limit opportunities for looking after Swedish interests in space." Swedish National Space Agency, *The Strategy of the Swedish National Space Agency*, Ministry of Education and Research, Government of Sweden, 2018, accessed 3 Dec 2019, online: <https://www.rymdstyrelsen.se/contentassets/3d8de30dbebb406c8f375c267ed04fe8/rymdstrategi-eng_web.pdf> at p 9.
[57] John Kennedy, *Address at Rice University on the Nation's Space Effort*, John F Kennedy Presidential Library and Museum, 12 Sep 1962, online: <http://www.jfklibrary.org/learn/about-jfk/historic-speeches/address-at-rice-university-on-the-nations-space-effort>.

and technology[58]; its laws, regulations and orders were therefore crafted in light of these overarching space policy objectives. For example, the US promulgation of the 1958 *National Aeronautics and Space Act*[59] was prompted by the launch of Sputnik and the associated fear of a legitimate attack on the US, and the 1962 *Commercial Communications Satellite Act*[60] was intended to provide less economically developed countries with access to telecommunication services to hinder Soviet influence during the Cold War.[61]

Although many of the US's original accomplishments in space were carried out by NASA, private industry played a supporting role.[62] Over time, as space technologies and activities began to develop and find new applications, newer and more diverse laws were adopted to govern the public and private spheres engaged in such activities.[63] For example, the US enacted activity-specific laws meant to address the commercialisation of certain industries (such as launch[64] and remote sensing[65])[66] which were then followed by years of regulatory refinement to better serve the private participants of the marketplace. The dual-intention of refining regulatory processes was to simultaneously clarify and itemise the regulatory process by drawing on the government's growing experience in such fields.[67]

Given the relative nascency of US space law, the diverse nature of space activities and the peculiarities of US law generally, prior to 2009, each of the individual US laws related to space existed within different titles of the US Code.[68] Therefore, in 2009, the Office of Law Revision Counsel proposed to improve the structure of US national space law by gathering and restating

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[58] Paul Dempsey, *Overview of the United States Space Policy and Law*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*Dempsey*] at p 384.
[59] *National Aeronautics and Space Act of 1958*, Public Law No 85-568, 72 Stat 426.
[60] *Commercial Communications Satellite Act of 1962*, Public Law No 87-624, 76 Stat 419.
[61] Joanne Gabrynowicz, *One Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-Term Emerging Issues*, (2010) 4:2 Harvard L and Policy R 405 [*Gabrynowicz*] at pp 406-410.
[62] *Dempsey*, *supra* note 58 at pp 389-390.
[63] *Gabrynowicz*, *supra* note 61 at p 405. "A hallmark of United States national space law is that it tends to follow the development of space technology and geo-political events. Technology that develops into applications tends to catalyze law that addresses the commercialization of the technology."
[64] *Commercial Space Launch Act of 1984*, Public Law No 98-575, 98 Stat 3055.
[65] *Land Remote Sensing Commercialization Act of 1984*, Public Law No 98-365, 98 Stat 451. *See also* Richard DalBello, *The Land Remote Sensing Commercialization Act of 1984*, (1985) 1:3 Space Policy 289 at p 297. "[T]he Remote Sensing Act provides a useful means by which the economic needs of the private sector can be balanced with the legal and political concerns of the international community".
[66] *Gabrynowicz*, *supra* note 61 at pp 411-416.
[67] *Ibid* at pp 415-419.
[68] *Ibid* at p 419. The US Code is the codified body of positive law in the United States, comprised of various Titles with respect to the themes or activities overseen.

existing laws under a common title of the US Code (what is today Title 51) without modification.[69] This codification of space law is significant for two reasons: first, it demonstrates the maturity of US space law (such that it deserves its own Title in the US Code) and second, it more easily represents a model that could be adopted by other countries, thereby spreading US ideals.[70] The US has moved away from a piecemeal-system where activity-specific space laws are enacted individually in favour of a system where a single title provides the law in a user-friendly manner.[71] US Code Title 51 includes seven subtitles and thirty-three chapters.

Generally[72], US space laws require operators to acquire a licence prior to undertaking space activities (whether launch, remote sensing, telecommunications, etc.) and authorities must consider, before issuing licences, the safety and national security implications of such activities.[73] With respect to launch, operations fall within the jurisdiction of the Department of Transportation, specifically, the Office of Space Transportation (OST).[74] All US nationals (citizens and companies) as well as foreign entities (in which US entities have a controlling interest) must obtain a licence to engage in launch activities. The rules applicable to launch differ with respect to human spaceflight and non-human spaceflight, as well as between experimental and operational launch activities. Prior to undertaking launch operations, in addition to the launch provider being licensed, the launch site must also be licensed - if a launch contemplates reentry, a reentry licence is also required.[75] There are strict timelines to administer applications and the OST may suspend or revoke licences as well as approve of licence transfers.[76] Licensees must also abide by the Department of State's International Traffic in Arms Regulations (ITARs) and US Munitions List (USML) requirements.[77]

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[69] Office of the Law Revision Counsel, *Importance of Positive Law Codification*, United States Code: Positive Law Codification, 9 February 2016, online: <http://uscode.house.gov/codification/legislation.shtml>.
[70] *Gabrynowicz*, *supra* note 61 at p 420.
[71] Notwithstanding this codification effort, there remain between 15 and 20 different US laws applicable to space that have not been merged into Title 51, such as telecommunications (Title 14).
[72] It would be outside the scope of this chapter (and the overall project) to examine each of the US space laws in any degree of detail. Nevertheless, general sweeping comments will be made.
[73] Ram Jakhu & Joseph Pelton, "Global Space Governance: An International Study" (Cham: Springer, 2017) [*Jakhu & Pelton*] at p 107.
[74] Petra Vorwig, *Regulation of Private Launch Services in the United States*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*Vorwig*] at pp 405-406.
[75] *Ibid* at pp 405-407.
[76] *Ibid* at p 408.
[77] *Ibid* at pp 416-419.

With respect to communications, the Federal Communications Commission (FCC, an independent regulatory agency) provides oversight of satellite communications activities, allocates spectrum, establishes operating requirements and enforces violations.[78] The characteristics of licensing satellite communications systems differs on the basis of whether a satellite system will be in a geostationary orbit or a non-geostationary orbit and whether it will provide mobile satellite service or fixed satellite service; nevertheless, many of the same licensing provisions apply.[79] In most cases, the FCC establishes specific rules related to the available spectrum for a particular activity and operators are to apply to be granted permission to use such spectrum. Applications can be competitive (with operators seeking spectrum filing public applications to which competitors respond) or on a first-come first-served basis.[80]

With respect to remote sensing, regulations are created and implemented by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA).[81] The main objective of remote sensing regulation is data protection and data preservation for national security reasons as well as national harmonisation with international standards.[82] Significant licensing attention is devoted to the locations being sensed as well as the resolution of the resulting remote sensing products: commercial operators desire wide access and high resolution to remain competitive with international counterparts while regulators seek to ensure the safety and security of the country. The balancing act is delicate and can be contrary to the direct interests of commercial development.[83]

In a never-ending process, the US continues to refine its space laws in hopes of streamlining regulatory processes and stimulating commercial development. Taking the lead are the reincarnated National Space Council (headed by the Vice-President and contributing to US space policy) and the Department of Commerce. In 2018, the Secretary of Commerce announced the department would be moving forward with regulatory reforms to ensure commercial space activities are not held up by regulators when space systems are otherwise ready for operation.[84]

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[78] *Vorwig*, *supra* note 74 at p 421.
[79] *Ibid* at pp 421-423.
[80] *Ibid* at pp 423-438.
[81] Eligar Sadeh, *Politics and Regulation of Earth Observation Services in the United States*, in Ram Jakhu, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*Sadeh*] at p 455.
[82] *Ibid* at pp 443-444.
[83] *Ibid* at pp 457-458.
[84] Jeff Foust, *Commerce Department pressing ahead with commercial space regulatory reform*, SpaceNews, 5 Mar 2018, online: <http://spacenews.com/commerce-department-pressing-ahead-with-commercial-space-regulatory-reform/> [*Foust 1*]. In an earlier announcement, the Secretary argued that "the rate of regulatory change must

The Secretary proposed merging existing government organisations with the Office of Space Commerce to create "a 'one stop shop' for commercial space regulatory activities"[85] and creating an Under Secretary of Space Commerce to oversee currently unregulated non-traditional space activities.[86] In promoting the US internationally[87], the Secretary has focussed on the suitability and regulatory advantages of undertaking commercial space operations in the US. The government's efforts of streamlining regulations or introducing new legislation to promote US space enterprise internationally have garnered widespread support from the commercial space industry, the National Space Council and the President.[88]

One specific focus of regulatory reform of particular interest to commercial entities is that related to export control and munitions lists.[89] These two related foreign policy directives limit the types of products US commercial entities are allowed to export to foreign buyers (including rockets, rocket engines, specific dual-use technologies, etc.). Commercial operators argue tha export controls (significantly affecting space manufacturers) are a hindrance to business development since they severely limit to whom they can sell their products; indeed, many commercial entities located in other jurisdictions do not have similar export controls and can serve the entire global community.[90] Although significant reforms have not yet been introduced, commercial operators are hopeful change is imminent.

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accelerate until it can match the rate of technological change". Jeff Foust, *The Secretary of (Space) Commerce*, The Space Review, 12 Mar 2018, online: <http://www.thespacereview.com/article/3449/1>. A literal application of this mantra would undermine the efficacy of regulation since changing regulations as quickly as technological change undermines the stabilising force of regulation. One of the many benefits of regulation is providing consistency and clarity to industry in what is and is not acceptable. *See* Chapter 5, *The Benefits of Space Regulation*. Nevertheless, the notion that regulations need to represent modern space applications is appropriate.

[85] *Foust 1*, *supra* note 84. The proposed merger would exclude the regulation of space activities already handled efficiently by other government organisations, such as launch and re-entry licensing (Federal Aviation Administration) or spectrum licensing (Federal Communications Commission).

[86] Jeff Foust, *Making space regulations great again*, The Space Review, 26 Feb 2018, online: <http://thespacereview.com/article/3441/1>. This proposal was first put forth by President Obama in his second term, seemingly signalling bipartisan support.

[87] At events such as the SelectUSA Investment Summit, the Paris Airshow and the Space Enterprise Summit. Jeff Foust, *Commerce Department seeks to increase American space industry's global competitiveness*, Space News, 9 Apr 2019, online: <https://spacenews.com/commerce-department-seeks-to-increase-american-space-industrys-global-competitiveness> [*Foust 2*].

[88] *Foust 1*, *supra* note 84.

[89] *Foust 2*, *supra* note 87.

[90] Further, the rationale that preventing the exportation of specific technologies will reduce the likelihood that it falls into the hands of US adversaries is much more difficult to justify in 2020 than it was in 1970 since, for example, there are now a number of other non-American sources from which a bad actor can acquire similar technology.

Unquestionably, the US has the most extensive and developed space law system in the world[91], the underlying reason for which is the size of its private space industry. The US recognised early on the value of legal certainty when promoting the commercialisation of space activities. As a multi-billion dollar industry (projected to continue growing) involving a number of different sectors and participants with varying degrees of sophistication, space regulations maintain a level playing field. Additionally, given the US' position as a world leader, it dedicates large sums of money to research and development projects intended to maintain the technological edge prolonging its leadership role. To this end, the US utilises space-based technologies to remain self-sufficient and avoid relying on outside parties, something it can only achieve through competent leadership.[92]

United Kingdom (1986)

Although the UK has always been involved in space activities it has not always, at the governmental level, been considered a priority.[93] Desiring to comply with its international obligations and create a licensing system for space activities, in 1986 the UK enacted its first domestic space legislation.[94] Although the *1986 UK Space Law* is a comprehensive regulatory framework applicable to space activities, all the licences granted under the law have been limited to the operation of satellites.[95] In 2015, the UK government released its National Space Policy in which it set as one of its goals the creation of a GBP £40 billion (approximately USD $52 billion) space sector.[96] One of the ways in which the UK seeks to make itself a global space hub is by

[91] *Jakhu & Pelton*, *supra* note 73 at p 106.
[92] Anne Wainscott-Sargent, *Senator Nelson on the Way Forward to a Sustainable Space Future*, Via Satellite, Apr 2018, online: <http://interactive.satellitetoday.com/via/april-2018/senator-nelson-on-the-way-forward-to-a-sustainable-space-future/>.
[93] Indeed, it was not until 2010 that the UK Space Agency was created. Sa'id Mosteshar, *Regulation of Space Activities in the United Kingdom*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*Mosteshar*] at p 358.
[94] *An Act to confer licensing and other powers on the Secretary of State to secure compliance with the international obligations of the United Kingdom with respect to the launching and operation of space objects and the carrying on of other activities in outer space by persons connected with this country*, 1986 Ch 38 [*1986 UK Space Law*]. The *1986 UK Space Law* was implemented in various other jurisdictions overseen by the UK (including Hong Kong, the Isle of Man, Jersey, Gibraltar, the Cayman Islands and Bermuda) through additional legislative acts.
[95] Annette Froehlich & Vincent Seffinga,"National Space Legislation: A Comparative and Evaluative Analysis" (Cham: Springer, 2018) [*Froehlich & Seffinga*] at p 22.
[96] Secretary of State for Business, Innovation and Skills, *National Space Policy*, Government of the United Kingdom, 13 Dec 2015, online: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/484865/NSP_-_Final.pdf> at p 4.

developing commercial spaceflight capabilities and, to this end, in 2018 introduced a new law applicable to spaceflight activities to stimulate private industry.[97]

Although the *2018 UK Space Law* amended the *1986 UK Space Law* so that it no longer applies to space activities carried out within the UK[98], the earlier law remains applicable to space launch activities, the operation of a space object or any activity in outer space when conducted from outside of the UK.[99] The purpose of the *1986 UK Space Law*'s licensing regime is to ensure all space activities are conducted in accordance with the UK's international obligations, including those related to liability, registration and remote sensing.[100] The space law applies to all UK nationals[101] and prohibits such individuals from undertaking space activities without first acquiring a licence granted by the Secretary of State for Business, Innovation and Skills (SSBIS).[102] Importantly, the law does not apply to foreign nationals carrying out activities within the UK, a potential regulatory gap.[103] In granting a licence, the SSBIS must take into consideration the public health and safety of persons and property as well as the international obligations and national security interests of the UK.[104] Further, the SSBIS may enact regulations with respect to licence application procedures[105], any fees that may be required to process the application[106] as well as for generally carrying out the *1986 UK Space Law*. A granted licence must describe the activities authorised by it and may impose specific conditions with respect to inspections and other various operator obligations.[107] Licensees may transfer their licence with prior permission of the SSBIS and the SSBIS may revoke, vary or suspend a licence if licence conditions have not been met or doing so would be in the interests of the UK.[108]

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[97] *An Act to make provision about space activities and sub-orbital activities, and for connected purposes*, 2018 Ch 5 [*2018 UK Space Law*].
[98] *2018 UK Space Law*, *supra* note 97 at s 1.
[99] *1986 UK Space Law*, *supra* note 94 at s 1; *Froehlich & Seffinga*, *supra* note 95.
[100] *Mosteshar*, *supra* note 93 at p 359.
[101] *1986 UK Space Law*, *supra* note 94 at s 2. A UK national includes: a British citizen, a British Dependent Territories citizen, a British National (Overseas), a British Overseas citizen, a person who under the M1 British Nationality Act 1981 is a British subject, or a British protected person within the meaning of that Act. Further, by an Order in Council, the act may apply to bodies incorporated in the Channel Islands, the Isle of Man or any dependent territory.
[102] *Ibid* at s 3.
[103] *Froehlich and Seffinga*, *supra* note 95 at p 23.
[104] *1986 UK Space Law*, *supra* note 94 at s 4.
[105] *Ibid* at s 4.
[106] *Ibid* at s 4A.
[107] *Ibid* at s 5.
[108] *Ibid* at s 6.

The SSBIS has the further responsibility of maintaining a register of space objects and shall enter into the national register any space objects the SSBIS deems necessary for the fulfillment of the UK's international obligations.[109] If a justice of the peace deems that there is a sufficient basis to conclude that an individual is undertaking space activities without a licence or that a licensed operator is not complying with their licence conditions, the justice of the peace may issue a warrant authorising anything deemed necessary to bring the individual in compliance with the provisions of the space law.[110] Operators of space activities are required to indemnify the UK government against any claims in respect of damage or loss arising out of activities carried on by the operator; the specific limits of liability are established in the licence when it is being granted by the SSBIS.[111] Individuals who violate certain provisions of the *1986 UK Space Law* are subject to a fine.[112]

The *2018 UK Space Law* functions similarly to the *1986 UK Space Law* albeit with a few notable differences.[113] The law prohibits any person from carrying out spaceflight activities (which includes both orbital and suborbital spaceflight activities[114]) or operating a spaceport from within the UK without a licence.[115] A regulator may grant a licence only if they are satisfied that doing so is not contrary to the national interest, would not impair national security and is consistent with the UK's international obligations.[116] Prior to receiving a licence, operators must demonstrate that they have carried out a "risk assessment" consistent with the prescribed requirements[117] and that all reasonable steps have been taken to ensure risks related to public safety are as low as reasonably practicable[118]. Separate from the required risk assessment, those seeking either a spaceport licence or a launch licence must also provide an "assessment of environmental effects".[119]

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[109] *Ibid* at s 7.
[110] *Ibid* at s 9. This section functions in satisfaction of the UK's obligation to supervisor operators, but the requirements for a warrant from a justice of the peace is unique; most States grant the appropriate government authority with the right to conduct oversight directly through the enacted space law.
[111] *Ibid* at s 10. It has been proposed that the reason for indemnification, aside from recouping money following the payment of an international claim, was to avoid EU competition laws dealing with subsidies. *Mosteshar* at p 361.
[112] *Ibid* at s 12.
[113] For example, the *2018 UK Space Law* applies explicitly to suborbital activities (which are different from space activities). *2018 UK Space Law*, *supra* note 97 at s 1.
[114] *Ibid*.
[115] *Ibid* at s 3.
[116] *Ibid* at s 8. Further, the individual seeking the licence must have the financial and technical resources to conduct the activities being authorised by the licence.
[117] *Ibid* at s 9.
[118] *Ibid* at s 10.
[119] *Ibid* at s 11. Those submitting subsequent applications may rely on previous "assessment of environmental effects" reports.

The regulator may impose any number of conditions on a spaceflight licence and must consult various other government departments before granting such a licence.[120] Licences may be granted for a specific period of time[121] and may be transferred, varied, suspended or terminated as determined by the regulator[122]. The *2018 UK Space Law* considers the practicalities of spaceflight operations and provides the regulator with the right to enact regulations pursuant to the training, qualification and/or medical fitness of individuals taking part in spaceflight operations[123], the safety of spaceflight operations[124] and the security of spaceflight operations[125]. The regulator is responsible for monitoring spaceflight activities and the operation of spaceports and may enact the relevant regulations to carry out such activities.[126]

Operators that cause damage to the UK (whether to persons or property on UK land or in UK waters) are absolutely liable[127] up to the limit established in their licence.[128] Further, operators are required to indemnify the government against any claims brought against it with respect to damage caused by the operator's space activities.[129] Operators may be required to procure insurance with respect to their space activities as determined by the regulator.[130] The *2018 UK Space Law* extends the country's criminal jurisdiction to spacecraft in flight, such that an act or omission that, if carried out in the UK would amount to an offence, are considered to be offences.[131] Individuals violating certain provisions of the space law are subject to fines and/or imprisonment.[132] The law also provides that the SSBIS must maintain a register of launches and that this register may be the same as that which the SSBIS is required to maintain under the *1986 UK Space Law*, thereby registering both launches and space objects in a single register.[133]

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[120] *Ibid* at s 13. Importantly, in deciding what licence conditions to impose, the regulator may recognise or accept a licence from a foreign jurisdiction as part of their assessment.
[121] *Ibid* at s 14.
[122] *Ibid* at s 15.
[123] *Ibid* at s 18.
[124] *Ibid* at s 19.
[125] *Ibid* at s 23. With respect to ensuring security at a spaceport, spaceport licensees are authorised to make by-laws regulating the use and operation of the spaceport. *Ibid* at s 24.
[126] *Ibid* at s 26.
[127] The language provides: "without proof of negligence or intention or other cause of action, as if the injury or damage had been caused by the wilful act, neglect, or default of the operator". *Ibid* at s 34.
[128] *Ibid*.
[129] *Ibid* at s 36.
[130] *Ibid* at s 38. The law provides that the State itself, beyond exempting a licensee from holding insurance, insure the licensee in its own capacity, either by means of insurance, reinsurance or other arrangements.
[131] *Ibid* at s 51.
[132] *Ibid* at s 53.
[133] *Ibid* at s 61.

In the UK, satellite communications are regulated by the Office of Communications and address spectrum management and content regulation through two related schemes: telecommunications[134] and broadcast services[135]. The telecommunication and broadcasting systems are independent of the overarching 1986 and 2018 space laws, primarily because they involve activities that were regulated long before the enactment of the UK's comprehensive space laws. Further, while the UK does not have a specific law that deals directly with the collection and distribution of remote sensing data, any such activity is still subject to national security and privacy laws.[136]

Argentina (1991)

Although Argentina played a prominent role in the negotiation and drafting of the various international space law treaties, its forays into space have been relatively limited.[137] The National Commission on Space Activities (CONAE) is the state agency competent in the design and execution of space programs and entrusted with the drafting of the National Space Plan.[138] CONAE is also responsible for transferring space technology to State entities and the private sector, to train space professionals, to enter into cooperative agreements with various entities (including other States) and to coordinate all national space activities (both public and private).[139] The National Space Plan provides that the primary purpose of undertaking space activities should be for the generation of space data that can be used to benefit society generally; this means it places an emphasis on the creation and use of data more than the development of space technology.[140] To this end, Argentina's role in the development of launch vehicles, for example, has been minimal since launch is viewed merely as an activity secondary to the generation of space data.[141]

Although CONAE is not a regulatory agency by design, it functions that way in practice and adopts resolutions with a wide ranging scope, some of which must be followed for the issuance of operational authorisation.[142] For example, one resolution related to launch requires a

[134] *Communications Act 2003*, 2003 Ch 21.
[135] *Broadcasting Act 1996*, 1996 Ch 55.
[136] *Mosteshar*, *supra* note 93 at p 369.
[137] Julian Hermida, *Regulation of Space Activities in Argentina*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*Hermida 2010*] at p 23.
[138] *Ibid* at p 25. The author has been unable to locate a copy of the Argentinian space plan.
[139] *Ibid*.
[140] *Ibid* at p 26.
[141] *Ibid*.
[142] *Ibid* at p 25.

prospective operator to notify CONAE of their engagement in launch activities and may have to modify their operations to comply with CONAE demands.[143] Given the National Space Plan's prioritisation of data over technological development, a private operator seeking to commercialise a particular space activity may find it difficult to obtain authorisation from CONAE given its lack of interest in such activities and lack of guidelines, standards or related measures meant to provide guidance to private operators.[144] Similarly, there is a clear lack of regulatory guidance on the supervisory role of CONAE insofar as their responsibility to continually supervise space activities. At best, a resolution created to function alongside the national space objects registry[145] provides that CONAE may require an operator to undertake corrective measures when proposing an activity not contemplated by the National Space Plan but to the degree that a governmental authority oversees a space activity or ensures it is carried out in compliance with its authorisation, such does not exist.[146]

Argentina's law enacting the creation of its national space object registry requires that all objects launched from its territory or facility must be registered.[147] The Argentine space object registry requires operators to provide more detailed information than most other national registration systems. In addition to the basic information required under Article IV of the *Registration Convention*, the Argentine registry requires operators to provide information related to the ownership and collateral nature of a space object; the demonstration of an ability to pay compensation for damage caused by a space object; and measures related to the prevention of contaminating outer space, among other things.[148] The regulation of satellite telecommunications, including broadcasting, is overseen by the Secretary of Communications and implemented by the National Communications Commission (CNC); in many respects, CNC's oversight of communication satellites overlaps with CONAE's oversight of space objects leading to a difficult and doubly-burdensome regulatory framework for certain space activities.[149]

[143] *Resolution 330 of 1996*, CONAE; *Hermida 2010*, *supra* note 137 at p 27.
[144] *Hermida 2010*, *supra* note 137 at pp 27-28.
[145] *Resolution 463 of 1997*, CONAE.
[146] *Hermida 2010*, *supra* note 137 at p 29.
[147] *Executive Decree on the National Registry of Objects Launched into Outer Space*, Decree No 125 of 1995.
[148] *Hermida 2010*, *supra* note at p 30.
[149] *Ibid* at pp 30-31.

Russia (1993)

For much of space history, Russia (and its predecessor, the USSR) has been at the forefront.[150] Even today, as its capabilities are matched by other national competitors, Russia remains an active and essential member of the international space community. Traditionally, most Russian space activities have been carried out by the government (often its space agency, ROSCOSMOS) but, like other jurisdictions, this too is changing as more private actors become interested and capable of engaging in space activities.

In 1993, Russia enacted a domestic law directed at regulating space activities for the purpose of developing the economy, science and technology[151], strengthening the defence and security of Russia and for furthering international cooperation[152]. The *Russian Space Law* provides that the President is in charge of developing and implementing space policy[153] and that the federal body of the executive (ROSCOSMOS) shall supervise space activities[154]. The law also provides that a space activity (defined extremely broadly[155]) is subject to licensing in compliance with Russian legislation.[156] Similarly, space technology requires certification in accordance with the requirements established by Russian legislation.[157] The law also provides, explicitly, that Russia retains jurisdiction and control over space objects registered in its national registry and that such ownership remains inviolable.[158] With respect to space activities, all must be implemented by observing the safety requirements established by ROSCOSMOS.[159] Finally, the *Russian Space Law* requires operators to have insurance to cover the life and health of cosmonauts and employees as well as to cover the harm or damage to people or property[160] and any compensation paid by the Russian government for damage caused by an operator must be compensated back to the government for the full amount.[161]

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[150] For example, the Union of Soviet Socialists Republics (the predecessor of modern-day Russia) was the first to launch into outer space a satellite (Sputnik-1), a living being (Laika) and a human (Yuri Gagarin).
[151] *Law on Space Activities*, Decree No 5663-1 of 1993 [*Russian Space Law*] at Art 3.
[152] *Ibid* at Art 4.
[153] *Ibid* at Art 5.
[154] *Ibid* at Art 6. However, with respect to the realisation of State policy for space activities in the interests of defence, the executive power for defense has authority. *Ibid* at Art 7.
[155] *Ibid* at Art 2.
[156] *Ibid* at Art 9.
[157] *Ibid* at Art 10.
[158] *Ibid* at Art 17. If a space activity is carried out in partnership with another foreign individual or entity, the registration is determined on the basis of the relevant international agreements.
[159] *Ibid* at Art 22.
[160] *Ibid* at Art 25. The need for insurance extends to foreign organisations and individuals. *Ibid* at Art 27.
[161] *Ibid* at Art 30.

Russia has also enacted a law that sets out the various responsibilities of an applicant seeking a licence to carry out space activities, including what needs to be submitted along with an application and the grounds by which ROSCOSMOS (as the licensing authority) shall grant such a licence.[162] ROSCOSMOS is afforded 30 days from receiving a completed application to grant or deny a licence[163] and licenses, when granted, are issued for a period of not less than three years[164]. Licenses are not transferable.[165] ROSCOSMOS has the right to monitor licensed space applications and suspend or annul a license[166]; licensees have the corresponding obligation to allow ROSCOSMOS to verify the conditions of a licence[167]. There is a non-refundable licensing application fee[168] and violations of a licence (or conducting space activities without a licence) subject the individual to bear responsibility under the system established by Russian legislation.[169] Russia also has regulations applicable to remote sensing data[170] and a draft order related to the registration of space objects[171].

South Africa (1993)

South Africa's national space program was initiated near the end of its apartheid regime as a means of securing its national security from perceived outside threats, both through launch and reconnaissance capabilities.[172] Following the end of the Cold War and the start of the transition from the apartheid regime, South Africa attempted to re-join the global arena with demonstrations of its peaceful intentions, such as by joining the Missile Technology Control Regime, UN COPUOS and other international organisations.[173] It was during this time, and within this context, that South Africa enacted its domestic space law.[174]

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[162] *Statute on Licensing Space Operations*, Law No 104 of 1996 [*Russian Space Licensing Regulation*] at Arts 5-11.
[163] *Ibid* at Art 12. Additional time may be granted if ROSCOSMOS requires additional expert examination.
[164] *Ibid* at Art 13.
[165] *Ibid* at Art 21.
[166] *Ibid* at Art 22.
[167] *Ibid* at Art 23.
[168] *Ibid* at Arts 28-31.
[169] *Ibid* at Art 33.
[170] *Resolution on the Order of Acquisition, Use and Provision of Geo-Spatial Information*, Law No 326 of 2007.
[171] *Draft Order Regarding the Fulfilment of the State Function of Keeping the Registry of Space Objects*, Oct 2007.
[172] Peter Martinez, *The Development of Space Law in South Africa*, (2015) 64 German J of Air and Space L 353 at pp 353-354 [*Martinez*].
[173] *Ibid* at p 354; Justine Limpitlaw, *Regulation of Space Activities in South Africa*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) at p 268 [*Limpitlaw*].
[174] *Space Affairs Act*, Act No 84 of 1993 [*South African Space Law*]. The *South African Space Law* was amended by the *Space Affairs Amendment Act, 1995*, No 64 of 1994 but such amendments were limited largely to administrative

The *South African Space Law* includes an extensive set of definitions.[175] The Minister of Trade and Industry is identified as the individual responsible for determining the general space policy of South Africa and for overseeing the development, transfer, acquisition and disposal of dual-purpose technologies.[176] The law also establishes the South African Council for Space Affairs (SACSA) which has the responsibility to implement the Minister's enumerated space policy and ensure compliance with South Africa's international obligations: to this end, the SACSA has the authority to issue licences, coordinate with industry, designate knowledgeable people to assist in its work, etc.[177] The *South African Space Law* was prepared and enacted in association with South Africa's law related to the non-proliferation of weapons of mass destruction[178] and so many of the space law's provisions address military and dual-use space technologies[179].

The *South African Space Law* prohibits space and space-related activities without a licence issued by the SACSA and licences are to be issued on the basis of minimum safety standards, the national interest of South Africa and its international obligations.[180] In situations where the SACSA refuses to issue a licence, it must inform the applicant and provide reasons for the refusal.[181] Once a licence has been issued, the SACSA may amend the conditions of the licence, suspend the licence or revoke a licence.[182] In issuing its licence, the SACSA may include conditions related to the liability of licensees for damage as well as security for potential liabilities.[183] Applicants and licensees may appeal a decision of the SACSA to the Minister for Trade and Industry or a court of law.[184] The SACSA has the authority to appoint inspectors to carry out investigative duties to determine whether licencees are acting within the confines of their

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and linguistic changes. *Martinez*, *supra* note 172 at p 356; Julian Hermida, "Legal Basis for a National Space Legislation" (Dordrecht: Kluwer, 2004) [*Hermida 2004*] at p 145.

[175] *South African Space Law*, *supra* note 174 at s 1.

[176] *Ibid* at s 2.

[177] *Ibid* at ss 4-5.

[178] *Non-Proliferation of Weapons of Mass Destruction Act*, Act No 87 of 1993 [*South African Non-Proliferation Law*].

[179] For example, *see South African Space Law*, *supra* note 174 at Art 1 where the law defines "dual-purpose technologies" as space technologies that can contribute to the proliferation of weapons of mass destruction and "weapons of mass destruction" as those defined as such under the *South African Non-Proliferation Law*, *supra* note 178.

[180] *South African Space Law*, *supra* note 174 at s 11. The language of the provision explicitly prohibits launch activities without a licence and includes "any other space or space related activities" as catch-all.

[181] *Ibid*.

[182] *Ibid* at s 13.

[183] *Ibid* at s 14. The language of the act does not provide for insurance explicitly, but the SACSA may require a licensee to demonstrate security for potential damages. *See also Hermida 2004*, *supra* note 174 at p 146.

[184] *South African Space Law*, *supra* note 174 at ss 16-17.

licences.[185] Those violating provisions of the *South African Space Law* face potential fines up to 1 million rand (approximately USD $68,000) and/or up to ten years imprisonment.[186]

Although a national domestic space law, the *South African Space Law* does not so much create a national space regulatory framework as it does establish a governmental authority through which space activities are licensed and supervised.[187] To this end, the *South African Space Law* establishes the responsibilities of the SACSA but does not even establish the guidelines by which future regulations related to its responsibilities are to be drafted. Further, even though liability and security are mentioned, the law does not detail the manner in which claims are to be evaluated or how potential methods of State indemnification would be carried out.[188] Lastly, the law neither discusses the creation of a national space object registry nor the registration of space objects. With respect to the allocation and coordination of radio frequencies, South Africa enacted a dedicated law in 2005[189] as well as a law related to space-based Earth observation data[190]. Finally, South Africa created a national space agency (the South African National Space Agency) in 2008.[191]

Ukraine (1996)

Following the dismantlement of the former USSR, Ukraine inherited a sizable component of the former Union's space capabilities and potential.[192] In the years following independence, Ukraine capably launched a significant number of rockets carrying hundreds of satellites for multiple countries and developed equipment and technology for use by various customers.[193] Since 2014, following Ukraine's conflict with Russia in the Crimea, the Ukrainian space industry

[185] *Ibid* at s 10.
[186] *Ibid* at s 23.
[187] *Hermida 2004*, *supra* note 174 at p 148.
[188] *Ibid*. "Other aspects, such as the mechanism for the reallocation of risks and liability, are merely referred to future regulations or administrative acts but the Act does not even outline the basic guidelines for their future adoption."
[189] *Electronic Communications Act*, Act No 36 of 2005. This law repealed the *Telecommunications Act*, Act No 103 of 1996 and the *Independent Broadcasting Authority Act*, Act No 153 of 1993.
[190] *Spatial Data Infrastructure Act*, Act No 54 of 2003.
[191] *South African National Space Agency Act*, Act No 36 of 2008. A significant role of the South African National Space Agency is advising the Minister of Science and Technology on the creation of a national space science and technology strategy and its implementation of said strategy. The degree to which South African space policy and space strategy differ, and how such distinctions are to be drawn and implemented, remains unclear. *Limpitlaw*, *supra* note 173 at p 279.
[192] Nataliya Malysheva, *Regulation of Space Activities in Ukraine*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*Malysheva*] at p 334; *Hermida 2004*, *supra* note 174 at p 135.
[193] *Malysheva*, *supra* note 192 at p 335.

has been a victim of significant economic difficulties and disruptions to its space industry supply chain.[194]

In 1996, Ukraine adopted a national space law[195], the objectives of which include furthering the socio-economic development and scientific progress of Ukraine, promoting the welfare of its citizens, contributing to solve the problems facing humanity, developing the export potential of the space sector and safeguarding long-term national security and defence interests, among other things.[196] The *Ukrainian Space Law* denotes the Ukrainian National Space Agency (UNSA) as the entity authorised for implementing State policy related to space and tasks it with formulating national space policy for peaceful purposes and in the interests of national security, directing the management and coordination of the work of the space sector, arranging for the licensing of Ukrainian space activities and implementing the registration of space technology, among other things.[197] Without specifying the relevant statutes under which authorities will perform their functions, the law also requires the creation of regulations related to the licensing of space activities, the certification and registration of space facilities, the organisation and execution of launches and environmental protection, among other things.[198]

Ukraine recognises the important role of international participation in space activities and explicitly references the various fundamental principles of undertaking space activities: namely, the strengthening of national sovereignty, developing international partnerships, freedom of foreign commercial activities, integrating Ukraine into the global economy and the legal equality of subjects of space.[199] The law also prohibits a number of specific activities stipulated in Article IV of the *Outer Space Treaty*, such as placing nuclear weapons into orbit or using the Moon for military purposes.[200]

The *Ukrainian Space Law* defines space activity as "scientific space research, the design and application of space technology and the use of outer space" and, notably, chooses to focus on a definition of "space facilities" as opposed to the more popular "space object" when defining the

[194] Space Watch, *Ukraine Passes Commercial Space Law Allowing Private Space Activities in 2020*, Space Watch, accessed Dec 5 2019, online: <https://spacewatch.global/2019/11/ukraine-passes-commercial-space-law-allowing-private-space-activities-in-2020> [*Space Watch*].
[195] *Ordinance of the Supreme Soviet of Ukraine on Space Activity, 15 November 1996* [*Ukrainian Space Law*].
[196] *Ibid* at Art 3.
[197] *Ibid* at Art 6.
[198] *Ibid* at Art 8.
[199] *Ibid* at Art 18.
[200] *Ibid* at Art 9.

subject of the law. Space facilities include both the space and ground segments and infrastructure associated with the exploration and use of space.[201] That law requires any space facility engaging or intending to engage in a space activity to obtain a licence from the UNSA.[202] All space facilities are subject to certification and registration, meaning that the ground segments of a space operation must be certified and registered as well as the physical objects in space.[203] Supervision of space activities are to be carried out by the UNSA.[204] Operators must comply with safety requirements related to the life and health of the public and private property, take necessary measures to prevent environmental damage[205] and take out compulsory insurance to cover their space activities[206]. Liability for damage sustained in the course of space activities, as well as the determination of the compensation that shall be payable, is to be established with existing Ukrainian legislation.[207] Finally, violations of the *Ukrainian Space Law* amount to offences that are punishable by disciplinary, civil-law or criminal penalties.[208]

Many of the provisions in the *Ukrainian Space Law* expressly require the formulation of specific regulations by way of separate legal instruments. Such additional legal prescriptions are necessary to allow the proper guidance for private operators to function within the established legal framework[209]: to date, such regulations have not been adopted. As a possible workaround, in November 2019, the government signed into law amendments to the *Ukrainian Space Law* aimed at inducing the commercialisation of space activities in Ukraine.[210] Generally, the law intends to attract investment by supporting the commercial development of the space sector and clearly establishing rights related to the free exploration and use of outer space, including space

[201] *Ibid* at Art 1.
[202] *Ibid* at Art 10.
[203] *Ibid* at Art 13.
[204] *Ibid* at Art 20.
[205] *Ibid* at Art 21.
[206] *Ibid* at Art 24.
[207] *Ibid* at Art 25.
[208] *Ibid* at Art 29.
[209] Frans von der Dunk & Sergei Negoda, *Ukrainian national space law from an international perspective*, (2002) 18 Space Policy 15 [*von der dunk & Negoda*] at pp 21-22.
[210] Oleksiy Burchevsky, *Ukraine allows private sector involvement in space activities*, Kinstellar, accessed 4 Dec 2019, online: <https://www.kinstellar.com/insights/detail/971/ukraine-allows-private-sector-involvement-in-space-activities>. It should be noted that the existing *Ukrainian Space Law* does not prohibit private actors from engaging in space operations. *See von der Dunk & Negoda*, *supra* note 209 at p 21. Nevertheless, the majority of space activities have been carried out by the State and this law aims to better incorporate commercial space activities. *Space Watch*, *supra* note 194.

resources.[211] The law seeks to reduce the role of supervision by State authorities generally, although certain activities like launch will still require explicit permits.[212] Whether these new amendments have removed the explicit need for additional regulations remains to be seen.

Hong Kong (1997)

Hong Kong has a relatively complicated legal system structured upon UK, Chinese and local rule. Nevertheless, with respect to space activities, Hong Kong passed an ordinance in 1997 to oversee space applications.[213] The *Hong Kong Space Law* requires that a person (or corporation[214]) engaging in launch, the operation of a space object or any activity in outer space, whether from within Hong Kong or outside its territory, first procure a licence from the Chief Executive.[215] Prior to granting a licence, the Chief Executive must ensure that the activity will not jeopardise the health and safety of persons or property, will be consistent with the international obligations of China and will not impact the security of China or Hong Kong.[216] In determining the conditions of licence, the Chief Executive may, but is not required to, place conditions related to the inspection of an operator's facilities and documents; the conduct of space activities with respect to environmental contamination (in space and on Earth) and the harmful interference of other space activities; the final disposal of a payload in space; and the procuring of insurance to protect against liability.[217] Operators are required to indemnify the governments of Hong Kong and China in circumstances where claims are brought against either government for damage caused by the space activities of the operator.[218]

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[211] Ukrinform, *President Zelensky signs law regulating space activities*, Ukrinform, 30 Oct 2019, online: <https://www.ukrinform.net/rubric-economy/2808470-president-zelensky-signs-law-regulating-space-activities.html>. The author has been unable to find a copy of the new law that will make amendments to the *Ukrainian Space Law*, likely since it has not yet come into force, and therefore cannot confirm this claim. If, indeed, the law provides rights related to the acquisition, use and ownership of space resources, the law would make Ukraine just the third country in the world to guarantee such rights.

[212] *Space Watch*, *supra* note 194.

[213] *An ordinance to confer licensing and other powers on the Chief Executive to secure compliance with the international obligations of the People's Republic of China with respect to the launching and operation of space objects and the carrying on of other activities in outer space*, Cap 523, 13 June 1997 [*Hong Kong Space Law*].

[214] *Ibid* at s 5.

[215] *Ibid* at ss 3-4. A party may be exempted from obtaining a licence if the Chief Executive certifies that arrangements have been made between China and another State with respect to China's international obligations. This peculiarity with respect to China's international obligations is derived from Hong Kong's relationship with China.

[216] *Ibid* at s 5.

[217] *Ibid* at s 6. In light of the fact that the Chief Executive may exempt an operator from requiring a licence outright, the decision to make discretionary so many important conditions of licence is interesting.

[218] *Ibid* at s 12.

Licences may be transferred with written consent of the Chief Executive and, in situations where a condition of a licence has not been complied with or in the interests of public health or security, the Chief Executive may revoke, vary or suspend a licence.[219] Prior to granting or revoking a licence, the Chief Executive must provide notice to the Chinese Central People's Government. In turn, the Chinese government may issue an instruction to the Chief Executive on the grounds of national security or upholding its international obligations with which the Chief Executive must comply.[220] The Chief Executive must also maintain a register of space objects and must carry out its related responsibilities in compliance with China's international obligations. The Chief Executive may also issue directions (and use the courts to enforce said directions[221]) in instances where it believes a person is undertaking space activities without authorisation to do so.[222] A person who violates certain provisions of the *Hong Kong Space Law* is guilty of an offence and subject to a fine, although may avail themselves of the defense of having used due diligence and taken all reasonable precautions to prevent the commission of the offence.[223]

Australia (1998)

Australia has long been an active participant in various space activities, with the creation of a test-launch facility developed in a remote southern region as early as 1949. Australia's space activities originally benefited from its geographic location and close relationship with the US, in partnership with whom it still provides tracking and communication services for many of its satellites. Australia had entered into a number of agreements with other States as well, providing access to its territory for the purposes of launch activities.[224] In 1998, realising the potential of a significant commercial space launch industry[225], the government enacted legislation[226] with the intention of ushering in an era of fruitful domestic and international space activity, focussed primarily on launch[227]. Prior to the 1998 law, Australia did not have any specific legislative or

[219] *Ibid* at s 7.
[220] *Ibid* at s 8.
[221] *Ibid* at s 11.
[222] *Ibid* at s 10.
[223] *Ibid* at s 14.
[224] Noel Siemon & Steven Freeland, *Regulation of Space Activities in Australia*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*Siemon & Freeland*] at pp 38-39.
[225] *Froehlich & Seffinga*, *supra* note 95 at p 32.
[226] *Space Activities Act*, Act No 123 of 1998 [*Australian Space Law*].
[227] Ricky Lee, "Regulation of Commercial Space Activities in Australia" (Nijhoff: Leiden, 2010) at p 68.

regulatory framework through which to govern space launch activities; in developing its laws, therefore, it borrowed heavily from the already established US model.[228]

When the government introduced to parliament the draft *Australian Space Law*, it prefaced the need for such a law with the following motivating factors: to attract foreign interest and investment in space launches; to indemnify the government against potential claims of liability; to ensure and promote the safe operation of space activities; and to establish a certain and predictable environment in which to engage in space activities while upholding its international obligations - all of which were to be directed through a comprehensive regulatory framework.[229] The *Australian Space Law* was amended in October 2002 with respect to the provisions on liability as well as the creation of special arrangements for scientific or educational space activities.[230]

Notwithstanding a relatively comprehensive regulatory framework for launch activities, Australia's space industry never truly took off. In October 2015, the government announced it would review its space legislation to assess whether the existing laws remained relevant to current and future space technologies and to provide an appropriate balance between supporting commercial opportunity and upholding its international obligations.[231] The review was intended to examine the regulatory framework's effectiveness in: supporting innovation and the advancement of space technology; promoting entrepreneurship, investment and competitiveness internationally; protecting against liability claims; addressing issues such as space environment management or technology convergence; limiting unnecessary regulatory burden; and providing the necessary authority to support government-led civil space activities.[232] The government sought public submissions to determine whether the regulatory framework was achieving its objectives and commissioned an expert to analyse and provide a report based on the submissions.[233]

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[228] *Ibid*.
[229] *Ibid* at pp 68-69.
[230] *Ibid* at p 76. Changes with respect to scientific and educational space activities were significant in that they considerably reduced the cost of licensing to promote research and development for approved scientific and educational organisations in comparison to commercial space activities. Nevertheless, the regulatory burden remained the same. These changes were carried over through the 2018 amendments.
[231] Department of Industry, Innovation and Science, *Review of the Space Activities Act 1998*, Government of Australia, accessed 9 Mar 2018, online: <http://www.industry.gov.au/industry/IndustrySectors/space/Pages/Review-of-the-Space-Activities-Act-1998.aspx#header>.
[232] Department of Industry, Innovation and Science, *Frequently Asked Questions: Review of the Space Activities Act 1998*, Government of Australia, accessed 17 May 2016, online: <http://www.industry.gov.au/industry/IndustrySectors/space/Pages/Frequently-asked-questions-Review-of-the-Space-Activities-Act-1998.aspx#>.
[233] Steven Freeland, *Analysis Report: Public Submissions into the Australian Government's Review of the Space Activities Act 1998*, August 2016.

In March 2017, the government released its findings and proposals and determined that the *Australian Space Law* was "not well suited to the changing operating environment for space, and was not conducive to providing an appropriate environment for innovation and investment in the sector".[234] Indeed, it found that the existing legislation was inflexible, too complicated and did not appropriately balance the risks associated with space activities with its desire to encourage space-based innovation. The report proposed that instead of amending the existing legislation it create an entirely new regulatory framework.[235] Notwithstanding the suggestion, in 2018 the government introduced wide-sweeping amendments (including a new name[236]) to the existing law.[237] Relatedly, in 2017, the government announced the creation of the Australian Space Agency[238] to guide Australian space activities.[239]

The *Australian Space Law* delimits space as starting 100 km above sea level[240] and prohibits the operation of a launch facility without a licence[241], the launch of a space object without a launch permit[242] and the launch of a high power rocket without a launch permit[243] . Further, the law prohibits the overseas launch of a space object without first obtaining an overseas payload permit.[244] With respect to space objects returning to Earth (whether in Australia or outside Australia), an operator requires a return authorisation certificate to avoid committing an offence.[245] In providing a launch facility licence, the Minister[246] must take into consideration a number of factors, such as the operator's environmental plan, appropriate funding to construct and operate

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[234] Department of Industry, Innovation and Science, *Reform of the Space Activities Act 1998 and associated framework*, Government of Australia, 24 Mar 2017, online: <https://industry.gov.au/industry/IndustrySectors/space/Documents/Legislative-Proposals-Paper.pdf> at p 6.
[235] It suggested the new regulatory framework include "[a] tiered structure which includes an Act, subordinate instruments, and supporting guidance material.... Foundation principles are to be included in the Act, with detail in subordinate instruments (such as legislative instruments), and operational process set out in guidance material." *Ibid* at p 7.
[236] The law changed names from the *Space Activities Act* to the *Space (Launches and Returns) Act*.
[237] Donna Lawlor, *New Space Laws for Australia*, Moonshot Space: Accelerating Humanity, 27 Sep 2019, online: <https://blog.moonshotspace.co/new-space-laws-for-australia-caeedf97a171#_ftn1> [*Lawlor*].
[238] Department of Industry, Innovation and Science, *Turnbull Government to establish national space agency*, Press Release, Government of Australia, 25 Sep 2017, online: <http://minister.industry.gov.au/ministers/sinodinos/media-releases/turnbull-government-establish-national-space-agency>.
[239] Jeff Foust, *Australia to establish national space agency*, SpaceNews, 24 Sep 2017, online: <http://spacenews.com/australia-to-establish-national-space-agency/>.
[240] *Australian Space Law*, *supra* note 226 at s 8. This delimitation is found in the definition of launch.
[241] *Ibid* at s 11.
[242] *Ibid* at s 12.
[243] *Ibid* at s 13.
[244] *Ibid* at s 14.
[245] *Ibid* at ss 15-15A.
[246] The *Australian Space Law* does not specify which Minister has the authority to implement the law.

the launch facility, the probability of harm or damage being caused to people or property and matters related to Australia's security.[247] Launch facility licences cannot be granted for longer than 20 years[248] may be transferred with the approval of the Minister and may be varied, revoked or suspended by the Minister[249].

With respect to granting a launch permit, the Minister may choose to permit the launch of one or more space objects or a series of launches with one or more space objects, as well as the return of such objects.[250] The Minister may include terms related to when a permit expires (whether at a certain time or at the conclusion of a certain event)[251] and must include certain standard terms (related to the likelihood of causing harm, not including weapons of mass destruction, not using a nuclear power source and provisions related to insurance)[252]. Launch permits may be transferred with permission from the Minister and may be varied, revoked or suspended.[253] The type and scope of the provisions that apply to a launch permit also apply, with few variations, to high power rocket permits[254], overseas payload permits[255] and space object return authorisations[256]. The space law provides that applicants for a licence must pay the relevant fees related to the processing of an application, as prescribed[257], and must include a debris mitigation strategy[258].

The *Australian Space Law* requires operators to demonstrate insurance or financial capabilities to cover the potential liability of their space operations up to $100 million (approximately USD $67 million) or the maximum probable loss.[259] With respect to the launch or

[247] *Australian Space Law*, *supra* note 226 at s 18.
[248] *Ibid* at s 19.
[249] *Ibid* at ss 22-26.
[250] *Ibid* at s 28. With respect to the return of a space object, a licensed launch is allowed to return a space object different from what it delivers to space.
[251] *Ibid* at s 29.
[252] *Ibid* at s 30.
[253] *Ibid* at ss 29-36.
[254] *Ibid* at ss 38-46A.
[255] *Ibid* at ss 46B-46K.
[256] *Ibid* at ss 46L-46T.
[257] *Ibid* at s 59. However, the government has not yet established the prescribed fees list and may determine not to impose any fees to avoid undermining the development of smaller space operators. Until the government reaches an official determination with respect to fees, it will not charge fees related to processing applications. *Lawlor*, *supra* note 237.
[258] *Australian Space Law*, *supra* note 226 at s 34.
[259] *Ibid* at ss 47-49. Those simply launching a payload are no longer required to procure separate insurance and may be covered under their launch operator's insurance. Prior to the 2018 amendments, payload operators were required to procure their own insurance and each licence holder (whether for launch or payload operations) had to procure

the return of a space object, the Minister may appoint a Launch Safety Officer to oversee the launch or return activities, ensure no person or property is harmed or damaged and that the launch operator is complying their licence obligations.[260] The party responsible for the launch or return of a space object is liable for damage caused by their space object on Earth or in the air or to another space object; however, the liability is limited to the amount covered by the mandatory insurance.[261] Operators of high power rockets are liable for damage caused on Earth or in the air, up to the amount covered by the mandatory insurance.[262] Operators that violate specific provisions of the law subject a person to up to 10 years imprisonment and/or up to 5,500 penalty units (approximately USD $600,000) or up to 100,000 penalty units (approximately USD $11 million) if a corporation.[263] Finally, the Minister is responsible for maintaining a register of space objects and ensuring the register is publicly available online.[264]

In Australia, telecommunications, radiocommunications and broadcasting are regulated by the Australian Communications and Media Authority by virtue of the *Australian Communications and Media Authority Act*[265] of 2005, which derives its powers from various national laws.[266] There is no formal Australian law related to remote sensing data.[267]

Belgium (2005)

In drafting its domestic space law, Belgium sought to create a regulatory framework appropriate for "a small country without national space assets or space programmes, but with a considerable investment in space" research and development.[268] Historically, much of Belgian space technology was implemented in ESA programs, managed by the regional space agency and thereby leaving the small nation without the need for, and resulting existence of, a national space

coverage of up to $750 million. Further, operators launching their payloads overseas no longer have insurance requirements if the launch service provider is insured. *Lawlor*, *supra* note 237.

[260] *Australian Space Law*, *supra* note 226 at ss 50-58.

[261] *Ibid* at ss 67-69.

[262] *Ibid* at ss 75B-75G.

[263] *Ibid* at ss 13-14, 15-15A. There are general consequences strewn throughout the act with respect to violating specific provisions.

[264] *Ibid* at s 76.

[265] *Australian Communications and Media Authority Act 2005*, Act No 44 of 2005.

[266] *Siemon and Freeland*, *supra* note 224 at pp 57-58.

[267] *Ibid* at p 57.

[268] Jean-Francois Mayence, *Implementing the Recommendations of the United Nations General Assembly on Outer Space Through National Space Legislation: An Illustration with the Belgian Space Law*, in Ram Jakhu, et al, eds, "Monograph Series III: Global Space Governance" (Montreal: CRASL, 2015) at p 654 [*Mayence*].

agency or law.[269] Nevertheless, with the realisation of an impending popularisation of microsatellites by universities and the potential jurisdiction for regional or international space consortiums, Belgium determined the need for a domestic space law.[270] In 2005, Belgium enacted its domestic space law[271] and amended the law in 2013[272]. Generally speaking, the Belgian domestic regulatory framework sought to allow Belgian operators the opportunity to interface with the international space community on the basis of common standards and cooperation.[273]

The *Belgian Space Law* applies to "activities of launching, flight operations[274] and guidance of space objects" undertaken within Belgian jurisdiction or by Belgian nationals[275].[276] The operator is defined as the person who has effective control (itself defined as the "means of control or remote control and the related means of supervision" of space objects) of a space object (and in circumstances where an object cannot be controlled, the person who ordered for the delivery of the space object into orbit[277]).[278] The *Belgian Space Law* requires any person wanting to carry out space activities to first obtain authorisation from the Minister[279].[280] Only with express

[269] *Ibid*.
[270] *Ibid*.
[271] Law of 17 September 2005 on the *Activities of Launching, Flight Operation or Guidance of Space Objects,* Belgian Official Journal, 11 Apr 2008, p 19517 [*Belgian Space Law*].
[272] *Amending Space Act of 1 December 2013*, Belgian Official Journal, 15 Jan 2014, p 1759 [*Belgian Space Law Amendment*].
[273] *Mayence*, *supra* note 268 at p 663. "The Belgian Space Law has been built upon the assumption that international standards and, more generally, international cooperation are the best means of fostering the development of national projects. It is a law designed to make Belgium fully in line with its international obligations and commitments while at the same time resolvedly being oriented towards the rest of the world."
[274] Belgium considers suborbital space flights to be governed by air law rather than space law. Patrick Michielsen, *The Belgian Space Act: An Innovative Legal Safeguard to Boost the Space Industry*, (2016) 41:2 Air and Space L 89 at p 93 [*Michielsen*].
[275] The requirement for a Belgian national (whether personal or juridical) to seek authorisation is limited to situations in which it is "provided for under an international agreement". Therefore, if a Belgian national is carrying out space activities in a jurisdiction with which Belgium does not have an agreement requiring Belgian authorisation, it is presumed the Belgian national may proceed without such authorisation.
[276] *Belgian Space Law*, *supra* note 271 at Art 2. "Flight operation" and "guidance" are collectively defined as an "operation relating to the delivery in orbit, the flying conditions, the navigation or the evolution of the space object in outer space, such as the selection, the control or the correction of its orbit or its trajectory". As a result, it seems that any space activity not amounting to a launch or movement of a satellite (for example, on-orbit servicing or resource exploitation once in an appropriate position) would not require prior authorisation. *Michielsen*, *supra* note 274 at p 95.
[277] This addition came about as a result of the *Belgian Space Law Amendment* which sought to keep pace with technological innovations, specifically, the development and use of small satellites. *Michielsen*, *supra* note 274 at p 94.
[278] *Belgian Space Law*, *supra* note 271 at Art 3.
[279] *Ibid*. The "Minister" is defined as "the Minister with responsibility for space research and its applications in the framework of international cooperation".
[280] *Ibid* at Art 4. Only the operator of a space object is required to seek prior authorisation from the Minister. This suggests that in cases where an operator is contracted to carry out the control and operation of a space object by an

permission from the Minister may an authorisation be transferred from one operator to another.[281] The Minister may impose specific conditions with respect to the authorisation related to the general safety of people and property, protecting the environment, the optimal use of air space and outer space, protecting the strategic, economic and financial interests of the Belgian State and its international obligations.[282] It is not mandatory for operators to take out insurance but the Minister may require insurance to cover damage caused to third parties resulting from an operator's space activities if the Minister deems it necessary.[283] In assessing applications for authorisation, the Minister may avail themselves of outside experts to assist in determining the "reliability, know-how and experience of the operators", among other things.[284] The Minister must notify operators as to the success of their application within 90 days (120 days if clarification from the operator is sought by the Minster) and if no response is given within the appropriate time frame, the application is deemed rejected.[285] The costs of an application are to be borne by the operator.[286]

With respect to environmental considerations, the *Belgian Space Law* requires an environmental impact assessment to take place before authorisation is granted (to assess the potential impact on the Earth and outer space environments of the proposed activity) and the Minister may request additional environmental impact assessment studies to be carried out during or upon the completion of a space activity, the costs of which are borne by the operator.[287] The *Belgian Space Law* recognises that nuclear power sources may be used in undertaking specific space missions but may only grant authorisation after taking into account a number of specific health and safety considerations.[288] The supervision and "control" of the activities being carried out are subject to inspections and checks by experts designated by the Minister, including access

owner or someone with significant financial investment, only the contracted operator must seek authorisation. *Michielsen*, *supra* note 274 at p 95.

[281] *Belgian Space Law*, *supra* note 271 at Art 13.

[282] *Ibid* at Art 5.

[283] *Ibid* at Art 5.

[284] *Ibid* at Art 7.

[285] *Ibid* at Art 9.

[286] *Ibid* at Art 18.

[287] *Ibid* at Art 8. There is a unique focus on the protection of the environment in the Belgian space law, more so than in most other jurisdictions. The requirement for an environmental impact assessment was the result of considerable consideration by the drafters of the law, taking into account not only the physical reentry of space objects but also the very real ecological effects of launches (recognising the importance of the principles enunciated in the *Rio Declaration on Environment and Development*, UN Doc A/CONF.151/26 (1992), especially that environmental protection cannot be managed independently of an activity and must be considered during its development process). *Mayence*, *supra* note 268 at p 659.

[288] *Belgian Space Law*, *supra* note 271 at Art 8.

to documents, information and premises.[289] The Minister may withdraw or suspend an authorisation for any number of reasons.[290]

The *Belgian Space Law* requires the creation of a "National Register of Space Objects" and further requires that all space objects for which Belgium is a launching State be registered in said national register.[291] In situations where Belgium is found liable for damage caused by the space activities of a private space operator, Belgium may counterclaim against the operator (or their insurer) up to a certain limit[292], currently set at 10% of the operator's overall turnover averaged over the preceding three years[293]. When a space object behaves unexpectedly or there is a likelihood of damage to persons, aircraft or other space objects, the operator must inform the government.[294] Any individual carrying out space activities without authorisation are subject to imprisonment up to one year or a fine of up to EUR 25,000 (approximately USD $27,000).[295]

South Korea (2005)

In 2005, recognising the need to promote the development of space, manage the launch of space objects and produce guidelines related to compensation for damage caused by space objects, the South Korean government enacted its first national space law[296].[297] The *South Korean Space Law*, which has been amended a number of times since its enactment[298], is directed towards both establishing a general plan to promote the development of space as well as the regulation of non-governmental space activities.[299] The purpose of the law is to facilitate the use and exploration of space to contribute to national security, grow the national economy and improve the lives of citizens.[300] The law details the extent to which a space plan is necessary for the development of

[289] *Ibid* at Art 10.
[290] *Ibid* at Art 11.
[291] *Ibid* at Art 14.
[292] *Ibid* at Art 15.
[293] *Michielsen*, *supra* note 274 at p 111. This limit is justified on the basis of fair competition between small and large space operators and the desire for private entities not to be forced into bankruptcy as a result of an accident. The fear is that operators under-finance their activities to mitigate their total possible risk although the benefit to the State is that more operators base themselves in Belgium.
[294] *Belgian Space Law*, *supra* note 271 at Art 16.
[295] *Ibid* at Art 19.
[296] *New Space Development Promotion Act*, Law No 7538 of 2005 [*South Korean Space Law*].
[297] Doo Hwan Kim, *Space Law in Korea: Existing Regulations and Future Tasks*, (2008) 57 German J of Air and Space L 571 [*Kim*] at p 575.
[298] The *South Korean Space Law* has been amended 11 times since its enactment in 2005, with the most recent amendment being Act No 15243 of 2017.
[299] *Kim*, *supra* note 297 at p 575.
[300] *South Korean Space Law*, *supra* note 296 at Art 1.

space and illustrates the various means by which a space plan is to be implemented[301]; it provides authority to determine and implement the national space plan to the National Space Committee[302]. Further, it sets out detailed guidelines with respect to identifying and addressing dangers in space, designating a space environment surveillance agency, creating a space accident investigation committee and the dissemination and utilisation of satellite information.[303]

The Minister of Science and ICT (MSICT) has the responsibility of maintaining and managing the national register of space objects.[304] The *South Korean Space Law* requires any person[305] intending to launch a space object to preliminarily register the space object with the MSICT at least 180 days before the scheduled launch date.[306] The application for preliminary registration requires the potential operator to indicate the purpose of the space object, its ownership, orbital information and ability to fulfill the liability requirements that may arise due to damage.[307] An operator who obtains preliminary registration of their space object is still required to register their space object with the MSICT within 90 days of placing their space object into orbit.[308] The MSICT has the responsibility of registering space objects placed into orbit with the UN.[309]

With respect to launch, any person intending to perform a launch from within South Korea or by using a space launch vehicle owned by the South Korean government or a Korean citizen must first obtain permission from the MSICT.[310] The MCIST must take into consideration a number of matters when determining whether to permit a launch, such as its safety and whether the operator has subscribed to compensation liability insurance, may attach conditions prior to permitting a launch[311] and may revoke a launch permit for a number of reasons, such as excessive

[301] *Ibid* at Arts 5-7.
[302] *Ibid* at Art 6.
[303] *Ibid* at Arts 15-17. To this end, South Korean established the Korea Astronomy and Space Science Institute (KASI) in 2015. Youngshin Ahn, *Recent Developments in the Republic of Korea's Space Policy: An Overview of Space Activities and National Laws*, (2019) 44:2 Air and Space L 169 [*Ahn*] at p 180.
[304] *South Korean Space Law*, *supra* note 296 at Art 10.
[305] *South Korean Space Law* at Art 8. This includes South Korean citizens, non-citizens intending to operate from within South Korea or a South Korean space launch vehicle. *See Ahn*, *supra* note 303 at p 177; Setsuko Aoki, *Domestic Legal Conditions for Space Activities in Asia*, (2019) 113 Am J of Int'l L 103 [*Aoki 2019*] at p 105.
[306] *South Korean Space Law*, *supra* note 296 at Art 8.
[307] *Ibid*. The MSICT requires an applicant to rectify their proposed plan if the MSICT determines they would not be able to bear the liability for potential damages.
[308] *Ibid*. This requirement does not exist if the space object is registered with a State with which South Korea has an agreement.
[309] *Ibid* at Art 9.
[310] *Ibid* at Art 11.
[311] *Ibid*.

delay or threat to national security[312].[313] The *South Korean Space Law* further provides that any person who has launched an authorised space object into space is liable for any damage caused by that space object, subject to any prescriptions made in other laws.[314] The *South Korean Space Law* implements the State's international obligations related to the rescue of astronauts and the return of space objects[315] and provides that violations of certain provisions may amount to fines of up to 50 million won (approximately USD $42,000) or imprisonment of up to 5 years.[316]

In 2007, South Korea enacted a law with respect to the State's indemnification for compensation paid as a result of an operator's liability with respect to damage caused by their space object.[317] The purpose of the *South Korean Indemnification Act* is to prescribe the scope of compensation for damage and limitation of liability for damage caused by space objects, thereby preventing victims and contributing to the sound development of space development projects.[318] The indemnification law provides that, in cases where the South Korean government has paid compensation to a foreign government, it may require indemnification by the person who launched the space object that caused damage.[319] In instances where indemnification is sought, the maximum amount to be compensated to the State is limited to 200 billion won (approximately USD $170 million).[320] Any person seeking permission to conduct a launch must first purchase liability insurance for an amount to be determined by the MSICT.[321] The State has one year from the date on which it learns of the damage to act on its right of indemnification.[322]

The *South Korean Space Law* also provides that the MSICT shall adopt measures "to promote space development projects and induce expansion of investments in research and development in the private sector, such as supply of outstanding human resources for space

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[312] *Ibid* at Art 13.
[313] Although the *South Korean Space Law* does require authorisation for space activities, it is silent on the manner in which the State is to continually supervise space activities. *See Ahn*, *supra* note 303 at p 178.
[314] *South Korean Space Law*, *supra* note 296 at Art 14.
[315] *Ibid* at Arts 22-23.
[316] *Ibid* at Arts 27-29.
[317] *Act on Compensation for Damage Caused by Space Objects*, Act No 8714 of 2007 [*South Korean Indemnification Act*]. The law has been amended four times since its enactment, the most recent being Act No 14839 of 2017.
[318] *Ibid* at Art 1.
[319] *Ibid* at Art 3. The law determines the applicability of damage on a strict liability basis. Liability does not attach to manufacturers for damage caused by space objects. *Aoki 2019*, *supra* note 305 at p 107. *But see Ahn*, *supra* note 303 at p 181, where the author suggests fault based liability may apply without providing textual or evidentiary support of such a claim.
[320] *South Korean Indemnification Act*, *supra* note 317 at Art 5.
[321] *Ibid* at Art 6.
[322] *Ibid* at Art 8. Even if it does not learn of the damage caused, the right of indemnification expires after three years.

development, taxational and financial support, preferential purchase".[323] To this end, in 2018, the government implemented a new five-year plan[324] with the explicit focus of transitioning from government-led projects to privately led ones to rapidly grow the Korean commercial space industry.[325]

Netherlands (2007)

Although the Netherlands itself does not have a rich history of State-sponsored or commercial driven space programs, as a State it has consistently advocated for international and multilateral cooperative efforts; to this end, many Dutch entities (including institutions of higher learning and private companies) have developed and contributed space components for larger cooperative missions.[326] In the early 2000s, as a result of growing commercial interest in, and development of, private space operators, the Dutch government began considering the need for a domestic space law.[327] In January 2007, the Dutch government enacted a law that would oversee the regulation of private space activities and the registration of space objects.[328]

The *Dutch Space Law* applies to space activities (which are defined as "the launch, the flight operation or the guidance of space objects in outer space"[329]) performed from within the Netherlands[330], a Dutch ship or Dutch aircraft but is not applicable to Dutch nationals who are performing activities in a State that is not a party to the *Outer Space Treaty*.[331] The Dutch law includes a blanket prohibition on all space activities without first obtaining a licence from the

[323] *South Korean Space Law*, *supra* note 296 at Art 18.
[324] As per the *South Korean Space Law*'s Article 5, a new space plan is to be implemented every five years.
[325] *Ahn*, *supra* note 303 at p 170.
[326] Frans von der Dunk, *Regulation of Space Activities in The Netherlands*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*von der Dunk 2010*] at pp 225-226.
[327] *Ibid* at p 234.
[328] *Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects*, Staatsblad 2007 (80), 24 Jan 2007 [*Dutch Space Law*].
[329] In January 2015, the *Dutch Space Law* was amended to include within its ambit the regulation of "unguided" space objects. *Decree of 19 January 2015 expanding the scope of the Space Activities Act to include the control of unguided satellites (Unguided Satellites Decree)* (2015).
[330] The law does not apply to the territories of Aruba or the Dutch Antilles. *von der Dunk 2010*, *supra* note 326 at p 237.
[331] *Dutch Space Law*, *supra* note 328 at s 2. Although not explicitly stated, it is presumed that the Dutch space law would not apply to Dutch nationals performing space activities in jurisdictions other than the Netherlands that are State parties to the *Outer Space Treaty*. *See von der Dunk 2010*, *supra* note 326 at p 238, suggesting that Dutch nationals operating in a jurisdiction other than the Netherlands that is a State party to the *Outer Space Treaty* would be governed by that State.

Minister of Economic Affairs (MEA)[332].[333] In administering a licence to carry out space activities, the MEA may consider the safety of persons and goods, the protection of the environment in outer space, financial security, security of the State, the Netherlands' international obligations, etc. in addition to the operator requiring insurance to cover the "maximum possible" liability, the amount of which is determined by the MEA. When licences are issued, they are for the duration of the space activity.[334] The MEA has six months to decide on whether or not to grant a licence following an operator's application[335]. There are certain criteria under which the MEA must refuse a licence and others whereby the MEA may refuse a licence[336]; similarly, there are situations in which the MEA must or may revoke a licence that has already been granted.[337] Licences are not transferable, although entries in the national registry may be changed in limited circumstances.[338] Although there are no established fees for the application process, an Order in Council may be decreed to cover the costs of the Dutch government's implementation of the space law (namely, the application process), requiring payment by the applicant/operator.[339]

Operators are required to provide the MEA with the information necessary for maintaining the space object registry, although the registry itself is maintained by the MEA.[340] In circumstances where the Netherlands is required to pay compensation under international law, the government may recover that amount from the operator whose activity caused the damage, up to the amount covered by the operator's insurance.[341] The supervision of space activities is undertaken by the officials designated by the MEA[342] and the Minister may utilise administrative orders and financial penalties in situations where violations have taken place[343].

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[332] *Dutch Space Law*, *supra* note 328 at s 1.
[333] *Ibid* at s 3.
[334] *Ibid*.
[335] *Ibid* at s 5.
[336] *Ibid* at s 6.
[337] *Ibid* at s 7.
[338] *Ibid* at s 8. Changing an entry in the registry does not amount to a transfer but is rather limited to corporations that merge, divide or change operating names.
[339] *Ibid* at s 9. It is likely this language was left vague as the administrative body in charge of administering licences was inexperienced and unaware of the time, work or cost that would be associated with evaluating an application. It was nevertheless anticipated that application costs, if implemented, would amount to a few thousand Euros. *von der Dunk 2010*, *supra* note 326 at p 240.
[340] *Dutch Space Law*, *supra* note 328 at s 11.
[341] *Ibid* at s 12.
[342] *Ibid* at s 13.
[343] *Ibid* at ss 14-23.

France (2008)

Although a country with a significant space industry, including indigenous launch capabilities, France did not have a comprehensive national space law until 2008.[344] Upon enactment, the *French Space Law* prohibited the launch or return of space objects from within its territory as well as outside its territory by French nationals (both natural and juridical persons) without prior authorisation.[345] The law provides for the transfer of a space object but only after receiving prior authorisation.[346] Authorisations are granted only after the administrative authority has determined the "moral, financial and professional guarantees of the applicant", that the systems comply with technical regulations for the safety of persons, property and the environment and that the operations do not jeopardise French national defence or security or France's international commitments.[347] The law does not enumerate the process by which an application is to be made or the grounds to be considered by the administrative authority but provides for the creation of such processes and grounds by the Council of State.[348] The administrative authority may include requirements related to risks posed by space debris to ensure the safety of persons and property.[349]

The *French Space Law* provides that selected individuals may be empowered to ensure the obligations related to a licence are carried out appropriately; namely, the law provides for supervision.[350] Authorisations may be revoked or suspended in instances where the operator violates their obligations or when the activity is likely to jeopardise French national defence interests or the State's international commitments.[351] Operators are required to procure appropriate insurance to cover any liability attributable to the French government, the European Space Agency and its Member States as well as the operator and manufacturer of the space object.[352] Further, operators are absolutely liable for damage caused by their space object on the ground or in airspace and liable only if they are at fault for damage caused anywhere else.[353] The government may bring

[344] *Law of 3 June 2008 on Space Operations*, Law No 2008-518 [*French Space Law*].
[345] *Ibid* at Art 2. France's jurisdiction extends to its territories, including the French Guyana.
[346] *Ibid* at Art 3.
[347] *Ibid* at Art 4. Licences may include in them a set time-period whereby a licensee is determined to satisfy the requirements of moral, financial and professional guarantee.
[348] *Ibid*.
[349] *Ibid* at Art 5.
[350] *Ibid* at Art 7.
[351] *Ibid* at Art 9.
[352] *Ibid* at Art 6.
[353] *Ibid* at Art 13. Claimants have up to one year to bring their claims for damage.

a claim for indemnification against the operator if the government has paid compensation for damage for which the operator was responsible.[354]

The French space agency (CNES) is responsible for maintaining a national space object registry and all space objects to which France has a registration obligation under the *Registration Convention* must be registered.[355] Operators engaged in space-based data acquisition must preliminarily declare certain technical characteristics (resolution, location accuracy, observation frequency band and quality of data) to the competent authority so that the authority may limit the activity if it decides doing so is necessary to safeguard the national defence, foreign policy or international commitments of the State.[356] Individuals who violate specific provisions of the law are subject to a fine of EUR 200,000 (approximately USD $221,000).[357]

Austria (2011)

In 2009, with the impending launch of Austria's first two satellites, the operators sought clarity with respect to the legal regime applicable to Austrian space activities.[358] Recognising a need for legislative action, the Minister for Transport, Innovation and Technology (MTIT) began the two-and-a-half year process of drafting and approving a domestic space law[359] and, in 2011, a comprehensive space law was enacted[360]. The *Austrian Space Law* applies to space activities carried out on Austrian territory, aboard vessels or airplanes registered in Austria or by Austrian nationals (citizens and legal persons seated in Austria) abroad.[361] All space activities (defined as "the launch, operation or control of a space object, as well as the operation of a launch facility"[362]) require authorisation by the MTIT.[363] The authorisation is granted on a number of factors, including the operator's "reliability, capability and expertise", the safety of people and property,

[354] *Ibid* at Art 14. Upper limits to indemnification may be established in an authorisation licence. *Ibid* at Arts 16-17.
[355] *Ibid* at Art 12.
[356] *Ibid* at Arts 23-24.
[357] *Ibid* at Arts 11, 25.
[358] Cordula Steinkogler, *Austrian National Space Law*, Oxford Encyclopedia of Planetary Science, accessed 3 Dec 2019, online: <https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-96>.
[359] Austrian National Point of Contract for Space Law, *Austrian Outer Space Act entered into force*, European Centre for Space Law, accessed 3 Dec 2019, online: <https://www.spacelaw.at/austrian-outer-space-act/>.
[360] *Austrian Federal Law on the Authorisation of Space Activities and the Establishment of a National Space Registry*, 6 Dec 2011 [*Austrian Space Law*].
[361] *Ibid* at s 1.
[362] *Ibid* at s 2.
[363] *Ibid* at s 3.

Austria's national security, foreign policy interests and obligations under international law, and the prevention of harmful contamination to outer space, among others.[364]

Upon receiving an application for authorisation, the MTIT provides a response within 6 months.[365] Operators are required to take out insurance policies covering a minimum of EUR 60 million (approximately USD $66 million), unless the space activity is in the public's interests (defined as space activities that "serve science, research or education"[366]), in which case the MTIT may lower or eliminate the required insurance.[367] The *Austrian Space Law* also requires operators to mitigate space debris in accordance with the "state of the art" and in "due consideration of … internationally recognised guidelines", with specific emphasis for limiting debris during normal operations.[368] Space activities are subject to the supervision of the MTIT and operators are to provide access to the relevant documents and information and make available their business premises for inspection.[369]

Operators are under specific notification requirements with respect to the delay or impossibility of carrying out an authorised space activity and an authorisation may be withdrawn.[370] The MTIT must first approve of a change in operator before a transfer takes place.[371] The MTIT maintains a registry of space objects and enters all space objects for which Austria is considered the launching State.[372] The *Austrian Space Law* explicitly provides that space objects in outer space and on celestial bodies, as well as their personnel, that are registered in Austria remain under its jurisdiction and control.[373] In situations where Austria has paid compensation as a result of damage caused by a space activity, the government has the right of recourse against the operator that caused the damage[374] up to the total sum of the operator's insurance but no less than

[364] *Ibid* at s 4.
[365] *Ibid* at s 6.
[366] *Ibid* at s 4.
[367] *Ibid*. If the operator of a space activity is the government of Austria, insurance is not required.
[368] *Ibid* at s 5.
[369] *Ibid* at s 13.
[370] *Ibid* at ss 6-7. In cases where an authorisation is withdrawn while a space activity is operational, by administrative decision the control of the space activity is conferred to another operator.
[371] *Ibid* at s 8.
[372] *Ibid* at s 9. In situations where there are multiple launching States, the agreement between Austria and the other States determines whether the space object should be registered in the Austrian registry.
[373] *Ibid* at s 9.
[374] *Ibid* at s 11. Interestingly, the *Austrian Space Law* explicitly refers to damage caused on the surface of the Earth or to an aircraft in flight but does not reference damage caused in space. Nevertheless, it is presumed the government has recourse up to the EUR 60 million for damage caused in space as well. Indeed, the Explanatory Note accompanying the *Austrian Space Law* discusses at length the nature of international strict liability for damage caused on Earth or to an aircraft in flight but does not comment on damage that may be caused in outer space. Ministry for

the minimum EUR 60 million requirement[375]. Operators are to reimburse the government for the cost of carrying out the authorisation request.[376] Failing to abide by the provisions of the *Austrian Space Law* will result in a fine of up to EUR 100,000 (approximately USD $110,000) (unless the action is criminal in nature) and undertaking a space activity without authorisation will result in a fine of at least EUR 200,000 (approximately USD $220,000).[377] Although the MTIT is responsible for the implementation of the *Austrian Space Law*, she is entrusted to work alongside its various Ministerial counterparts as it relates to implementing specific provisions of the law.[378]

Kazakhstan (2012)

With a long history of launching objects into space, largely from the Baikonur Cosmodrome[379], Kazakhstan is a space faring nation. Although most of its space activities have been limited to projects led and undertaken by the USSR and Russia, its current relationship with Russia is not viewed as an impediment to developing potential relationships with other nations and/or private entities.[380] Recognising the growing role and utility of space activities, in 2012 Kazakhstan enacted a domestic space law establishing the regulatory framework applicable to the space activities of governmental and non-governmental entities.[381] Kazakhstan recognises that outer space begins 100 km above sea level.[382]

The *Kazakhstani Space Law* sets out as its purpose to: ensure the defence and national security of the country; support the development and economic stimulation of space activities; address issues of compensation for damage caused by space activities; and comply with

Transport, Industry and Technology, *Explanatory Note on Austrian Outer Space Act*, Government of Austria, accessed 3 Dec 2019, online: <https://www.spacelaw.at/documents/2012/Explanatory_Report.pdf> at p 10.

[375] *Austrian Space Law*, *supra* note 360 at s 11. If the damage is due to the operator's fault, there is no limit to the recourse.

[376] *Ibid* at s 12.

[377] *Ibid* at s 14.

[378] *Ibid* at s 17.

[379] Both Sputnik and Yuri Gagarin were launched from the Baikonur Cosmodrome

[380] Abaideldinov Musinovich, et al, *National Law of the Republic of Kazakhstan and International Outer Space Law*, (2015) 6:6 Mediterranean J of Social Sciences 227 [*Musinovich*] at p 227-228. The Baikonur Cosmodrome is currently leased to Russia until 2050.

[381] *Law of the Republic of Kazakhstan on Space Activities*, Law No 528-IV of 2012 [*Kazakhstani Space Law*].

[382] *Ibid* at Art 1.

environmental requirements[383] and obligations under international law.[384] The law also provides guidance on the direction, type and end-users of space activities.[385] The *Kazakhstani Space Law* grants authority to the government to undertake a number of activities with respect to the general field of space activities, including the development of space policy, matters with respect to cosmonaut selection and training and procedures related to specific space activities, among other things.[386] Further, the law allows for the creation of an authorised body with respect to space activities (determined to be the central executive body[387]), tasked with implementing the State's space policy, carrying out scientific research and development work, regulating, licensing and controlling space activities, registering space objects and carrying out international cooperation in space, among other things.[388]

The *Kazakhstani Space Law* applies to all individuals or legal entities performing space activities on the territory of Kazakhstan.[389] Projects requiring the expertise of a specific field must be authorised by industry experts before authorisation may be provided.[390] Space objects owned by individuals or legal entities of Kazakhstan as well as those of foreign individuals or legal entities must be registered.[391] Licenses with respect to space activities are issued in accordance with other Kazakhstani legislation related to licensing.[392] Similarly, the control of space activities is carried out in accordance with a separate Kazakhstani law.[393] The law also has specific provisions dealing with the use of space communication systems[394], remote sensing systems[395], navigation systems[396]

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[383] The *Kazakhstani Space Law* refers specifically to "ecological, sanitary and epidemiological" which the author has chosen to group into "environmental". Although it is possible such specific language is the result of a poor translation, it is likely the specific words were chosen intentionally as they encapsulate, quite vividly, the concepts of environmental and backward contamination. *Ibid* at Art 3.
[384] *Ibid*.
[385] *Ibid* at Arts 4-6. The text uses the language "material and human resource bases" which the author has taken to mean "end-users" as the discussion relates to the use of products derived from space activities.
[386] *Ibid* at Art 8.
[387] *Ibid* at Art 1.
[388] *Ibid* at Art 9.
[389] *Ibid* at Art 1. Although it is not clear whether such individuals must be citizens, the inclusion of the territorial application addresses this concern. The lack of application on the basis of nationality, however, is striking.
[390] *Ibid* at Art 10. The language in this article is unclear and it is possible the author has misunderstood the content, scope or intention of Article 10.
[391] *Ibid* at Art 11.
[392] *Ibid* at Art 13. The *Kazakhstani Space Law*, therefore, does not provide the mechanism through which to regulate a space activity. *Jakhu & Pelton*, *supra* note 73 at p 98-99.
[393] *Kazakhstani Space Law*, *supra* note 381 at Art 12. The law responsible for overseeing space activities is the law *On the state control and supervision in the Republic of Kazakhstan*.
[394] *Ibid* at Art 16.
[395] *Ibid* at Art 17.
[396] *Ibid* at Art 18.

and launch complexes[397]. The law explores the various forms of infrastructure necessary to carry out space activities as well as the methods by which such infrastructure development and supervision is to take place.[398] With respect to safety, the *Kazakhstani Space Law* requires operators to carry out their space activities in line with the rules established by the government authority.[399] With regards to the environment, the government authority is to monitor space activities and operators are to make sure they exercise their activities in accordance with national legislation related to the environment.[400] Certain specific space acts are prohibited: the creation of immediate threats to life or health; placing into orbit weapons of mass destruction; using space engineering to cause harm to the environment; and violating international norms and standards related to pollution.[401] Finally, an entity that violates the provisions of the *Kazakhstani Space Law* is subject to responsibility according to separate laws of Kazakhstan.[402]

Indonesia (2013)

Recognising the unique geographic position of its territory (along the equator, between two continents and oceans and prone to natural disasters) and its significant reliance on space technology, Indonesia enacted in 2013, after ten years of deliberation[403], a national space law.[404] The *Indonesian Space Law* aims to achieve self-reliance and improve the competitiveness of the nation, optimise space activities for the benefit of people, ensure the safety, security and sustainability of space activities, protect against the potential negative consequences of space activities and optimise the implementation of international agreements.[405] The law applies to all space activities carried out within the territory or jurisdiction of Indonesia, all Indonesian citizens and legal entities participating in space activities and foreigners who have a licence to carry out space activities.[406] Although Indonesia only recently enacted a comprehensive space law, its interest and pedigree in space activities dates back to 1963 with the creation of its National

[397] *Ibid* at Art 19.
[398] *Ibid* at Arts 20-26.
[399] *Ibid* at Art 27.
[400] *Ibid* at Art 29.
[401] *Ibid* at Art 30.
[402] *Ibid* at Art 36.
[403] Ida Supancana, *How the Progressive Development of Outer Space Law Affects the Formulation of National Space Legislation: The Experience of Indonesia*, (2015) 4:1 Air and Space L 93 [*Supancana*] at p 93.
[404] *Law on Space Activities*, Law No 21 of 2013 [*Indonesian Space Law*].
[405] *Ibid* at Art 2.
[406] *Ibid* at Art 5.

Aeronautics and Space Institute (LAPAN, the Indonesian equivalent to NASA) and in 1976 when it launched the Palapa communication satellites (making Indonesia the first developing country to do so).[407]

The *Indonesian Space Law* applies to activities involving space science, remote sensing, space technology capabilities, launching and the commercialisation of space and are carried out in account of the safety and security of Indonesians as well as the country's national interests, developing science and technology, the benefits, effectiveness and efficiency of space activities, the protection of the Earth and space environment and international obligations.[408] The law explicitly provides that outer space "is the province of all mankind and carried out for the benefit and in the interests of all countries" and that it is "free for the exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law".[409] Further, the law prohibits the placement of weapons of mass destruction into space, testing such weapons in space, conducting activities that threaten the security and safety of space objects, individuals or the public interest and conduct that may contaminate or cause damage to the Earth and space environments (including the destruction of space objects).[410] The use of space is to be directed towards achieving national objectives and interests, although, in times of emergency or for the sake of defence, the Ministry of Defence may use all of Indonesia's space assets for security purposes.[411]

The *Indonesian Space Law* has specific provisions with respect to space science[412], remote sensing[413], space technology capability[414], launch provisions[415] and spaceports[416]. The law explicitly allows for the operation of commercial space activities by an entity established under

[407] *Supancana*, *supra* note 403 at pp 98-99.
[408] *Indonesian Space Law*, *supra* note 404 at Art 7. In many instances, the language of the *Indonesian Space Law* is not clear; for example, it does not always include the words "shall" or "may" when seemingly appropriate. It is possible this is just a consequence of an imperfect translation of the law into English.
[409] *Ibid* at Art 3.
[410] *Ibid* at Art 8.
[411] *Ibid* at Art 10.
[412] *Ibid* at Arts 9, 11-14. The law provides that the space agency is to make recommendations related to space policy development and to undertake the country's space science research. However, the definition of space agency only provides for "a government institution" and does not specify which government institution is to carry out such activities. Nevertheless, the author presumes this to be the Indonesian space agency LAPAN.
[413] *Ibid* at Arts 15-23.
[414] *Ibid* at Arts 24-33. These articles discuss matters related to the development of rocket technology, satellite technology, aeronautic technology and spin-off technologies. The space agency is to make the transfer of these technologies but it is unclear to whom since the language of the treaty is vague.
[415] *Ibid* at Arts 34-36. Launch activities are to be carried out by the space agency.
[416] *Ibid* at Arts 44-50.

Indonesian law or a foreign enterprise but simply provides that "the requirements and procedures on commercial space activities… shall be regulated by government regulation".[417] The government is to manage and supervise space activities through its regulatory functions[418], including with respect to the establishment of technical norms, standards, guidelines and criteria[419] and all operators are responsible for the security[420] and safety[421] of their space activities. LAPAN is responsible for maintaining the national register of space objects and all space objects launched from Indonesia or by Indonesians must be registered.[422] LAPAN also manages and controls Indonesia's radio frequency spectrum.[423]

The *Indonesian Space Law* provides that operators are absolutely liable for damage caused on Earth or to an aircraft in flight and liable on the basis of fault for damage caused in space[424]; further, operators must compensate the government for damage caused by their activities[425]. The law further provides that in situations where ownership of a space asset has been transferred, liability is also transferred; this suggests that the transfer of space objects is permitted, although the law does not explicitly provide for this.[426] Operators are required to have insurance to cover their liability for damage to third-parties, but the specifics are implemented by way of government regulation.[427] Further, operators are obliged to maintain the preservation of the environment.[428] Finally, to develop space activities in the country, the government is permitted to provide facilities related to the operation of space activities to operators.[429] Individuals who violate specific provisions of the law are subject to administrative sanctions[430], imprisonment up to fifteen years and/or a fine of up to five trillion rupiahs (approximately USD $350 million)[431].

[417] *Ibid* at Art 37.
[418] *Ibid* at Art 41.
[419] *Ibid* at Art 42.
[420] *Ibid* at Art 51.
[421] *Ibid* at Art 52.
[422] *Ibid* at Art 71.
[423] *Ibid* at Arts 101-102.
[424] *Ibid* at Arts 76-77.
[425] *Ibid* at Art 79.
[426] *Ibid* at Art 78.
[427] *Ibid* at Art 84. Interestingly, space assets may be used as objects of security interest. It is assumed that this means that liens and mortgages, for example, can be taken out against a space asset. *Ibid* at Art 85.
[428] *Ibid* at Arts 87-88.
[429] *Ibid* at Art 86.
[430] *Ibid* at Art 94.
[431] *Ibid* at Arts 95-100.

Denmark (2016)

Denmark enacted its *Outer Space Act*[432] in 2016, along with regulations[433], with the express objective of ensuring space activities are carried out in a regulated and safe manner by approving and supervising space activities, registering space objects and clarifying liability for damages.[434] The Danish space law applies to all space activities carried out within Denmark[435] as well as by Danish operators or on Danish craft or facilities outside Denmark.[436] Uniquely, in its definitions section of the law, Denmark defines "outer space" as "space above the altitude of 100 km above sea level"[437] thereby demarcating where its sovereign airspace ends and outer space begins.[438]

Operators seeking to carry out activities in space must first acquire approval from the Minister for Higher Education and Science (MHES) by submitting an application.[439] Applications must include documentation demonstrating the technical expertise and financial capacity of the operator, that the activities will be carried out in a safe manner and in accordance with relevant standards and guidelines, that debris management measures have been taken[440], that the activities do not conflict with the national security and foreign-policy interests nor the international obligations of Denmark, that the activity meets the regulations established by the International Telecommunications Union (ITU) and that it is in compliance with export control regulations.[441] In situations of new or changed circumstances, operators must notify the MHES and it may change or withdraw an otherwise approved authorisation.[442]

The MHES is required to establish and manage a public registry of space objects. The registry is to contain information about space objects launched into space for which Denmark is the launching State. In situations where there are two or more launching States, the MHES is to

[432] *Outer Space Act*, No 409 (2016) [*Danish Space Law*].
[433] *Executive Order on requirements in connection with approval of activities in outer space, etc.*, Executive Order No 552 of 31 May 2016 [Danish Space Regulations].
[434] *Danish Space Law*, *supra* note 432 at s 1.
[435] The *Danish Space Law* does not apply to the Faeroe Islands or Greenland. *Ibid* at s 23.
[436] *Ibid* at s 2.
[437] *Ibid* at s 4.
[438] Although the *Danish Space Law* does not explicitly State that its airspace ends at 100 km, the logical inference is that, at most, its airspace extends to 100 km (although much lower in reality).
[439] *Ibid* at s 5. However, the MHES may grant exemptions from the requirement for such an authorisation as well as an exemption from supervision. *Ibid* at s 18.
[440] Operators may be required to implement established standards and guidelines for space debris management and, as a general rule, the expectation is that 25 year following the functional operation of a space object it should either be deorbited or parked in a graveyard orbit. *Danish Space Regulations*, *supra* note 433 at s 6.
[441] *Danish Space Law*, *supra* note 432 at s 6.
[442] *Ibid* at ss 8-9.

register the space object if it has agreed to with the other launching States. The MHES is to pass on all registration-related information to the Secretary General of the UN.[443] With respect to liability, operators must pay compensation for damage caused by a space object to persons or property on Earth or to an aircraft in flight; for damage caused in space, the operator is liable under the general rules of Danish law on compensation.[444] Denmark may make claims against the operator if it is required to pay compensation in its capacity as a State (pending limitations).[445] The *Danish Space Law* requires operators to take out insurance or in some other way provide security to cover their potential liability from damage caused by their space activities.[446]

Operators may transfer their space objects to another owner or operator only after receiving approval from the MHES; in situations where the transfer is to be granted to an owner or operator of another State, before approving of such a transfer, the MHES may impose requirements that the other State agree to take over Danish liability obligations.[447] The MHES is the responsible governmental authority to supervise private operators and, to this end, owners and operators must provide any information required to fulfill its supervisory obligations as well as access to its premises for the same purpose.[448] The MHES may establish regulations on the payment of costs related to the State's administrative operations[449] and may create a government authority to carry out the tasks and exercise the power afforded to it under the Danish space law.[450] Finally, non-compliance with the provisions of the space law may incur fines and/or imprisonment.[451]

Japan (2016)

Although Japan was the fourth nation to launch a domestically developed rocket into outer space, it did not enact a national space law since almost all of its activities focused on research and development undertaken by governmental entities.[452] It was not until 2008 that Japan introduced

[443] *Ibid* at s 10.
[444] *Ibid* at s 11. However, an operator's liability is capped at approximately EUR 60 million. *Danish Space Regulations*, *supra* note 433 at s 12(1).
[445] *Danish Space Law*, *supra* note 432 at s 12.
[446] *Ibid* at s 13.
[447] *Ibid* at s 15.
[448] *Ibid* at ss 16-17.
[449] *Ibid* at s 19.
[450] *Ibid* at s 20.
[451] *Ibid* at s 21.
[452] Nagai Yuichiro, et al, *Space Governance in Japan*, (2013) 56 Proceedings of the IISL 479 [*Yuichiro*] at pp 479-480.

a law mandating the creation of a Strategic Headquarters for Space Development that was entrusted with establishing a Japanese space policy, including a new overarching space regulatory framework.[453] Prior to this, the only Japanese law related to space activities was that which created and outlined the scope of activities of the Japan Aerospace Exploration Agency (JAXA), the national space agency.[454] The *Basic Space Law* was meant to promote the industrialisation and commercialisation of Japan's space activities, to relax the interpretation of "peaceful use" of outer space from non-military to non-aggressive[455] and to streamline governmental space organisations to suit new economic realities.[456] The ensuing Basic Space Policy established a set of principles intended to guide the promotion of commercialising Japanese space activities, including using space as a tool for realising a secure, safe and affluent society, for strengthening international and national security, for promoting space diplomacy, for advancing strategic space industries and for investing in the next generation.[457]

As per the Basic Space Policy, a new law was drafted for the enactment of an overarching space regulatory framework in 2010 but stalled considerably at the bill stage due to historical parliamentary changes in 2009.[458] Nevertheless, in November 2016, Japan's new national space law was enacted.[459] The purpose of the *Japanese Space Law* is to ensure the development and use of outer space in a manner that ensures public safety by "establishing a system for permission and license related to" space activities "as well as a system for compensation for damage" to "contribute to the improvement of the lives of the citizens as well as the development of the

[453] *Basic Space Law*, Law No 43 of 2008. Even though the *Basic Space Law* is a law, it functions more as a policy document and is therefore not considered to be Japan's first "national space law" in the same way as its later 2016 law and the laws of the other jurisdictions under consideration.
[454] *Law Concerning Japan Aerospace Exploration Agency*, Law No 161 of 2002.
[455] Setsuko Aoki*, Regulation of Space Activities in Japan*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrech: Springer, 2010) at p 217 [*Aoki 2010*]. The *Basic Space Law*'s inclusion of the government's responsibility "to take the necessary measures to promote space development and use to ensure international peace and security as well as to contribute to the national security of Japan" has been understood as transforming Japan's space policy from non-military to non-aggressive.
[456] Setsuko Aoki*, First Basic Space Plan of Japan: What Will be Changed*, (2009) 52 Proceedings of the IISL 413 [*Aoki 2009*] at p 414.
[457] *Ibid* at p 415; *Yuichiro*, *supra* note 452 at p 482.
[458] Setsuko Aoki, *Japanese Space Activities Act in the Making*, (2012) 61:1 German J of Air and Space L 111 [*Aoki 2012*] at p 112.
[459] *Act on Launching of Spacecraft, etc. and Control of Spacecraft*, Act No 76 of 2016 [*Japanese Space Law*].

economy and society".[460] The *Japanese Space Law* provides for the regulation and licensing of the launch of a spacecraft separately but in parallel to the control of a spacecraft.[461]

Every person who intends to launch a spacecraft from within Japan or aboard a Japanese ship or aircraft must first obtain permission from the Prime Minister.[462] The *Japanese Space Law* provides for detailed guidelines on who may apply for a launch licence and under what circumstances the Prime Minister may grant such a licence.[463] Even after obtaining a licence for a launch, an operator must first establish that it has taken "security measures for compensation for damages".[464] Transfers of launch licences are allowed, with certain conditions[465] and the Prime Minister may rescind a licence for any number of reasons.[466] The *Japanese Space Law* also extensively covers the licensing of launch sites and facilities.[467] For launches undertaken by JAXA, it is possible the authorising office will apply simplified procedures.[468]

Individuals intending to control a spacecraft using a spacecraft control facility located in Japan must obtain a licence from the Prime Minister for each spacecraft.[469] Similar to launch licenses, the *Japanese Space Law* provides detailed guidelines on who may apply for a spacecraft control licence and under what circumstances the Prime Minister may grant such a licence.[470] Operators licensed to control a spacecraft must control the spacecraft in a manner that complies

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[460] *Ibid* at Art 1.
[461] For example, there are chapters related to the licensing of a launch vehicle and similar chapters for a licence to control a spacecraft.
[462] *Japanese Space Law*, *supra* note 459 at Art 4. The *Japanese Space Law* does not apply to the activities of people or companies undertaking their space activities from outside Japan. *Aoki* 2019, *supra* note 305 at p 106.
[463] *Japanese Space Law*, *supra* note 459 at Arts 5-8. For example, the Prime Minister must be satisfied of the launch vehicle's safety and the site's safety, approve of the launch plan and the purposes and methods of the spacecraft. *Aoki 2019*, *supra* note 305 at p 106.
[464] The *Japanese Space Law* defines "security measures for compensation for damages" as including insurance or a deposit as approved by the Prime Minister. *Japanese Space Law*, *supra* note 459 at Art 9.
[465] *Ibid* at Arts 10-11.
[466] *Ibid* at Art 12.
[467] *Ibid* at Arts 13-18.
[468] *Ibid* at Art 19.
[469] *Ibid* at Art 20. A "spacecraft control facility" is defined in Article 1 as "the radio equipment used to detect signals indicating the position, attitude and condition of a spacecraft transmitted by spacecraft-borne radio equipment" or to detect the position of the spacecraft using radio or other means.
[470] *Ibid* at Arts 22-23. For example, the Prime Minister must be satisfied that "the purposes and methods of use of the spacecraft comport with UN treaties on outer space and basic principles of" the *Basic Space Law*. *Aoki 2019*, *supra* note 305 at pp 106-107. Further, the spacecraft control operator must ensure that the spacecraft is configured in such a way as to prevent the" dispersion of its component and parts" so that it is "not likely to cause an adverse effect on the prevention of the harmful contamination of outer space including the Moon and other celestial bodies and the prevention of potentially harmful interference with the activities of other countries". *Japanese National Space Law*, *supra* note 459 at Art 22.

with the control place for which the licence was issued[471], except in cases of disaster or other unavoidable situations.[472] Spacecraft control licences may be transferred or cease to be valid[473] and the Prime Minister may rescind a license for a number of reasons.[474]

The Prime Minister may request a licence holder (whether launch or control licence) to provide necessary reports or access to its offices for the purposes of inspecting relevant documents.[475] An operator who, during a launch, causes damage is liable for the damage caused.[476] The government may choose to enter into an indemnification contract with an operator up to an amount covered by compensation (whether insurance or deposit) as determined when issuing the licence.[477] For damage caused by a spacecraft operator with a control licence, the operator is liable.[478] Failing to abide by the provisions of the *Japanese Space Law* may be imprisoned for up to three years and/or a fine of up to 3 million yen (approximately USD $27,000).[479]

In 2018, Japan began investing heavily in its private space sector, announcing a USD $940 million fund to support Japanese start-ups with both direct funding and indirect connections through established investors.[480] Japan also announced it may develop new policies and laws related to the acquisition of extracted resources along the lines of the American and Luxembourgish regulations.[481] Although the existing *Japanese Space Law* does not regulate on this topic directly, it is possible to create additional regulations under the existing law to cover new and emerging activities; of course, such a space application would necessarily require the Prime Minister's sanctioning as all licences must conform to what the Japanese authorities deem to be appropriate and in-line with international norms.

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[471] *Japanese Space Law*, *supra* note 459 at Art 24.
[472] *Ibid* at Arts 24-25.
[473] *Ibid* at Arts 26-29.
[474] *Ibid* at Art 30.
[475] *Ibid* at Art 31.
[476] *Ibid* at Art 35.
[477] *Ibid* at Arts 40-52.
[478] *Ibid* at Art 53.
[479] *Ibid* at Art 60.
[480] Jeff Foust, *New fund to boost Japanese space startups*, Space News, 21 Mar 2018, online: <http://spacenews.com/new-fund-to-boost-japanese-space-startups/>.
[481] Nikkei Staff Writers, *Japan to fuel space startups with $1 billion funding pool*, Asian Review, 20 Mar 2018, online: <https://asia.nikkei.com/Politics-Economy/Policy-Politics/Japan-to-fuel-space-startups-with-nearly-1bn-funding-pool>. The penultimate paragraph of this article states: "Commercial development and land ownership on the moon are not forbidden under the *Outer Space Treaty*, a United Nations document dating to 1967, but Japanese businesses have had difficulty advancing on that front due to complicated standards. Japan probably will draft laws on the American model." From a legal perspective, the notion of purchasing and/or owning plots of land on the Moon is clearly a violation of Article II of the *Outer Space Treaty*.

New Zealand (2017)

Recognising the development of a small satellite marketplace and the need for small satellite launch systems, New Zealand enacted in 2017 a domestic law applicable to launch activities.[482] The law seeks to facilitate the development of a safe and secure space industry, implement New Zealand's international obligations, address concerns of liability and establish a system for the regulation of space activities and high-altitude activities.[483] The law applies both to the government of New Zealand (with the exception of the New Zealand Defence Force)[484] as well as New Zealand nationals (citizens and bodies corporate)[485].

The *New Zealand Space Law* prohibits a person from launching a vehicle from New Zealand or from a vehicle in the air originally launched from New Zealand (such as an aircraft) without a licence.[486] A person may apply for a launch licence from the Minister[487] and the Minister is to grant such a licence upon satisfaction of a number of criteria, including that the applicant is technically capable, public safety is taken into account, there is a debris mitigation plan, New Zealand's international obligations will be followed and it is in the national interest.[488] In addition to including various requirements and conditions related to launch, a launch licence must also contain conditions related to insurance and indemnification against damage caused by the licensee.[489] Launch licenses expire 5 years after being granted although they may be renewed.[490] The Minister may vary, revoke or suspend a launch licence for a variety of reasons.[491] With respect to the registration of a space object, the *New Zealand Space Law* is silent except as to give the Minister the right to make regulations to that effect.[492]

The New Zealand Space Law prohibits a person from procuring the launch of a payload (defined as an object that is carried or placed in outer space[493]) with first obtaining a payload

[482] *Outer Space and High-altitude Activities Act*, Act No 29 of 2017 [*New Zealand Space Law*].
[483] *Ibid* at Art 3.
[484] *Ibid* at Art 6.
[485] *Ibid* at Art 4.
[486] *Ibid* at Art 7.
[487] The *New Zealand Space Law* does not explicitly provide which Minister is responsible to oversee activities, merely stating that the minister under the authority of a warrant or the Prime Minister is responsible for the administration of the law. *Ibid* at Art 4.
[488] *Ibid* at Art 9. Before issuing a licence, the Minister must first consult the security ministers. *But see ibid* at Art 55.
[489] *Ibid* at Art 10.
[490] *Ibid* at Arts 11-12.
[491] *Ibid* at Art 14.
[492] *Ibid at* Art 88. The Minister recommends regulations to the Governor-General for implementation.
[493] *Ibid* at Art 4.

permit.[494] Before granting a permit, the Minister must be satisfied that the operation of a payload is in the national interest, will be managed safely and follow a prescribed debris mitigation plan.[495] Permit holders may be required, at the Minister's discretion, to indemnify the government and purchase insurance against possible claims arising from damage caused by the permit holder's space operation.[496] The Minister may vary, revoke or suspend a payload permit for a variety of reasons. Similarly, a New Zealand national must first obtain an overseas payload permit prior to launching their payload from outside New Zealand.[497] Interestingly, the *New Zealand Space Law*'s requirement for a payload licence only applies to space objects being launched into outer space. Therefore, if a New Zealand national sought to operate a space object that was already in space (either by way of transfer or, in the future, having a space object created in space), the law, as drafted, would not apply.

A New Zealand national seeking to launch a vehicle into space from outside New Zealand must first obtain an overseas launch licence that is similar in nature to the licence required for the launch of a vehicle from New Zealand.[498] Similarly, a person must not launch a high-altitude vehicle from New Zealand without first obtaining a high-altitude licence from the Minister, carrying many of the same requirements as a launch licence.[499] Finally, an individual seeking to operate a launch facility must first obtain a facility licence from the Minister with many of the same requirements and conditions as with the other licences anticipated by the *New Zealand Space Law*.[500] In carrying out their obligations with respect to issuing an overseas licence, the Minister may request any information required for performing their functions.[501] Further, the Minister may take into account an authorisation granted in a country other than New Zealand when determining whether to issue a licence or permit.[502] Licences may only be transferred with prior approval of the Minister and may, in approving the transfer, impose additional conditions.[503]

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[494] *Ibid* at Art 15. A payload permit may be granted for more than one payload at a time, seemingly covering the launch of many satellites operating as a constellation. *Ibid* at Art 16.
[495] *Ibid* at Art 17.
[496] *Ibid* at Art 18.
[497] *Ibid* at Arts 31-37.
[498] *Ibid* at Arts 23-30.
[499] *Ibid* at Arts 45-49. High-altitude is defined as above the highest upper limit of controlled airspace. Although the law does not provide a definition for where "high-altitude" ends and "outer space" begins, they are to be considered distinct zones given the law distinguishes between "space activities and certain high-altitude activities" in Article 3.
[500] *Ibid* at Arts 38-44.
[501] *Ibid* at Art 50.
[502] *Ibid* at Art 51.
[503] *Ibid* at Arts 53-54.

The *New Zealand Space Law* also allows for the appointment of enforcement officers to investigate and enforce compliance with the law[504] and grants them wide powers to carry out their enforcement responsibilities.[505] The law further incorporates the Minister's ability to declare a certain area as segregated to allow for the technological safeguarding of US spacecraft.[506] Individuals who violate certain provisions of the law are subject to an offence with a penalty of up to one year imprisonment or a fine up to NZD $250,000 (approximately USD $165,000).[507] The law also provides that a person intending to develop or acquire missile technology must notify the Minister.[508] Finally, the Minister must review the *New Zealand Space Law* three years from the commencement of the act and must thereafter present the report to the House of Representatives.[509]

Finland (2018)

In 1970, Finland introduced a law[510] incorporating its international obligations under the *Rescue Agreement* into domestic law and for nearly five decades did not enact any subsequent domestic space law. In January 2018, using the recent 2016 Danish space law as a guide[511], Finland enacted its first commercially-oriented space law[512] and accompanying regulations[513].[514] The impetus behind the enactment of this new space law was a recognition of the realities of commercialisation, the miniaturisation of space objects and the opportunities for advanced study and research.[515] Indeed, in the government's proposal to parliament on the adoption of the new

[504] *Ibid* at Art 59.
[505] *Ibid* at Art 60.
[506] *Ibid* at Art 63. This provision is included because of the *Agreement between the Government of New Zealand and the Government of the United States of America on Technology Safeguards Associated with United States Participation in Space Launches from New Zealand dated 16 June 2016*.
[507] *New Zealand Space Law*, *supra* note 482 at Arts 65-75.
[508] *Ibid* at Art 84.
[509] *Ibid* at Art 86. The *New Zealand Space Law* came into force in December 2017 so it is expected that the review report will be presented in early 2021.
[510] *Act on the Rescue and Return of Astronauts and the Return of Space Objects*, 616/1970.
[511] Marjaana Aarnikka, *Nordic cooperation boosts the preparation of the Space Act*, Ministry of Economic Affairs and Employment of Finland, 24 May 2017, online: <https://tem.fi/en/article/-/asset_publisher/pohjoismaisesta-yhteistyosta-vauhtia-avaruuslain-valmisteluun>.
[512] *Act on Space Activities*, 63/2018 [*Finnish Space Law*].
[513] *Decree of the Ministry of Economic Affairs and Employment on Space Activities*, 74/2018 [*Finnish Space Regulations*].
[514] Ministry of Economic Affairs and Employment, *New space legislation*, Government of Finland, accessed 18 Mar 2018, online: <https://tem.fi/en/spacelaw>.
[515] Maija Lonnqvist, *Law for space: Why is a Finnish Space Act needed?*, Ministry of Economic Affairs and Employment, Government of Finland, 8 May 2017, online: <https://tem.fi/en/artikkeli/-/asset_publisher/blogi_avaruuslaki_lonnqvist>.

law, it acknowledged that private space projects and advanced scientific projects were quickly becoming reality and that there was a need for national legislation to authorise such activities.[516] In an assessment conducted in 2016, Finland acknowledged the significant role of its space industry and found that "space technology and space applications generate at least EUR 22 billion [approximately USD $23.4 billion] in turnover, more than 40,000 jobs and EUR 13 billion [approximately USD $13.8 billion] in export earnings (around 20% of Finland's exports)."[517]

Motivated by the likely growth of the commercial space sector, Finland acknowledged that although it would be internationally liable for the activities of its non-governmental entities, it did not have, without domestic legislation, "a clear right of recourse against operators for compensation paid by the State for damage caused by space objects to third parties"[518]. Similarly, without a space law it could not require operators to take out insurance to cover damage caused by their activities.[519] Although the enactment of a space law would help protect and indemnify the interests of the State, Finland equally recognised the beneficial role it would play in the promotion of the private space sector and specifically acknowledged the important balance it would need to achieve between minimising the State's risks and promoting growth of the industry.[520] The *Finnish Space Law*'s objective includes creating a predictable and legally clear operating environment for national space activities (to promote the competitiveness, growth and safe and secure operations of a space industry that would attract new actors and investments to Finland) as well as minimising the State's risks.[521] To this end, the Finnish space law seeks to accomplish the same goals as most other domestic space laws: minimising national harm and maximising commercial opportunity.

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[516] Ministry of Economic Affairs and Employment, *Government proposal to Parliament for the approval and implementation of the Convention on Registration of Objects Launched into Outer Space and for the Act on Space Activities and the Act on the Amendment of Section 2 of the Lost and Found Objects Act*, Background Information, Government of Finland, accessed 30 Nov 2019, online: <https://tem.fi/documents/1410877/3227301/Government+Proposal+157-2017/21eb1c15-dc28-42bb-9180-a4c4ad4adc42/Government+Proposal+157-2017.pdf> at p 1.
[517] *Ibid* at 3.
[518] *Ibid* at 17.
[519] *Ibid*.
[520] Enacting a space law "... creates a clear and predictable operating environment and conditions for future growth for actors in the sector. It is important to find a balance in legislation between the management of the State's risks and favourable operating conditions of enterprises in the sector." *Ibid*.
[521] *Ibid* at 18.

Finland's space law applies to all space activities carried out from within Finland and to all Finish people and legal persons.[522] The Ministry of Economic Affairs and Employment (MEAE) is the government entity responsible for the overall "guidance, monitoring and development"[523] of space activities with the exception of space activities carried out by the Defence Forces[524] and is the entity responsible for the supervision of space activities[525]. The *Finnish Space Law* defines the terms "space activities", "space object" and "operator" in line with their traditionally-accepted interpretations under international law[526] and sets out the specific conditions for authorisation[527]. Importantly, the *Finnish Space Law* prohibits any space activity that is not first authorised by the MEAE.[528] The space law also establishes a public registry of space objects and provides the information operators need to submit to appropriately register their space objects.[529]

The *Finnish Space Law* establishes that damage caused by space objects "shall be paid from State funds" but also provides the State with the right to recover compensation up to a maximum of approximately EUR 60 million (approximately USD $66 million), unless the operator has not complied with the space law, in which case the State may recover more than the maximum.[530] To this end, operators must take out insurance policies for their activities covering the EUR 60 million maximum recovery, unless the MEAE deems otherwise.[531] Further, the space law requires the operator to "have the know-how and experience required" to carry out their space activities "without causing any particular risk to persons, property or public safety".[532] With respect to environmental considerations, operators are to assess and outline in their applications for authorisation the environmental impacts of their activities on Earth, in the atmosphere and in

[522] *Finnish Space Law*, *supra* note 512 at s 1.
[523] *Ibid* at s 2.
[524] *Ibid* at s 3.
[525] *Ibid* at s 14.
[526] *Ibid* at s 4.
[527] *Ibid* at s 5.
[528] *Ibid*.
[529] *Ibid* at s 6. On 15 January 2018, the same day Finland enacted its space law, Finland acceded to the *Registration Convention*. Office for Outer Space Affairs, *Status of International Agreements relating to Activities in Outer Space*, United Nations, accessed 4 Apr 2018, online: <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/status/index.html>.
[530] *Finnish Space Law*, *supra* note 512 at s 7.
[531] *Ibid* at s 8. However, if there is a risk of less than 1/1,000 that there will be an in-orbit collision and a risk of less that 1/10,000 that the space object will not burn up in the atmosphere, an operator may not be required to take out insurance. *Finnish Space Regulations*, *supra* note 513 at s 5.
[532] *Finnish Space Law*, *supra* note 512 at s 9.

space; with respect to the creation of space debris, operators are to restrict the creation of and reduce the likelihood of space debris generation as well as move a space object to "a less used orbit or into the atmosphere" after the completion of its mission[533].[534]

The *Finnish Space Law* foresees the desire of operators to transfer space objects to others and allows for such transfers following approval of the MEAE. In determining whether to authorise the transfer of a Finnish space object to an operator or owner incorporated in another State, the MEAE may first require an agreement related to liability with the other State.[535] The space law requires operators to notify the MEAE of any significant changes which may affect the "conditions for authorisation" upon which the operator acquired its licence[536] and the MEAE is entitled to amend or withdraw an authorisation for a variety of reasons[537]. Further, operators are required to submit an annual report to the MEAE[538].

The *Finnish Space Law* grants the MEAE the right to conduct necessary inspections or have an inspection conducted by an independent expert to ensure operators are complying with their authorisations.[539] Further, in carrying out its responsibilities the MEAE may avail itself of the opinions of independent experts[540] as well as information from other government departments[541] as is necessary to carry out its tasks related to the authorisation of private space activities. The MEAE may also impose conditional fines[542] and operators can be prosecuted under the penal provisions of the Finnish Criminal Code for certain intentional or grossly negligent activity[543]. Finally, operators are entitled to appeal decisions of the MEAE to administrative courts.[544]

[533] The current requirement is for such space objects to be disposed of or moved to a parking orbit within 25 years. *Finnish Space Regulations*, *supra* note 531 at s 3.
[534] *Finnish Space Law*, *supra* note 512 at s 10.
[535] *Ibid* at s 11.
[536] *Ibid* at s 12.
[537] *Ibid* at s 13.
[538] *Ibid* at s 14.
[539] *Ibid* at s 15.
[540] *Ibid* at s 17.
[541] *Ibid* at s 18.
[542] *Ibid* at s 19.
[543] *Ibid* at s 21.
[544] *Ibid* at s 20.

Portugal (2019)

In March 2018, Portugal adopted a long-term space strategy[545] with a key component being the establishment of a spaceport in the Azores for use with low-cost and frequent small satellites launches.[546] In developing the necessary international partnerships and generating domestic interests, the Portuguese government sought to establish an appropriate regulatory framework. Interestingly, in developing a space law, the Portuguese government chose not to regulate the licensing of spaceports, likely due to the specific regulatory needs of a specific spaceport (for example, environmental and noise considerations, security and safety, navigation, etc.).[547] Additionally, the drafters were likely deterred from incorporating such provisions since the envisioned spaceport would be in the autonomous region of the Azores, which requires a specific regional legislative decree.[548] Nevertheless, in January 2019 Portugal enacted a general domestic space law.

The *Portuguese Space Law*'s preface describes that space employed roughly 1,400 people, including 300 highly skilled engineers, and generated EUR 890 million (approximately USD $1 billion) between 2006 and 2015. The government also recognised the new opportunities afforded by the continuing commercialisation of space and, in the Portuguese Space Strategy, recognised the need for a domestic law to help advance the country's space interests. Specifically, it recognises that a new law, while regulating the exercise of space activities, makes the exercise more flexible and adds for streamlined processing in certain situations. This is all done in hopes that a "simple, effective, rigorous and technologically neutral" regulatory process will encourage business development and stimulate research.[549]

The *Portuguese Space Law* applies to space activities (whether considered space operations or launch center operations) carried out on Portuguese territory, under Portuguese jurisdiction or by Portuguese operators, but not those carried out in the context of national defence.[550] The law defines a number of terms, including a "launching site" (an installation intended to launch or return

[545] *Resolution of the Council of Ministers*, No 30/2018 [*Portuguese Space Strategy*].
[546] Mark Holmes, et al, *Analysis on the Portuguese Space Act*, Via Satellite, accessed 3 Dec 2019, online: <http://interactive.satellitetoday.com/via/february-2019/analysis-on-the-portuguese-space-act/> [*Holmes et al*].
[547] *Ibid*.
[548] *Decree Law, No 16/2019* [*Portuguese Space Law*] at Art 27.
[549] *Ibid* at s Preface.
[550] *Ibid* at Art 2. In cases where a Portuguese national is conducting space activities in another jurisdiction, the operator does not need authorisation under the *Portuguese Space Law* if Portugal and the other jurisdiction have an agreement ensuring compliance with international obligations. *Ibid* at Art 4.

space objects), a "space object" (an object launch or intended to be launched into space or the vehicle intended to launch said object into space) and "space operation" (which is subdivided into "launch and/or return operation" and "command and control operation").[551] The "Space Authority"[552] has the responsibility to supervise space activities and, to facilitate the Space Authority's supervisory responsibilities, operators are to grant free access to their premises and facilities, provide all information and assistance requested by the Space Authority and maintain copies of its legal documents related to the licence at its premises in Portugal.[553]

Space activities require a licence for launch and/or return operations as well as for command and control operations.[554] Operators may request prior qualification from the regulating authority (which would dispense with the obligation to provide detailed information contained in the licensing application) by demonstrating, prior to an application for a licence, that they have the technical, economical and financial capacity to carry out their intended space operations as well as additional information.[555] The *Portuguese Space Law* allows for the issuance of two types of space activity licences: unit licences and global licences. Unit licences apply to a single space operation whereas global licences apply to a series of space operations that are of the same type.[556] As with the prior qualification designation, licences themselves are granted upon verification of the technical, economic and financial capacity of the operator, in addition to the operator demonstrating that their space activity will protect the Earth, airspace and outer space from damage, will minimise the creation of debris, is compatible with public safety standards and does not endanger the national security, strategic or international interests of the State.[557] Decisions with respect to a licensing application must be made within 90 days of receiving the completed application.[558]

The *Portuguese Space Law* provides that a special licensing regime may be approved with reduced deadlines and simplified procedures for: public entities or international organisations;

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[551] *Ibid* at Art 3.
[552] Although the space authority has not been identified explicitly in the *Portuguese Space Law*, the new Portuguese Space Agency will be tasked with this responsibility. *Holmes et al*, *supra* note 546.
[553] *Portuguese Space Law*, *supra* note 548 at Arts 22-23.
[554] *Ibid* at Art 4.
[555] *Ibid* at Art 5. Prior qualification may be extinguished for a number of reasons, including changed circumstances or failing to update the regulatory authority with respect to changed circumstances.
[556] *Ibid* at Art 6. Unit licenses are assigned for a specific period of time whereas global licences are assigned for a specific period of time or a specific number of operations. *Ibid* at Art 10.
[557] *Ibid* at Art 7.
[558] *Ibid* at Art 8.

space activities intended solely for scientific, research and development or education purposes; experimental activities that have been shown to have a reduced risk of damage and harm; and activities that have already been authorised by the internationally-compliant legal regime of another State. Operators who are granted a licence must comply with a number of duties: first, they must comply and respect the international principles of space law to which Portugal is bound; second, they must register their space objects with the national registry[559]; third, procure and maintain the compulsory liability insurance[560]; and fourth, provide for and properly protect any damage to Earth and space whether directly or indirectly. Licences may be transferred with prior authorisation by the regulatory authority[561] and may be terminated, expire, waived or revoked.[562] The transfer of registered space objects may be made and the regulating authority must be informed of the transfer.[563]

Operators are liable for damage they cause on Earth, to spacecraft in flight or in space. In situations where Portugal is liable for damage caused by the space object of an operator, the government has a right of recourse to recover the damages it paid up to a certain limit.[564] The *Portuguese Space Law* does not provide a minimum amount of insurance coverage required, leaving such a figure to be determined in a subsequent ordinance. However, the law does provide that the requirement for insurance may be reduced or waived for space activities involving small space objects, for purely scientific, research and development or education and training purposes, if the operator can provide another financial guarantee or for activities that are proven to pose reduced risks.[565] Failing to abide by any number of the provisions established in the *Portuguese Space Law* amount to contraventions with associated fines.[566]

United Arab Emirates (2020)

Over the last several years, the UAE has invested considerable resources and energy into space, including the creation of a National Plan for the Promotion of Space Investment which will,

[559] *Ibid* at Art 16.
[560] *Ibid* at Art 19.
[561] *Ibid* at Art 11.
[562] *Ibid* at Arts 12-15
[563] *Ibid* at Art 17.
[564] *Ibid* at Art 18. The *Portuguese Space Law* does not provide a set specific limit, leaving such a figure to be determined by a subsequent ordinance. However, if the damage is a result of the operator's gross negligence or for failing to comply with the law, there is no recourse limit.
[565] *Ibid* at Art 19.
[566] *Ibid* at Arts 24-26.

under the auspices of the UAE Space Agency, invest Emirati money in domestic and foreign space ventures as well as encourage the investment of foreign money into Emirati space projects.[567] Indeed, prior to the creation of this national plan, over a relatively short period of time, the UAE made significant advances in the domain of space: it launched and now operates a number of satellites in low Earth orbit[568], is preparing to launch a satellite destined for Mars[569] and has committed to settling Mars (as part of an international effort) over the next 100 years.[570] In early 2020, after several years of preparation and discussion, the United Arab Emirates (UAE) enacted a comprehensive national space law[571], the first in the Middle East and North Africa region.[572]

The newly created legal framework will facilitate the UAE's continued engagement of the space domain with increased commercial participation. Prior to its release, there was significant discussion related to whether the UAE would enact a space law applicable only to space resource utilisation (in a manner similar to the laws of Luxembourg and the US[573]) or whether it would enact a comprehensive space law. Upon its release, it became clear the UAE had selected the latter approach, drafting legislation that is broad and applicable to more than one space activity. The *Emirati Space Law* establishes at the outset its objectives, namely, promoting private and academic space activities, supporting the long-term stability and sustainability of space activities and upholding the State's international commitments related to space.[574] The extensive definition section includes a delimitation of eighty kilometers[575], distinguishing between orbital and sub-orbital space flights and other common terms.[576]

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[567] Jeff Foust, UAE to establish space investment plan, Space News, 22 Jan 2019, online: <https://spacenews.com/uaeto-establish-space-investment-plan>.
[568] Government of Dubai, Dubai Sat 1, Mohammed bin Rasheed Space Center, online: <https://mbrsc.ae/en/page/dubai-sat-1>.
[569] Government of Dubai, Hope Mars Probe, Mohammed bin Rasheed Space Center, online: <https://mbrsc.ae/en/page/mars-probe>.
[570] Andrew Blum, Oil won't last forever, so Dubai is betting big on science and tech, Popular Science, 15 May 2017, online: <http://www.popsci.com/dubai-science-tech-innovation>.
[571] *On the Regulation of the Space Sector, Federal Law No 12 of 2019* [*Emirati Space Law*].
[572] Sarwat Nasir, UAE's national space law comes into effect, The National, 24 Feb 2020, online: <https://www.thenational.ae/uae/science/uae-s-national-space-law-comes-into-effect-1.983817>.
[573] Lucy Barnard, UAE to finalise space laws soon, The National, 8 March 2016, online: <http://www.thenational.ae/business/aviation/uae-to-finalise-space-laws-soon>.
[574] *Emirati Space Law*, *supra* note 571 at Art 2.
[575] *Ibid* at Art 1. Although the definition of "defined area" does not explicitly provide that outer space begins at 80 km, given the context of the law and the fact that this is an unofficial English version, there is a high level of confidence that the UAE intended to demarcate outer space from air space at this altitude. A further definition of "outer space" provides "the area above the Earth's atmosphere". It is unclear how these two definitions interact as the term "defined area" is not used outside of the definitions section.
[576] *Ibid* at Art 1.

The *Emirati Space Law* applies within the State's territory, to activities carried out at State facilities, from vessels and aircraft registered to the State and by nationals and companies headquartered in the State.[577] The law also provides a litany of activities that qualify as "space activities", including traditional activities such as launch, the operation of space objects, telecommunication and Earth observation activities. Uniquely, the *Emirati Space Law* also explicitly includes non-traditional activities, including space situational awareness, space resource exploration and extraction, providing logistical support services, long-duration human spaceflight and the "manufacture, assembly, completion, development, testing, transportation, storage, trade or disposal of space technologies".[578] The law also applies to high-altitude activities (defined as space activities taking place above the "scope of air traffic control and lower than the defined area"[579]), space data management activities (including "receiving, storing, processing, distributing, archiving or disposing" of such data), collecting or trading meteorites and specialised space-related training programs offered by non-governmental agencies.[580]

The inclusion of these non-traditional features of space activities results in an extremely broad regulatory framework that captures nearly all aspects of space activities. Indeed, unlike other jurisdictions, the *Emirati Space Law* seems to regulate not only "up-stream" space activities (such as the development, launch and operation of space objects) but also "down-stream" space activities (such as undertaking ground-based space situational awareness or using global navigation space system space data to create novel applications useful in everyday life). Indeed, by applying this law even to space related training programs, the UAE ensures it is directly involved in approving (via authorisation) each and every aspect of the nation's private space activities. The extent to which such direct oversight will promote the development of commercial space activities (an expressed objective of the law) is curious. Although legally required, it is likely that the practical reality will be such that the State will not individually authorise each new smartphone app that uses space data or oversee the accreditation of aerospace engineering or space law university programs.

The *Emirati Space Law* is also the legal instrument that creates the UAE Space Agency (UAESA), tasking it with encouraging and developing the "uses of space science and technology

[577] *Ibid* at Art 3.
[578] *Ibid* at Art 4.1.
[579] *Ibid* at Art 1.
[580] *Ibid* at Art 4.2.

in the State, and … spread[ing] awareness of the importance of the Space Sector".[581] The UAESA is also responsible for proposing policies, strategies and legislations related to the space sector, representing the State international forums, commenting on bilateral or multilateral international agreements as well as granting authorisations for space activities.[582]

The *Emirati Space Law* prohibits carrying out or participating in space activities without authorisation for the UAESA as well as prohibiting the ownership of a space object.[583] This latter clause makes the *Emirati Space Law* unique as it is the only comprehensive national space law that prohibits owning a space object without authorisation. The extent to which this will have real-world consequences is unclear, as most often those owning space objects intend to use them in space, which would otherwise require authorisation. Nevertheless, this provision is unique but seemingly in-line with the law's prohibition on the trading or collecting of meteorites.[584]

The general conditions, regulations and procedures related to authorisations shall be determined by the UAESA and it is within the agency's authority to grant, renew, amend, cancel, suspend or assign to a third party an authorisation for a space activity. With respect to suspending, revoking or assigning an authorisation, a previously-authorised operator remains liable notwithstanding the change in their status. Nevertheless, the UAESA may exempt a specific operator or a specific space activity from requiring authorisation entirely.[585]

With respect to specific kinds of space activities, the *Emirati Space Law* requires operators to undertake certain additional measures before attaining authorisation, including for telecommunications[586], human spaceflight[587], the use of nuclear power sources[588], and the extraction, exploitation or utilisation of space resources[589]. With respect to space mining, the law provides that specific authorisation shall be determined by the UAESA Director General related to the "ownership, purchase, sale, trade, transportation, storage and any Space Activities aimed at providing logistical services" for space mining. The language employed by the *Emirati Space Law* therefore balances the current international dilemma surrounding space mining by neither

[581] *Ibid* at Art 7.
[582] *Ibid*.
[583] *Ibid* at Art 14.
[584] *Ibid* at Art 30.
[585] *Ibid* at Art 14.
[586] *Ibid* at Art 15.
[587] *Ibid* at Art 16.
[588] *Ibid* at Art 17.
[589] *Ibid* at Art 18.

expressly authorising space mining activities nor prohibiting them; rather, the middle ground offered allows a prospective operator to seek specific authorisation (and, therefore, legitimacy) from the head of the UAESA. The law also addresses space debris mitigation, which requires operators to take the necessary measures and implement appropriate plans to mitigate space debris.[590]

With respect to liability, the *Emirati Space Law* provides that the operator is liable for any damage (whether on Earth, to aircraft in flight or in outer space), even if the operator had contracted out some of the responsibilities for which they were authorised, and that the State shall not be liable for compensation arising out of the operator's space activity.[591] For operators who are authorised, they remain liable for damage caused to third parties[592] as well as other space objects[593]; for operators who are not authorised, they are absolutely liable in both circumstances. With respect to damage caused by operators who are appropriately carrying out their authorised activities, the UAESA can assess liability limitations based on the size of the launch vehicle and space object, the record of the operator, the re-entry conditions and any other elements that may increase the probability of accidents or incidents.[594] With respect to insurance, operators must obtain an insurance policy from a UAESA-approved insurance company or provide another approved guarantee[595]; with respect to damage caused by the activities of an authorised operator for which the UAE is internationally responsible, the operator is to compensate the State in accordance with any appropriate liability limitations unless the operator was not authorised, in which case the unauthorised operator is absolutely liable for the claims brought against the State.[596]

The *Emirati Space Law* also addresses the registration of space objects by requiring the UAESA to establish a national space registry and requiring space object operators to provide the UAESA with the information necessary for submitting such information to the UN.[597] The law also provides that the UAESA may establish rules related to the import or export of certain goods (namely, dual-use goods) and that space activities must abide by such regulations.[598] Those who

[590] *Ibid* at Art 19.
[591] *Ibid* at Art 20.
[592] *Ibid* at Art 21.
[593] *Ibid* at Art 22.
[594] *Ibid* at Art 24.
[595] *Ibid* at Art 25.
[596] *Ibid* at Art 26.
[597] *Ibid* at Art 31.
[598] *Ibid* at Art 33.

violate the *Emirati Space Law* may be subject to up to 10,000,000 dirhams (approximately USD $2,700,000), two years in prison or both (and, if repeated violations, the penalties shall be doubled).[599]

Although the *Emirati Space Law* is a comprehensive space law, it is noticeably more broad than the domestic space laws of other jurisdictions. Theoretically, the fact that the law is extremely broad does not mean that it would necessarily fail to achieve the ultimate objectives of the law; indeed, as described in the introduction to this chapter, national space laws are as much a reflection of the context and legal culture of the jurisdiction in which they are enacted as they are a reflection of the desired outcomes. Although the *Emirati Space Law* very clearly requires all space activities, even those considered down-stream, to first obtain authorisation from the national space agency, it does not mean that commercial space activities will fail to thrive. Indeed, the UAE's public discussions related to their ambitious space program suggest the State is as much interested in large-scale space projects (such as sending humans to Mars) as it is on simply democratising the benefits of space. Its success will only become measurable in time and with an appreciation of the context in which the law was enacted.

Non-Comprehensive Regulation of Commercial Space Activities

Notwithstanding the above list, there exist some space-faring States that have not yet enacted comprehensive national space legislation. The likely reason for such regulatory delay is that the space activities carried out in these jurisdictions are largely undertaken by government organisations rather than private industries; indeed, in cases where private industry does exist, their role is limited to simply supporting government projects (for example, by providing specific sensing components rather than developing an entire remote sensing system). Nevertheless, it is likely that as the trend of commercialisation continues, these States will also enact national legislation. To this end, India has already released a draft space law, Germany and Luxembourg are preparing similar legislation and there are calls for regulatory reform in China and Brasil. Finally, this section's inclusion of the Philippines is meant to illustrate that emerging nations, aware of the significant opportunities provided by space activities, are preparing their public space capabilities with a view to taking advantage of the growing trend of commercialisation - to this end, Greece and/or Turkey would have also been suitable examples.

[599] *Ibid* at Arts 37-45.

Brasil (2001)

Brasil does not have a national space law.[600] Brasil's initial interests in space were national security related and, for the most part, controlled by the military. This led to a number of difficulties related to developing partnerships with other space-faring nations, specifically as a result of limitations on technology transfers.[601] Recognising the need for increased international partnerships, Brasil established, in 1994, the Brasilian Space Agency (AEB)[602] and granted it the power to administer edicts with binding legal effect[603]. By the late 1990s, Brasil wanted to develop its commercial launch capabilities and considered creating a national space law to oversee commercial space activities. The AEB, however, reached the conclusion that a traditional law would have taken too long to draft and enact and so instead decided to promulgate an edict related to launch.[604] As a result, in 2001, the AEB adopted an edict related to carrying out launch activities on Brasilian territory.[605] This *Brasilian Launch Law*, as well as a subsequent Edict in 2002[606], provides the AEB with authority to issue licenses and authorisations for launch activities. The AEB has not yet used its administrative edict power to regulate any other aspects of the Brasilian commercial space sector.

China (2001)

China has long been a user of space and, more recently, has become one of the major space-faring States.[607] Until very recently, space activities were carried out by government agencies and research organisations (or private entities owned largely by the government) requiring very limited oversight by way of national space legislation. However, the global shift from public to private space activities is also having an effect in China, with private companies starting to play an

[600] Ana Cristina Calhego Rosa & Himilcon de Carvalho, *Small Satellites: Challenges of the Brazilian National Space Law and Policy*, United Nations/Brazil Symposium on Basic Space Technology, 11 Sep 2018 at slide 7.
[601] Jose Monserrat Filho, *Regulation of Space Activities in Brazil*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) at p 64 [*Filho*].
[602] *Ibid* at p 66.
[603] *Ibid* at p 72.
[604] *Ibid*.
[605] *Regulation of procedures and the definition of requirements necessary for request, evaluation, issuance, control and follow-up of licenses for carrying out space launching activities on the Brazilian territory,* Administrative Edict No 27, 20 June 2001 [*Brasilian Launch Law*].
[606] *Regulation of procedures for authorizing space launching operations form the Brazilian territory*, Administrative Edict No 5, 21 February 2002.
[607] Fabio Tronchetti, *Space Law and China*, in Oxford Research, "Encyclopedia of Planetary Science", Feb 2019, online: <https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-66> [*Tronchetti*].

increasing role in the development of the nation's space capabilities.[608] In most jurisdictions, the lack of regulatory guidance traditionally afforded by national legislation stifles commercial space development; the lack of a robust space regulatory framework in China may be having a similar effect.[609] Currently, Chinese space law consists of two instruments: measures related to registration[610] and launch[611].[612]

In China, laws are created at one of four levels of descending hierarchical value: the Chinese Constitution, national laws, administrative regulations and departmental rules.[613] With respect to space activities, "most of the rules… are put down in the form of departmental rules; thus, the regulatory regime in the space field is at a relatively low level".[614] Both the *Chinese Registration Measures* and the *Chinese Launch Measures* are departmental regulations, suggesting that at the time of their enactment, and through to the present, they have been considered low-priority (or at least not deserving of significant legislative attention).[615] Notwithstanding their legislative authority, they are also limited insofar as they relate to fulfilling China's international obligations with respect to registration and creating a licensing system for launch activities. Neither measure contemplates the regulation of other space activities and therefore cannot be considered a national space law. Further, given the combined military/civilian use of many space objects, the role of the Central Military Commission, which itself may enact space related regulations, complicates matters.[616]

Given that the current national regulatory regime is largely policy-oriented, with administrative regulations offering supplementary support, the lack of comprehensive national space legislation affects the development of commercial space activities in China.[617] It is possible

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[608] *Ibid*.
[609] Yun Zhao, "National Space Law in China" (Leiden: Brill Nijhoff, 2015) [*Zhao*] at pp 232-235.
[610] *Measures for the Administration of Registration of Objects Launched into Outer Space*, Order No 6 of 2001, Commission of Science, Technology and Industry [*Chinese Registration Measures*].
[611] *Interim Measures on the Administration of Licensing the Project of Launching Civil Space*, Order No 12 of 2002, Commission of Science, Technology and Industry [*Chinese Launch Measures*].
[612] *Jakhu & Pelton*, *supra* note 73 at p 93. Notwithstanding the traditional narrative that China only has two regulatory instruments, a more broad understanding of space and its applications reveals that China has additional regulatory instruments with respect to telecommunications and export controls, among others. *Zhao*, *supra* note 609 at pp 40-41.
[613] *Zhao*, *supra* note 609 at p 23.
[614] *Ibid* at p 24.
[615] *Tronchetti*, *supra* note 607.
[616] *Zhao*, *supra* note 609 at pp 24-25, 31.
[617] *Ibid* at p 41.

China will enact a comprehensive, national space law in the future[618]. Until then, the lack of such a regulatory framework will likely hinder the development of commercial space activities within the country.

Germany (2007)

As a space faring nation, Germany is a competent international partner through its participation in ESA (and more generally with the EU) as well as by way of multilateral and bilateral cooperation agreements.[619] Generally, German space activities fall within the jurisdiction of, and are organised at the national and international levels by, the Ministry of Economics and Technology (MET), which has delegated[620] most of its powers to the German Aerospace Center (DLR), the national space agency.[621] Germany does not yet have a single domestic law to regulate space activities[622] although in 2018 it announced that it was preparing such a law[623]. Since DLR does not perform a regulatory function (nor does it have the legal mandate to do so), German space activities are regulated by other existing pieces of legislation, of which space regulation is not the priority. For example, the *German Aviation Code* provides that when flying through airspace, spacecraft and rockets are deemed to be aircraft and must be registered but does not provide appropriate regulations with respect to how to register space vehicles.[624] With respect to satellite telecommunications, the *Telecommunications Act* necessitates that orbital and frequency usage rights be transferred from the federal authority to an operator.[625]

In 2007, Germany enacted a law[626] related to the distribution of high resolution remote sensing data; importantly, it does not regulate the remote sensing satellite systems but rather it

[618] *Ibid* at pp 41-42; *Tronchetti*, *supra* note 607.
[619] Stephan Hobe & Julia Neumann, *Regulation of Space Activities in Germany*, in Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) at pp 127-128 [*Hobe & Neumann*].
[620] *Law Governing the Transfer of Responsibilities for Space Activities of 22 August 1998*. The function of this law is limited to the political responsibilities of the organisation. *Ibid* at pp 130.
[621] *Ibid* at pp 128-129.
[622] *Ibid* at p 124.
[623] Federal Foreign Office, *Space Law*, Government of Germany, 31 Aug 2018, online: <https://www.auswaertiges-amt.de/en/aussenpolitik/themen/internatrecht/einzelfragen/weltraumrecht/-/231384?openAccordionId=item-231662-0-panel>; Andrea Shalal, *Fly me to the moon: Germany eyes slice of lucrative space market*, Reuters, 28 Apr 2019, online: <https://www.reuters.com/article/us-space-exploration-germany-analysis/fly-me-to-the-moon-germany-eyes-slice-of-lucrative-space-market-idUSKCN1S406Y>.
[624] *Hobe & Neumann*, *supra* note 619 at pp 130-131.
[625] *Ibid* at pp 134-136.
[626] *Act on safeguarding security interests in distribution of high resolution satellite data*, Nov 2007 [*German Remote Sensing Law*].

regulates the distribution of the data collected by such systems.[627] The *German Remote Sensing Law* was developed to focus primarily on addressing potential national security concerns (as a result of a private operator bringing a high-resolution remote sensing system online) as well as fostering the commercialisation of remote sensing data).[628] The regulatory process implemented in Germany with respect to remote sensing space activities is distinct from other jurisdictions, insofar as it implements a "transaction-oriented" approach rather than a "license-oriented approach".[629] The *German Remote Sensing Law* requires operators of remote sensing space systems to implement a two-step "control procedure" to determine whether specific remote sensing data may be delivered to a client. The first step involves the operator determining whether the data sought by the client is sensitive.[630] If the data is not sensitive, the operator may deliver the data to the client. However, if the data is sensitive, the operator may request a review and authorisation by a government authority[631] to determine whether the sensitive data can be delivered to the client.[632] Most often, the data sought by clients is non-sensitive and can therefore be delivered efficiently to the client. In 2012, approximately 85% of remote sensing data requests made by clients were not sensitive (and therefore delivered directly to clients) and of the 15% that were sensitive, 90% were approved for delivery by the appropriate governmental authority.[633] Whether Germany's existing telecommunications and remote sensing regimes remain in place following the enactment of a comprehensive space law may suggest the country's views on the efficacy of its

[627] *Hobe & Neumann*, *supra* note 619 at pp 142-143.
[628] *Ibid* at pp 143; Max Kroymann, *German National Data Security Policy for Space-Based Earth Remote Sensing Systems*, Presentation, 23 Mar 2010, online: <https://www.unoosa.org/pdf/pres/lsc2010/tech-02.pdf> [*Kroymann*] at slide 3; Wolfgang Schneider, *National Data Security Policy for Space-Based Earth Remote Sensing Systems - Background Information*, Federal Ministry of Economics and Technology, 15 Apr 2008 [*Schneider*] at pp 1-2.
[629] *Kroymann*, *supra* note 628 at slide 12. For example, both the United States and Canada require remote sensing space systems to be licensed whereas German law simply requires the supervision of sensitive data.
[630] *Schneider*, *supra* note 628 at p 6. "Elements that are examined as part of the sensitivity check include technical data of the sensor operation modes that are used to acquire the specific data set (e.g. spatial resolution, observed spectral/frequency range, number of spectral channels, etc.), the information content of the data retained by the type of processing used (specification of the data product), the target area surveyed by the data, the time of data acquisition, and the time lag between data acquisition and supply to the customer, the individual making the request or submitting the order, and the ground segments to which the data are to be transmitted." This process can be automated to ensure transparency, effective planning and speedy implementation.
[631] The Federal Office of Economics and Export Control is the designated governmental authority. *Hobe & Neumann*, *supra* note 619 at p 145; *Kroymann*, *supra* note 628 at slide 8.
[632] *Schneider*, *supra* note 628 at p 6.
[633] Max Kroymann, *GMES data security policy and German experiences in the national satellite data security policy*, Presentation, 13 Jan 2012, online: <https://ec.europa.eu/docsroom/documents/630/attachments/1/translations/en/renditions/native+&cd=1&hl=en&ct=clnk&gl=ca> at slide 7.

existing laws. It is, of course, also possible that the existing regimes are integrated into a new comprehensive law without significant change.

India (2017)

India's space program developed in earnest in the early 1960s and, over the past five decades, has grown to develop a full complement of space capabilities: India now operates programs related to Earth observation, telecommunication, broadband, navigation, meteorology and space science and, most recently, planetary exploration.[634] India has also developed a series of launch vehicles capable of placing payloads into various orbits for both its own missions as well as those of paying customers.[635] All of these accomplishments have been made possible by the Indian Space Research Organisation (ISRO[636], founded in 1969 and succeeding the Indian National Committee for Space Research)[637]; however, with the need to reduce the government's budget and ISRO's inability to address every societal or social need, there are movements to allow for the entry of private actors and the commercialisation of space activities.[638] Private space entities are willing to take on space related challenges and develop national capabilities in the process, however, they demand an appropriate and welcoming policy environment.[639]

Seemingly recognising the need for regulatory reform, in 2017 India drafted and publicly presented a draft bill related to space activities.[640] The *Indian Draft Space Law* proposes the application of its provisions to Indian territory, ships and aircraft as well as all Indian citizens and legal persons[641] and provides the Central Government with varying powers, including the development of space policies, the ability to grant authorisations related to space activities and the

[634] Rakesh Sood, *An Indian Space Law: Long Overdue*, Observer Research Foundation, Issue Brief No 309, Aug 2019 [*Sood*] at pp 2-4.
[635] *Ibid* at p 4.
[636] ISRO falls within the jurisdiction of India's Department of Space, the only such governmental department in the world.
[637] Ranjana Kaul & Ram Jakhu, *Regulation of Space Activities in India*, Ram Jakhu, ed, "National Regulation of Space Activities" (Dordrecht: Springer, 2010) [*Kaul & Jakhu*] at p 154; Kumar Abhjeet, *Development of National Space Law*, (2016) 14:2 Astropolitics 185 [*Abhjeet*] at p 188; *Sood*, *supra* note 634 at p 2.
[638] *Sood*, *supra* note 634 at p 2; *Abhjeet*, *supra* note 637 at pp 185-186.
[639] India has only developed two policy documents with respect to remote sensing data and telecommunications. *Jakhu & Pelton*, *supra* note 73 at p 95; *Kaul & Jakhu*, *supra* note 637 at p 155.
[640] *Draft Space Activities Bill, 2017* released by Under Secretary to the Government of India, 21 Nov 2017 [*Indian Draft Space Law*]. In the Explanatory Note released with the *Indian Draft Space Law*, it provides: "Thus there is a need for national space legislation for supporting the overall growth of the space activities in India. This would encourage enhanced participation of non-governmental/private sector agencies in space activities in India, in compliance with international treaty obligations, which is becoming very relevant today."
[641] *Ibid* at Art 1.

responsibility to maintain and administer a register of space objects[642]. The law would prohibit any person from carrying on a space activity without first obtaining a licence[643] and would grant the Central Government the right to impose terms and conditions on a licence,[644] permit the transfer of a licence[645] and suspend, revoke or vary a licence[646]. Licensees would be required to indemnify the government against damage and the government has the power to determine the quantum of liability.[647] Individuals who violate specific provisions of the proposed law would be subject to up to three years imprisonment or up to 50 crore rupees (approximately USD $7 million).[648]

The *Indian Draft Space Law*'s release sought public comment from all stakeholders and was eventually discussed in Parliament before failing to pass and lapsing.[649] Neither the *Indian Draft Space Law* nor similar legislation has been reintroduced to the public or Parliament. India's lack of national legislation with respect to space activities is a limitation to its ability to foster the growth of domestic commercial space activities.

Luxembourg (2017)

Although Luxembourg does not currently have a domestic space law to oversee all space activities, it is in the process of drafting one.[650] Nevertheless, Luxembourg does have two laws that apply to space activities: one related to the operation of satellite systems[651] and the other related to space resource exploitation[652].[653] The *Law on Electronic Media* requires that no person may establish and operate a Luxembourgish satellite system without first obtaining a concession

[642] *Ibid* at Art 3.
[643] *Ibid* at Art 6.
[644] *Ibid* at Art 8.
[645] *Ibid* at Art 9.
[646] *Ibid* at Art 10.
[647] *Ibid* at Art 12.
[648] *Ibid* at Arts 13-24.
[649] *Sood*, *supra* note 607 at p 8.
[650] "Since 2018, the government is working on a comprehensive law addressing space activities authorization and supervision. The draft law establishes general rules on compliance with international law and environmental protection, including space debris. It sets up a system of authorization, monitoring and sanctions, making it possible to ensure that the risks incurred by the state are limited. The project also introduces a national registry of space objects, thus laying the foundation for the approval of the Registration Convention." Luxembourg Space Agency, *Legal Framework*, Government of Luxembourg, 18 Nov 2019, online: <https://space-agency.public.lu/en/agency/legal-framework.html#> [*Luxembourg Legal Framework*].
[651] *Law of 27 July 1991 on Electronic Media*. This law is not considered comprehensive with respect to all space activities since it was originally intended (and is still directed) towards regulating television and radio broadcast services, rather than all forms of satellite services. *Law of 27 July 1991 on Electronic Media* at Arts 1, 2, 21 and 22.
[652] *Law of 20 July 2017 on the Exploration and Use of Space Resources* [*Luxembourgish Space Resources Law*].
[653] *Luxembourg Legal Framework*, *supra* note 650.

from the ministers responsible for telecommunications and media and that the concession is non-transferrable.[654] As a relative newcomer to space, Luxembourg also created the Luxembourg Space Agency (LSA), under the authority of the Ministry of Economy, to further Luxembourg's "commercial and co-operative initiatives [to shape] a vibrant space economy".[655] One of the LSA's pivotal platforms is the creation of a venture capital vehicle to support and foster "new space companies with ground-breaking ideas and technology".[656]

The more recent *Luxembourgish Space Resources Law* establishes at the outset that space resources are capable of being appropriated.[657] Individuals seeking to embark on owning space resources, however, must first receive authorisation from the ministers in charge of the economy and space activities (collectively, the "Ministers") and must abide by the conditions of their authorisation and the international obligations of Luxembourg.[658] Only public companies, corporate partnerships or private limited liability companies of Luxembourg (or of another European country registered in Luxembourg) may receive an authorisation for space resource exploitation.[659] Applicants are further required to provide detailed information related to their plans on how to explore, use and commercialise space resources[660] as well as a risk assessment and demonstration of sufficient financial means or insurance coverage[661]. Applicants must pay a fee to cover the costs of the application[662] and operators are required to subject themselves to annual account audits[663]. The Ministers are responsible for the continuous supervision of authorised missions[664] and may withdraw authorisations on a variety of grounds[665]. Authorised operators are fully responsible for any damage caused as a result of their space activities.[666] Individuals who violate certain provisions of the *Luxembourgish Space Resource Law* may be

[654] *Law of 27 July 1991 on Electronic Media*, *supra* note 651 at Art 20.
[655] Business Wire, *Luxembourg Launches Business-Focussed Space Agency*, Business Wire, 12 Sep 2018, online: <https://www.businesswire.com/news/home/20180912005673/en/Luxembourg-Launches-Business-Focused-National-Space-Agency>.
[656] *Ibid*.
[657] *Luxembourgish Space Resources Law*, *supra* note 652 at Art 1. There is significant debate among scholars and governments as to whether such a statement is legally accurate.
[658] *Ibid* at Art 2. Whether the ownership of space resources violates Article II of the *Outer Space Treaty*, to which Luxembourg is a State party, remains an open question.
[659] *Ibid* at Arts 3-4.
[660] *Ibid* at Art 7.
[661] *Ibid* at Art 10.
[662] *Ibid* at Art 13. The fee will range from EUR 5,000 to EUR 500,000 depending on the complexity of the application.
[663] *Ibid* at Art 11.
[664] *Ibid* at Art 15.
[665] *Ibid* at Art 14.
[666] *Ibid* at Art 16.

fined up to EUR 1.25 million (approximately USD $1.4 million) and/or imprisoned up to five years.[667]

Philippines (2018)

Although not a significant player in space, in 2018 the Philippines enacted a national law related to space.[668] The stated purpose of the *Philippine Space Law* is to: safeguard the sovereignty, territorial integrity and interests of the Philippines; support the development of science and technology to accelerate social progress; promote national security; maintain pace with the development of other nations in space; allow for official representation in international fora; and ensure conformity with international space law.[669] The *Philippine Space Law* promulgates the creation of a space policy based on becoming a space-capable and space-faring nation within ten years and focussing areas of space science and technology to address national issues.[670] The space policy highlights areas related to national security, climate studies, space research and development, the creation of a space industry, training of space personnel and developing international partnerships.[671]

The *Philippine Space Law* also created the Philippine Space Agency (PhilSA) with a mandate of developing the national space program.[672] Although the law does not explicitly regulate the activities of private entities, it does empower PhilSA with the responsibility to coordinate all space activities of various sectors and stakeholders as well as to promote the development of a space industry and economy.[673] The *Philippine Space Law* also requires PhilSA to create a national registry for space objects launched into outer space for which it is a launching State.[674] Finally, the law designates the Philippine government as the party responsible and liable for damage caused by space objects registered in the Philippines national space registry.[675] The Philippines' decision to enact a space law can be appreciated as a measure to help concentrate its

[667] *Ibid* at Art 18.
[668] *An Act Establishing the Philippine Space Development and Utilization Policy and Creating the Philippine Space Agency, And for Other Purposes*, Act No 11363 of 2019 [*Philippine Space Law*].
[669] *Ibid* at s 2.
[670] *Ibid* at s 4.
[671] *Ibid* at s 5.
[672] *Ibid* at ss 6-7.
[673] *Ibid* at s 8.
[674] *Ibid* at s 23.
[675] *Ibid* at s 24.

public space capabilities and the demonstration of an emerging nation, interested in space, laying the legal groundwork for the future regulation of commercial operations.

Analysis of Comprehensive National Space Laws

Over the span of fifty years - starting with Norway in 1969 and most recently the UAE in 2020 - a number of States have taken efforts to regulate space activities. Of the 29 jurisdictions explored above, 23 have created regulatory frameworks by adopting comprehensive national space laws. The States that have enacted such legislation include most established space-faring nations - with the few notable exceptions being Canada, Germany, Spain, Italy and Mexico - and have done so to simultaneously maintain their national interests and regulate private space activities. Indeed, in nearly all of the laws reviewed, one of the explicit purposes of the law is to ensure the protection of the national interest, whether from a safety, security or international obligation perspective. To ensure this objective is satisfied, the laws include specific language directing governmental authorities to refuse (using the word "shall" rather than "may") applicants seeking authorisation when the proposed space activity undermines or is contrary to the national interest. Simultaneously, nearly all of the examined laws (whether explicitly or implicitly) include as a supplementary purpose the guidance or development of space industries and private space activities within their jurisdictions. It is clear, therefore, that, all things being equal, States enact comprehensive domestic space legislation to ensure they both protect their national interests and stimulate the commercial space sector.

Although none of the 23 examined laws are identical, most share common features and a few are nearly the same (in both language and substance). Appendix II is a comparative chart listing all 23 jurisdictions as well as the features present in their comprehensive space laws. The ensuing analysis will examine and draw conclusions based on the various national space laws with respect to their scope, subject matter and method of implementation and, where appropriate, will highlight the unique approaches of certain jurisdictions. For example, the *South Korean Space Law* requires that a national space plan be created every five years (with the national space plan informing the context of the law)[676] and the *New Zealand Space Law* requires the government to review its space law three years after coming into force[677]. What will become apparent is that

[676] *South Korean Space Law*, *supra* note 296 at Arts 5-7.
[677] *New Zealand Space Law*, *supra* note 482 at Art 86.

most national space laws apply directly to space activities in a manner consistent with their international obligations.

Scope

With respect to the scope of a State's space law, there are two main factors that determine its applicability: territoriality and nationality. The single most consistent characteristic of the national space laws is that they all apply to space activities occurring within their territory: in all 23 States, the provisions of the law apply to activities either occurring or originating in their territorial jurisdiction. When defining the scope of the law in terms of its physical origination, the laws include (more often than not) naval vessels and aircraft registered to the State, with some even including aircraft not registered in their State but taking off from within their territory (for example, New Zealand[678]). There is slight variation with respect to the application of a State's space law to its nationals (almost always both natural and juridical) undertaking space activities outside their territory: 16 States explicitly provide the applicability of their law to nationals operating overseas, five are silent on the issue (namely, Argentina, South Africa, Ukraine, Kazakhstan and Japan) and the Netherlands[679] explicitly provides that its law does not apply to nationals undertaking space activities outside its jurisdiction (unless declared otherwise by an official order).

Generally speaking, States ensure the application of their space law to activities originating within their territory and undertaken by their nationals because those are the most likely bases upon which a State would be found internationally liable for damage caused as the launching State. Nevertheless, the scope of a space law is also characterised by the kind of space activity to which it applies. Of those laws that define or illustrate what amounts to a space activity, they always include launch and launch-related activities, roughly half include the operation or control of a space object and a select few broaden their application to include any activity in outer space. In contrast to the generally implemented functionalist approach (which determines something as a "space activity" based on the function it performs) three jurisdictions (Australia[680], Kazakhstan[681]

[678] *Ibid* at Art 47.
[679] *Dutch Space Law*, *supra* note 328 at s 2.
[680] *Australian Space Law*, *supra* note 226 at s 8.
[681] *Kazakhstani Space Law*, *supra* note 381 Art 1.

and Denmark[682]) delimit outer space at 100 km (with the UAE delimiting at 80 km[683]), adopting a spatialist approach (which determines something as a "space activity" based on its altitudinal location) in addition to their functionalist regulation of space activities.

With respect to the laws that only expressly apply to launch and launch-related activities, it does not result in operators simply conducting activities in space without appropriate regulation. Since all space activities rely on the operation of space objects and all space objects must be launched into space, by regulating all launch activities, payloads are brought within the State's regulatory umbrella (often by way of payload-review within the launch licence itself). In effect, the State is able to ensure it regulates the operation and control of space objects while in space by regulating the launch of the payloads that will end up operating in space. Although a launch-licence reliant regulatory regime may currently prove effective, in the future, space activities may be performed without space objects or space objects may be operated in space without first being launched (for example, if a space object is manufactured in space using *in situ* resources and a 3D printer and, therefore, not needing to be launched from Earth) and would fall outside the scope of such a law. Nevertheless, even if such occurrences become reality, States may not be interested in regulating (or feel compelled to regulate) such activities since they would not be considered a launching State (and would not be held liable, as discussed in the next section).

Just as the characterisation of a "space activity" can have effects on the applicability of a law, so too does the characterisation of a "space object". For example, Belgium[684] defines a space object as any object launched or intended to be launched into outer space on an orbital trajectory. The requirements that an object be on an orbital trajectory to qualify as a space object limits the number of objects in space (such as suborbital vehicles or high-altitude vehicles) to which the Belgian law would apply. In contrast, although Denmark does not define a space object, its inclusion of space beginning above 100 km brings within its purview any object above 100 km. Therefore, Danish suborbital flights and high-altitude vehicles qualify as space objects and would require prior authorisation. Ukraine[685] chose to focus the attention of its law on "space facilities", a term that includes both the space segments (rockets, satellites, etc.) as well as the ground

[682] *Danish Space Law*, *supra* note 432 at s 4.
[683] *Emirati Space Law*, *supra* note 571 at Art 1.
[684] *Belgian Space Law*, *supra* note 271 at Art 3.
[685] *Ukrainian Space Law*, *supra* note 195 at Art 1.

segments (receiving stations and related infrastructure) of a space activity; by doing so, both launch providers and satellite operators are applicable subjects of the law.

In the 23 jurisdictions examined, therefore, before undertaking space activities entities must determine whether they, by virtue of their geographical location or nationality, will fall within the purview of an established space law and, if so, they must first seek authorisation from the appropriate governmental authority or authorities. By establishing such a regulatory process and requiring authorisation by way of granted licences or permits, a State has insight into, and control over, the types of activities that are carried out by entities over whom they have jurisdiction. Generally, when determining the applicability of the law, it is best to avoid adopting a framework that is too broad or too narrow. By adopting a broad approach (for example, regulating "all space activities"), the law would bring within its purview space activities for which strict regulation is not necessarily desirable (for example, astronomy), which may be the case with the *Emirati Space Law*[686]. Conversely, by adopting a narrow approach (for example, "only launch activities"), the law would exclude from its purview space activities that ought to be appropriately regulated (such as broadcasting). The delicate balance between excluding and including appropriate space activities from the regulatory framework requires careful consideration and precise language.

Authorisation

As a general rule, all national space laws prohibit space activities without prior authorisation from an appropriate government authority. Those desiring to undertake space activities (whether providing launch services or operating space objects) must apply to the appropriate governmental authority for permission. Applicants are usually required to submit the necessary technical documentation associated with their planned space activity, demonstrate that they have acquired (or provide sufficient information for the State to acquire on their behalf) the appropriate radio spectrum (often in accordance with ITU regulations) and prove that they have the technical, financial and, in some cases, moral[687] capacity to carry out their proposed space activity. Of course, not all States require the same information to be submitted with an application for authorisation.

[686] *Emirati Space Law*, *supra* note 571.
[687] *French Space Law*, *supra* note 344 at Art 4.

None of the 23 national space laws explicitly provide exactly what regulators are to consider when determining whether to grant or refuse a licence. Rather, most include language empowering authorities to create regulations outlining the requirements for acceptance and/or refusal of a licence. In some instances, the law provides a few provisions that regulators must consider; other laws provide conditions that regulators may consider; and others still provide a combination of conditions that must and may be considered. With respect to the role of the regulator, only a very few national space laws provide timelines or deadlines by which a governmental authority has to reach a decision: Belgium[688] and Portugal[689] require their regulators to respond to an application within 90 days, the Netherlands[690] and Austria[691] require regulators to respond within 6 months and Russia[692] requires ROSCOSMOS to respond within 30 days. In two jurisdictions (South Africa[693] and Finland[694]), applicants are explicitly permitted to appeal a regulator's refusal to licence the proposed space activity. In the UK[695], Australia[696] and Russia[697], applicants are required to pay an application fee as set out in the regulations (although Australia still has not established such a fee) and in the Netherlands[698], applicants must pay an application fee if one is created by the regulator.

With respect to licences that are granted, most national space laws require that such licences include conditions operators must abide by throughout the use and/or operation of their space object. In this way, operators are required to carry out their space activities in a specific manner, consistent with the conditions established in the licence. Failing to abide by licence conditions often results in a licence being suspended or revoked, as discussed in the next section. Although most space laws require authorities to implement conditions, they do not all provide the explicit conditions that ought to be imposed. For example, Sweden[699] provides that conditions are implemented on a case-by-case basis whereas France[700] requires operators to ensure their ongoing

[688] *Belgian Space Law*, *supra* note 271 at Art 9.
[689] *Portuguese Space Law*, *supra* note 548 at Art 8.
[690] *Dutch Space Law*, *supra* note 328 at s 5.
[691] *Austrian Space Law*, *supra* note 360 at s 4.
[692] *Russian Space Law*, *supra* note 151 at Art 12.
[693] *South African Space Law*, *supra* note 174 at ss 16-17.
[694] *Finnish Space Law*, *supra* note 512 at s 20.
[695] *1986 UK Space Law*, *supra* note 94 at s 4A.
[696] *Australian Space Law*, *supra* note 226 at s 59.
[697] *Russian Space Law*, *supra* note 151 at Arts 28-31.
[698] *Dutch Space Law*, *supra* note 328 at s 9.
[699] *Swedish Space Law*, *supra* note 43 at s 3.
[700] *French Space Law*, *supra* note 344 at Art 4.

activities do not impact national security or national interests and that operators maintain their financial security. Most space laws allow ensuing regulations to determine the length of a licence's validity, however, Australia[701] explicitly limits a launch facility licence to a maximum of 20 years and New Zealand[702] provides that launch licences expire five years after being granted. In Russia[703], granted licences are valid for a minimum of three years.

Once a licence has been granted, the licence can usually be transferred. In 15 of the jurisdictions examined, all require the prior authorisation of the government authority before a transfer of licence and registration can be made and, in Indonesia[704], a transfer may be made without prior approval (the only jurisdiction to allow for non-pre-authorised transfer). However, in the Netherlands[705], a transfer is explicitly prohibited (although if a company holding a licence merges with another or begins operating under a new name, the register may be amended). Seven jurisdictions are silent on the issue of transfer and do not provide whether a licence may be transferred one way or another.

With respect to the kinds of licences that are granted, national space laws vary. For example, New Zealand[706] requires separate licences for a launch facility, an actual launch, the payload being launched (as well as licences for overseas launches and payloads being launched overseas) as well as for a high-altitude space activity: it is feasible, therefore, that a single space activity could require three different licences. Portugal[707], on the other hand, offers both "unit licences" that would apply for a single space-related activity as well as "global licences" that would apply to a series of the same space-related activity (such as for satellite constellations).

Therefore, although all space laws require authorisation, the specificity with which the laws detail the requirements for authorisation vary widely and much is left to be determined by way of regulation. The decision not to include such precise language in the legislation (and instead include it in subsequent regulation) is likely due to the difficulty of predicting the types of activities applicants will propose and the varied ways in which they will propose carrying them out. This is especially true for non-established space faring nations that do not have the necessary expertise or

[701] *Australian Space Law*, *supra* note 226 at s 19.
[702] *New Zealand Space Law*, *supra* note 482 at Arts 11-12.
[703] *Russian Space Law*, *supra* note 151 at Art 13.
[704] *Indonesian Space Law*, *supra* note 404 at Art 78.
[705] *Dutch Space Law*, *supra* note 328 at s 8.
[706] *New Zealand Space Law*, *supra* note 482 at ss 7, 15, 23, 31, 38, 45.
[707] *Portuguese Space Law*, *supra* note 548 at Art 6.

experience to appropriately lay out, in an overarching legislative act, the exhaustive requirements needed to determine whether a proposed activity will be appropriate or not. Nevertheless, by establishing a need for such requirements and including them in regulatory instruments, States simultaneously protect their national interests (with respect to responsibility and liability) and allow for flexible adaptation to changing technologies and activities. Over time, as the regulator's experience develops, the regulations implementing the various application requirements and/or conditions placed on licences will concretise and maintain their consistency.

The ideal comprehensive space law would provide, in general terms, the kinds of things a regulator must and may take into consideration without listing the exact details that must be considered. For example, a law ought to State that regulators, when considering whether to grant a licence, must ensure a space operation does not jeopardise national security without specifying exactly what amounts to national security; similarly, the law ought to State that operators must take measures to ensure the protection of the Earth environment, without specifying that all LEO satellites must be deorbited in 15 or 25 years. The ensuing regulations that are implemented by regulators would detail what amounts to "national security" and what "protection of the Earth environment" would entail, with necessary changes made over time. By enacting laws that provide general requirements and subsequent regulations that provide details, entities seeking authorisation will be better prepared to address the concerns of the State in a manner that is not unnecessarily prescriptive.

Supervision

With respect to the supervision of space activities, all but three space laws (Norway, Argentina and South Korea) provide some language granting an authority to the appropriate regulator to oversee the space activities carried out by their nationals or within their territory (as the case may be). Most often, the supervisory language provides that authorities have the right to inspect documents and/or property and that licence holders must comply with governmental requests for information. One common characteristic is that the appropriate governmental authority may implement rules related to the supervision and/or control of space activities after they have been licenced. A few laws (such as that of the Netherlands[708]) provide that appropriate governmental actors shall supervise space activities without detailing the manner in which such

[708] *Dutch Space Law*, *supra* note 328 at s 13.

supervision is to be carried out: for example, Finland[709] requires its operators to submit an annual report detailing their space activities and South Africa[710] may appoint an inspector to carry out investigative duties to determine whether a licence holder is acting within the confines of their licence.

Similarly, most of the laws, especially those enacted within the last twenty five years (such as the recent UK[711] and New Zealand[712] laws), provide that a licence may be modified, suspended and/or revoked for various reasons, often related to the performance of a licence (whether the operator is complying with the various conditions imposed when the licence was granted) or maintaining national interests (whether public health, safety of property or national security). Additionally, Australia[713] and New Zealand[714] allow for modifications to a licence on the request of the operator, for example, if a new mission parameter is to be added to an existing operation or an additional launch is to be added to a licence authorising a series of launches.

The *Outer Space Treaty*'s lack of clarity or detail with respect to how States are to fulfill their obligations to "continually supervise" space activities has led to a generally lacklustre legislative approach in most States. As a result, most have enacted passive, rather than active, supervisory requirements in their national space laws. By merely requiring operators to comply with information or access requests by authorities, the likelihood is that authorities will only effectively carry out their supervisory responsibilities after an incident comes to light, a reactionary rather than precautionary approach. In contrast, the Finnish[715] requirement that space operators submit annual reports allows the governmental authority to be more proactive in its supervision and determine before an incident whether an operator is following the conditions laid out in its licence.

The ideal comprehensive space law would consist of provisions that are both passive and active from a supervisory perspective. Generally, the law should empower regulators with the right to inspect documents and premises (subject to conditions) and require operators to provide annual reports or other reporting obligations. By doing so, States would be able to confirm,

[709] *Finnish Space Law*, *supra* note 512 at s 14.
[710] *South African Space Law*, *supra* note 174 at s 10.
[711] *2018 UK Space Law*, *supra* note 97 at s 15.
[712] *New Zealand Space Law*, *supra* note 482 at ss 14, 21, 30, 37, 44, 49.
[713] *Australian Space Law*, *supra* note 226 at s 28.
[714] *New Zealand Space Law*, *supra* note 482 at s 53.
[715] *Finnish Space Law*, *supra* note 512 at s 14.

annually for example, that operators are complying with their obligations and be notified of any anomalies; simultaneously, States would be able to inspect documents and premises if they suspect or discover anomalies. This method of active and passive supervision will require increased regulatory resources but allow for the most effective supervision as required by international space law.

Liability, Insurance and Indemnification

Since one of the motivating forces behind enacting a comprehensive national space law is the management of liability risk, almost all States have provisions on this topic: indeed, only Norway, Argentina, Kazakhstan and New Zealand do not expressly include such a discussion in their space laws (although New Zealand[716] may require operators to carry insurance and requires operators to indemnify the State against damage therefore suggesting an implicit acknowledgement of liability). As per the *Liability Convention*, launching States are liable for damage caused by a space object and a launching State is defined as the State that launches or who procures the launch of a space object, or the State from whose territory or facility a space object is launched. Since States generally want to avoid being liable for damage, the comprehensive space laws of all States include within their purview activities taking place in their territories or undertaken by their nationals (as described above). By doing so, States are able to implement provisions related both to insurance and indemnification. Out of the 18 States that explicitly provide that operators are liable for damage caused by their space activities, twelve require operators to carry insurance coverage and the other six may require such coverage. Uniquely, in Austria[717], the law explicitly provides that although all space activities require insurance, if a space activity is deemed to be in the public's interest (which is defined as a space activity that serves science, research or education) the operator may benefit from having lower insurance requirements or be exempt altogether.

With respect to indemnification, seven national space laws make governmental indemnification mandatory and an additional eight leave it up to the discretion of the governmental authorities as to whether to seek indemnification for damage caused by a space operator for which the State paid compensation. Some States have unique provisions regarding damage caused by

[716] *New Zealand Space Law*, *supra* note 482 at ss 10, 18, 26, 34, 48.
[717] *Austrian Space Law*, *supra* note 360 at s 4.

space activities and indemnification. For example, in France[718], claimants only have one year to bring a claim for damages and in South Korea[719], the period of claim is limited to one year from learning of the damage suffered (or a total of three years from the date of the damage being caused). In Belgium[720], although the law allows the State the option of pursuing a claim for indemnification, if it does proceed with such a claim, they are limited to recovering a maximum of 10% of the three-year average of the operator's earnings and, in the Netherlands[721] and Austria[722], the government may claim up to the licensee's insured amount (with the exception that in Austria the amount must be at least EUR 60 million). Similarly, if the State pursues recourse by way of indemnification, in Finland[723] the amount is capped at EUR 60 million and in Portugal[724] the amount is capped at an amount decided by way of order made by the Minister of Finance.

The ideal comprehensive space law would include provisions related to liability, insurance and indemnification. A general provision determining that operators are liable for the damage they cause in space would be suitable to establish the legal characterisation of private operators undertaking activities for which States are internationally liable. With respect to insurance, including a provision that allows the regulator to require insurance ensures that any damage caused by an operator would be, at least to a certain degree, financially secured. Of course, if catastrophic damage is caused by an operator the financial repercussions would largely exceed a reasonable insurance policy and extend to the State. Similarly, by including a provision that allows the State to determine when to seek indemnification and does not establish any arbitrary limits would allow the State to protect its overall interests. The Belgian and Finnish approach of limiting indemnification to a certain percentage of earnings or to a hard limit undermines the State's ability to recover in cases of catastrophic loss. Although both laws provide that an operator's negligence removes the imposed limits, it remains possible that an operator, acting appropriately, causes catastrophic damage for which they are at fault. In such instances, the State would be internationally responsible to pay compensation and unable to avail itself of the relatively appropriate recourse. Although the Belgian and Finnish models act as incentives to private

[718] *French Space Law*, *supra* note 344 at Arts 14-17.
[719] *South Korean Space Law*, *supra* note 296 at Art 8.
[720] *Michielsen*, *supra* note 274 at p 111.
[721] *Dutch Space Law*, *supra* note 328 at s 12.
[722] *Austrian Space Law*, *supra* note 360 at s 11.
[723] *Finnish Space Law*, *supra* note 512 at s 7.
[724] *Portuguese Space Law*, *supra* note 548 at Art 18.

entities, given the physics of outer space and the possibility that even a small satellite operated by a small company could cause catastrophic damage, maintaining avenues of recourse is prudent.

Registration and Transfer

With respect to a State's obligation under the *Registration Convention* to register its national space object to retain jurisdiction and control, 19 of the 23 national space laws include provisions related to the registry of space objects and/or the creation and administration of a national register. Only the Norweigian, South African, Japanese and New Zealand laws do not provide for the registration of space objects (although New Zealand[725] does provide, in a catch-all section, that the Governor General may make general regulations, including those related to registration). South Korea[726] is the only State to require potential operators, six-months prior to launch, to preliminarily register their space object and again, within three months of the successful launch and orbital placement of the space object, officially register their space object (using the same information provided in the preliminary registration). The method by which States request information to enter into their registration is split: some provide that the governmental authority will determine (either by way of subsequent law, regulation, decree or ordinance) the specific information operators must provide in the registration of their space object; others explicitly include the necessary provisions (such as those itemised in the *Registration Convention*) directly in the law itself; and a few (for example, Australia[727], France[728] and Austria[729]) require information in addition to that required under the treaty.

Since only one launching State is supposed to register a space object, a handful of States (mostly European States that have enacted their national space laws within the last fifteen years and do not have indigenous launch capabilities) have included in their national space laws that if a national of State A launches a space object from State B, the operator is not required to register the space object in State A if State A and State B have an agreement regarding the registration of objects in such instances. Since jurisdiction and control over a space object are linked to registration and liability is linked to launching States, States want to ensure that they have some

[725] *New Zealand Space Law*, *supra* note 482 at s 88.
[726] *South Korean Space Law*, *supra* note 296 at Art 8.
[727] *Australian Space Law*, *supra* note 226 at s 76.
[728] *French Space Law*, *supra* note 344 at Arts 23-24.
[729] *Austrian Space Law*, *supra* note 360 at s 9.

degree of control over the space objects to which they may be liable. By ensuring all space operators register their space objects, States seemingly avoid the risk of being liable for damage caused by a space object of which they are a launching State but over which they do not have control.

The ideal comprehensive space law would include provisions directing a regulator or other appropriate governmental body to create a national register, require all operators to register their space objects, provide the characteristics that must be included with the registration and allow for additional characteristics to be required by the regulator by way of subsequent regulations. By doing so, a State ensures that it retains jurisdiction and control over space objects for which it is internationally responsible and liable.

Environment and Debris Mitigation

With respect to provisions related to environmental protection (whether the protection of the Earth's environment or the space environment) States are relatively mixed. Only the laws of Ukraine[730], Australia[731], Belgium[732], Kazakhstan[733], Indonesia[734] and Finland[735] have provisions requiring environmental consideration to be taken into account either at the application stage or as conditions that must be followed as part of a licence. In the Hong Kong[736] and the Netherlands[737], environmental protections may be required, whether as elements that must be included in a government's authorisation application process or as conditions of a licence. The remainder of the examined jurisdictions are silent on the issue of environmental protection.

With respect to debris mitigation, ten jurisdictions require operators to demonstrate their consideration to the mitigation of space debris as a part of their space activities (with some requiring specific de-orbiting plans rather than general debris mitigation strategies) while Hong Kong[738], France[739] and Denmark[740], allow regulators to determine whether to include debris

[730] *Ukrainian Space Law*, *supra* note 195 at Art 21.
[731] *Australian Space Law*, *supra* note 226 at s 18.
[732] *Belgian Space Law*, *supra* note 271 at Art 8.
[733] *Kazakhstani Space Law*, *supra* note 381 at Arts 3, 29.
[734] *Indonesian Space Law*, *supra* note 404 at Art 8.
[735] *Finnish Space Law*, *supra* note 512 at s 3.
[736] *Hong Kong Space*, *supra* note 213 *Law* at s 6.
[737] *Dutch Space Law*, *supra* note 328 at s 3.
[738] *Hong Kong Space Law*, *supra* note 213 at s 6.
[739] *French Space Law*, *supra* note 348 at Art 5.
[740] *Danish Space Regulations*, *supra* note 433 at s 6.

mitigation requirements in their authorisation procedures. Most of the space laws addressing debris mitigation reference appropriate international standards as the requirements operators are to follow, with the more recently enacted laws referring to the Debris Mitigation Guidelines created by the Inter-Agency Space Debris Development Committee and adopted by UN COPUOS. Over the last 15 years, two thirds of States (eight of twelve) States that enacted comprehensive space laws included mandatory requirements with respect to space debris (as compared with two over the previous thirty-five years), demonstrating a recent acknowledgement of the significant problems posed by space debris and States' willingness to implement appropriate regulations.

The ideal comprehensive space law would include provisions related to ensuring environmental protection and debris mitigation. Although neither of these concepts are currently binding under the generally accepted principles of international law, States would be prudent to adopt such provisions to ensure their legislation is future-proof. It is unnecessary to spell out in overly detailed terms what kinds of environmental protections must be followed or how exactly debris should be mitigated; rather, including that such issues should be considered by regulators allows for regulatory flexibility.

Consequences of Violation

Individuals who violate the various space laws are subject to a number of explicit consequences. Depending on the provisions violated, individuals may be subject to fines, imprisonment or both: in nine jurisdictions, regulators have the option to fine and imprison violators; in Sweden[741], Belgium[742] and South Korea[743], regulators may fine or imprison violators, but not both; in the Netherlands[744], France[745] and Austria[746], violators are subject only to a fine; and in six jurisdictions, the consequences flowing from the violation of the law are unclear. The most significant penalties come by way of Indonesia[747] (up to 15 years imprisonment and/or fines of up to approximately USD $350 million). By comparison, the consequences in Belgium are

[741] *Swedish Space Law*, *supra* note 43 at s 5.
[742] *Belgian Space Law*, *supra* note 271 at Art 19.
[743] *South Korean Space Law*, *supra* note 296 at Arts 27-29.
[744] *Dutch Space Law*, *supra* note 328 at ss 13-15.
[745] *French Space Law*, *supra* note 348 at Arts 11, 25.
[746] *Austrian Space Law*, *supra* note 360 at s 14.
[747] *Indonesian Space Law*, *supra* note 404 at Arts 95-100.

relatively minor, with violators facing a term of imprisonment of up to one year or a fine of up to approximately USD $27,000.

The ideal comprehensive space law would include provisions related to the consequences of violating the law as appropriate for the jurisdiction being considered, on the basis of denouncing activities that violate the law.

Conclusion

The decision to enact a comprehensive domestic space law is often motivated by a State's desire to simultaneously ensure the safety and security of space operations, protect against potential liability claims and uphold its international obligations. To this end, although no two national space laws are identical, most comprehensive national space laws share similar characteristics. As identified above, these common characteristics ensure the law applies appropriately, provide mechanisms for the authorisation and supervision of space activities, protect against liability through insurance and indemnification clauses, oversee the transfer of licences and the registration of space objects and protect the Earth and space environments. The growing trend of enacting domestic space legislation will likely continue into the future as more States see the benefits of creating legislative frameworks for the regulation of commercial space activities; indeed, over the last five years alone, six States have enacted comprehensive national space laws.

Chapter 8: Rationale for a Comprehensive Canadian Space Law

Purpose and Outline

The purpose of this chapter is to provide a rationale for why Canada may choose to enact a comprehensive space law. Having demonstrated in previous chapters the growth of the commercial space industry, the obligation for authorisation and supervision and the existing regulatory gap for both current and emerging space activities, this chapter will provide the rationale for how the creation of a new comprehensive Canadian space law could address some of the fundamental shortcomings of Canada's space regulatory framework.

This chapter will begin with a brief restatement of the salient facts applicable to the Canadian commercial space sector as well as the current Canadian space regulatory framework. The chapter will then discuss the various general regulatory advantages of a comprehensive space law as well as provide the specific rationale that may induce the government, industry and third-parties to consider adopting such a law. The chapter will also include a discussion on how, to augment the effectiveness of the proposed comprehensive space law, other aspects of the Canadian space regulatory framework would need to be improved. The chapter will conclude by presenting a series of likely criticisms to the proposed comprehensive space law and providing responses to each.

Future of Canadian Commercial Space Activities

As presented in Chapter 2, both the global and Canadian commercial space sectors continue to grow. In many cases, existing public agencies and entities are transitioning from space actors to space regulators as they scale back their operations, increasingly incorporate commercial partners and, in some cases, allow private operators to take the lead. As governmental entities focus less on the operation of space activities, commercial entities will begin adapting and advancing space activities to suit their needs. The expectation is that this transition from a public to a private leadership of space activities will bring with it an evolution of the kinds of space activities, including those that, at present, are merely theoretical. Further still, commercial operators may dream up, and successfully implement, space activities and/or services that have not yet been imagined.

In Canada, the commercialisation of space is already a reality. Without domestic, indigenous launch capability, a number of private operators are seeking to develop orbital delivery mechanisms of their own. With respect to remote sensing, commercial operators have been

pushing the technological boundaries of synthetic aperture radar[1] and continue to innovate in the applicability of space based remote sensing data to terrestrial needs. Commercial communications satellite operators also provide industry-leading services with increasingly expanding capabilities. Many Canadian firms are also considering the next impending wave of commercial space activities, including on-orbit servicing, debris remediation, space resource exploitation, space tourism and other, currently unthinkable, activities and corresponding applications.

In jurisdictions seeking to embrace commercial space development and transition the role of government from public operator to public regulator, there will be a need for more robust regulatory frameworks. Indeed, in many jurisdictions, as demonstrated in Chapter 7, this has already taken place. Given the unique physical and legal characteristics of space, a robust regulatory framework ensures commercial operators have the necessary clarity, consistency and certainty to experiment with cutting-edge space technologies and develop emerging space applications. Aging regulatory frameworks, such as that which exists in Canada, are not suited for the regulation of novel space activities as they lack the legal foresight necessary to accommodate technological variability and change.

Current Canadian Space Regulatory Framework

As explored in Chapter 4, the Canadian space regulatory framework is anchored in five distinct laws: the *Radiocommunications Act*[2], the *Aeronautics Act*[3], the *Broadcasting Act*[4], the *Telecommunications Act*[5] and the *Remote Sensing Space Systems Act*[6]. Although the *Radiocommunications Act*, the *Broadcasting Act* and the *Telecommunications Act*, by and large, seem to appropriately regulate their respective activities in their current forms, it is possible that technological change and new applications will undermine their efficacy in the future. With respect to the *RSSSA* and the *Aeronautics Act*, however, there are already clear concerns.

The *RSSSA* is now more than ten-years old and the underlying interests that motivated its enactment are no longer representative of the current global landscape. Although the fundamental

[1] Although the RADARSAT Constellation Mission is owned by the Government of Canada and operated by the Canadian Space Agency, the three satellites were built by MDA and developed using the knowledge and expertise gained from the previous RADARSAT II satellite (owned and operated by MDA).
[2] *Radiocommunication Act*, RSC 1985, c R-2.
[3] *Aeronautics Act*, RSC 1985, c A-2.
[4] *Broadcasting Act*, SC 1991, c 11.
[5] *Telecommunications Act*, SC 1993, c 38.
[6] *Remote Sensing Space Systems Act*, SC 2005, c 45 [*RSSSA*].

notion of balancing national security with commercial development remains applicable, the sensitivities and particularities that were present a decade ago that shaped the balanced formula may now be resulting in regulatory outcomes that are imbalanced. At the very least, the two legislatively-mandated independent reviews of the *RSSSA* suggested a general recalculation of this balance as well as more specific recommendations.[7] Since the conclusion of the 2017 review, additional issues with respect to the timeliness of licensing, misapplication of the law's scope and other concerns have been voiced by members of the Canadian space community suggesting a desire and opportunity for remote sensing regulatory improvements.[8]

Conversely, the *Aeronautics Act*'s complete lack of regulatory guidance with respect to launch activities is a serious and consequential regulatory failure: the *Aeronautics Act* explicitly applies to launch activities but the *Canadian Aviation Regulations* flatly prohibit any significant rocket activity without licence. Although this form of authorisation is common in other jurisdictions as well, the fact that no licensing procedure exists (whether formally through the legislation or subordinate legislation or informally through government circulars or procedurals) is quite peculiar and disheartening for any entrepreneur interested in developing launch capabilities (of which there are currently several in Canada[9]). Indeed, even though a private entity is legitimately attempting to develop a spaceport in Eastern Canada and is currently undergoing the provincial and federal licensing processes to make that a reality, even if it is successful it would not be able to host launch activities as a result of the current regulatory framework established under the *Aeronautics Act*.

Even if the existing five Canadian space laws were effective, they each only regulate a single specific activity; therefore, any space activity that does not fall within the scope of one of these laws cannot be regulated and therefore cannot be licensed. Acknowledging Canada's international obligations under the *Outer Space Treaty* to authorise and continually supervise space activities, and further acknowledging that Canada carries out these obligations through the licensing of specific space activities, without a proper regulatory framework, activities other than those currently within the scope of existing legislation cannot be licensed and consequently cannot be

[7] For a discussion on the varied challenges identified by two independent reviews of the law, see Ram Jakhu, et al, *Independent Review of the Remote Sensing Space Systems Act*, Institute of Air and Space Law, McGill University, 22 Mar 2012 and Ram Jakhu & Aram Kerkonian, *Second Independent Review of the Canada's Remote Sensing Space Systems Act*, (2019) 42:1 J of Space L 1 at pp 2-3. *See* Chapter 2, *Current Canadian Space Activities*.
[8] *See* Chapter 3, *Canadian Space Laws*.
[9] *See* Chapter 2, *Emerging Space Applications*.

undertaken by private operators.[10] Although most successful commercial space activities today fall within the purview of existing legislation, many future space activities will not: for example, neither on-orbit servicing, debris remediation, space resource exploitation or space tourism fall squarely within the scope of an existing space law. If Canada wishes to maintain the global position of its commercial space sector, it ought to provide the regulatory framework through which to authorise such activities.

Proposed Comprehensive Space Law

The proposed creation of a comprehensive Canadian space law would likely address the interests of the country and the needs of industry in a manner more desirable than either amending existing legislation and/or creating multiple space laws would. A comprehensive space law would act as the foundation of the Canadian space regulatory framework and provide overarching guidance on the regulation of specific space activities. In this way, it would provide the government with an opportunity to address the commercialisation of space, provide industry with a clear and consistent regulatory framework and provide concrete advantages to various other stakeholders.

General Advantages of a Comprehensive Space Law

The proposed comprehensive Canadian space law, a draft of which is included in Appendix III and a commentary on which is provided in Chapter 9, is most generally characterised as a law that includes broad provisions related to the overall regulation of space activities and leaves to subordinate legislation (also referred to as regulations) the details of how to precisely regulate specific activities. This legislative structuring provides three discernable advantages: first, it allows the law to play the role of a foundational regulatory document (similar to that of a constitution); second, it allows the subordinate legislation to freely respond to the technological evolutions driving the commercial space sector; and third, it provides for a coherent and accessible regulatory framework.

[10] Each member of the Canadian space community who responded to the questionnaire (included as Appendix I) responded that the current Canadian regulatory framework was ineffective and that there was room for improvement. *See* Chapter 6, *The Application of Canada's Space Regulatory Framework*.

Overarching Foundational Document

Canada's current space regulatory framework is not built upon a solid legal foundation. Although Canada's individual space laws, their accompanying regulations, broad strategy documents and departmental plans do establish a seeming regulatory framework, there is no single instrument that unites their approach or sets out the most basic objectives of Canadian space regulation. If, hypothetically, the *Broadcasting Act* provided that, for cultural awareness purposes all information related to Canada's geographic landscapes must be publicly disseminated and the *RSSSA* established that commercial operators could choose to restrict the dissemination of their space data to specific entities, there is no fundamental regulatory document to consult to clarify the inconsistency. As it exists, Canada's space regulatory instruments offer individual regulatory guidance, often related to a single space activity, resulting in a piecemeal framework lacking cohesive underlying regulatory values. A comprehensive Canadian space law could provide this unifying function by establishing, at its core, a set of principles or objectives meant to guide the general regulation of commercial space activities.

Loosely, the nature of the comprehensive Canadian space law being described can be compared to the role a constitution plays in the legal systems of most countries.[11] In most States, aside from the specific laws and regulatory documents that relate to specific issues, there exists an underlying legal instrument that establishes the State's guiding principles. Although the analogy between a national constitution and the proposed comprehensive space law is far from perfect, there exist a few common characteristics: first, constitutions establish the basic ideological or legal tenets of the community upon which more specific additions can be built; second, participants in the system know their roles and respective rights; and third, although constitutions can be amended, the process is intentionally more arduous than amending traditional statutes. It could be argued that in a structurally-but-not-legally similar way, a comprehensive Canadian space law could embody these characteristics and provide the same kind of structure to the regulation of space activities in Canada that a constitution provides to a country.

[11] One obvious criticism is that constitutions usually establish governmental organs and, in an analogous sense, a comprehensive Canadian space law would not be establishing any new departments or regulatory implementation/enforcement organs. While this is true in the proposed form, it is entirely legitimate for a comprehensive Canadian space law to establish, for example, a Department of Space (or Commercial Space Office within an existing department), to implement the regulatory framework established by the law.

There are certain immutable attributes that apply to any regulatory document applicable to commercial space activities, such as maintaining the national interest, ensuring safety and security, promoting commercial development and honouring international commitments.[12] Regardless of the political party and irrespective of changes in societal attitudes, principles such as these always play a central role when crafting Canadian space regulations. By including these - and potentially other[13] - ideological principles in a comprehensive space law, timeless and foundational elements of the Canadian space regulatory framework would be concretised and the law would act to unify the other regulatory instruments that focus on specific issues. The benefit of such a legally-grounded structure includes, but is not limited to, uniformity in regulatory messaging, clarity in overall space sector objectives and consistency in long-term expectations.

This is not to say that individual planning or strategy documents would no longer be necessary; rather, the policy decisions established in such documents would provide short-term guidance as they would be forced to set more specific goals and objectives than their current versions. For example, each and every Canadian space policy document from the *Chapman Report* to the *2019 Space Strategy* has established the promotion of industrial development as an objective. Although worthwhile and valid, there is no need to repeat this same sentiment in all future space policy documents if the "promotion and development of industrial capability and global competitiveness" is established as an objective of a comprehensive Canadian space law. Instead of reiterating this objective[14], future space policy documents would specify how exactly they would meet this goal. For example, instead of a space policy document stating that it will "stimulate talent development in youth", it would provide the details related to a program that creates "50 internships with the Canadian Space Agency where young engineers develop tangible skills and, after an intensive year, return to their companies with renewed insights".

A comprehensive Canadian space law would also establish the expected roles individual members and entities of the space community are expected to fulfill. Government departments would be aware, for example, over which activities they have oversight and the considerations

[12] When asked what specific interest Canada should attempt to balance by way of commercial space regulation, most members of the Canadian space community identified safety, security and international commercial competitiveness. *See* Chapter 6, *Canada's Space Regulatory Framework*.
[13] A total of eight objectives were established in the draft comprehensive Canadian space law. *See* Appendix III, s 3.
[14] Some members of the Canadian space community expressed frustration at the government's use of the same language in successive policy documents without actually implementing the necessary policies that would lead to the idealised objectives. *See* Chapter 6, *The Future of Space Regulation in Canada*.

they are expected to take into account when evaluating space activity applications, the general nature of their supervisory responsibilities and the manner in which they are to collaborate with other departments in the regulation of multi-faceted activities. Commercial operators would be aware, for example, that they need to submit specific applications for specific activities or that they are expected to file annual reports related to all of their space activities. Academics and scientific researchers would be aware, for example, that certain general regulatory exclusions apply to their space activities and that unique funding opportunities may exist for addressing contemporaneous challenges. In this way, by providing some elementary regulatory guidance, actors involved in the Canadian space community would have a better idea of how the framework in which they are expected to operate functions.

Further, a comprehensive space law, as a form of legislation, would be more challenging - or, at the very least, demand more legislative resources - to amend than, for example, subordinate legislation or a strategy document. As a result, it would be more prudent to make changes to the space regulatory framework by amending specific subordinate legislation rather than the law itself. Although this rigidity may seem like an obstacle to regulatory flexibility, it in fact provides at least two discrete advantages. First, this structure creates a more responsive regulatory framework since the Minister can make changes to the subordinate legislation without having to wait for parliamentary action (an extremely time consuming process).[15] Second, this structure allows for the regulatory framework to address changing circumstances while at the same time protecting the regulatory framework itself. To this end, it is easy to make changes within the regulatory framework but more challenging to make changes to the regulatory framework. By maintaining this structural integrity yet allowing for regulatory flexibility, the Canadian space sector would be positioned on a solid legal foundation that can still adapt to the changing domestic and global commercial space environments.

[15] Indeed, as evidenced by the *RSSSA*, making changes to the regulatory framework can be extremely difficult and time-consuming. At the time of writing, eight years have passed since the first legislatively-mandated independent review of this law was conducted and three years since the second; even though Global Affairs Canada has stated that it is working to implement the various recommendations of those two reviews, it is unclear whether changes will be made to the *RSSSA* itself or to its subordinate legislation. If the chosen route requires amendments to the *RSSSA* (rather than improvements to the subordinate legislation), it will likely prolong the period further since Parliament necessarily moves slowly (especially in comparison to a single department). In the meantime, the commercial remote sensing sector remains subject to the provisions of the now-outdated law.

Responsive and Flexible Application to Emerging Activities

Examining the regulatory benefits of enacting a comprehensive Canadian space law can be discussed in two contexts: with respect to the existing regulatory framework or in response to a competing proposal for multiple, activity-specific space laws. The first can be dismissed quite simply: as commercial space technologies and applications continue to develop, Canada will not have a regulatory instrument through which to licence and oversee such novel space activities. This will result in one of three scenarios: Canada will actively prevent commercial operators from carrying out such emerging space activities[16]; Canada will allow such activities but fail to uphold its international obligations[17]; or Canada will attempt to regulate such activities under existing legislation[18]. Needless to say, these scenarios are neither ideal nor desirable: actively or passively hindering the development of a growing and significant commercial industry is irresponsible and, as demonstrated, existing legislation is not up to the challenge. It is likely, therefore, that Canada will enact legislation in some form or another to regulate emerging space activities. The likelihood is that Canada has two legislative options (a single comprehensive space law or multiple, activity-specific laws); contrasting them ought to suggest the more appropriate legislative route forward.

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[16] There may be an argument to be made that without a Canadian law that explicitly prevents private space activities (such as a generally-prohibitive provision that would be established in a comprehensive national space law like those of the 22 other jurisdictions surveyed in Chapter 7), private operators are not legally prohibited from carrying out space activities. Although they have an obligation to first acquire a licence for telecommunication, broadcasting and/or remote sensing activities (because existing laws require this), as well as a licence to communicate with their space object using some means of radiocommunication, there is no domestic legal obligation, for example, to acquire a licence before undertaking space resource exploitation activities. Although a space mining company would still require a radiocommunication licence, they would not need a specific "space mining" licence. (Even though it is possible that the government may choose not to grant a radiocommunication licence to prevent the entity from carrying out space mining activities, this is likely an inappropriate use of the *Radiocommunication Act's* prohibition. For more information with respect to the *Radiocommunication Act* being used in place of a proper comprehensive space law, see *Potential Criticisms of the Proposed Comprehensive Canadian Space Law* below.) Nevertheless, without a licence granting explicit permission to undertake a specific space activity, it is unlikely that operators would be willing to risk their time and money pursuing such an undertaking. In this way, the government would effectively be preventing commercial space operators from engaging in emerging space activities.

[17] As discussed numerous times, Canada has a clear obligation to authorise and continually supervise the space activities of its non-governmental entities. Traditionally, Canada satisfies this obligation by licensing and supervising space activities. Without a law appropriately applicable to a specific emerging space activity, Canada would be unable to authorise this activity, thereby violating its international obligation. *See* Chapter 2, *Current International Space Law*.

[18] For example, any emerging activity that carries a camera aboard may be regulated under the *RSSSA* since the extremely broad definition of "remote sensing system" includes any system "capable of sensing the Earth". Even if an onboard camera has no realistic ability of sensing the Earth, the fact that it has the functional capability of doing so may bring it within the ambit of the *RSSSA*. Needless to say, attempting to regulate on-orbit servicing or space mining (both activities that will likely require abilities that can also be deemed "capable of sensing the Earth") seems ineffective at best.

It is with a mindset of the future regulatory opportunities and challenges posed by emerging space activities that Canada ought to decide on the regulatory route it follows. By their very nature, emerging space activities are those space activities that are not yet commercially viable but will, in the future, prove technologically and financially feasible. When such commercial viability is demonstrated, there will be a need for a regulatory mechanism through which to licence the operation. The question is whether the regulatory mechanism will exist before, during or after the emergent space activity's development and demonstration. In another sense, will the law that will license emerging space activity X (ESAX) exist before ESAX is conceptualised in the mind of an entrepreneur, while the engineering challenges of ESAX are being worked through in a company's laboratory, or after ESAX's space components are ready for launch. Acknowledging that Canada ought not hinder the development of a commercial space activity, the "after" scenario is likely too late for creating the necessary law as it would inevitably slow down the "bring to market" capabilities of the operator and stifle commercial competitiveness. Therefore, the question is reduced to whether Canada should create a law before ESAX is conceptualised or after it has been identified as a potential new space activity.[19]

It is likely the suggestion of creating a law to regulate ESAX before it has even been conceptualised is unnerving and that, instead, the law should be created after the activity itself can be identified and has demonstrated itself as a realistic potential commercial space activity. This reaction is justified if the conceptualisation of a new law is limited to an "activity-specific" law rather than a comprehensive law. Indeed, it would not have been possible to draft the *RSSSA* (being an example of an activity-specific law) before commercial remote sensing was conceptualised and some technological progress was demonstrated; however, in 1982 Sweden[20], long before it was possible to realistically conceptualise the commercial applications of remote sensing activities, did, in fact, enact a law capable of regulating such activities. The claim that the *RSSSA* and Sweden's comprehensive national space law are equally capable of regulating remote sensing space activities is justifiable since the regulation of remote sensing is carried out (or would

[19] Nearly all members of the Canadian space community desire proactive laws that are in place before an emerging space activity is brought to market. *See* Chapter 2, *A New Canadian Space Law*.
[20] *Act on Space Activities*, 18 Nov 1982 [*Swedish Space Law*].

be, if Sweden had a robust commercial remote sensing industry) via the subordinate legislation much more than the law itself.[21]

In this way, therefore, a comprehensive space law does not see into the future when regulating emerging space activities but rather prepares for the unimaginable-yet-likely continued development of space activities.[22] By bringing within its legislative framework "all space activities"[23], the scope of a comprehensive space law is broad enough to apply to future space activities for which specific laws cannot currently be developed. As a result, when ESAX (or ESAY, ESAZ, etc.) demonstrates its potential technological feasibility and commercial viability, the most appropriate Minister - as pre-determined by the law - can more quickly set in motion the development and implementation of the subordinate legislation that would authorise, license and regulate the activity. In comparison, without a comprehensive space law, Parliament would first have to identify a new activity, recognise the need for a regulatory regime, draft and pass through both bodies of Parliament an appropriate law, wait until the law comes into force and then enact the necessary regulations that provide precise guidance. The concern with this regulatory approach is only compounded by the fact that the process must be repeated for ESAX, ESAY, ESAZ and each and every other emerging space activity in the future. From a responsiveness perspective, therefore, enacting a single comprehensive space law rather than multiple, activity-specific space laws would likely result in a more proactive and less reactionary regulatory framework.

Increased Coherence and Regulatory Accessibility

One of the understated and under-considered advantages of a comprehensive Canadian space law would be its harmonising effect on the existing regulatory framework related to space.

[21] Although the *RSSSA* provides the legal framework (by establishing general concerns and regulatory criteria) through which to regulate remote sensing space activities, the *Remote Sensing Space Systems Regulations* is the regulatory instrument through which commercial operators are actually licensed.

[22] A similar rationale was provided to support the adoption of an Argentinian national space law as it would allow for legal stability while maintaining regulatory flexibility. Julian Hermida, "Legal Basis for a National Space Legislation" (Dordrecht: Kluwer, 2004) at p 217.

[23] The importance of this very basic notion cannot be overstated. Only in a comprehensive space law would it be appropriate to include a provision such as: "It is prohibited to carry out space activities unless prior authorisation has been granted by the Minister." In an activity-specific space law, the provision would have to say "It is prohibited to carry out X space activity unless prior authorisation has been granted by the Minister." In the latter case, any future space activities that are not X would exist in legislative limbo without a clear regulatory pathway to attaining legitimacy. The result is that regulating emerging space activities would require a multitude of new laws every decade. It is only with a comprehensive space law that "all space activities" can be brought within the scope of a single law and thereby allow for regulatory flexibility.

Regardless of whether the comprehensive law incorporates existing pieces of legislation (such as the *Telecommunications Act* or the *RSSSA*) or simply refers to their existence (as is proposed in Chapter 9), having a single space law would improve the awareness of how space activities are regulated in Canada for non-specialists and specialists alike.[24] When commercial operators, academics, or even government bureaucrats seek guidance on the rules applicable to space activities in Canada, they currently have to wade through a number of different laws (both those that regulate specific activities and those that are related to space activities), their subordinate legislation (which, for example, can include dozens of sets of instruments as with the *Aeronautics Act*) and ensure no recent space policy document has explicitly altered the government's regulatory priorities, all with the uneasy feeling that they may have overlooked an applicable regulatory instrument. This process will be made even more cumbersome and challenging if an activity-specific regulatory approach is taken where, overtime, there would be dozens of additional space laws and accompanying subordinate legislation.

The creation of a comprehensive space law would improve this process. Any interested individual would first consult the general space law, determine immediately that it applies to their space activity[25], determine that they require a licence for their activity, locate the provisions that discuss the need for an application, consult the specific subordinate legislation that provides more granular instructions and apply for and eventually obtain a licence authorising them to carry out their space activity. This same process would apply to an individual regardless of whether they seek to undertake telecommunication activities, remote sensing activities, on-orbit servicing activities, space resource exploitation activities or any other future space activity. Ideally the law would be drafted in simple language that is both linguistically and functionally accessible and the general guidelines would be published to an online governmental webpage that includes hyperlinks to all the individual documents that make up the space regulatory framework.[26]

Indeed, similar rationale inspired the United States government to enact Title 51 as a compilation of its existing space regulations. The Office of the Law Revision Counsel listed the

[24] Most members of the Canadian space community, including both industry and government representatives, are not aware of the full extent of Canada's regulatory framework or the way in which its different elements interact. *See* Chapter 6, *Canada's Space Regulatory Framework*.
[25] This is stated as directly since the comprehensive space law would apply to all space activities.
[26] Although this online-portal proposal would also be possible with an approach that enacts multiple, activity-specific laws, interested parties would have to read through each and every law to determine which laws apply to their activities as the title of a law very rarely captures the entirety of its scope.

following reasons for codifying existing legislation into one title: organising existing legislation and creating a flexible framework to include future legislation; ensuring drafting styles and word choices are consistent; removing expired provisions; clarifying ambiguities and removing duplicate provisions; and improving the organisation to make the law more accessible.[27] Although the US and Canadian regulatory frameworks are distinct, the motivations for a comprehensive approach to regulation, especially space regulation, are analogous.

Avoiding legislative fragmentation will lead to overall more efficient regulatory processes: operators will know which laws apply to their activities and regulators will know which pieces of subordinate legislation contain the licensing procedures for specific activities. By clearly including all regulatory aspects of space activities in one law, there is less room for contradictions that may result in, for example, a framework comprised of multiple laws, drafted at different times, with non-uniform definitions and unsynchronised objectives. A regulatory system anchored in a single law will likely prove more uniform and stable than one that is patched together with multiple laws in a piecemeal fashion.[28]

Stakeholder Rationale for the Creation of a Comprehensive Space Law

There are many reasons why the creation of a comprehensive Canadian space law may improve Canada's existing space regulatory framework, including those discussed above. However, given the wide-ranging effects of a space regulatory framework, the consequences of enacting and implementing a new foundational Canadian space law document will have varied effects on different stakeholder groups, including the government (as regulators), industry (as operators) and third-parties (acting in a variety of capacities). Therefore, although the benefits of a comprehensive Canadian space law will be widespread, with respect to specific stakeholder groups, the benefits will also be discrete. As a result, it is expected that different stakeholder groups will have different underlying rationales for why they ought to be in favour of a comprehensive space law.

[27] Office of the Law Revision Counsel, *Importance of Positive Law Codification*, United States Code: Positive Law Codification, 9 February 2016, online: <http://uscode.house.gov/codification/legislation.shtml>.
[28] Most members of the Canadian space community responded that a comprehensive space law would be preferable to a piecemeal approach made up of multiple activity-specific laws. *See* Chapter 6, *A New Canadian Space Law*.

Government Perspective

Although the governmental benefits of a comprehensive Canadian space law may not be immediately apparent, there are, in fact, numerous ways in which such an improvement to the regulatory framework would advantage the regulator of that framework. There are three main reasons why the government ought to desire the creation of a comprehensive space law: first, it would protect the financial interests of the State against potential liability claims; second, it would positively engage with the commercialisation of space; and third, it would allow Canada to wholeheartedly lead international space law harmonisation efforts. In combination, these and other reasons provide the rationale for why the government may seek to create and implement a comprehensive Canadian space law.

Under existing international space law, launching States are liable for the damage caused by space objects - this remains true whether the launching State (or an entity within its jurisdiction) directly controls the space object or such control is localised in another jurisdiction. Since a single space object often has a number of launching States (as described in Chapter 3), these States are jointly and severally liable for any damage caused by the space object.[29] As a result, even though Canada does not possess launch capabilities, any Canadian space object launched into outer space for a public or private Canadian entity makes Canada a launching State by virtue of Canada being considered to have procured the launch. When Canada licences its space activities it implicitly agrees to be a launching State and becomes the subject of liability claims. Importantly, international space law does not extend liability to non-governmental entities operating in space: liability only applies to launching States. As a result, since Canada is internationally liable for damage caused by space objects for which it is a launching State, if it seeks to recoup from the private operator who is responsible for the reparations Canada paid to satisfy an international claim against it, it must do so through domestic legislation.

Of course, all States risk being found internationally liable for damage caused by their non-governmental entities engaging in space activities and must seek indemnification through domestic laws. Unlike Canada, however, most space-faring States have included provisions in their

[29] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies*, 27 Jan 1967, 610 UNTS 205 [*Outer Space Treaty*] at Art VII; *Convention on International Liability for Damage Caused by Space Objects*, 29 Mar 1972, 961 UNTS 187 at Arts IV, V [*Liability Convention*].

comprehensive national space laws[30] (and those that do not have a comprehensive space law nevertheless have laws related to liability and indemnification) related to attributing liability to, and seeking indemnification from, private entities. None of Canada's existing space laws, nor any of its non-space laws, provide that Canada may indemnify itself for the financial consequences of being found internationally liable for damage caused by a private operator. A comprehensive space law would allow Canada to include such a provision to ensure Canada may seek indemnification in instances where it has had to make reparations to another State.

Nevertheless, even if Canada did have a legal provision related to indemnification (whether in space law or a more general law), there is no guarantee that Canada would be successful in reclaiming the totality of the compensation it pays to satisfy an international claim. The commercialisation of space has reduced the barriers to entry and many private entities operating in space are, and will continue to be, relatively small companies with limited assets. The laws of physics, however, do not discriminate and apply in equal measure to large companies and start-ups alike. For this reason, if a Canadian start-up's $100,000 small satellite collides with a $100,000,000 NASA satellite and causes catastrophic damage, Canada would be liable for satisfying the $100,000,000 claim. Even if Canada successfully indemnifies itself against the start-up company, if it only has assets totalling $10,000,000, Canada (through its taxpayers) would be on the hook for the remaining $90,000,000. A comprehensive space law would allow Canada to implement insurance requirements on its private operators to ensure that, in cases where they cause damage and Canada is internationally liable, they can successfully reimburse Canada by way of indemnification.[31]

Further, by enacting a comprehensive space law, the government would be demonstrating to its domestic space industry that it is serious about the commercialisation of space and that it is interested in stimulating the space sector. The enactment of a new space law would send a two-fold message to industry: first, that the government recognises existing space activities require an improved regulatory framework and second, that the government understands it has a role to play

[30] *See* Appendix II for the list of the States that have included liability, insurance and indemnification provisions in their comprehensive national space laws.

[31] Including provisions related to indemnification and insurance does not mean that for each and every space activity insurance will be mandatory and that each and every time damage is caused indemnification will be sought. Rather, the legislative legitimacy of including such provisions in a comprehensive Canadian space law would give the government the flexibility of determining when to require or avail itself of the necessary provisions. For a more detailed discussion, *see* Chapter 9, *Obligation of Licensees* and *Public Interest Exemptions*.

in the continued development of a growing commercial industry. In this way, a new comprehensive Canadian space law would demonstrate that the government is not only responding to existing conditions but also promoting the continued growth of the private space sector. By improving the space regulatory framework, industry would view the government as a willing partner in their efforts to engage in a highly competitive global market rather than as a simple bystander or, worse, an obstacle.[32]

Developing this kind of relationship with its domestic space industry is beneficial not only for the short-term satisfaction of existing commercial operators but instrumental to demonstrating Canada's long-term approach to space for new commercial operators and for foreign operators seeking to relocate to a new jurisdiction. The global commercial space industry continues to grow and, aside from providing more diverse and useful applications, will increase in economic importance for all States. By demonstrating that Canada is responsive to the needs of its industry, such as by making the improvements to a regulatory framework that most operators deem necessary[33], it will project to the world a jurisdiction that is regulatorily attractive and responsive to its commercial space sector.

This is undoubtedly the image Luxembourg cultivated by enacting its space resource law in 2017. While academics and other third-parties questioned whether the law was a violation of international law, commercial operators viewed the law as a regulatory oasis of clarity. Luxembourg then leveraged the notoriety of this unique regulatory environment by announcing significant financial commitments to firms willing to relocate to its jurisdiction. Surprisingly[34], and yet unsurprisingly[35], the two leaders in the field of space mining promptly established corporate footholds in Luxembourg[36] and since then, Luxembourg has attracted non-space

[32] Members of the Canadian space community are generally quite disapproving of Canada's leadership regarding space and seek a more clear and effective government approach. *See* Chapter 6, *Canada's Space Policy*.
[33] *See* Chapter 6, *The Future of Space Regulation in Canada*.
[34] Given the speed of the announcements and the significance of the decision to relocate, at least in part, US companies to another jurisdiction to take advantage of a regulatory framework, this was surprising.
[35] Given that commercial space operators seek regulatory clarity and, in this case, Luxembourg was providing regulatory clarity through a framework that unquestionably benefited commercial operators, this was unsurprising.
[36] Jeff Foust, *Luxembourg expands its space resources vision*, Space News, 6 Dec 2019, online: <https://spacenews.com/luxembourg-expands-its-space-resources-vision/>. It is worth noting that since their relocation to Luxembourg, both companies have been bought by entities not explicitly interested in space activities and have scaled back their ambitious space mining plans. Nevertheless, these decisions were not a result of the welcoming Luxembourgish regulatory framework but rather in spite of it.

resource companies as well[37]. Luxembourg has maintained this momentum with various investments as well as the creation of a fund intended solely to invest in early-stage space enterprises.[38] Like all countries, Canada has the opportunity to do something similar: by enacting a comprehensive space law that is forward looking and one that provides tangible, real-world benefits to commercial operators, Canada's regulatory improvements can be seen as the first of many moves that demonstrate its commitment to commercial space activities.[39]

Lastly, the government's enactment of a comprehensive space law would grant it the necessary legitimately to engage with the international community on the benefits of harmonised domestic regulatory frameworks. Although international space law has had a positive impact on the first sixty years of space activities, without appetite (in Canada or globally) for increased international efforts for treaty making or amending existing treaties, the only way to ensure space operators based in different jurisdictions compete on a level playing field is through the harmonisation of domestic laws.[40] Indeed, for Canadian commercial operators, a level playing field is a priority: if remote sensing operators based in Canada are legally prohibited from distributing data related to a certain geographic area in Mexico but Brasilian remote sensing operators are not, the Canadian operators are at a competitive disadvantage to their Brasilian counterparts. In an increasingly fragmented regulatory world, where the manner in which non-governmental space operators are regulated is determined by the jurisdiction in which they are licensed, Canada ought to play an important role in increasing harmonisation efforts.

Without a robust regulatory framework, Canada cannot advocate for such harmonisation. It is only after Canada has enacted a comprehensive space law that it can advocate for the harmonisation of national laws to create a level playing field for commercial space operators across all jurisdictions; without such a law, Canada will not be taken seriously. Although enacting a comprehensive space law is a necessary step in this effort, it is not sufficient: Canada must also make efforts to convince other nations why harmonisation is favourable to fragmentation and,

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[37] Luxembourg Space Agency, *Three US Space Companies Choose Luxembourg to Implement Activities in Europe*, Government of Luxembourg, 27 Sep 2018, online: <https://space-agency.public.lu/en/news-media/news/2018/three-us-space-companies-choose-luxembourg-to-implement-activities-in-europe.html>.

[38] Jeff Foust, *Luxembourg establishes space industry venture fund*, Space News, 16 Jan 2020, online: <https://spacenews.com/luxembourg-establishes-space-industry-venture-fund/>.

[39] Of course, a comprehensive space law is only one piece of the puzzle. Canada must also implement other regulatory improvements. *See Other Necessary Changes to the Regulatory Framework* below.

[40] Nearly every member of the Canadian space community believed that Canada ought to take a leadership role in the harmonisation of domestic space law to ensure fair competition. *See* Chapter 6, *A New Canadian Space Law* and *Canadian Leadership in International Space-Related Issues*. *But see* Chapter 6, *Canada's Space Policy*.

ideally, why Canada's regulatory approach is an appropriate one. By failing to take these steps, Canada may leave open the door for other States to take leadership roles that direct global space governance in directions that are not in line with Canadian interests.

Indeed, returning again to the example of Luxembourg, in late 2019 the small, landlocked European country announced that it had partnered with the United Nations Office for Outer Space Affairs (UN OOSA) to launch a new program that would provide assistance to emerging States with the drafting of their domestic space laws.[41] Whether publicly stated or not, by doing so Luxembourg has positioned itself to capably influence emerging States to enact domestic space laws that are similar to, or at least ideologically aligned with, its own, promulgating a narrative around space entrepreneurship that would likely benefit its space ambitions. Such shrewd manoeuvring is available to Canada (or any other jurisdiction for that matter), but cannot be successfully carried out without first creating a robust domestic regulatory framework that can be used as a blueprint for emerging States to follow or established States to adopt. Opportunities for international harmonisation that would be favourable to the global commercial space community should not be overlooked as a means of also improving the position, competitiveness and relevance of Canada's commercial space sector. Enacting a comprehensive space law is the first necessary step to actualising these benefits.

Notwithstanding the aforementioned anticipated benefits to the government, there also remains the simple fact that enacting a new comprehensive space law would make it easier for individual regulators to carry out their regulatory duties. Currently, regulators are working within a regulatory framework that was last improved over a decade ago.[42] Although in most domains, an older, more polished regulatory framework provides precedent and institutional efficiencies, in a domain as evolutive as space, an old regulatory framework is simply ineffective. As a result, regulators are sometimes forced to stretch the scope of a law to bring within its ambit space activities that were never envisioned to be regulated by that law (such as the *RSSSA* and satellite-

[41] Office for Outer Space Affairs, *United Nations Office for Outer Space Affairs signed an agreement with the Government of Luxembourg to launch new "Space Law for New Space Actors" project*, United Nations, UNIS/OS/523, 13 Nov 2019, online: <http://www.unis.unvienna.org/unis/en/pressrels/2019/unisos523.html>.

[42] Improvements were made with the introduction of the *RSSSA* in 2007 but, since then, the existing space regulatory framework has not been updated to provide regulators with improved day-to-day decision making guidelines. Although the Broadcasting and Telecommunications Legislative Review Panel suggested improvements to the general radiocommunications system, these suggestions were, at best, only minimally related to space. *See* Janet Yale, et al, *Canada's Communications Future: Time to Act*, Broadcasting and Telecommunications Review Panel, Innovation, Science and Industry, Government of Canada, Jan 2020, online: <https://www.ic.gc.ca/eic/site/110.nsf/vwapj/BTLR_Eng-V3.pdf/$file/BTLR_Eng-V3.pdf>.

automatic identification systems) but are the only legislative vehicles through which regulation is possible. A new law would clearly establish the guideposts regulators are to follow in carrying out their responsibilities and although there may be a learning curve, the long-term benefits could be substantial.

All of these improvements are set against the more obvious backdrop of increased economic activity: a strong and competitive commercial space sector will create jobs domestically and increase sales globally. With an industry that is only just beginning to demonstrate its potential, any necessary financial expenditures to support its growth would likely be offset by its positive long-term economic impacts. The space sector is already a notable contributor to the overall Canadian economy, offering significant returns to financial investments at a rate of 2-to-1[43], suggesting an industry well-suited for increased public funding. As a result, the government ought to take advantage of opportunities to encourage and stimulate the growth of the commercial space industry, such as with the enactment of a comprehensive Canadian space law.

Industry Perspective

A new comprehensive Canadian space law would likely produce a number of benefits to Canada's space industry: this is true of both operators undertaking currently regulated space activities as well as operators desiring to undertake currently unregulated space activities. In both situations, the current regulatory framework serves as an impediment to, rather than as a catalyst for, commercial space activities. For those undertaking space activities within the existing regulatory framework, they must contend with outdated laws and complicated licensing procedures; for those desiring to undertake currently unregulated space activities, they must contend with not knowing whether their activities are allowed and, if allowed, how such activities would be regulated. The enactment of a comprehensive space law could reverse the role of the regulatory framework from obstacle to stimulant and could provide clarity, certainty and consistency to those desiring to undertake commercial space activities.[44] Indeed, in a capitalist marketplace, these three principles are the bedrock of any successful competitive industry.

[43] Adam Keith, *Comprehensive Socio-Economic Impact Assessment of the Canadian Space Sector*, Euroconsult, 27 Mar 2015, online: <http://www.asc-csa.gc.ca/eng/publications/2015-assessment-canadian-space-sector.asp> at p 32.
[44] Most members of the Canadian space community believe that a comprehensive space law would improve the current regulatory framework. *See* Chapter 6, *A New Canadian Space Law*.

A comprehensive Canadian space law would provide industry with clarity both by establishing the overarching principles applicable to space activities generally and by providing the guideposts specific to certain activities. By doing so, operators engaged in space activities will know the parameters of the law and determine how to best design and implement their activities from the outset. This knowledge is instrumental in any project and especially so in space projects, given their highly complex nature, long research and development timelines and significant up-front financial costs. By knowing in advance what regulators will consider when assessing licensing applications, operators can design their activities with these parameters in mind, rather than design a project not knowing what regulators will consider and then try to squeeze it through the regulatory process with much resistance. Although the details of a licensing application would be outlined in subordinate legislation (which may evolve over time), the underlying principles instrumental to the creation of the subordinate legislation would remain constant, offering a predictability upon which operators can rely.

A comprehensive space law would also establish the regulatory process by which emerging space activities would be authorised. Contrary to the current framework, where there is no legal avenue through which to seek a licence for an emerging activity, a comprehensive space law would provide the framework for licensing such activities. Although it is true that the actual licensing application process would be articulated in subordinate legislation, without a comprehensive space law it would not be possible to create the subordinate legislation through which to license an emerging space activity. The knowledge that an emerging space activity is capable of being licensed (so long as the activity meets certain predefined principles) would likely promote confidence in operators seeking to carry out such an activity that they otherwise would not have. This confidence will allow operators to vigorously pursue their novel and ambitious space projects knowing that their operations are legitimate in the eyes of the law and supported by the State at all relevant levels.[45]

[45] "The Dutch national space law of 2007 ... had not been made applicable to small satellites as these were not "guided" in outer space. When a few years later a Dutch company entered the market ... this omission was restored — not on the initiative of the Dutch government itself, but upon the insistence of the private company at issue. The company realized that only in that way they could both judge their business and liability risks much more precisely, and create a much higher level of trust with the validity and legitimacy of their business operations. After all, they now operated under licenses granted by the Dutch government which was thereby also committed to defend the interests of the company in the international arena." Frans von der Dunk, *Some Remarks Further to Outer Space and International Geography: Article II and the Shape of Global Order by PJ Blount*, (2017) 52:2 New England L R 125 at pp 125-126 (citations omitted).

The notion that regulation hinders innovation and/or development, specifically with respect to space, is not founded in reality. Rather than participating in a domain that does not have any rules or prescribed requirements, space operators seek to undertake their activities in an environment where all participants have undergone the necessary levels of scrutiny.[46] A comprehensive space law offers the Canadian space sector such regulatory consistency by ensuring all operators have met or exceeded the basic requirements for appropriately operating in space. By levelling the playing field in this way, the Canadian space industry remains domestically competitive and retains a reputation for excellence. Although Canadian space operators compete globally, they also compete domestically for public funds, partnership opportunities and other sources of business activity: ensuring all space operators are held to the same standards ensures that the best ideas, most functional systems and innovative companies thrive. In a global marketplace, the reputation of the entire Canadian industry is paramount. Although Canada's reputation for being a leader in telecommunications, remote sensing and robotics extends to a generally-positive reputation in all space activities, this reputation can just as easily be tarnished by a series of poorly-designed projects.[47] A proper, thorough and non-discriminatory regulatory process, such as one that may be established in a comprehensive space law, could help maintain the quality of Canadian space activities and Canada's world-class reputation.

Aside from the practical benefits, there are also psychological benefits of enacting a new comprehensive Canadian space law. The Canadian space industry is interested not only in a new regulatory framework but also in government leadership, participation and investment in commercial space activities.[48] Although a comprehensive space law does not satisfy all of these desires, it does send the message that Canada takes space seriously and that it is likely committed to promoting the development of the space industry.[49] In a country where most private space entities question the true commitment of the government to space - whether in terms of financial,

[46] An overwhelming majority of the members of the Canadian space community identified their preference for the regulation of space activities rather than no regulation. *See* Chapter 6, *The Future of Space Regulation in Canada*.
[47] For example, in a general societal context, German manufacturing is considered high-quality, Japanese technology is cutting edge and French sparkling wine is incomparable. Although these reputations have built up over long periods of time, it is foreseeable that the reputations of these States can be tarnished by just a few improprieties, such as following Volkswagen's emissions scandal. Maintaining Canada's reputation for excellence in space is important to grant continued legitimacy to Canadian operators and a free source of marketing that cannot be reproduced easily.
[48] *See generally* Chapter 6, *Canada's Space Regulatory Framework*.
[49] For additional insight into how the space sector views the government's involvement in space, *see* Chapter 6, *Canada's Space Policy* and *A New Canadian Space Law*. Specifically, when asked what message a new space law would send to the commercial space industry, each and every response noted that the message would be positive.

leadership or an overall visionary commitment - the creation of a comprehensive space law that improves the regulatory framework would likely be seen as a positive step to countering that narrative.[50] Indeed, the fact that the space industry seeks appropriate regulation and finds value in being licensed is something that ought to be celebrated and actively encouraged by the government.

Third-Party Perspective

Notwithstanding the likely benefits a comprehensive Canadian space law would bring to the government and the Canadian space industry, there are a series of other stakeholders who would also benefit, namely: academics and scientists, Canadians and humanity. These third-party groups are characterised as such because although they are not the focus of the proposed comprehensive space law they would likely also benefit from its enactment; indeed, there are likely numerous other groups who would also benefit from an overall improvement to the current space regulatory framework, albeit in an unpredictable manner.

Most academic and scientific space activities are not undertaken for commercial purposes; indeed, even though some do spin-off into successful commercial enterprises, most academic and scientific space activities are meant to generate knowledge with respect to a new field or from a new vantage point. In this way, space can be incredibly useful in a variety of applications, including monitoring weather patterns to better understand climate change, using microgravity to test new material properties or using global navigation satellite systems to more efficiently cultivate farmland. Nevertheless, as non-governmental entities, Canada has an international obligation to authorise and continually supervise the researchers carrying out these and other space activities. Traditionally, such research has been conducted by using existing governmental or commercial space systems and so the regulatory process has been largely circumvented by piggy-backing on existing projects and simply using already-generated data.

However, with the reduction in price and complexity of developing small satellites brought about by commercialisation, it is feasible that such research could be carried out by way of dedicated space systems. In such instances, researchers would have to acquire licences to operate such space systems, a potentially challenging and time-consuming process. A comprehensive

[50] *See generally* Chapter 6, *Uninspiring State of the Canadian Space Sector* and *Dismal View of the Canadian Space Regulatory Framework*.

Canadian space law (such as that proposed in Appendix III) could include provisions that offer regulatory expediency or flexibility for purely academic and scientific research to help promote new insights, knowledge and commercial applications while simultaneously maintaining Canada's national interests, protecting against liability risks and upholding its international obligations.

With respect to the benefits the average Canadian may derive from an improved space regulatory framework, they stem from the overall growth and proliferation of the commercial space industry. Aside from the taxable income generated by the space industry, much of Canadian society already benefits from the various space activities undertaken by governmental and commercial space operators: weather prediction, transportation updates and driving directions, safety at sea, dissemination of information and knowledge, etc. With the continued growth of the industry, society will increase its use of, and benefits derived from, space activities. Some of the more obvious short-term benefits will include telehealth and telemedicine as a result of high-speed connectivity in remote communities, increased traffic safety as a result of autonomous vehicles using space-based data and cheaper and healthier foods as a result of more efficient local crop yields. Over the longer-term, average Canadians may have opportunities to orbit the Earth as tourists or vacation to a space hotel, take advantage of renewable energy by means of solar-power satellites or afford currently unaffordable jewellery. Although a single piece of legislation will never result in such significant technological feats, it is a necessary step in the continued development of the commercial space industry and the benefits that trickle down to all Canadians.

The most clear benefits of a comprehensive space law with respect to the average Canadian would include the law's provisions related to Earth-based environmental protection and indemnification for damage caused by a private entity. With respect to Earth-based environmental damage, a robust regulatory framework is necessary to ensure that space activities, such as orbital launches, do not cause unnecessary levels of harm in their local communities. With a variety of different proposed launch capabilities and Canada's vast geographic expanse, it is possible that reckless launch operators could conduct tests in remote locations without appropriate regulatory clearance, causing various forms of environmental harm. Indeed, even responsible launch operators would benefit from regulatory clearance to ensure people are appropriately warned and wildlife and other environmental features are protected. A comprehensive space law could establish the appropriate guidelines by which such activities would be carried out and only license those entities satisfying the necessary requirements. Similarly, the proposed space law would

provide Canada with an opportunity to seek indemnification for any damage for which it is found internationally liable as a result of a private entity's space activities. Without a clear provision related to indemnification, Canada - and, by extension, Canadian taxpayers - would be responsible for satisfying the international claim. The proposed space law could further protect average taxpayers by imposing insurance obligations that would ensure the commercial entity responsible for causing the damage does not default on their indemnification obligations.

Finally, the enactment of a comprehensive Canadian space law would have benefits for humanity in two distinct ways: first, the Canadian law could include explicit requirements related to using space in such a way as to directly benefit humanity; and second, as discussed above, the Canadian space law could be a model for other nations to adopt, eventually leading to a customary international law framework applicable to the domestic regulation of space activities. Although less direct than the benefits to researchers or Canadians, the benefits brought about by a comprehensive Canadian space law would arguably have more significant consequences for humanity in the long-term.

With respect to including explicit provisions related directly to benefiting humanity, Canada's comprehensive space law could include a provision that simply requires that Canada's commercial operators must contribute, in some way, their expertise, services or financial resources to better humankind. This could be achieved through a mandatory financial contribution to a fund (for example, 1% of revenues averaged over the previous three years), a requirement to provide specialised services without charge (for example, launching one small satellite free of charge for every 100 launched or providing annual remote sensing data to an agriculturally dependent State) or an obligation to engage with communities (for example, volunteering 1,000 person-hours per year to run a space engineering club for students in an underfunded jurisdiction). Alternatively, the comprehensive space law could include a provision whereby all protected technology must be made publicly available after 10 years, ensuring a technological gap of no more than 10 years exists between leading space faring nations and those States attempting to maintain pace.[51] Acknowledging the seemingly-radical philosophical proposal, when considering the mutually

[51] For a more detailed discussion on the benefits and palatability of such a proposal, see Chapter 9, *External Market Maturation Assistance Fund*.

beneficial relationships between municipalities, provinces and countries, it does not seem unreasonable to extend this relationship to include the international community as well.[52]

With respect to the proposed comprehensive space law influencing other States to adopt similar laws, acknowledging the size of the opportunity is important: notwithstanding that 23 States have adopted comprehensive national space laws, there remain approximately 170 States without such laws. This means that an overwhelming majority of States have not yet determined the need for a national space law: when such a determination is made, however, they will likely follow the model of an existing national space law.[53] As demonstrated in Chapter 7, most national space laws include the same common characteristics. Three, however, are unique for delimiting the boundary between airspace and outer space at 100 km: if such a trivial distinction makes these laws stand out, the proposed humanity-centered provisions discussed immediately above would surely make Canada's national space law unique. If drafted appropriately, therefore, Canada's comprehensive national space law could prove to create a model regulatory framework that, in light of its humanity-oriented provisions, could lead to a significant shift in global dialogue related to space activities. If even just 25 States (less than 15% of the 170 jurisdictions still without a comprehensive national space law) are inspired by Canada's leadership with respect to ensuring space activities directly benefit all of humanity, the majority of the world's domestic space laws would be united in advocating for a humanistic approach to space. Even if unsuccessful in completely altering the global attitude related to the commercialisation of space, it would at least temper the current trend of commercialisation as a means of generating individual and State-centric profit as well as increase the affinity between Canada and 25 States who may otherwise be seen to share ideological similarities.

Other Necessary Changes to the Regulatory Framework

A comprehensive Canadian space law is not a panacea to the challenges facing the Canadian space regulatory framework: although a robust, foundational space law is necessary, it is not, on

[52] For example, in the simplest of concepts, municipalities provide taxable revenues for their provinces and provinces provide taxable revenues for their countries. In return, countries provide services to their provinces and provinces provide services to their municipalities. Extending these relationships to countries providing taxable revenues to the international community and the international community providing services to countries (in whatever form that takes place) may seem more palatable.

[53] For example, Finland's space law was modelled on Denmark's space law, which was in turn influenced by Belgium's space law.

its own, sufficient to improve the overall regulatory framework. As discussed above, the space regulatory framework consists of Canada's various space laws, the subordinate legislation that flow from such laws, the various circulars and guidance documents that help explain these legislative instruments as well as policy and visionary documents that set out specific plans. Although a modern, progressive, comprehensive space law would be a positive development in establishing a proper foundation upon which these other framework components can be built, it would only be one piece of the regulatory puzzle. Further, given the highly evolutive character of space activities, once a solid legal foundation is built, it will require constant maintenance and adjustments to ensure its continued applicability to, and usefulness for, the commercial space sector: such work can only be completed by a highly-trained, well-funded and dedicated group of regulators. As a result, the overall improvement of Canada's space regulatory framework will require more than the just proposed comprehensive space law.

Maintaining the Overall Regulatory Framework

Once a comprehensive Canadian space law is enacted, it would establish general objectives and provide broad principles related to the regulation of space activities; it will not establish the details and/or specific considerations that must go into the regulation of specific activities. The responsibility to establish these finer regulatory requirements will be delegated to an appropriate minister who will be in charge of creating and implementing the subordinate legislation. The selection of the most appropriate Minister will likely depend on the space activity being considered and, more specifically, the federal department with oversight of that activity. For example, at least in the beginning, it is likely that remote sensing activities will remain within the purview of Global Affairs Canada (GAC), launch within Transport Canada and radiocommunications within Innovation, Science and Economic Development Canada (ISED): as a result, the Ministers of Foreign Affairs, Transport and Innovation, Science and Industry, respectively, would be delegated the responsibility of creating appropriate subordinate legislation to regulate such activities. It is, of course, possible that such delegations change over time.[54]

[54] If, for example, a Department of Space is created in the future, it is likely that the Minister of Space would be responsible for creating subordinate legislation for all space activities. It also remains possible that a Minister of Space can be created within ISED to oversee space activities. For example, ISED already has two Ministers (a Minister of Innovation, Science and Industry and a Minister of Economic Development and Official Languages) and so adding a third minister to oversee the space portfolio would not be unprecedented.

To ensure an effective and efficient space regulatory framework, therefore, individual Ministers must create subordinate legislation that is appropriate, up-to-date and cognisant of the realities faced by commercial space operators. The rules established in these documents must take into consideration the state of a specific space activity, whether it is generally undertaken for scientific or commercial purposes, the technological components being utilised, how other jurisdictions regulate the same activity, the risks posed by such an activity, etc. Although the Minister must establish these regulations, they must also be updated to adapt to changing circumstances, for example: if a largely scientific activity becomes commercially feasible, there may be new considerations to take into account; if technological advances risk national security, certain regulatory precautions may be warranted; or if international consensus shifts, keeping pace may require amendments. Notwithstanding the ability to update subordinate legislation relatively easily, abrupt and wide-ranging changes should be cautioned against, since the clarity, certainty and consistency provided by the underlying comprehensive space law would be undermined by such sudden shifts.

Even though subordinate legislation is more specific and focussed than a comprehensive space law, subordinate legislation is still a legal instrument that must be drafted using clear legal language that is, ironically, often difficult to understand. As a result, to ensure that the specific rules and requirements established in subordinate legislation are comprehensible and accessible to its intended audience, namely, non-lawyers (such as scientists, engineers, entrepreneurs, etc.), explanatory notes in the form of circulars or digests would be useful. Although the specific provisions of subordinate legislation would still apply, having regulator-prepared documents that provide the necessary information in layman's terms would ensure that commercial operators seeking licences understand and are capable of completing applications without much outside assistance. Without diminishing the important role of legal counsel, having access to such explanatory notes will allow smaller companies without legal specialists the opportunity to engage with the regulator and proceed through the licensing process without unnecessary difficulty. Needless to say, maintaining these helpful documents on a website (along with a varied list of contact information for different departments, explanations for why specific departments regulate different space activities, the estimated time it takes to licence a space activity, etc.) would also be useful.

In addition to an appropriate comprehensive space law, subordinate legislation and explanatory notes, Canada's space regulatory framework would also greatly benefit from timely and ambitious strategic guidance documents (such as long-term plans, strategies or other visionary documents). Although the proposed comprehensive space law would establish the guiding foundational principles of the regulatory framework (and the subordinate legislation and explanatory notes would provide additional detail), supplementary documents are necessary to appropriately guide the Canadian space sector over time, as technological possibilities and demands for services change. For example, a *2022 Space Strategy* document would establish the short-term goals of the Canadian space sector (such as to enhance space robotics capabilities), outline the public projects to be led by the Canadian Space Agency (provide a new Canadarm for the Lunar Orbital Platform-Gateway), prioritise the commercial capabilities that ought to be developed (on-orbit servicing for functional low Earth orbit space objects) and discuss the international efforts that will be championed (guidelines and standards applicable to debris remediation). Without such visionary documentation, the Canadian space regulatory framework - regardless of how efficient - cannot effectively steer the entire space sector over the course of decades. Indeed, for a comprehensive Canadian space law to have the most effect, it must be supplemented by shorter-term visionary documents that realise the overall objectives established in such a law.

Supporting the Role of the Regulator

Even if the comprehensive space law is supported by appropriate subordinate legislation, clarifying circulars and guiding strategic documents, they will prove inconsequential without fully supporting regulators. For an improved space regulatory framework to have any meaningful effect, it must be made clear which departments will oversee the authorisation and continued supervision of specific emerging space activities[55] and that the individual regulators within those departments are capable of carrying out their responsibilities. In addition, the regulatory framework must be well-funded to ensure the various departments and their personnel can provide the necessary commercial oversight that is required.

[55] Many members of the Canadian space community, including government representatives, were unaware of the extent of the various government departments involved in regulating space activities. See Chapter 6, *Canada's Space Regulatory Framework*.

Departmental Clarity

Without a Department of Space, it is unclear if a single Canadian governmental department or authority would have jurisdiction over all space activities. In most jurisdictions, States assign regulatory responsibility to a single governmental entity (for example, the national space agency, the department or ministry in charge of business relations or international relations, or a high-level cabinet committee) to oversee all space activities, regardless of the specific nature of that activity. In Canada, space activities are regulated by at least three different federal departments with, in many cases, another department and the Canadian Space Agency offering assistance.[56] Aside from the US regulatory system, which is undoubtedly more robust and expansive, this kind of regulatory fragmentation is unique to Canada. Although it is expected that most governmental regulators would be aware of their regulatory role and the corresponding roles of their colleagues in different departments[57], it is not clear that commercial operators and other interested parties are aware of the responsibilities of different departments over different space activities. For example, to most non-governmental entities, it is unclear why ISED is responsible for telecommunications and broadcasting activities but not for remote sensing space activities. The fragmentation that currently exists in the Canadian space regulatory framework complicates the nature of space activities; such complications will only become more convoluted with the introduction and emergence of new space activities.

The example of space resource exploitation is particularly poignant of this fact. Any operator undertaking space mining operations will require a radiocommunication licence to communicate with their space objects: managing the radio spectrum is ISED's responsibility. Simultaneously, the space mining systems will require a suite of cameras and sensors that would have the capability of "sensing the Earth": this would place it within the purview of the *RSSSA* and GAC. Similarly, space mining is a hotly debated topic internationally, further suggesting GAC would be involved in harmonising national space mining regulations with international standards and/or guidelines. Yet at the same time, Natural Resources Canada is the federal department that oversees terrestrial mining operations and has expressed interest in stimulating commercial space

[56] GAC, ISED and Transport Canada all have regulatory responsibilities. The Department of National Defence and the Canadian Space Agency often provide national security and technical advice, respectively, to the three regulating departments.

[57] The results of the questionnaire presented in Chapter 6 seem to suggest that not all government regulators are aware of the space regulatory aspects of other departments. *See* Chapter 6, *Canada's Space Regulatory Framework*.

mining activities.[58] With so many competing interests and responsibilities, an entrepreneur interested in undertaking space mining operations would be justified for being confused as to which department they are to approach to even begin to discuss potential operations. The same discussions can be had with respect to on-orbit servicing missions, debris remediation, solar power satellites, settlement activities, etc.

To effectively implement the proposed improvements to Canada's space regulatory framework, what is necessary is either a high-level committee tasked with regulating space activities or a single department designated as the "point of first contact".[59] In both instances there would be departmental collaboration on the regulation of emerging space activities. A high-level interdepartmental committee or a cabinet-level committee would jointly determine the manner in which space activities are to be regulated and after reaching a joint conclusion, the committee would designate a specific group within a department as being responsible for handling that particular kind of activity. Similarly, with the "point of first contact" approach, a single government department would be identified as the regulatory entity tasked with overseeing all space activities but seeking assistance through interdepartmental channels. Although neither approach would be as functional as a single Department of Space, both would be better than the current fragmented state of space regulation in Canada. In the short term, it would be prudent to develop a cabinet-level committee that recognises the importance of, and opportunities presented by, space activities and determines a national strategy. In the long term, after identifying space as a governmental priority, the cabinet-level committee would delegate, to whichever entity it deems appropriate (either an intergovernmental regulatory body or an existing or new department), the responsibility of carrying out the actual implementation of the national strategy.

Skilled Human Resources

Regardless of the intergovernmental regulatory structure designed to oversee space activities, the day-to-day oversight will be carried out by individual public servants. The importance of these individual regulators cannot be overstated and such a statement remains true regardless of whether they carry out their responsibilities by means of a fragmented and outdated

[58] Natural Resources Canada, *The Canadian Minerals and Metals Plan*, Government of Canada, 2019 at pp 31-32.
[59] Most members of the Canadian space community believed that a high-level interdepartmental committee or a Department of Space were feasible approaches to a more unified and consistent regulation of commercial space activities. *See* Chapter 6, *The Future of Space Activities*.

framework or an improved model (such as that proposed in this project). As the individuals who are preparing national space strategies, reviewing licensing applications, performing on-site supervisions, negotiating international standards, etc., regulators play an extremely important role in the implementation of the regulatory framework. As a result, ensuring the most competent, capable, connected and skilled individuals carry out these responsibilities is as important as the regulatory framework itself.

Space activities are, by their very nature, highly technical and commercial space activities are even more so. Ensuring that the regulators that oversee commercial licensing applications understand the technical and scientific complexities of the proposed project, appreciate the various national interests at stake and effectively communicate concerns is not an easy task. Many of these necessary skills are developed through experience. Indeed, in other jurisdictions such as the US, many of the current technical regulators used to be technicians with first-hand experience of designing satellites, testing rockets or studying space-based data. Given the size of Canada's space program, most regulators do not have these prior first-hand experiences, necessitating that regulators undergo significant training to understand and thereby competently regulate commercial operations. Given the constantly changing nature of space technology and its applications, scheduled annual training will likely not be sufficient; regulators would likely require constant training, domestically and abroad, to ensure they keep pace with commercial innovation.

Aside from implementing measures that would improve the quality of Canadian space regulators, there is also a need for an increased quantity of regulators. A well-staffed regulatory workforce will allow for more efficient reviews of licensing applications, thorough training programmes, opportunities for collaboration with foreign counterparts, methodical supervision, etc. Indeed, an increase in regulators will allow for: more timely licensing dispositions as the number of licensing applications, and their expected complexities, increases; rotating training programmes for regulators to improve their knowledge and regulatory capabilities while away from their traditional responsibilities; collaboration with foreign counterparts to ensure harmonisation of rules or development of coordinated actions; and carrying out supervision activities, such as visiting commercial space operator premises or reviewing financial records and annual reports. Indeed, the current lack of "continued supervision", as required under international law, seems to be significant. For the proposed comprehensive space law to have the desired

positive effect and improve the existing Canadian space regulatory framework, regulators must be in a position to carry out their designated responsibilities capably.

Appropriate Levels of Funding

Without appropriate funding none of the measures proposed above will be possible. Ensuring there are individuals capable of drafting appropriate subordinate legislation, communicating effectively in layman's terms with commercial operators, administering the complexities of an interdepartmental committee on space, reviewing applications, remaining abreast of technological developments, ensuring compliance with licensing conditions and negotiating with international partners all require appropriate levels of funding. Whether the ever-present budgetary concerns of any government organisation are satisfied by way of traditional government expenditures or augmented by licensing application fees (whether pre-determined or on a cost-recovery basis), the reality is that increased funding is required to ensure Canada has a functional space regulatory framework in practical terms. Given the likely continued growth of commercial space activities, domestic operators will demand more of their regulators to ensure they keep pace with international competition: satisfying these demands can only happen when the regulatory framework is appropriately resourced.

Potential Criticisms of the Proposed Comprehensive Canadian Space Law

There is no doubt that the proposed comprehensive Canadian space law would be an imperfect improvement to the Canadian space regulatory framework. Notwithstanding the above discussions related to the necessary non-law related improvements that must be made to the existing framework, the concept of a comprehensive space law as an improvement, in and of itself, to the framework can also be challenged. Indeed, there are likely five main potential concerns and/or criticisms to the suggested proposal: first, a broad law, insofar as it attempts to be comprehensive, cannot offer the desired regulatory clarity to commercial operators; second, a broad law must rely on its subordinate legislation, thereby undermining its purported advantages regarding consistency; third, the underlying purpose of the comprehensive law (which is the regulation of emerging space activities) can be satisfied by existing legislation; fourth, the creation of new or additional laws and/or regulations hinders rather than helps commercial innovation; and fifth, the creation of a new law will cause negative unintended consequences. Although valid on

their face, there are reasons why each of these criticisms will likely not prove fatal to the proposed comprehensive space law.

A Broad Law Does Not Offer Regulatory Clarity

Even though the proposed comprehensive space law is supposed to improve the existing space regulatory framework by offering increased clarity, the reality is that a law drafted broadly enough to capture within its scope future space activities will necessarily suffer from a lack of clarity. The main thrust of this criticism is that a specific space law will always provide more clarity than a general space law with respect to the regulation of a specific space activity. Since a comprehensive space law must anticipate the regulation of non-existent space activities, the regulatory structure it creates for the regulation of such activities cannot be specific and therefore cannot offer clarity to commercial operators seeking to undertake such activities. Rather, enacting a new piece of legislation for each nearly-emergent space activity would allow legislators to create a more substantive and specific regulatory environment that would have the effect of providing increased clarity to commercial operators.

While this argument is legitimate, the reason it is not fatal to the proposal is because a law - whether comprehensive or specific - often does not provide the specificity required by commercial operators to know exactly how to license their space activity. Rather, a law merely creates the regulatory structure that provides the general principles, purposes or priorities related to its subject matter. For example, the *RSSSA* establishes the kinds of conditions that must (and may) apply to a specific remote sensing space system licence but do not specify the details of such conditions; the details are found in the *RSSSA*'s subordinate legislation.

Since the function of a law (rather than its subordinate legislation) is to provide the general regulatory structure applicable to a specific activity, it is possible for a well-crafted comprehensive space law to accomplish this feat as well as an activity-specific law. Indeed, most space laws - whether existing Canadian space laws or the comprehensive space laws of other countries - require space activities to be authorised in such a way as to protect the various national interests of the State, uphold the State's international obligations, stimulate commercial development and contribute to the overall welfare of the people (whether nationals or humanity): meeting these specific objectives is the role of subordinate legislation. Based on this understanding of the role of a law, when stating that the creation of a comprehensive space law would provide clarity to

commercial operators, the notion of clarity is more in line with "the proposed space activity is legitimate and can be licensed" rather than "these are the forms that must be filed to acquire a licence": as discussed generally above, this form of clarity is better served by a comprehensive space law rather than multiple activity-specific space laws.

A Broad Law Does Not Offer Regulatory Consistency

This criticism flows from the conclusion offered in defence of the previous criticism: namely, if a comprehensive space law relies on its subordinate legislation to carry out the "actual" regulation of an activity, the law will not provide the purported consistency since subordinate legislation can easily be changed. As articulated above, the use of subordinate legislation to regulate emerging space activities is preferred over including all the specific regulatory details in the law itself since the subordinate legislation can more easily be changed by the Minister without needing to go through Parliament (as would be required to amend a law). The consequence of this reality is that a Minister may, of their own volition, alter the regulatory provisions applicable to a specific space activity and that, in a worst case scenario, these changes would be substantial, made without prior notification or consultation with industry and for an arbitrary purpose. Indeed, if a comprehensive space law relies too heavily on its subordinate legislation (which, for emerging space activities, would not be created until well into the future), it runs the risk of proving inconsistent and being an unreliable source of legitimacy for a commercial operator.

The criticism is valid: although relying on subordinate legislation to manage a specific activity offers regulatory flexibility, it also exposes the legal framework to potential abuse. The likely unsatisfying answer is that such abuse is possible in every law that delegates some of its rule-making authority to an individual or entity other than Parliament and yet such significant or brazen abuses of power are uncommon. Indeed, Ministers generally craft and implement their subordinate legislation with a view to carrying out the objectives of the law; with respect to Canada's existing space laws and the proposed comprehensive space law, one of these objectives would be commercial development. Acknowledging that there are no guarantees and that exceptions to the rule pose the most danger, it is expected that Canada's future Ministers delegated with the authority to craft and implement subordinate legislation related to space activities would act within the confines of the law to further the objectives of the legislation with which they are entrusted. The fact that Canada's space-related subordinate legislation has not undergone

significant change over the previous decades - indeed, one of the more serious existing concerns of commercial operators -, there is reason to believe the behavioural patterns of Ministers would not suddenly change as a result of introducing a comprehensive space law.

An Existing Law Can Satisfy the Purpose of the Proposed Comprehensive Space Law

One of the stated purposes of a comprehensive Canadian space law is that it would provide a legal fortification against a private entity undertaking a space activity without authorisation, thereby resulting in Canada violating its international obligations and exposing the State to potential claims of liability. Without a comprehensive space law, there is no legal mechanism to require entities to seek authorisation before undertaking an emerging space activity. Although this is true, since all space activities utilise the radio spectrum to communicate with and control their space objects and the *Radiocommunication Act* prohibits the use of the radio spectrum without a licence, the government could use the *Radiocommunication Act* as a means of authorising or prohibiting certain space activities. By doing so, there would be no need for the creation of a comprehensive Canadian space law.

Technically, the criticism has some merit: without a radio spectrum licence, an operator cannot control their space object and would, effectively, be legally prevented from carrying out their space activity. There are two main concerns with this criticism. First, not all space activities in the future may require radio spectrum. Significant advances are being made in laser and line-of-sight communication that may avoid the need for a radio spectrum licence to communicate with a space object and, separately, there may be future space activities that do not require the operator to interact with their space object after launch. Second, the proposed application of the *Radiocommunication Act* would considerably alter the law's original object and purpose (namely, to manage the radio spectrum and limit interference). The specific provisions of the *Radiocommunication Act* were not drafted with a broad space regulatory function in mind and so its existing provisions would have to be stretched to satisfy this new responsibility. Alternatively, the *Radiocommunication Act* could be amended to allow for a more general regulatory role; this option, however, would require a similar amount of legislative capital as enacting a comprehensive space law while offering a less-desirable product. Although the *Radiocommunication Act* could satisfy the gate-keeper role of the proposed comprehensive Canadian space law, it would do so

less effectively than a comprehensive Canadian space law and not offer the other various advantages discussed throughout this chapter.

Additional Regulation Hinders Commercial Innovation

In discussions related to regulation, invariably an argument related to the role of regulation in stifling innovation is raised based on the premise that only in the most open of markets is competition legitimate and innovation may thrive. With respect to space activities, the argument would advance a position that increased regulation - whether by amending existing laws, updating subordinate legislation, or enacting a comprehensive space law - would necessarily add new layers of government interaction and/or intervention in the marketplace effectively preventing the free market from determining what is acceptable, functional, profitable, etc. As a result, commercial operators would struggle to innovate with new ideas, products or business models because of the governmental obstacles requiring or prohibiting certain kinds of activities. In a completely free market, customers would use their ability to pick and choose from a variety of space-based services and such individualised decision making would perform a feedback function for what is desirable and undesirable.

Notwithstanding general discussions about the role of government in a free market economy, with respect to space there are three environmental reasons why governmental regulatory oversight is required: first, the physical environment is unlike most other terrestrial environments; second, the commercial environment is, as a result of physics, not well suited to robust competition; and third, the legal environment is unique and reflective of non-traditional values. With respect to the physical environment, the fact that all space activities exist relationally to one-another and are in constant movement (often around Earth) and share spatio-temporal location means that the operation of one entity's space activity could interfere with another's. For example, if an entity decides to implement an innovative design for its small satellite constellation in LEO and its individual satellites end up breaking apart in orbit, the market would consider this a failure. However, if the break-up of these satellites causes catastrophic damage to the otherwise extremely reliable small satellites of another entity, the market would indiscriminately dictate that the second entity's space activity is also not viable (since without its satellites it cannot offer its services),

even though the damage was the direct result of another entity's design ineptitude.[60] Terrestrially, similar occurrences would likely not result in a market failure: for example, a bike manufacturer's innovative design (which turns out to be ineffective) does not put at risk the viability of other bike manufacturers to continue operating nor does an airplane manufacturer's in-flight failures as a result of a new technology close their airspace to other manufacturer's airplanes or the grounding of entire airlines. Appropriate regulations could have flagged the innovative design as having potential flaws or required that operators procure insurance to cover potential claims against them.

With respect to the economic environment in space, there are two main concerns: first, it is extremely expensive to access space and second, the costs of indirect damage often bear their consequences long after a specific activity has concluded. Even though costs have dropped significantly with the commercialisation of space, the laws of physics still make it extremely expensive to access space. As a result, in comparison to other industries (especially terrestrial industries) the financial barrier to entry is extremely high, meaning that the number of competitors undertaking any given space activity or service is limited. With limited competitors, the market does not offer the same kind of corrective forces as one expects from a market with many alternatives. For example, if there are only two space-based telecommunications service providers, and both offer non-optimal service for a high-price, those who require such services will likely stay with the same service provider notwithstanding that they are displeased with the service; in this way, there is no customer feedback mechanism to reward better service since the number of competitors is so low. Further, given the vastness of space, the harmful effects of an operator's decision may not manifest until 25 years later, limiting the economic incentive to operate appropriately on day one. For example, the creation of space debris (like the anthropomorphic causes of climate change on Earth) does not have immediate consequences on the party responsible for its creation and therefore is not factored into the cost of operation, undermining a customer's ability to determine whether they want to support that operator. Appropriate regulation can allow for competitive pricing and appropriate long-term planning to ensure tomorrow's costs are factored into today's prices.

[60] Imagine, for example, that the first entity did not have sufficient assets or insurance to reimburse the second entity for its damage and that both were incorporated in the same jurisdiction, removing the option to pursue a State for liability.

Finally, the legal environment related to space was specifically designed in such a way as to temper the outright competition-driven tendencies of the free market. Indeed, international space law is unique amongst its legal peers insofar as it places the responsibility of space activities, whether carried out by governmental or non-governmental entities, on States. This legal quirk was intentional and meant to reflect the potential benefits of a new environment that was not already dominated by capitalistic ideology and a colonial history. In the ensuing compromise, for damage caused by the space activities of non-governmental entities, the appropriate State would be responsible, thereby freeing private operators from responsibility and liability for their actions. Without appropriate domestic regulation, therefore, an operator may undertake innovative-but-risky activities they otherwise would not, knowing they are not responsible for the consequences: indeed, the operator would not bear the costs of its failed innovation but rather it would fall to the State's taxpayers to pay those costs. Therefore, appropriate regulation ensures (whether it is through mandatory insurance, potential indemnification or simply prohibiting extremely risky activities) that operators act only in such a way that is economically feasible given the circumstances of space.

These responses to the "regulation hinders innovation" criticism are not meant to suggest that all regulation is acceptable and beneficial. There are, of course, situations in which over-regulation can significantly hamper innovation in any field. For example, extremely prescriptive regulations that require operators to follow the established procedure without deviation would prevent operators from innovating. Similarly, excessively onerous regulations with respect to one aspect of a space operation (for example, debris mitigation requirements) in a single jurisdiction could undermine the competitiveness of an entire domestic space industry; therefore, ensuring regulations are harmonised with their international counterparts is necessary. Nevertheless, these justifications do not undermine the position that regulation, especially with respect to space, can operate alongside market forces to promote commercial innovation.

A Broad Law Creates Unintended Consequences

A comprehensive space law, to be truly effective, would require a broad scope so as to capture all space activities, including those not currently imagined. Although this may be desirable, the unintended consequence will be that all space activities, even those not desired to be captured by the law, will fall within its scope. For example, it is likely that space-based astronomy

will fall within the purview of a comprehensive Canadian space law and require astronomers to seek appropriate authorisation prior to undertaking their activities: this would be an unnecessarily costly and time-consuming process for a clearly non-commercial space activity. Indeed, the creation of such a broad space law will likely also result in other unintended negative consequences, including negative consequences that cannot yet be imagined.

With respect to the criticism directed towards the scope of the law, it is true that non-commercial space activities would likely fall within its purview and require authorisation. However, as is demonstrated in the draft comprehensive space law presented in Appendix III, exceptions can be made for purely scientific, research or educational space activities. A comprehensive space law does not require that all space activities undergo the same authorisation process: it is possible to create expedited application procedures, exempt certain activities from insurance requirements, waive application fees, etc. With respect to the general criticism that a broad space law will have unintended negative consequences, it is again likely true. However, the argument that "since a comprehensive space law may have currently-unimaginable negative consequences it should not be enacted" devalues the fact that the proposed comprehensive space law would be addressing very clear and existing regulatory issues. The reality is that without such a law the currently unresolved issues related to Canada's space regulatory framework will remain unaddressed and their certain consequences will materialise. Preventing the enactment of such a law simply because unintended negative consequences may emerge in the future is short-sighted; the fear of potential future problems should not paralyse the ability to address current ones.

Conclusion

The enactment of a comprehensive Canadian space law would offer significant advantages over both the existing space regulatory framework as well as alternatives. Since the authorisation and continued supervision of non-governmental space activities is an international obligation Canada must honour, the relevant question is how it ought to carry out this responsibility. The current framework of activity-specific laws has significant drawbacks, most notably the fact that it is reactive rather than proactive and that it does not address the legal vacuity created by emerging space activities. The proposed comprehensive Canadian space law provides numerous regulatory advantages, including its broad scope, its role as a foundational legal instrument, the message of support it sends to industry and the ability to protect Canada's various national interests. Although

no model is perfect, the most likely criticisms of the proposed comprehensive space law can be disposed of when considering the unique nature of space activities and the opportunity the law provides for measured-flexibility in creating an appropriate regulatory framework.

Chapter 9: Proposed Comprehensive Canadian Space Law

Purpose and Outline

The purpose of this chapter is to contextualise the proposed comprehensive Canadian space law included in Appendix III. Following the detailed discussions of the preceding chapters (namely, on the state of space activities, international and Canadian space law, the theoretical underpinnings of regulation, the sentiments of the Canadian space community, the global regulatory trend towards the enactment of comprehensive domestic legislation related to space activities and the benefits of Canada enacting its own comprehensive space law), this chapter provides the rationale for why the specific provisions in the proposed comprehensive space law (as drafted in Appendix III) are included. Since it is intended that the proposed draft comprehensive space law will be used by Canadian legislators as a model upon which to develop and implement a real comprehensive Canadian space law, these explanatory notes are intended to provide insights into the precise choices made with respect to the law.

This chapter will begin with general comments related to the nature of drafting a comprehensive national space law before engaging in a more detailed discussion related to the various provisions included in the draft law. The chapter then explores the basis for why certain provisions were included or excluded in the draft law and provides critical insights into the reason why specific language was used or criteria were listed. The chapter culminates with brief comments related to what must be done to appropriately implement the proposed draft law and offers concluding comments related to the law.

General Comments

Although 23 different models of comprehensive space legislation currently exist, the draft comprehensive Canadian space law proposed in Appendix III is distinct from all other existing national space laws. The simple reason for this (which also explains why none of the 22 national space laws surveyed in Chapter 7 are identical) is that each country's laws are influenced by its specific geographical, political, social, industrial and economic composition. For example, even though Finland and Denmark are similar in many ways (their northern geographic location, as Scandinavian democracies, as traditionally non-space faring nations, as desiring to incentivise commercial space development, etc.) and even though the *Finnish Space Law*[1] is modelled quite

[1] *Act on Space Activities*, 63/2018 [*Finnish Space Law*].

clearly and explicitly on the *Danish Space Law*[2], there remain distinctions because Finland and Denmark are two very different countries. As a result of these often-obvious-but-sometimes-subtle local peculiarities, every country requires a custom comprehensive national space law that takes into consideration the specific contexts of that State: Canada is no different. The proposed comprehensive Canadian space law, therefore, is a custom document that, although influenced by the existing national space laws of other jurisdictions, is reflective of Canada, its capabilities and its priorities. Indeed, having identified the common characteristics of a comprehensive national law in Chapter 7, the most ideal form of these characteristics have been included in the proposed law, taking into consideration the Canadian context.

The format in which the proposed comprehensive Canadian space law is presented in Appendix III is intended to mirror existing Canadian legislation and follow generally-accepted Canadian legislative drafting principles.[3] Although the presentation of the proposed law is not as cumbersome as the *2018 UK Space Law*[4] or the *New Zealand Space Law*[5] (in terms of their repetition and length), it is also not as streamlined as the *Belgian Space Law*[6] or the *Finnish Space Law*[7]: nevertheless, the proposed comprehensive Canadian space law is designed to be both clear to concerned parties and accessible to uninformed readers with the overall goal of conveying its regulatory intentions effectively.

In the section that follows, specific insights are provided with respect to the individual sections of the proposed comprehensive Canadian space law. Although the entirety of the law is provided in Appendix III, immediately following each subsection heading in this chapter, the text of the law is reproduced in a smaller font and in italics. The purpose of these textual inclusions is to facilitate an understanding of why certain language or provisions were included or excluded from the draft law without having to constantly make reference to Appendix III. Throughout this chapter, references of "this law" are references to the draft comprehensive Canadian space law found in Appendix III.

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[2] *Outer Space Act*, No 409 (2016) [*Danish Space Law*].
[3] Privy Council Office, "Guide to Making Federal Acts and Regulations", *2nd ed*, Government of Canada, 2001.
[4] *An Act to make provision about space activities and sub-orbital activities, and for connected purposes*, 2018 Ch 5 [*2018 UK Space Law*].
[5] *Outer Space and High-altitude Activities Act*, Act No 29 of 2017 [*New Zealand Space Law*].
[6] *Law of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects*, Belgian Official Journal, 11 Apr 2008, p 19517 [*Belgian Space Law*].
[7] *Finnish Space Law*, *supra* note 1.

Specific Provisions

Short Title

1. This Act may be cited as the Space Activities Act.

A number of different options were considered when determining the title (and, more importantly, the short title) of this law, including "Outer Space Act", "Act on Space Activities", "Law on Space Activities", "Law on Licensing Space Activities", "Commercial Space Activities Act", "Space Development Promotion Act", "Extraterrestrial Mission Management Act" and "Canadian Space Law". None of these titles, however, accurately capture the entirety of this law's scope. For example: since this law is not limited to addressing commercial space activities (insofar as purely scientific and experimental space activities also fall within the purview of this law) the titles "Commercial Space Activities Act" and "Space Development Promotion Act" are too narrow; since this law is not limited to activities taking place only in outer space or simply "extraterrestrial missions" (insofar as the ground operations supporting outer space activities and Earth-focussed space activities also fall within the purview of this law) the titles "Outer Space Act" and "Extraterrestrial Mission Management Act" are too narrow; and finally, since this law is not limited to the licensing of space activities (insofar as it lays out the country's general space policy objectives and the registration of space objects) the title "Law on Licensing Space Activities" is too narrow. The remainder of the titles are all relatively similar and so the most straightforward, "Space Activities Act", was adopted.

Definitions

2. In this Act,

damage *means damage to persons, property, the public health or the environment, caused by a space object in the course of a space activity*

fund *means External Market Maturation Assistance Fund*

launching State *means a State which launches or procures the launching of a space object or from whose territory or facility a space object is launched*

licence *means the documentation provided by the Minister to a licensee demonstrating the authorisation of a specific space activity*

licensee *means a natural or legal person who intends to carry out, carries out or continues space activities or is effectively responsible for such activities*

Minister *subject to section 5, means the Minister of Innovation, Science and Industry*

outer space *means an area beyond the distance of 100 km above mean sea level on Earth, including celestial bodies, or as defined by international consensus*

space activity *means an activity related to the exploration and use of outer space, including, but not limited to, launching a space object into outer space, the operation and other control of a space object in outer space, as well as measures to return a space object and the return of a space object to Earth*

space object *means any object launched or intended to be launched into outer space, including the component parts of such an object, and any device used or intended to be used for launching an object into outer space, including the component parts of such a device*

The provisions related to defining the terms used in the law, as presented in section 2, serve to specify the precise concepts intended by the drafter when using a more generic term. Of the nine definitions included, the three most consequential are "outer space", "space activity" and "space object". This law defines outer space as the area above 100 km (essentially following the Australian[8], Kazakhstani[9] and Danish[10] precedent) and explicitly includes celestial bodies. The adoption of such a definition of outer space is intended to provide Canada with a spatial delimitation between airspace and outer space, removing any doubt as to where the latter begins.[11] The clarity provided by this definition allows licensees to know whether their activities would amount to a space activity (if taking place or intending to take place above 100 km) or whether it would amount to an activity in Canadian airspace (for example a high-altitude balloon that does not reach 100 km); if the former, this law would apply and if the latter, any number of existing or new Canadian laws related to the air would apply. Specific mentions of high-altitude balloons were intentionally excluded from this law, as opposed to its inclusion in the *New Zealand Space Law*[12], so as to not specify the application of this law to specific technological features. Nevertheless, the activities of high-altitude balloons would still fall within the purview of this law if it is determined that the activities can be classified as a "space activity" (discussed below). If not, the activity would remain within Canadian airspace and be regulated by existing aviation law.

Although most States are hesitant to provide a delimitation of space for fear of undermining their future sovereignty, the reality is that most non-terrestrial activities either take place in

[8] *Space (Launches and Returns) Act*, Act No 123 of 1998 at s 8 [*Australian Space Law*].
[9] *Law of the Republic of Kazakhstan on Space Activities*, Law No 528-IV of 2012 at Art 1.
[10] *Danish Space Law*, *supra* note 2 at s 4.
[11] Importantly, a persuasive argument has been made for the adoption of an 80 km delimitation on the scientific basis of the lowest maintainable orbit of a space object. Jonathan McDowell, *The edge of space: Revisiting the Karman Line*, (2018) 151 Acta Astronautica 668. Nevertheless, the motivation behind proposing Canada adopt a 100 km delimitation is based on the fact that, legally, there is some degree of consensus (albeit currently limited to three States) on where a strict delimitation should be drawn. Instead of further muddying international discussions with a proposal for 80 km (even if it is scientifically more accurate and even though the UAE's space law has chosen this altitude), the politically pragmatic decision is to increase momentum towards the legal adoption of an international definition. Indeed, the altitude eventually chosen by the international community will necessarily be a human construct as boundaries are neither natural nor necessary and, may, with improvements to technology, prove arbitrary. *See* Shantnu Mishra & Tomas Pavlasek, *On the Lack of Physical Bases for Defining a Boundary between Air Space and Outer Space*, (1982) 7 Annals of Air & Space L 399.
[12] *New Zealand Space Law*, *supra* note 5 at Art 3.

airspace lower than 25km or outer space higher than 100 km[13]. By refusing to publicly state where airspace ends and outer space begins, States merely prevent a crystallisation of legal clarity in exchange for limited future functional value.[14] Canada's adoption of a 100 km delimitation between airspace and outer space could therefore be seen as a demonstration of its commitment to the harmonisation of international space-related norms and would provide clarity to operators on where their activities would begin to be regulated by this law. Indeed, a delimitation of 100 km would exceed by 50 km the "lower limit" of the atmosphere as established in the *Chapman Report* more than fifty years ago[15], thereby securing Canada's sovereignty over its functional airspace and, to an extent, a portion of outer space. Of course, the chosen delimitation of 100 km is a legal definition and can easily be changed if future international discussions determine that another altitude is more suitable.[16] It is for this reason that the definition of outer space includes the phrase "or as defined by international consensus".

The definition of space activity does not specify the exact activities (for example, telecommunications, remote sensing, space resource exploitation, etc.) that would qualify as space activities but rather focuses on the control exerted over any space object that happens to be in outer space. Since the definition of outer space is defined as anything above 100 km, it is necessary to define what amounts to a space object to make sense of a space activity. A space object is any object that is launched (or intended to be launched) into outer space, including its component parts, as well as the device used to launch the object into space, including the launching device's component parts: essentially, a space object includes any launch vehicle, its payload and their component parts. Therefore, rockets, spent fuel tanks, fairings and nose cones, planes designed to launch satellites, spacecraft, large geostationary satellites, small satellites and any pieces that may separate (intentionally or unintentionally) are all considered space objects. A combination of outer space and space object, therefore, result in a definition of a space activity as any control exerted over a specific object in outer space.

[13] Although this may change in the future as new technologies can better take advantage of the lower atmosphere, it remains such that a delimitation at 100 km does not limit a State's functional sovereignty.
[14] The altitudes higher than functional airspace (more than 25 km) and less than functional outer space (less than 150 km) have been referred to as the "protozone" by some scholars. Joseph Pelton, *New Uses of the Protozone*, in Joseph Pelton, "Space 2.0" (Cham: Springer, 2019).
[15] John Chapman et al, Upper Atmosphere and Space Programs in Canada, Science Secretariat, Government of Canada, 1967 at p v.
[16] The Legal Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space has been discussing the question of delimitation since its inception more than 50 years ago.

The definition of space activity, however, is further qualified by language that adds "an activity related to the exploration and use of outer space" to ensure that activities that may, in the future, be carried out without the use of a space object may amount to a space activity. For example, if general international agreement develops to the effect that objects built on the Moon, using *in situ* resources, and then launched into space from the Moon are not to be considered "space objects" for the purposes of the various international treaties, the definition provided in this law creates a scope that is sufficiently wide to maintain Canada's authority over such activities. Further, the inclusion of this qualifying language brings within the scope of the law the ground-based infrastructure that is used to support space activities.[17] This extremely broad definition is necessary for a comprehensive space law as it encapsulates all current space activities as well as future space activities. Indeed, this law is designed to apply to space activities that take place on the Moon or other celestial bodies or activities that are launched from the Moon or other celestial bodies. Although it may be desirable to draft a more specific law in the future (when such activities become widespread and more specific), the existence of this law ensures there is no legal vacuity until such time.

Objectives

3. In the regulation of space activities, the objectives of this Act are:
- *3.1. To ensure space activities are safely carried out;*
- *3.2. To ensure the national security interests of Canada are maintained;*
- *3.3. To ensure the international obligations of Canada are upheld;*
- *3.4. To promote the common interests of all humankind in the continued exploration and use of outer space on a sustainable basis and for peaceful purposes;*
- *3.5. To stimulate the research and development of Canadian space activities;*
- *3.6. To stimulate the commercialisation of Canadian space activities;*
- *3.7. To enhance the efficiency and competitiveness of Canada's commercial space activities in national and international domains; and*
- *3.8. To encourage innovation in the provision of space related services.*

The eight enumerated objectives of this law, listed in section 3, are meant to provide the underlying foundational principles upon which a competent space regulatory framework is to be built. The purpose of including these objectives at the forefront of this law in general-yet-distinct language is to provide overarching guidance to the Minister in carrying out their various

[17] The *Ordinance of the Supreme Soviet of Ukraine on Space Activity*, 15 November 1996 [*Ukrainian Space Law*] at Art 1 uses the language of a "space facility" to bring within its scope both the space segments and ground segments of a space system; the same effect is achieved in this law by using the language "activities related to the exploration and use of space".

obligations under this law. Indeed, this law is designed to provide the Minister with considerable discretion in how to implement their various obligations under this law, and these objectives are intended to ensure that the chosen method of implementation conforms with these basic principles. For example, the Minister may establish requirements related to licensees procuring insurance for their space activities: if the Minister requires that every licensee must procure $1 billion of insurance coverage, the Minister would neither be stimulating the commercialisation of Canadian space activities nor would the Minister be encouraging the provision of innovative space services. As a result, the Minister would not be satisfying the objectives of this law and would fail to appropriately implement their obligations under this law.

The eight objectives listed in this law are meant to span the motivations of the regulatory spectrum. Four of the objectives include ensuring that space activities are carried out safely, that they do not jeopardise national security, that they uphold international obligations and that they cumulatively promote the space-related interests of humankind in a sustainable and peaceful manner. These four provisions are fundamental to any comprehensive national space law as they ensure space activities are carried out in a way that appreciates the potentially significant negative consequences of space activities. This law also includes as its objective the general stimulation of commercial space activities and space services and the competitiveness of such endeavours in the marketplace. These provisions are essential to include in the objectives section to demonstrate that although negative consequences are to be avoided, there are also positive consequences of space activities that ought to be encouraged. Therefore, the objective of this law can be summed up as the promotion of Canadian commercial space activities in a safe, secure and competitive manner that takes into consideration the interests of humankind. When implementing the various components of this law, therefore, the Minister must ensure that commercial space activities are regulated in such a way as to allow for growth without compromising Canadian or human interests.

<u>Responsible Representative of Government</u>

4. *The Minister may delegate to any officer or class of officers the exercise of their powers under this Act.*

5. *The Governor in Council may designate a member of the Queen's Privy Council for Canada to be the Minister for the purposes of this Act.*

Although multiple Minister's currently oversee existing space activities, this law proposes in the definitions section that the Minister of Innovation, Science and Industry (ISI), take a

leadership role in providing oversight to the overall Canadian space sector, especially with respect to emerging space activities. Indeed, the two other seemingly viable options would be the Minister of Foreign Affairs or the President of the Canadian Space Agency. Although the Minister of Foreign Affairs has an important role to play with ensuring Canada upholds its international obligations and ensuring Canadian interests related to space are advocated for internationally, the actual regulation of commercial space activities is a much more domestic issue that requires working closely with private companies; as such, the Minister of Foreign Affairs would be ill-suited to fulfill all of the responsibilities required under this law (with the exception that they would be best-suited as the Minister in charge of the national register). The President of the Canadian Space Agency is also not a suitable candidate for overseeing the implementation of this law as the Canadian Space Agency is not a regulatory body nor does its mandate provide for such a regulatory role: although the CSA fosters intimate relations with industry, it does so in its role as a scientific and technical partner rather than as a regulator. Indeed, having an agency tasked with regulating the very industry to whom it is committed to help develop is burdening that agency with an unnecessarily challenging balancing act.

The Minister of ISI, however, is well positioned to oversee the implementation of Canada's international obligation to authorise and continually supervise the space activities of Canada's non-governmental entities. In fact, the Minister of ISI (or, at least, the Minister's delegates) currently license radiocommunication, broadcasting and telecommunication activities[18]. Acknowledging that most future space activities will rely on innovative technologies and result in novel applications developed by or in partnership with the private sector, the Minister of ISI is best positioned to leverage their knowledge of technology, their relationships with industry and their mandate to promote innovation. As with most laws designating authority to a specific minister, section 4 of this law allows the Minister to delegate their responsibilities to their officers. Such a delegation ensures an efficient implementation of the various provisions of this law since it is impossible for any minister to single-handedly implement an expansive law (let alone the other duties, functions and laws with which they are charged).

[18] The only existing space activity the Minister of ISI does not regulate is remote sensing. Further, when launch activities within Canada become a reality (likely after new regulations are developed), the Minister of Transport would regulate such activities.

Importantly, this law provides in section 5 that any member of the Queen's Privy Council (colloquially, a cabinet minister) may be tasked with implementing this law. Notwithstanding the Minister of ISI's current appropriateness with respect to implementing this law, the most significant reason for including this provision is to allow the government, in the future, to designate the responsibilities under this law to a different minister if it would make sense to do so. For example, if commercial space applications continue to develop and command more attention and more ministerial-level focus than that which could be provided by the Minister of ISI (considering all of the Minister's other priorities), section 5 renders it possible for Cabinet to create the role of, and designate the responsibility of implementing this law to, a Minister of Space. Although such a position does not exist in other countries, such an unprecedented move would signal Canada's very serious focus on the continued development of space.

Application of Law

6. This Act applies to all space activities taking place from within Canada or on board:
- *6.1. Any ship, vessel or aircraft that is*
  - *6.1.1. Registered or licensed under an Act of Parliament, or*
  - *6.1.2. Owned by, or under the direction or control of, Her Majesty in right of Canada or a province;*
- *6.2. Any spacecraft that is under the direction or control of*
  - *6.2.1. Her Majesty in right of Canada or a province,*
  - *6.2.2. A citizen or resident of Canada, or*
  - *6.2.3. A corporation incorporated or resident in Canada; and*
- *6.3. Any platform, rig, structure or formation that is affixed or attached to land situated in the continental shelf of Canada.*

7. This Act applies to all space activities taking place outside Canada by the following persons:
- *7.1. Canadian citizens;*
- *7.2. Permanent residents within the meaning of subsection 2(1) of the Immigration and Refugee Protection Act;*
- *7.3. Corporations that are incorporated or continued under the laws of Canada or a province; and*
- *7.4. Members of any prescribed class of persons having a substantial connection to Canada related to space activities.*

8. The provisions of this Act do not apply to space activities carried on by the Department of National Defence.

9. The Minister of Defence shall submit an unclassified annual report to the Minister with respect to the space activities carried on by the Department of National Defence.

The provisions in section 6 and 7 of the Act were intentionally drafted as broadly as possible to bring within the scope of this law all space activities that may be carried out from within Canada or by Canadians. The overarching rationale for a broad scope are Canada's international obligations and its potential liability for damage caused by such activities. With respect to the

territorial distinction, it is important to include areas other than the traditionally-considered sovereign territory of Canada and explicitly bring within the ambit of this law Canadian ships, vessels, aircraft, spacecraft and artificial platforms; given the rise of novel launch applications (such as from custom aircraft), a wide scope will prevent the need for amending this law in the future. With respect to the nationality based application of this law, including a wide scope protects Canadian interests by ensuring Canada does not unknowingly become a launching State of a space object and subject to potential liability claims against it. In circumstances where a potential Canadian licensee is undertaking space activities solely outside the jurisdiction of Canada, is authorised by another State and Canada has an agreement with that other State, the Minister may exempt the licensee from requiring a licence as per section 12.

The decision to exclude the Department of National Defence from the application of this law in section 8 is meant to prevent unnecessary oversight by one Minister over the activities of another independent Minister.[19] Since defence-related space activities undertaken by the Department of National Defence are carried out in the interests of Canada, the underlying objectives motivating such activities would likely be in line with those provided in this law - as such, dual oversight, taking into consideration the same principles, would be unnecessary. Further, the true purpose of this law is to ensure Canada appropriately regulates commercial space activities; military space activities, including those carried out by non-governmental contractors, would necessarily undergo the appropriate authorisation and supervision procedures carried out by the Department of National Defence in light of their national security implications. Nevertheless, section 9 requires the Minister of Defence to provide an unclassified report to the Minister of ISI detailing the Department of National Defence's space activities so that any governmental and commercial overlaps can be identified, efficiencies can be implemented and a general "whole of government" approach to Canadian space activities can be realised. The unclassified nature of the annual report is to ensure Canada's national security is not jeopardised and strategic advantages are not lost.

Authorisation

10. No person shall, except under and in accordance with an appropriate licence, undertake a space activity.

11. The Minister may, by order, create and administer distinct licences for specific space activities including, but not limited to:

[19] Similar provisions exist in the *New Zealand Space Law*, *supra* note 5 at Art 6, the *Finnish Space Law*, *supra* note 1 at s 3 and the Portuguese *Decree Law No 16/2019* [*Portuguese Space Law*] at Art 2.

11.1. On-orbit servicing activities;
11.2. Debris remediation activities;
11.3. Space tourism activities;
11.4. Temporary habitation activities;
11.5. Permanent settlement activities;
11.6. Space resource exploitation activities;
11.7. Solar power satellite activities;
11.8. Planetary protection activities;
11.9. Extraterrestrial life form contact activities; and
11.10. Any other space activity.

12. The Minister may, by order, subject to any terms and conditions that the Minister may specify, exempt any person, class of persons or entity from the application of section 10.

13. Any person seeking to undertake radiocommunication activities, as defined in the Radiocommunication Act, using a space object shall obtain an appropriate licence under the Radiocommunication Act.
13.1. If a radiocommunication activity is deemed to not fall within the scope of the Radiocommunication Act, a licence shall be sought under this Act.

14. Any person seeking to undertake broadcasting activities, as defined in the Broadcasting Act, using a space object shall obtain an appropriate licence under the Broadcasting Act.
14.1. If a broadcasting activity is deemed to not fall within the scope of the Broadcasting Act, a licence shall be sought under this Act.

15. Any person seeking to undertake telecommunications activities, as defined in the Telecommunications Act, using a space object shall obtain an appropriate licence under the Telecommunications Act.
15.1. If a telecommunications activity is deemed to not fall within the scope of the Telecommunications Act, a licence shall be sought under this Act.

16. Any person seeking to undertake remote sensing activities, as defined in the Remote Sensing Space Systems Act, using a space object shall obtain an appropriate licence under the Remote Sensing Space Systems Act.
16.1. If a remote sensing activity is deemed to not fall within the scope of the Remote Sensing Space Systems Act, a licence shall be sought under this Act.

17. Any person seeking to undertake launch activities using a space object shall obtain an appropriate licence under the Aeronautics Act.
17.1. If a launch activity is deemed to not fall within the scope of the Aeronautics Act, a licence shall be sought under this Act.

18. The Minister may, by order, provide alternate licencing procedures with respect to sections 13-17.

The language included in section 10 creates the single most important provision of this law as it prohibits any person from carrying out space activities without an appropriate licence; absent this provision, this law would fail to meet its purpose of ensuring Canadian space activities are only carried out with the authorisation of the government, as is required by Canada's international obligations (specifically, Article VI of the *Outer Space Treaty*[20]). The intentional lack of specificity as to which space activities require prior authorisation ensures that all space activities,

[20] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies*, 27 Jan 1967, 610 UNTS 205 [*Outer Space Treaty*].

in any of their present and future manifestations, are subject to this law, providing the foundation for a truly comprehensive regulatory framework. Nevertheless, the following provision explicitly grants the Minister the authority to create and administer different kinds of licences for individual activities and includes a non-comprehensive list of examples of the kinds of specific licences that may be created.

The follow-on provision, section 12, allows the Minister to determine whether certain classes of people ought to be exempt from the prohibition of undertaking space activities without first receiving a licence. This provision was included to allow the Minister some discretion in the administration of licences with respect to certain low-risk activities, such as those carried out for educational purposes.[21] In combination with section 47, the Minister may choose to exempt, for example, all academic space researchers or specific academic space activities from requiring prior authorisation. In addition, this provision allows the Minister to exclude from prior authorisation entities who are clearly and explicitly regulated by the space regulatory framework of other States, subject to the Minister's satisfaction that Canadian interests are appropriately protected.

The following provisions, namely sections 13-17, implement the existing regulatory regimes related to radiocommunication, broadcasting, telecommunication, remote sensing and launch activities rather than creating a new system. This was done for two reasons: first, the existing regimes work relatively well with respect to the current activities they oversee; and second, many of these laws are undergoing legislative review that may result in sweeping reformations. For example the January 2020 report of the Broadcasting and Telecommunications Legislative Review Panel[22], prepared for the Minister of ISI, suggested significant changes to the *Broadcasting Act* and the *Telecommunications Act* and the ongoing internal reviews of the *Aeronautics Act* and the *Canadian Aviation Regulations* (by Transport Canada) with respect to launch licensing as well as the *Remote Sensing Space Systems Act* and its regulations (by Global Affairs Canada) are expected to result in proposals for similar regulatory changes. As a result, creating two parallel systems of review and/or suggestion would simply complicate the regulatory framework. Ideally, the

[21] Similar provisions are found in the *Portuguese Space Law*, *supra* note 19 at Arts 16, 19 whereby a special licensing regime applies to space activities intended solely for scientific, research and development or educational purposes (and a potential waiver for procuring liability) as well as the *Austrian Federal Law on the Authorisation of Space Activities and the Establishment of a National Space Registry*, 6 Dec 2011 [*Austrian Space Law*] at s 4 which allows the appropriate minister to reduce or waive insurance requirements.

[22] Janet Yale, et al, *Canada's Communications Future: Time to Act*, Broadcasting and Telecommunications Review Panel, Innovation, Science and Industry, Government of Canada, Jan 2020, online: <https://www.ic.gc.ca/eic/site/110.nsf/vwapj/BTLR_Eng-V3.pdf/$file/BTLR_Eng-V3.pdf>.

authorisation and licensing processes related to the space-based activities of the above-listed regulatory regimes would be carried out through subordinate legislation created under this law (as is provided for in section 19); doing so at this point, however, without repealing the existing laws (or amending them so that they no longer apply to space activities) would create a parallel regulatory structure that would unnecessarily complicate matters. Until the appropriate reviews have been completed (and determinations made on how to prepare the existing systems for future space activities) the most straightforward regulatory process is simply to refer licensees to the authorisation procedures established within the existing framework.

Applications for Licensing

19. A licensee's application to the Minister to issue, amend or renew a licence shall be made in the prescribed form and manner, including, but not limited to:

19.1. Information demonstrating technical and financial capacity of the licensee to carry out the proposed space activities;

19.2. Information describing the specific space activities for which a licence is sought;

19.3. Information describing how the safety of people and property is to be ensured;

19.4. Information demonstrating an assessment of the environmental impacts of the proposed space activities on Earth, in the atmosphere and in outer space;

19.5. Information explicitly denoting an intention to use nuclear or other potentially radioactive or hazardous materials in the space object or the proposed space activity;

19.6. Information demonstrating a proposed system disposal plan;

19.7. Information demonstrating the appropriate procurement of, or agreement to procure, insurance;

19.8. Any other information of which the licensee is aware and which may be relevant to the Minister's decision to grant the licence;

19.9. Any other prescribed information, documents or undertakings; and

19.10. Any prescribed application fee.

20. A licensee's application for a licence may apply to multiple space objects, so long as the multiple space objects function together in relation to a single space activity.

21. The Minister may request the licensee to provide any additional information, documents or undertakings the Minister may deem necessary and relevant to the Minister's decision to grant the licence.

22. Within sixty (60) days of receiving a licensee's application for licence, amendment or renewal, the Minister shall, in writing, notify the licensee as to whether the Minister considers the application complete or whether any additional information, documents or undertakings are necessary before the application may be considered complete, specifying the additional information, documents or undertakings required by the Minister.

A licensee desiring to undertake a space activity must submit to the Minister an application for a licence, ensuring specific information is provided, before receiving authorisation. The necessary information is listed at section 19 and is designed to ensure the Minister has a complete picture of the proposed activity so that an appropriate decision may be made. Although there is a requirement for a demonstration of technical and financial capacity, this provision is not intended

to prevent inexperienced individuals or small operators from undertaking space activities; rather, it is meant to ensure the Minister evaluates applications with an appropriate appreciation of the licensee's specific characteristics, financial solvency and business case. The provision related to procuring insurance is meant to highlight to the licensee at the outset that space activities are inherently risky and potentially debilitating; by demonstrating that insurance has been procured, or has been agreed to be procured, the Minister is assured that the licensee understands the complexities of undertaking space activities and is prepared to appropriately safeguard against financial risks.

With the advent of small satellite constellations, it is likely that commercial operators will deploy sets of satellites to accomplish their objectives - requiring an application for each individual satellite in a constellation of ten, one hundred or one thousand satellites would be administratively inefficient and unnecessary. As a result, section 20 provides that a single application is satisfactory for seeking authorisation for a multi-space object activity (so long as all the relevant information is provided in the application).[23] The timeline established in section 22 ensures that licensees receive timely feedback on their applications and know whether they have submitted all of the necessary information required to evaluate their application for a licence; if not, the Minister must detail what additional information, documents or undertakings are necessary to complete their application. Similarly, the 60 day deadline ensures the Minister is keeping pace with commercial demands: as a result, the Minister must proactively ensure that the Minister and the Minister's delegated officers are aware of technological innovations, novel space applications and emerging activities.

Licensing Activities

23. When considering an application for a licence under this Act, the Minister shall take into consideration:
- *23.1. The safety of people and property;*
- *23.2. The protection of the Earth and outer space environments;*
- *23.3. The national security interests of Canada; and*
- *23.4. The international obligations of Canada.*

24. When considering an application for a licence under this Act, the Minister may take into consideration:
- *24.1. The technical capacity of the licensee;*
- *24.2. The financial capacity of the licensee;*
- *24.3. The nature of the space activity for which a licence is sought;*
- *24.4. The proposed end-users or clients of the space activity for which a licence is sought;*

[23] Similar provisions are found in the *New Zealand Space Law*, *supra* note 5 at Art 16 and the *Portuguese Space Law*, *supra* note 19 at Art 10.

24.5. The nature of the proposed system disposal plan;
24.6. The nature and extent of the proposed insurance procurement; and
24.7. Any other considerations relevant to the regulation of Canadian space activities.

25. Within one-hundred and eighty (180) days of receiving a licensee's complete application for a licence, the Minister shall, in writing, either grant or refuse to grant a licence.

26. A licence is valid for the period that the Minister considers appropriate and specifies in the licence.

27. When considering an application to amend or renew a licence granted under this Act, the Minister may, in addition to the prescribed requirements under section 19, take into consideration:
27.1. The licensee's previous applications for licenses, amendments or renewals; and
27.2. The licensee's compliance with its previous and existing licence conditions.

28. A licence granted under this Act shall not be transferred to any other person except with the prior written approval of the Minister.

29. In determining whether to authorise the transfer of a licence, the Minister shall take into consideration:
29.1. The continued safety of people and property;
29.2. Maintaining the national security interests of Canada;
29.3. Upholding Canada's international obligations; and
29.4. The technical and financial capacity of the transferee to carry out the licensed space activity.

30. In determining whether to authorise the transfer of a licence, the Minister may take into consideration:
30.1. The nationality of the transferee;
30.2. The Canadian licensing history of the transferee; and
30.3. The economic opportunities and risks to the Canadian space industry.

31. The Minister may suspend a licence granted under this Act if:
31.1. The licensee fails to comply with a licence condition;
31.2. The licensee fails to comply with a rule made under this Act;
31.3. The suspension is necessary for protecting the interests of Canada, including, but not limited to:
31.3.1. The public health and safety of Canada or Canadians;
31.3.2. The national security interests of Canada; or
31.3.3. The international obligations of Canada.

32. Prior to suspending a licence, the Minister shall provide written notice to the licensee outlining the Minister's intention to suspend the licensee's licence and the reason or reasons for the suspension of the licensee's licence. The licensee has seven (7) days from receiving the Minister's written notice of the intended suspension of its licence to submit responses or propose alternatives to the intended suspension of its licence to the Minister in writing. After seven (7) days from which the Minister provided written notice of the intention to suspend the licensee's licence, the Minister shall, taking into account, if any, the licensee's submitted responses or proposed alternatives to the suspension of its licence, provide in writing to the licensee the Minister's decision on whether to suspend the licensee's licence.

33. In situations of emergency, the Minister may immediately suspend a licensee's licence on written notice, notwithstanding the requirements related to licence suspensions as provided in section 32.

34. A licence is suspended for the period that the Minister considers appropriate and specifies in the Minister's written decision to suspend a licence.

35. Following the suspension of a licence, the Minister may lift the suspension before the period for which the licence was suspended has elapsed if, in the opinion of the Minister, the reason for suspending the licence has been appropriately addressed and/or rectified.

36. The Minister may terminate a licence granted under this Act if:

36.1. The licensee fails to comply with a licence condition;
36.2. The licensee fails to comply with a rule made under this Act;
36.3. The suspension is necessary for protecting the interests of Canada, including, but not limited to:
36.3.1. The public health and safety of Canada or Canadians;
36.3.2. The national security interests of Canada; or
36.3.3. The international obligations of Canada.

37. Prior to terminating a licence, the Minister shall provide written notice to the licensee outlining the Minister's intention to terminate the licensee's licence and the reason or reasons for the termination of the licensee's licence. The licensee has seven (7) days from receiving the Minister's written notice of the intended termination of its licence to submit responses or propose alternatives to the intended termination of its licence to the Minister in writing. After seven (7) days from which the Minister provided written notice of the intention to terminate the licensee's licence, the Minister shall, taking into account, if any, the licensee's submitted responses or proposed alternatives to the termination of its licence, provide in writing to the licensee the Minister's decision on whether to terminate the licensee's licence.

38. The Minister may terminate a suspended licence.

39. The termination of a licence is permanent and cannot be reverted. A licensee whose licence is terminated is permitted to submit a new application for licence to the Minister in accordance with the requirements provided in section 19.

Upon receiving a completed application, the Minister is to determine whether to grant or refuse to grant the licence sought by the licensee within 180 days (as per section 25). In reaching their conclusion, the Minister must consider the safety of people and property, the protection of the Earth and outer space environments, Canada's national security interests and the international obligations of Canada. At a minimum, by ensuring the Minister considers the four criteria listed in section 23, the Minister is protecting the interests of Canadians and Canada with respect to space activities. The considerations listed in section 24, although not required, are relevant to the Minister's ability to appropriately determine whether a licence ought to be granted or refused; indeed, only by considering the more granular aspects of a licensee's application can the Minister satisfactorily evaluate the manner in which the proposed space activity would satisfy the objectives of this law as provided in section 3. Nevertheless, it is possible that certain conditions may not be relevant and/or appropriate in certain circumstances, justifying their inclusion in section 24's list of optional considerations rather than section 23's list of mandatory considerations.

As with the 60 day deadline imposed on the Minister with respect to the evaluation for completeness of an application, the 180 day deadline imposed on the Minister to grant or refuse to grant a licence is meant to ensure the regulatory process keeps pace with commercial demands.[24]

[24] Similar deadlines are present in *Belgian Space Law*, *supra* note 6 at Art 9, *Portuguese Space Law*, *supra* note 19 at Art 8, the *Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects*,

To maintain this timeline, regulatory officers must be trained proactively to maintain an understanding of scientific and real-world developments related to all space activities. Broad provisions related to extending the Minister's evaluation period were intentionally excluded so as not to provide the Minister or the Minister's delegates with a legislative tool to justify a delay in processing applications in a timely fashion. Since licences must be granted or refused within 180 days, this puts added pressure on the government to ensure the Minister's team is appropriately-resourced and able to work efficiently.

Operators are allowed to seek amendments or renewals of their licences by submitting an application for an amendment or renewal, as per section 27. In considering whether to authorise the amendment or renewal of an existing licence, the Minister is to take into consideration the same notions required in determining whether to issue a first licence but also take into consideration any previous applications (for example, to speed along an otherwise potentially lengthy process in instances where a simple change is required) as well as the licensee's compliance with its previous licensing conditions (for example, to determine whether the licensee has a history of responsible or negligent behaviour). The Minister may also grant a licensee's request to transfer a licence (sections 28-30), after taking into consideration any potential national security risks, the safety of people and property and the transferee's technical and financial capacity to continue carrying out the licensed activity. The Minister may also take into consideration the nationality of the transferee, the nature of the transferee's licensing history in Canada, if any, Canada's national security interests and the potential economic risks that the transfer may have for Canada. For example, if a Canadian company was the exclusive provider of space-to-ground Internet connectivity for the Arctic, the Minister may determine that the transfer of that company's licence to a Russian operator may jeopardise national security given the contentious status of the Arctic between Canada, Russia and other States.

The Minister is authorised to suspend a licensee's licence for a variety of reasons, including reasons internal and external to a licensee's conduct. The purpose of a licence suspension is to grant the Minister a certain degree of control over space activities in situations where Canada's interests may be at increased risk. The process outlined in section 32 is meant to ensure that licensees are aware of why their licence is being suspended and to provide them with an

Staatsblad 2007 (80), 24 Jan 2007 [*Dutch Space Law*] at s 5, the *Austrian Space Law*, *supra* note 21 at s 4 and the *Law on Space Activities*, Decree No 5663-1 of 1993 [*Russian Space Law*] at Art 12.

opportunity to respond in a manner that may avoid suspension of their licence prior to the Minister's decision to finalise a suspension. In situations of emergency, however, the Minister may immediately suspend a licence. In implementing a suspension, the Minister must provide the period over which a licence is suspended - this requirement is essential as an indefinite suspension would otherwise have the potential to amount to a termination of a licence.

Although the process for terminating a licence is similar to that of suspending a licence, they serve different purposes: the purpose of a licence termination is to prevent an activity that poses a temporally-irrelevant risk to Canadian interests. Since termination of a licence is irreversible (as per section 39), the Minister may not terminate a licence without first undertaking a process that allows the licensee to respond to the potential termination. In situations of emergency, therefore, the Minister must first suspend a licence and then move to terminate the licence. The cumulative effect of these two steps (immediate suspension followed by termination) ensures that a potential risk to Canadian interests is avoided by immediately suspending a licence while still providing the licensee with a chance to respond to the proposed termination as per section 37. This balance ensures that licensees' licences are not terminated without detailed consideration.

Expertise

40. The Minister may designate and make use of governmental and non-governmental experts in assisting the Minister to carry out the Minister's responsibilities under this Act.

The role of the regulator in authorising and continually supervising space activities is demanding and, aside from requiring significant administrative capacity, requires significant knowledge of and experience in undertaking space activities. In fact, since it is intended for this law to oversee the regulation of emerging space activities, regulators will be responsible for administering applications (and supervising) highly technical, complex and advanced space activities. As a result, regulators ought to be competent in various space science, engineering and related backgrounds to ensure they have the necessary understanding of the activity they are regulating to make appropriate determinations related to applications and licences. Given Canada's relatively limited breadth of expertise with respect to space activities (insofar as it is a specialist in only a few areas), it is likely that government employees do not currently possess the expertise necessary to thoroughly administer their regulatory authority, especially with respect to certain emerging activities. Using launch activities as an example, with a limited (and only

historic) involvement in launch, Canadian regulators likely do not have the first-hand experience of designing, building and operating complicated orbital launch systems. Nevertheless, Canadian companies are pursuing (and will continue to pursue) various launch systems, relying on the government to provide regulatory oversight. In some jurisdictions regulators may rely on governmental experience and institutional knowledge to help guide commercial activities: for example, NASA's historical launch accomplishments mean that the US has generations of public scientists with experiences related to launch that can provide regulatory guidance and oversight to commercial operators. Canada does not have such deep-rooted knowledge and therefore government scientists cannot provide industry with such experientially-grounded guidance.

As a result, section 40 is intended to allow the Minister to seek assistance from experts outside government to help satisfy the Minister's various responsibilities under this law.[25] The experts may be retired government employees, government employees of other allied nations, Canadian consultants from private practice, foreign experts or other individuals suited to provide the Minister with appropriate experience-derived expert advice. Although the Minister may determine the individual qualifications of each person capable of providing such advice, the Minister is ultimately responsible for ensuring the accuracy and appropriateness of the expert advice. Given the experiences of Canadian government employees, it would be necessary to supplement their capabilities with the specialised knowledge of experts to ensure commercial space activities appropriately uphold Canadian interests and that such activities will not be impeded by the government's inability to provide regulatory guidance.

Obligations of Licensees

41. Licensees shall be liable for damage caused by the licensee's space activities, whether such damage is caused in outer space, to an aircraft in flight or on Earth.

42. Licensees shall procure insurance to protect against liability the licensee may incur with respect to damage or loss arising out of space activities carried out by the licensee.

43. The Minister may establish the amount of insurance to be procured by a licensee with respect to a specific space activity.

44. Licensees shall indemnify the government against any claims brought against the government with respect to damage or loss arising out of space activities carried out by the licensee.

[25] The *Belgian Space Law*, *supra* note 6 at Arts 7, 10, the *Kazakhstani Space Law*, *supra* note 9 at Art 10, and the *Finnish Space Law*, *supra* note 1 at ss 15, 17 include similar provisions, whereby their authorising governmental bodies may seek expertise from non-governmental experts. The *Russian Space Law*, *supra* note 24 at Arts 5-11 also provides for outside expert assistance.

45. The Minister may establish the maximum amount of the licensee's liability to indemnify the government as a condition of the licensee's licence.

45.1. The maximum amount established as the licensee's liability to indemnify the government is void if the damage caused by the licensee was intentional or a result of gross negligence or recklessness.

46. The expiration, suspension or termination of a licence does not affect the licensee's obligations under the conditions of the licence.

The fundamental reason for including the provisions outlined in sections 41-46 is to reduce the likelihood that the State may be found internationally liable for damage caused by a non-governmental entity in space (as per the *Outer Space Treaty* and the *Liability Convention*)[26] and to protect Canada's long-term financial interests. Although international space law designates that launching States are liable for damage caused by their space objects (including those of their non-governmental entities), it does not prevent States from implementing domestic rules related to transferring such liability to the appropriate party; indeed, most States with comprehensive national space laws have included provisions related to liability.[27] By including such language in this law, licensees are aware of the potential legal consequences that may result from their space object causing damage, incentivising licensees to procure insurance to cover the potential financial obligations that may follow from such a finding of liability.

Indeed, the requirement to procure insurance plays three important roles: first, it protects licensees from potential financial ruin; second, it protects Canada from paying for damage caused by a private operator; and third, it stimulates the growth of a potentially vibrant insurance market. Any damage caused by a space object has the potential to prove catastrophic (especially if the damage is caused in space given the nature of orbital physics), even if the space object is a small satellite. As a result, even an entity operating a single small satellite can be found liable for millions of dollars in financial reparations, a sum that would financially ruin or bankrupt an otherwise viable company. Although in traditional market industries this would be acceptable (for example, if a company releases an unsafe product and is liable to pay compensation to settle a class action lawsuit), in space the consequences are much more acute. For example, it is possible that a Canadian company (Company X) with a revolutionary technology on the cusp of creating a

[26] *Outer Space Treaty*, *supra* note 20 at Art VII; *Convention on International Liability for Damage Caused by Space Objects*, 29 Mar 1972, 961 UNTS 187 [*Liability Convention*] at Arts III and IV.
[27] For an analysis of the various provisions related to liability in comprehensive national space laws, *see* Chapter 7, *Liability, Insurance and Indemnification*.

new space application can be derailed during its technology demonstration phase because of a poorly calibrated thruster that causes it to collide with and destroy a $100 million Earth observation satellite. Without insurance, the company would be forced into bankruptcy and its potentially innovative technology could be lost. With insurance, the company can continue to develop and bring to market its revolutionary technology, greatly benefiting itself, its shareholders, Canada and the various beneficiaries of the new application.

Continuing with this same example, if Company X did not have insurance and was unable to satisfy the $100 million claim against it, it would be forced into bankruptcy and Canada, as the launching State and liable party under international law, would be unable to recover any of the compensation it would have paid in satisfying the international claim. Acknowledging this reality and recognising that the Canadian taxpayer ought not be liable for damage caused by a private company, regulators may be more risk averse when authorising and licensing cutting-edge space technologies and applications if they know the licensee has not procured insurance. The nature of a global and competitive commercial space marketplace, however, is such that Canada must be willing - to a certain degree - to authorise relatively risky space activities to allow Canadian industry to gain an edge on competitors and offer compelling services. By requiring licensees to procure insurance, Canadian regulators would theoretically be more comfortable authorising riskier space activities knowing that taxpayers would not be underwriting the commercial space industry.

Although licensees may balk at the notion of being required to procure insurance for their space activities, mandatory coverage brings with it two distinct advantages: first, the number of policyholders increases, reducing the cost of premiums; and second, industry gains more exposure and can better evaluate potential risks. The current cost of insurance premiums for space activities are likely inflated and so licensees are justified in criticising the need to pay for coverage that is not representative of their risk. However, by requiring all licensees to procure insurance for their space activities, the number of policyholders would increase and the insurer's risk would be spread across more policyholders bringing down the cost of premiums. Similarly, by exposing insurance adjusters to more numerous and more diverse space activities, their risk assessment abilities will increase, their relationship with the industry will improve and the market will be less susceptible to shock; overtime, these too will bring down the cost of premiums, offering licensees with increased coverage for less.

The provisions related to indemnification, as per sections 44-45, protect Canadian interests by allowing the government to recoup any financial expenditures it makes to satisfy a claim against it by virtue of its international liability as the launching State of one of its licensees. These indemnification provisions ensure Canadian taxpayers are not paying for the damage caused by a private operator. Ideally, the licensee's insurance would be sufficient to cover the government's claim for indemnification, ensuring the licensee can continue carrying on its business and the taxpayers are not financing failed operations. Nevertheless, there may be situations in which the Minister would want to establish the maximum amount of a licensee's liability to indemnify the government as a condition of the operator's licence. For example, the government may limit its indemnification to the total amount of coverage provided for under the licensee's insurance policy after taking into consideration the size of the licensee's business, the nature of the activity or other related factors. Such limitations, however, are invalidated if the licensee's damage was the result of intentional or negligent conduct.

Lastly, section 46 provides that even if a licensee's licence authorising them to carry out a space activity expires, is suspended or is terminated, the licensee's obligations provided in that licence continue to be in force. The reason for this provision is to ensure that upon learning of a Minister's decision not to renew or to suspend or terminate a licence, the licensee does not abandon a space object thinking it no longer has an obligation to operate it safely. Indeed, this provision requires that licensees continue to abide by their licence conditions which would include remaining liable for damage, maintaining insurance, safely de-orbiting their space object, etc.

Public Interest Exemptions

47. The Minister may, by order, exempt certain scientific, academic or educational space activities that are in the public interest from requiring prior authorisation. The Minister may also, by order, exempt certain scientific, academic or educational entities that are in the public interest from requiring prior authorisation.

48. The Minister may consider the following non-exhaustive list of characteristics in determining whether such scientific, academic or educational space activities should be exempt from prior authorisation:
- *48.1. The status and nature of the licensee;*
- *48.2. The financial status of the licensee;*
- *48.3. The nature of the potential benefits to the licensee; and*
- *48.4. The nature of the potential public interest.*

49. The Minister may, by order, exempt certain scientific, academic or educational space activities that are in the public interest from requiring insurance prior to the scientific, academic or educational space activity being carried out.

50. The Minister may, by order, choose not to seek indemnification for certain scientific, academic or educational space activities that result in Canada being found internationally liable for damage caused by the scientific, academic or educational space activity.

By virtue of section 10, all people require authorisation prior to engaging in space activities. Since this provision applies indiscriminately, section 47 (and similarly, sections 49-50) allows the Minister to exempt from prior authorisation specific space activities that are in the public interest or specific operators who conduct activities in the public interest.[28] In reality, the Minister will likely streamline the application process (rather than eliminate the authorisation requirement entirely) for such public interest activities so as to facilitate the low-risk/high-value endeavours of the public interest community. The provision specifically does not define what amounts to "public interest" as a strict definition may exclude some activities that warrant such a status and may include some activities that do not warrant such a status - instead, taking into consideration the limited characteristics provided in section 48, the Minister can make an appropriate contemporaneous determination. For example, the Minister may determine that the entirety of the CSA's space missions do not require authorisation or merely require reporting obligations. Similarly, the Minister may determine that inter-university rocketry competitions can benefit from streamlined authorisation and supervision requirements while orbital-class commercial test flights do not.

Safety and Sustainability of the Environment

51. Licensees shall carry out their space activities without causing any particular risk to persons, property or public safety. Any person undertaking space activities shall have the requisite knowledge and experience required to safely carry out the space activity under his or her responsibility.

52. Licensees shall carry out their space activities in a manner that is environmentally sustainable and that promotes the sustainable use of outer space.

53. The Minister shall, by order, establish requirements related to environmental sustainability and the sustainable use of space. In establishing such requirements the Minister shall be informed by international guidelines and norms, including, but not limited to, the United Nations Long-Term Sustainability Guidelines.

54. Licensees shall ensure their space activities do not generate space debris and shall carry out their space activities in such a way as to limit the creation of space debris. In particular, the licensees shall:
54.1. Restrict the generation of space debris during the normal operations of the space object;
54.2. Reduce the risks of in-orbit break-ups of the space object;
54.3. Reduce the risks of in-orbit collisions with other space objects or space debris; and

[28] This provision was inspired by the *Austrian Space Law*, *supra* note 21 at s 4 which limits or eliminates the insurance requirements for space activities that "serve science, research or education".

54.4. Remediate, de-orbit or move to a less used orbit the space object once it has reached, or is expected to reach, the end of its life.

55. The Minister shall, by order, establish requirements related to the mitigation of space debris. In establishing such requirements the Minister shall be informed by international guidelines and norms, including, but not limited to, the United Nations Debris Mitigation Guidelines.

The desire for Canadian commercial space operations to be conducted safely is fairly straightforward: although space activities are important and beneficial, they should be carried out in such a manner that reduces the risk to people and property. In addition, ensuring that space activities are carried out in such a manner that they recognise the inherent value of the Earth and space environments provides opportunities for the long-term viability of such activities. Activities that neglect the importance of the Earth environment (for example, by launching nuclear powered space objects in an unsafe manner that exposes the environment to potentially hazardous damage) are not sustainable and undermine the viability of space activities by other operators. To this end, the Minister is required, as per section 53, to establish requirements related to the sustainability of the environment and the sustainable use of space. The language requiring that the "Minister shall be informed by" international norms and guidelines[29] was included to ensure Canadian space activities are carried out in compliance and coordination with other States and that Canada plays a leading role in the negotiation and determination of such rules.[30]

With respect to mitigating the very specific environmental hazard of space debris, this law directly addresses operator requirements to mitigate the creation of such debris. Specifically, sections 54 and 55 require licensees to carry out their space activities in a manner that is in accordance with generally accepted international guidelines related to the mitigation of space debris.[31] International guidelines and norms were included as the standard in hopes that, over time, current standards would be strengthened to represent advances in scientific and technical

[29] The Long-Term Sustainability Guidelines are those that were presented to the UN General Assembly in 2019. General Assembly, *Report of the Committee on the Peaceful Uses of Outer Space: Sixty-second Session 12-21 June 2019*, United Nations, UN Doc A/74/20, Jun 2019 at Annex II, p 50.

[30] Canada's failure to engage international partners on the creation of guidelines and norms will result in Canadian companies being required to implement international standards that their government did not participate in drafting; it is expected that this palpable responsibility will ensure Canada's ongoing engagement with the international community as it relates to global space governance.

[31] The Debris Mitigation Guidelines are those that were referred to the UN General Assembly in 2016. General Assembly, *Resolution Adopted by the General Assembly on 6 December 2016*, United Nations, UN Doc A/Res/71/90, 22 Dec 2016. Although a number of national space laws include provisions related to debris mitigation, the *Austrian Space Law*, *supra* note 21 at s 5 and *Danish Space Law*, *supra* note 2 at s 6 specifically reference international standards.

capabilities and licensees would be required to keep pace with such global developments. This approach is preferred over the alternative, which would be establishing a set of national guidelines that, while appropriate today, may be lacklustre in comparison to other jurisdictions in the future. Ensuring Canadian commercial operators undertake their space activities in a responsible manner is essential to maintaining Canada's reputation as a leader in space. Canada therefore has an opportunity to push for more stringent guidelines internationally which would further protect the space environment but also ensure that Canadian companies are not disadvantaged by potentially stricter domestic regulations than their foreign competitors.

Supervision

56. The Minister shall ensure licensees comply with the conditions of their licence.

57. Licensees shall prepare and submit to the Minister by 31 January of each year a report specifying the space activities carried out by the licensee over the previous year.

58. The Minister may, by order, establish requirements related to the information that licensee's shall provide in their annual report.

59. Upon written request from the Minister, licensees shall make available for investigation any and all premises from which they undertake the space activities for which they are licensed.

60. Upon written request from the Minister, licensees shall make available for investigation any and all documents related to the space activities for which they are licensed.

61. Upon written request from the Minister, licensees shall make available for investigation any and all information related to the space activities for which they are licensed.

In addition to the mandatory authorisation of space activities, Canada also has an international responsibility to continually supervise space activities. Sections 56-61 ensure that both licensees and the Minister take the necessary minimum steps to ensure Canada satisfies this obligation (which is neither internationally defined nor explicitly agreed upon). These provisions are designed so as to provide both passive and active supervisory obligations so that at all times the Minister is aware of the space activities carried out by licensees. By requiring licensees to provide the Minister with an annual report, the Minister can passively determine whether licensees are abiding by their license requirements, engaging in non-sanctioned activities, undertaking risky or otherwise unnecessary manoeuvres, etc. and act accordingly. Further, by granting the Minister investigative powers, the Minister may actively gather additional information from the licensee's premises, documents, etc. and evaluate potential risks with the benefit of a complete picture.

Neither the annual reporting obligations nor the investigative opportunities are intended to be onerous but rather ensure both licensees and the Minister are synchronised.

Registration

62. The Minister shall create and maintain a public registry of space objects.

63. Each licensee shall provide the Minister, within six months from the date of launch, with information concerning the space object launched into earth orbit or beyond into outer space, including, but not limited to:
- *63.1. The name of the launching State or States;*
- *63.2. The date and place of launch and launch vehicle;*
- *63.3. The name of the licensee;*
- *63.4. The designator or registration number of the space object;*
- *63.5. The general function of the space object;*
- *63.6. The orbital parameters of the space object, including:*
  - *63.6.1. The nodal period;*
  - *63.6.2. The inclination;*
  - *63.6.3. The apogee;*
  - *63.6.4. The perigee; and*
- *63.7. Any other information prescribed by order of the Minister.*

64. The Minister shall furnish to the United Nations Secretary General the information provided in subsections 63.1-63.6 for each space object entered into the registry created under section 62.

The *Registration Convention*[32] requires State parties to create and maintain a national register of space objects and, further, to provide relevant information related to such space objects to the Secretary General of the United Nations. The fundamental purpose of creating, maintaining and sharing the information on a national register is to ensure all State parties have knowledge of the space activities of other States so as to facilitate the further development of international space law. Additionally, requiring that national registers provide information that is then put into a central United Nations register allows for the identification of space objects by all State parties, potentially improving coordination and cooperation between space faring nations. Although it is likely Canada has created and continues to maintain a national space object registry[33], there is no

[32] *Convention on Registration of Objects Launched into Outer Space*, 15 Sep 1976, 1023 UNTS 15 [*Registration Convention*].

[33] The only reference to such a registry is a 1976 *note verbale* from Canada to the United Nations notifying the Secretary General that Canada had established a national registry and that it would be maintained by the Secretary of Canada's Interdepartmental Committee on Space. Secretariat, *Note verbale dated 24 August 1976 from the Permanent Mission of Canada to the United Nations addressed to the Secretary-General*, United Nations, UN Doc ST/SG/SER.E/INF/2, 16 Nov 1976. It is believed that the Interdepartmental Committee on Space no longer exists (or, at the very least, is no longer operational) although there have been murmurs related to the recreation or reanimation of a similar committee. Nevertheless, it is unclear from public sources where the Canadian space object registry now resides and who is charged with its maintenance.

domestic Canadian law explicitly requiring the creation and maintenance of a register, creating a potential legal vacuum - these provisions satisfy that void.

The provisions established in sections 62-64 of this law were included to explicitly require the Minister to create and maintain a public registry; by doing so, Canada's clear international obligation is implemented in domestic law. The provisions of this law also require that licensees must submit to the Minister certain enumerated criteria with respect to the characteristics of the space objects they launch into space. Upon receiving this information, the Minister is to provide such information to the Secretary General as part of its international obligations. Although in Canada the satisfaction of international obligations are usually carried out by the Minister of Foreign Affairs, the national register of space objects would be more appropriately handled by the Minister of ISI since the majority of the work related to maintaining the register will be concluded by working with industry partners.

External Market Maturation Assistance Fund

65. The Minister shall establish a fund for the purposes of disseminating the benefits of commercial space activities to non-Canadian non-space faring communities that have not directly benefited from the commercialisation of space activities.

66. The primary purpose of the fund is to ensure that communities that have not directly benefited from the commercialisation of space activities benefit from such activities.

67. The secondary purpose of the fund is to provide assistance to immature space markets external to Canada so as to develop such markets for Canadian commercial space technologies and services.

68. The Minister shall create an advisory board to provide advice to the Minister on how the Minister ought to carry out their responsibilities with respect to the fund.

69. The advisory board shall be comprised of eleven (11) individuals chosen by the Minister: three (3) from the commercial space sector, two (2) from academia, two (2) from development-related from not-for-profits, two (2) from the federal government, one (1) from the provincial governments and one (1) from Indigenous groups located in Canada.

70. The Minister shall disseminate at least one-quarter (25%) and at most three-quarters (75%) of the funds annually in a manner that, in the opinion of the Minister, would address the priorities of underserved non-space faring communities including, but not limited to:

- *70.1. Financial support for indigenous space capabilities;*
- *70.2. Capacity building for space entrepreneurs;*
- *70.3. Training individuals in specific space capabilities;*
- *70.4. Educational activities related to the benefits of space capabilities;*
- *70.5. Business partnerships with local companies; and*
- *70.6. Other activities that, in the opinion of the Minister, would contribute to the benefit of underserved communities.*

71. The Minister may seek consultations from the advisory board on how to best disseminate the funds.

72. The funds not disseminated in any given year shall be added to the total funds to be disseminated the following year as per the formula in section 70.

73. The fund shall be supported by licensees licensed to carry out space activities in the form of financial contributions totalling 1% of a licensee's annual revenues, averaged over the previous three years.

74. In lieu of financial contributions, the Minister may, by order, establish alternative forms of contributions equalling 1% of a licensee's annual revenues, averaged over the previous three years, including, but not limited to:
- *74.1. The sharing of specific technical expertise;*
- *74.2. The provision of specific space-based services; or*
- *74.3. Any other form of contribution that, in the opinion of the Minister, would be appropriate.*

75. Licensees are required to contribute to the fund annually, beginning in the fourth year following the Minister's authorisation of the licensee's space activity.
- *75.1. Licensees may volunteer to contribute to the fund before the fourth year following the Minister's authorisation of the licensee's space activity.*

The purpose of the provisions related to the creation of an External Market Maturation Assistance Fund are to provide Canada with an appropriate way of manifesting the language in Article I of the *Outer Space Treaty* that requires the exploration and use of outer space to be carried out in a manner that benefits all countries. Without global consensus on how such an obligation is to be implemented, States have not made concerted efforts to directly ensure their space activities directly benefit all countries; indeed, although rarely stated publicly, it seems the eventual trickle-down benefits of a space activity making its way to all countries is perceived as acceptable. Without engaging in a theoretical discussion on why space faring States ought to ensure their activities directly benefit all countries (rather than relying on the trickle down approach), suffice to say that Canada, Canadian companies and non-space faring countries and communities can all benefit from mandated assistance programs that seek to disseminate the benefits of space activities to all countries.

Indeed, the original name of the proposed fund was the Global Goodwill Fund in an effort to demonstrate that Canada takes seriously its obligation to ensure the benefits of its space activities are extended to all countries. It was also originally intended that the benefits of Canadian commercial space activities would flow directly to assist in the general welfare of non-space faring communities. However, given the general resistance to government-mandated foreign assistance (which would likely be viewed as an unconscionable tax) and the likely small contribution space-derived financial commitments would make in Canada's overall assistance program, the name and the objectives of the fund were changed to more appropriately represent the revised intentions behind the fund. As such, the External Market Maturation Assistance Fund has as its objective the

provision of assistance (whether financial, technical or otherwise) to underserved space-faring communities to help develop indigenous space-related capacity. Instead of the word "nations" or "States", the word "communities" is used explicitly to identify the more-localised communities that would benefit from this fund rather than general States. Indeed, by localising assistance to communities, it is possible for this fund to assist non-space faring communities in otherwise space faring nations. For example, if there is an identified need for space-related assistance in a small community in northern Brasil but, as a space faring nation, Brasil chooses not to extend its space resources to that community, Canada could choose to use this fund to help develop local assistance programs in the northern Brasilian community.

There are three main reasons why such a fund is appropriate to implement in Canada: first, to satisfy Canada's legal and, arguably, moral obligations; second, to help realistically disseminate the overall benefits of space activities to underserved communities; and third, to develop new markets for Canada's commercial space sector. As discussed above, Canada - and all space faring States - has an obligation to ensure their space activities benefit all countries. Although this obligation has traditionally been interpreted as an indirect obligation (such that so long as space activities develop and space services mature, all countries will eventually benefit from the cumulative advances), a more direct and literal interpretation of the obligation is seemingly more in-line with the intentions of the drafting and negotiating parties of the treaty. By directly harnessing an albeit small proportion of the benefits Canada accrues from its commercial space activities and directing them to the benefit of underserved communities, Canada would be satisfying its international obligation. In addition, Canada would be the first country in the world and, by default, a leader, in ensuring the commercialisation of space does not leave behind currently non-space faring countries, a role it can leverage in its bid to reclaim its overall reputation for international leadership.

By implementing the provisions related to the contributions that must be made by Canadian licensees to the fund (as outlined in sections 73-75), this law ensures that underserved communities receive tangible financial investments, useful services or technical expertise (as representations of the benefits of space activities), through which they may develop their own space capabilities and markets. Indeed, regardless of the lofty intentions of the negotiating parties of the *Outer Space Treaty*, it is highly unlikely that any country will distribute all of the benefits they accrue from their space activities to all other countries (on either an equitable or equal basis); at best, States

will provide a small portion of their space-derived benefits to other countries. The manner in which this law proposes to distribute the benefits of space activities (as discussed in section 70) is likely the best-case scenario for non-space faring nations: given the significant financial and technical advantages already developed by leading space powers, it is unlikely these powers would, short of complete benevolence, significantly undercut their advantages by providing more than what is included in this proposal.

Indeed, the proposed 1% mandatory contribution may still seem too steep and unrealistic from the perspective of commercial operators. To ensure licensees willingly contribute to such a fund, this law introduces the notion of developing external markets to offer long-term returns on commercial operators' short-term contributions. The intention is that the disseminated funds would be put towards developing underserved non-space faring communities that could benefit from space capabilities as well as develop future marketplaces for space services. For example, agrarian communities would benefit from harnessing remote sensing capabilities to improve the efficiency of their farming practices and communities with low population densities would benefit from accessing satellite-based Internet to connect and share information. By providing the initial resources necessary to access these services, or help develop local capabilities, Canada's commercial operators would be stimulating a new market that, over time, would develop additional needs that can be satisfied by other Canadian space capabilities. The rationale is similar to "free trials" offered by various commercial ventures, intended to demonstrate the benefits of a service, develop a market and then sell ongoing or additional services. Doing so would require Canadian commercial operators to make long-term investments by way of annual contributions to the fund but, after some time, these same companies would reap the benefits of new clients seeking similar services, growing markets seeking additional services, and potential partners requiring specialised components or sub-components for their own space capabilities.

With respect to the specific provisions of this fund, sections 68-69 establish the composition of an advisory board the Minister is required to create. Although the committee will only provide the Minister with advice, the eleven members are intended to provide a wide spectrum of opinions and perspectives. Industry is represented by three members, more than any other group, since it is the contributions of the commercial space sector that will fund this initiative and they would likely possess the most knowledge of real-world capabilities. Academia is represented by two members, with the intention that their advice would ensure the Minister's decisions are theoretically sound

and take into consideration long-term perspectives. The not-for-profit sector is represented by two members with development-related experience to ensure that appropriate underserved communities are identified and that their appropriate needs are addressed by the Minister's dissemination of the fund. Government is represented by a total of three members (two from the federal government and one from the provincial governments) to counterbalance the number of industry advisors, and would ideally be economists or development-related professionals so as to offer advice on how to disseminate the funds in a manner that maintains Canadian priorities and interests. Finally, Canada's Indigenous groups are represented by one member who will offer advice on how to best assist communities in a manner that respects their autonomy and does not end up using space as a tool of 21st century colonisation.

It is envisioned, through section 70, that the actual dissemination of the fund can be carried out in any number of ways, limited only by the Minister's imagination of how underserved communities can benefit from the opportunities provided by Canada's commercial space industry. For example, aside from direct transfers of money (for example, to fund the development of a small satellite undertaken by the local community itself), Canadian licensees may: provide advice to local entrepreneurs on how to build a business plan, source components or reach out to potential customers; train interested individuals on how to actually develop small satellites or components for larger space objects either locally or by sponsoring training programs in Canada; help promote the utility and benefits of space capabilities to raise local awareness; provide gratuitous services to a local entity that resells the services to the local community developing a market and business case; etc. The objective is to provide innovative ways for Canadian companies to engage with underserved communities and build positive relationships that can be leveraged over the long-term to the benefit of both Canada's commercial space sector and currently underserved communities across the world.

Indeed, section 74 allows the Minister to create alternative contribution methods so that Canadian licensees can determine how best to contribute to the fund so that both they and the served community benefit: they can decide to make a straight-forward financial contribution, offer their services (such as local remote sensing data or bandwidth for telecommunications) gratuitously or in some other acceptable form, so long as they amount to 1% of their annual revenues averaged over the previous three years (as determined by the Minister). A revenue-based contribution was chosen over a profit-based contribution because of the potential strategies that

may be employed to reduce overall contributions (for example, moving funds to different jurisdictions or investing all profits back into a business). The objective of the fund is not to exact a tax on Canada's commercial space operators; although it is mandatory, it is meant to ensure the entire community participates so as to generate the most substantial long-term benefits. The 1% contribution was determined, at a very basic level, as being palatable to operators and sufficient to provide genuine impacts in underserved communities; at least 25% of the fund will be carried over to the following year, which, compounded over a number of years will ensure the fund's constant and significant growth. Finally, the provisions in section 75 requiring contributions only three years after a licensee receives their licence is designed to ensure recent licensees are not overwhelmed by the added pressure of assisting underserved communities before they themselves have become established. Indeed, since the 1% contribution is based only on revenue, a company may spend a decade simply designing and implementing their space service before they begin generating revenue; during this decade, they would have no obligation to contribute to the fund.

Space Program Plan and Review

76. The Minister shall prepare and publish a long-term space plan every ten (10) years that outlines the overall objectives of the Canadian space program.

77. The long-term space plan shall include, but is not limited to:
- *77.1. A retrospective analysis of the previous ten years;*
- *77.2. An examination of the specific objectives identified in the previous long-term space plan;*
- *77.3. A list of recommendations on how the objectives identified in the previous long-term space plan could have been better achieved;*
- *77.4. An examination of the needs of the country;*
- *77.5. A list of new objectives for the next long-term space plan;*
- *77.6. A discussion of how the new list of objectives can be achieved including, but not limited to:*
  - *77.6.1. Necessary investments related to space infrastructure;*
  - *77.6.2. Programs focusing on the development of specific activities;*
  - *77.6.3. Financial mechanisms to incentivise growth;*
  - *77.6.4. Coordination between government departments;*
  - *77.6.5. Canada's approach to engaging the international community;*
- *77.7. Short-term and long-term economic forecasts related to the proposed space plan; and*
- *77.8. A list of approximate budgetary requirements to achieve the new list of objectives.*

78. The Minister shall prepare and publish the first long-term space plan within one (1) year of the coming into force of this Act. The Minister is not required to include in the first long-term space plan the information required in subsections 77.2-77.3.

79. The Minister shall cause an independent review of the provisions and operation of this Act to be conducted every five (5) years in order to assess, in particular, its impact on the objectives of this Act, as provided in section 3.
- *79.1. The independent reviewer shall publish a report of its review within one (1) year of the Minister's assignment of the review.*

80. The Minister shall provide each House of Parliament with the report of the independent review within two (2) months of receiving the report of the independent review.

81. The Minister shall initiate the first independent review within five (5) years after the coming into force of this Act.

Canada's history of sporadically releasing policy documents related to space undermines the belief that Canada has a coherent vision of long-term space development. Long-term plans are valuable because they instill confidence in a domain that requires prolonged commitments and significant investments, establish clear goals and paths for achieving such goals and provide a unifying force for otherwise seemingly-disparate activities. The requirement that the Minister prepare and publish a long-term space plan every ten years, as provided in section 76, is meant to address this ever-present policy gap.[34] The objective of the long-term space plan is to establish a high-level governmental policy document that sets the tone for Canada's space program. The required components of such a long-term space plan, as articulated in section 77, ensure that the Minister actively considers Canada's past, present and future. Specifically, this law requires the Minister to engage with the previous plan's objectives and examine whether they were successful and how they could have been addressed better; doing so requires an introspection that previous Canadian space policy documents have lacked. Further, the creation of a new list of objectives for the future decade demands the Minister to consider the Canadian space program, examine the country's needs and visualise its accomplishments in ten year's time.

The provisions listed in section 77 also demand the Minister to explicitly consider certain characteristics that are necessary to a successful space program but have not been (or have been limitedly) addressed in previous space policy documents: critical infrastructure investments (whether space-based, ground-based, technical or human) will ensure Canada's national space program develops along an appropriate path; prioritising certain space activities will allow Canada, as a middle space power, to cultivate areas of expertise; devising financial mechanisms that can be leveraged to grow domestic capabilities would incentivise foreign operators to relocate or otherwise contribute to the overall growth of the Canadian space program; methods of coordination among government departments will prevent operational overlap and stimulate a whole-of-government approach; and a clear plan on how to engage the international community with respect

[34] A similar requirement is made in South Korea's *New Space Development Promotion Act*, Law No 7538 of 2005 at Art 5, requiring the government to implement a space-related five-year plan every five years.

to space governance to maintain a fair and sustainable space environment. Finally, by forecasting the potential economic benefits of the proposed long-term space plan, the Minister signals to the rest of government that the budget requests being made will create significant economic return over the long-term.

The Minister is also required (as per section 79) to organise, every five years, an independent review of this law to assess its impact on satisfying its internally-stated objectives.[35] The purpose of this provision is to ensure that the manner in which this law is implemented results in a Canadian space program and space industry that is functional and desired. Acknowledging that the law has been drafted in such a way as to provide an appropriate blueprint for the regulation of space activities in Canada, an appropriate independent review would highlight areas for improvement and provide recommendations on how the law can be implemented differently to reach its objectives more effectively. Indeed, given the likely continued speedy development of space technologies and space activities, independent reviews ensure that the regulatory framework is keeping pace with real-world developments.

Offences for Violation

82. Any person who contravenes this Act or an order made under this Act is guilty of an offence and liable on summary conviction:

82.1. In the case of an individual, to a fine not exceeding $100,000 or to imprisonment for a term not exceeding 18 months, or to both; and

82.2. In any other case, to a fine not exceeding $500,000.

83. Any person who contravenes this Act or an order made under this Act is, subject to the Minister's discretion, prohibited from submitting any future applications for a licence under section 19 of this Act.

84. If a court of competent jurisdiction is satisfied, on application by the Minister, that a contravention of a provision of this Act is being or is likely to be committed, the court may grant an injunction, subject to any conditions that the court considers appropriate, ordering any person to cease or refrain from any activity related to that contravention, or ordering the person to take any measure that a licensee could, under this Act, be required to take.

Undertaking space activities without the appropriate authorisations can result in potentially catastrophic consequences including the damage or destruction of important space objects, polluting the space and Earth environments or directly damaging people and property. As a result, this law includes provisions in sections 82-83 intended to deter individuals from acting in a manner

[35] This provision is in line with both the Canadian *Remote Sensing Space Systems Act* at s 45.1 (once every 5 years) and the *New Zealand Space Law*, *supra* note 5 at Art 86 (the third year after the law comes into force), which require an independent review to determine whether the law is satisfying its overall objectives.

that would otherwise contravene this law for fear of having to pay a fine or, in the case of individuals, being incarcerated. Unfortunately, a $500,000 fine for a potentially significant violation will likely have a limited deterrent effect on large corporations; to truly deter such lawless activity, the fine would have to be in the tens of millions of dollars. However, allowing for the Minister to implement a $10 million fine would, in most cases, be questioned with respect to its enforceability and proportionality. Therefore, the final consequence, subject to the Minister's discretion, would potentially have the most significant deterrent effect if an entity is prohibited from applying for any future licences. Having a licence to carry out a space activity provides the licensee with legitimacy; being barred from acquiring such a licence would have a far more significant detrimental effect than a relatively limited fine. As a result, the traditional consequences of violating a provision of this law remain in place with the added benefit of knowing that if found guilty, a licensee would be crippled by not being able to apply for further licences.

This law also provides the Minister with the ability to secure an injunction against a licensee to prohibit them from carrying out or cease them from continuing to carry out an activity related to space. The reason for allowing the Minister to acquire an injunction is to ensure that, in situations where an explicit violation of this law has not yet been committed, the Minister can still protect Canadian interests. Since this law prohibits a person from carrying out a space activity without prior authorisation, it is necessarily only after a person has conducted a space activity that a violation of this provision would materialise and the consequences (of a fine or imprisonment) could be enforced. For example, up until a person launches an object into space, they have not violated this law since they have not undertaken a space activity without authorisation; it is only after they launch the object and undertake the activity that the Minister may enforce section 82 on the basis that the person violated section 10 by undertaking a space activity without prior authorisation. It is entirely possible, however, that by this point the undesirable activity has already jeopardised Canadian interests. The use of an injunction, however, allows the Minister to preempt the space activity before it is launched and before it has the potential to put Canadian interests at risk. Section 84, therefore, allows the Minister to proactively protect Canadian interests upon demonstrating to a court that there exists a reasonable risk.

Next Steps

Although this chapter drafts and explains the reasons for why a Canadian comprehensive space law ought to include the provisions suggested, it is only the first step to creating and implementing an appropriate comprehensive national space law. The next step that must be taken is for the government to determine whether the law itself, as well as its specific provisions, are in line with its overall agenda, priorities, processes and methods. Following this, members of the Canadian space community must be consulted to provide insights into the expected consequences (whether positive or negative) the implementation of the proposed law would have on their activities.[36] These stakeholders would include individual operators, industry associations, academic communities, end-users of space activities, etc. It may be beneficial to assign an independent committee of experts - such as the existing Space Advisory Board - to carry out this consultative process to ensure neutrality in the gathering and presentation of the responses; nevertheless, the final decision on how to move forward would belong with the government.

With respect to the actual implementation of the law, the single most important feature would be to appropriately resource the Minister to carry out their responsibilities under this law. The very nature of a broad comprehensive national space law is that it does not provide the exact regulatory specifications for how to authorise and supervise individual space activities; rather, that task falls to the subordinate legislation and the individual regulators who carry out space regulation on a day-to-day basis. Ensuring that the regulators have the appropriate resources to efficiently dispose of applications, ensure consistency and harmonisation with foreign counterparts, remain aware of changing trends, understand technological innovation, etc. is absolutely necessary for them to appropriately and competently carry out this law's various responsibilities in a way that does not jeopardise Canadian interests or hamper commercial development. Striking such a balance is difficult for even the best-resourced office and will be nearly impossible for an under-resourced one; realistically, the future of Canada's space regulatory framework and its commercial operators depends on achieving such a balance.

Conclusion

A comprehensive Canadian space law would have to cover a number of important topics and address a number of important issues. The draft law provided in Appendix III as well as the

[36] Members of the Canadian space community, specifically industry representatives, very enthusiastically advocated for their participation in the proposed law-making process. *See* Chapter 6, *A New Canadian Space Law*.

explanatory notes discussed in this chapter provide a list of the topics that ought to be addressed and the rationale for how the various issues ought to be tackled, respectively, in a manner that satisfies the objectives of the space law to maintain Canadian interests and develop commercial opportunities. The framework provided in this draft law is, of course, non-conclusive in scope (such that there may be other topics that ought to be added) or depth (such that many of the topics require further subordinate legislation-level guidance), but rather provides the skeletal structure upon which different regulatory mechanisms can be built. This draft comprehensive Canadian space law is meant only to be the legal foundation of Canada's space regulatory framework.

Chapter 10: Conclusion

Summary of Findings

This project begins by asking whether Canada's space regulatory framework is appropriate given the ever-increasing commercialisation of space and, if not, how it may better prepare to satisfy its obligations to authorise and supervise commercial space activities. Over the preceding chapters, this project has demonstrated that Canada's existing space regulatory framework is no longer suited to regulate the activities of the Canadian commercial space industry and that enacting a new comprehensive space law would provide significant advantages to satisfying its international obligations.

Specifically, Chapter 2 illustrates the current and likely future environments in which private space companies will be operating and highlights the transformative consequences of emerging space activities. Chapter 3 describes the nature of international space law, articulates Canada's existing obligations and identifies the institutional mechanisms through which global space governance will develop. Chapter 4 provides a historical analysis of Canadian space policy and examines current Canadian space law, demonstrating the incongruences between emerging space activities and the scope of existing law. Chapter 5 demonstrates why Canada has a legal, moral and economic obligation to regulate commercial space activities and expresses the various benefits of implementing an appropriate regulatory regime. Chapter 6 presents the regulatory perspectives of the Canadian space community and reveals why they believe the regime is out-dated and in urgent need of improvement. Chapter 7 contextualises the regulatory frameworks of most space-faring jurisdictions and highlights the common, unique and exemplary themes of most comprehensive national space laws. Chapter 8 concludes that Canada requires a comprehensive Canadian space law and expresses the rationale for why such a legislative instrument is warranted. Finally, Chapter 9 proposes a draft comprehensive Canadian space law and explains the reasons behind, and the benefits of, specific provisions.

Given the limited scope of existing space laws, the continued emergence of novel space activities, the desires of commercial operators and the international obligation to authorise and supervise, Canada's regulatory regime is a delicate and unsustainable balancing act: either Canada will allow unregulated commercial activities and violate its international obligations, prohibit unregulated activities and thereby limit the growth of industry or stretch the scope of existing laws and render them unrecognisable. Long-term, neither option is tenable. Instead, Canada ought to prudently rebuild the foundation of its regulatory framework by enacting a comprehensive national

space law that will allow it to uphold its international obligations, protect its national interests and support commercial industry, today and into the future.

Suggestions Moving Forward

Commercial space activities continue to increase both in Canada and around the world; if Canadian operators are to keep pace, they require a regulatory framework that supports their activities. For the numerous reasons outlined throughout this project, the existing regulatory system fails to provide this needed support and will continue to fail as new and emerging space activities prove feasible. To best address these regulatory failures, Canada ought to enact a comprehensive Canadian space law. Of course, simply desiring the creation, enactment and implementation of a new law is insufficient: instead, multiple steps must be taken by the government before meaningful progress can be made to support the commercial space industry.

First, the government must internally identify, recognise and accept that commercial space activities are integral to the success of the country and deserving of high-level governmental support; whether such support results in the formation of a Cabinet working group, the recreation of an active Interdepartmental Committee on Space or the creation of a Department of Space, the important feature is that it represents a whole-of-government approach. Second, the government must concretise its recognition of the importance of commercial space activities by appropriately resourcing the government organs that will be responsible for overseeing such activities. Quite separate from the Canadian Space Agency's annual budget, the policy and regulatory arms of the government must be appropriately funded to carry out their regulatory roles; without such funding, legislative improvements to the regulatory framework are simply a facade. Third, those responsible for Canadian space policy and those entrusted with commercial regulation must devise a proper regulatory framework (such as the comprehensive Canadian space law proposed in Appendix III) to ensure Canadian national interests are protected while commercial interests are promoted.

Fourth, to ensure commercial and other stakeholder interests are appropriately identified, the government ought to consult with such stakeholders in an open forum and then honestly consider their provided perspectives. Fifth, the government ought to implement its revised space regulatory framework, which will necessarily consist of not only a comprehensive space law but also its various pieces of subordinate legislation that ensure the regulatory regime functions

appropriately. Sixth, the government ought to take a leadership role, collaborate with its international partners and continue to develop the various norms and guidelines that characterise international space law. It is only through these kinds of global governance mechanisms that Canada can ensure a level international playing field for its commercial space industry. Seventh, the government ought to periodically reflect on the consequences of its regulatory framework and remain vigilant in updating and tweaking the framework; it is only through such introspection that Canada can ensure its national and commercial interests remain appropriately balanced.

There is no question that the government must initiate this process as quickly as feasible. The continued global commercialisation of space will not wait for Canadian action and a comprehensive Canadian space law would allow Canada to address current regulatory concerns and protect against future unknowns. As demonstrated by the six jurisdictions over the last four years to enact comprehensive national space laws (as well as the three jurisdictions currently considering similar action), the means by which any single nation's commercial space industry remains globally competitive is through a robust regulatory regime: positive regulatory action would simultaneously protect Canadian national interests while demonstrating to the Canadian commercial space industry that the government is supportive of their activities.

Further Areas of Research

As acknowledged in Chapter 1, this project was an ambitious investigation into Canada's space regulatory framework that considered a number of important yet hitherto underanalysed topics from various vantage points. Nevertheless, given the spatiotemporal limitations of this project, a number of research areas warranting further investigation simply could not be accommodated in a work of this nature. Specifically, there are four areas deserving of additional research and investigation, the results of which would help guide and inform the ongoing development of Canada's space regulatory framework.

First, returning to Chapter 4's investigation of Canada's space policy documents, there is significant opportunity for further research. One exploratory avenue entails the re-examination of each of the roughly fifteen policy instruments considered in this project (beginning with the *Chapman Report* and concluding with the *2019 Strategy*) in a more contextualised manner that takes into account the effect of contemporaneous national and international events, competing government priorities, budgetary expenditures, etc. For example, by contrasting the emphasis of

international cooperation in the *1986 Program* and the *1994 Program* (recognising that the period roughly in between these two documents marks the end of the Cold War) new insights may be gleaned that help understand the effects of global markets and international relations on space activities. Conversely, by comparing the annual budgetary expenditures associated with the release of each policy document against a variety of factors (such as Canada's general space accomplishments, its international market share related to a specific activity, the overall growth of its commercial space industry, etc.) five or ten years after the budgetary allocation, important data may be generated that could demonstrate the positive long-term consequences of space sector investment. Although such analysis was outside the scope of this project, investigations similar to those described herein would be helpful in better understanding the complicated factors that influence Canada's space activities.

Second, remaining within the subject matter covered in Chapter 4, additional research into Canada's current space laws would be useful to better understand their exact impact on commercial operations. Although a cursory examination of the laws' historical origins was conducted in this project, a more thorough exploration of why past governments decided to enact a specific legislation, the alternative approaches that were considered, the parliamentary debates on the topic or similar discussions would provide additional useful information in determining the relative benefits of undertaking a specific regulatory approach as opposed to another. Similarly, with respect to the five laws considered in Chapter 4, additional research into their subordinate legislation would provide insights into the relationship between a law and its subordinate legislation and what, if any, benefits come of such a relationship. For example, if it is determined that a very broad law coupled with very specific subordinate legislation provides better guidance to operators rather than a balanced relationship between a law and its subordinate legislation, the former approach can be implemented in future space laws (including a comprehensive space law).

Third, Chapter 6's empirical investigation is a first attempt at collecting the varied perspectives of members of the Canadian space community who, in many cases, are the subjects of Canada's space regulatory framework; nevertheless, as is true with all empirical investigations, refinements and follow-up discussions would undoubtedly provide additional useful information. It is likely that after the publication of this project and the dissemination of its research results, many members of the Canadian space community will better appreciate the value and impact of their perspectives on the formulation of this project's recommendations (and, in turn, potential

improvement to the space regulatory framework). As such, a new empirical inquiry would likely result in increased substantive participation by those who responded to the questionnaire included at Appendix I (for example, by providing more detailed information than that that was included in their original responses) as well as numerical participation by those who did not respond to this project's questionnaire (for example, by those seeking to ensure their viewpoints are taken into consideration). Ideally, to ensure the legitimacy of an empirical information-gathering process and the reliability of its results, such research ought to be carried out by a neutral party, such as an academic or the Space Advisory Board, rather than an industry association or a governmental organ.

Fourth, the breadth of information presented in Chapter 7 would benefit significantly from a project that prioritises a corresponding depth of research. Indeed, although the laws of nearly 30 jurisdictions were explored in this project, as a result of spatiotemporal limitations they were relatively superficial examinations; a project that prioritises identifying the motivations behind the enactment of each jurisdiction's space laws, the alternatives considered prior to enactment, the consequences (both long-term and short-term) such laws have had on domestic commercial space industries, etc. would generate significant insights into the benefits of specific space regulatory frameworks. Such examinations would be enhanced by thoroughly examining the subordinate legislation complementing national space laws that States have chosen to implement. Finally, although most space-faring jurisdictions have enacted comprehensive national space laws (and, to some degree, subordinate legislation), it is worth investigating the few jurisdictions (Canada among them) who have chosen alternative regulatory approaches. Indeed, if it is possible to identify certain long-term consequences (or patterns of consequence) resulting from different approaches, such insights would prove invaluable for Canadian space policy makers designing Canada's future regulatory framework.

Appendix I

Insights into Canada's Regulatory Framework Related to Space

PROJECT BACKGROUND

This questionnaire has been prepared by Aram Daniel Kerkonian (the “Researcher”), a doctoral candidate in space law at McGill University's Institute of Air and Space Law. The Researcher focuses on whether Canada's current regulatory framework related to space is functional for current and future space activities, especially given the rise of commercial space operations. The title of the research project is "New Law for New Space: Canada's Need for a New Space Regulatory Framework". The Researcher's academic supervisor is Prof. Ram Jakhu of McGill University's Institute of Air and Space Law. The Researcher expects to present his research at various conferences, in journal articles and through a final dissertation. Different from traditional academic research, the final product is intended to provide government decision makers with a comprehensive evaluation of the historical and current realities related to space regulation in Canada, with concrete proposals for how to prepare for future potentialities.

The purpose of this questionnaire is to elicit the current understanding, knowledge, opinions and expertise of industry participants, government representatives and academia with respect to the relationship between Canada's existing space regulatory framework and commercial space activities. The information provided by you (the “Participant”) will be used to inform the analysis, conclusions, recommendations and proposals made by the Researcher in his doctoral dissertation. Although the answers provided by Participants will not be the sole information upon which the Researcher makes his analysis, conclusions, recommendations and/or proposals, they will form an integral part of gaining “real world, on the ground” insights from people who, in their everyday lives, interact with space regulatory frameworks and conduct space activities.

Further, although there are no guarantees that the information, insights and opinions provided by Participants will be incorporated into the Researcher’s final product, the Participant’s contributions are expected to have an impact on the structure of the Researcher’s final proposals and recommendations and thus inform the discussions that the Researcher anticipates will take place at the governmental level following the release of the final product.

PARTICIPANT CONSENT

Participants may complete the questionnaire until 15 December 2019, after which the Researcher will no longer accept responses. This questionnaire will likely take thirty minutes to complete. Once a Participant has started the questionnaire, they cannot stop and return where they left off - the entire questionnaire would have to be restarted. Although it is not necessary to answer every question, detailed responses provided by Participants will benefit the Researcher's work.

Participants may, at any time and for any reason, decide to stop completing the questionnaire. The information provided in the questionnaire will only be received by the Researcher after the Participant has clicked the "Submit" button at the end of the questionnaire - therefore, so long as a Participant does not click "Submit", the Researcher will not be able to view any of the information included in the questionnaire. If a Participant clicks "Submit" and then later wishes to withdraw the information they have provided, simply contact the Researcher by e-mail at aram.kerkonian@mail.mcgill.ca and the Researcher will not include any of the information provided by the Participant in the research project. However, if the Participant chooses to withdraw after the research findings have already been published, it may not be possible to withdraw the Participant's data in its entirety.

The Participant’s answers, information, insights and opinions will remain confidential and will not be attributed to the Participant. Nevertheless, the Researcher requests that Participants identify themselves and their affiliation(s) to contextualise their responses for the Researcher.

The Researcher will store a PDF copy of the Participants’ answers on his local password-protected computer, on a password-protected cloud storage service and in printed hard copy form. Since this questionnaire is created using Google Forms, it is likely Google will also retain a copy of the Participant’s answers on their servers. Following the conclusion of the research project, the Researcher and/or the Researcher's academic supervisor will retain copies of the Participant's answers for a minimum of seven

years, as mandated by McGill University's research policies. No one other than the Researcher or the Researcher's academic supervisor will have access to the Participant's data without that Participant's prior permission.

This questionnaire has been approved by McGill University's Research Ethics Board (Record Number 138-0819) for research on, and the collection of data from, human participants. Funding for this research has been provided by the Erin J.C. Arsenault Fellowship, administered by McGill University's Institute of Air and Space Law.

If you have any questions regarding the questionnaire or the underlying research, the Researcher can be reached at aram.kerkonian@mail.mcgill.ca. Alternatively, you may contact the Researcher's academic supervisor, Prof. Ram Jakhu, at ram.jakhu@mcgill.ca. If you have any ethical concerns or complaints about your participation in this study, and want to speak with someone not on the research team, please contact the McGill Ethics Manager at 514-398-6831 or Deanna Collin at deanna.collin@mcgill.ca.

By completing this questionnaire, you consent to having the information provided in your answers used at the Researcher's discretion which may include presentations, journal articles, a dissertation or other final product as the Researcher deems appropriate.

* Required

1. **Email address** *

2. **Please check "I Agree" to signify that you have read the description above and that you consent to completing the questionnaire:** *
   Check all that apply.
   - [ ] I Agree

General Information

The answers provided in this section will provide the Researcher with information to help contextualise the Participant'ss answers provided in the following sections.

3. **Name:** *

4. **Organisational Affiliation:**

5. **With which of the following classifications do you or your organisation most closely associate?**
   Check all that apply.
   - [ ] Government/Regulatory
   - [ ] Industry/Private Practice
   - [ ] Academia/Teaching
   - [ ] Consulting
   - [ ] Not-for-Profit
   - [ ] Other:

6. **In which of the following areas are you or your organisation involved?**
Check all that apply.

- [ ] Space Science
- [ ] National Defence
- [ ] Telecommunication
- [ ] Broadcasting
- [ ] Remote Sensing and Earth Observation
- [ ] Meteorological and Weather Forecasting
- [ ] Launch and Related Services
- [ ] Space-to-Earth Internet
- [ ] Satellite-to-Satellite Communication
- [ ] Space Situational Awareness
- [ ] Space Traffic Management
- [ ] Space Travel and Tourism
- [ ] Space Mining
- [ ] On-Orbit Servicing
- [ ] Data Processing
- [ ] Manufacturing
- [ ] Project Management
- [ ] Other: _____

7. **In which of the following areas (in which you are not currently involved) do you believe you or your organisation will become involved in the future?**
   Check all that apply.

   - [ ] Space Science
   - [ ] National Defence
   - [ ] Telecommunication
   - [ ] Broadcasting
   - [ ] Remote Sensing and Earth Observation
   - [ ] Meteorological and Weather Forecasting
   - [ ] Launch and Related Services
   - [ ] Space-to-Earth Internet
   - [ ] Satellite-to-Satellite Communication
   - [ ] Space Situational Awareness
   - [ ] Space Traffic Management
   - [ ] Space Travel and Tourism
   - [ ] Space Mining
   - [ ] On-Orbit Servicing
   - [ ] Data Processing
   - [ ] Manufacturing
   - [ ] Project Management
   - [ ] Other: _____

8. **Please leave any comments you wish the Researcher to consider when reviewing your answers in this section.**

Canada's Space Policy

The answers provided in this section will provide the Researcher with insights into the Participant's general knowledge and opinion regarding Canada's existing space policy.

In answering the questions in this section, consider the current global realities of national space programs, commercial development and investment as well as where/how you believe future growth in these domains will take place.

9. **Generally, how would you rate Canada's current position regarding outer space?**
   In answering this question, please consider that "position" refers to the overall state of the space industry and ought to reflect things like investment in public and private projects, public commitments, public perception, private development, international leadership, international cooperation, etc.
   Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Poorly Positioned	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Well Positioned

10. **How would you rate the role of government in promoting Canada's current position regarding outer space?**
    Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Poorly Promoted	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Well Promoted

11. **How would you rate the development of Canada's governmental space programs?**
    Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Poorly Developed	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Well Developed

12. **How would you rate the government's investment in the Canadian space sector?**
    Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Poorly Invested	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Well Invested

13. **How would you rate the development of Canada's commercial space industry?**
    Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Poorly Developed	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Well Developed

14. **Briefly, what were the most important factors you considered in determining your various ratings above?**

_____

15. **How would you rate Canada's recent Space Strategy?**
Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Poorly Developed	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Well Developed

16. **Briefly, what would have made you rate the Space Strategy higher?**

_____

17. **Please leave any comments you wish the Researcher to consider when reviewing your answers in this section.**

_____

_____

_____

_____

_____

Canada's Space Regulatory Framework

The answers provided in this section will provide the Researcher with insights into the Participant's general knowledge and awareness related to space regulation as well as illustrate the general attitude related to the regulation of space activities.

In this section, "regulation" should be understand as the overall legal framework (laws, rules, standards, ciruclars, directives, etc.) that governs space activities. Generally, regulations are the government's way of identifying, specifying, guiding and making known what kinds of activities are permitted or prohibited, what kinds of specific standards may be required, who has authority over making such determinations, how licences may be acquired, etc.

18. **Should Canada regulate commercial space activities?**
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Some Activities
- ◯ Most Activities
- ◯ Other: _____

19. **If you wish to provide additional information based on your answer above, please do so here:**

_____

20. **Are you aware of any obligations (international or otherwise) that require Canada to regulate commercial space activities?**
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Other: _____

21. **What specific interests should Canada attempt to balance by way of regulating commercial space activities?**
Check all that apply.

- ☐ Safety
- ☐ Security
- ☐ Innovation
- ☐ Commercial Development
- ☐ International Commercial Competitiveness
- ☐ International Harmonisation
- ☐ International Leadership
- ☐ Other: _____

22. **Based on your answer above, what specific objectives (if any) ought Canada's space regulations seek to achieve?**

_____

23. **Are you aware of the number of existing Canadian laws that apply to space activities?**
Mark only one oval.

- ◯ 0
- ◯ 1-2
- ◯ 3-4
- ◯ 5-6
- ◯ 6-7
- ◯ 8-9
- ◯ 9+
- ◯ Other: _____

24. **Please list the Canadian space laws of which you are aware:**

_____

25. **Are you aware of which government departments are involved in regulating space activities?**
Check all that apply.

- [ ] Yes
- [ ] No
- [ ] Other: _____

26. **If you answered "Yes", please briefly list the various government departments you believe are involved in the regulation of space activities:**

_____

_____

_____

_____

_____

27. **Please leave any comments you wish the Researcher to consider when reviewing your answers in this section.**

_____

_____

_____

_____

_____

The Application of Canada's Space Regulatory Framework

The answers provided in this section will provide the Researcher with insights into the Participant's individual experiences related to the regulation of space activities. Specifically, these questions will ask the Participant to discuss their experiences with reference to how well they believe the space activities with which they are involved are being regulated. When answering these questions, please keep in mind both your positive and negative experiences as well as the various instances in which you believe regulation was absent but could have been useful.

28. **Are you and/or your organisation currently regulated by one or more of Canada's space laws?**
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Does Not Apply
- ◯ Other: _____

29. **If you answered "Yes", please list the space laws by which you are regulated:**

_____

30. **Do you believe the Canadian space laws that apply to your organisation are working effectively?**

In answering this question, please consider the overall objective of the law (safety, security, international compliance, etc.) and how its real world effects impact your activities. In determining a level of "effectiveness", please consider your subjective experiences related to whether the law is doing what it was intended to do and, additionally, whether the law's objectives are relevant and appropriate.

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Does Not Apply
- ◯ Other: _____

31. **If you answered "No", please briefly discuss why you believe the laws are ineffective?**

In answering this question, please be specific with why you think the law is ineffective and what you believe an effective application of the law could look like.

_____

32. **Do you believe the Canadian space laws that apply to your organisation can be improved?**

In answering this question, please consider whether the law is clear, effective, forward-looking, etc. and how it may be changed to address these considerations.

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Does Not Apply
- ◯ Other: _____

33. **If you answered "Yes", please briefly elaborate on how the laws can be improved.**

_____

34. **Has it always been clear which government department (or who within a department) you should approach regarding your space activities?**

Check all that apply.

- ☐ Yes
- ☐ No
- ☐ Other: _____

35. **If you answered "No", please briefly explain why.**

_____

36. **How would you rate the relationship between commercial space operators and government regulators?**

In answering this question, please consider the ease of access to government services, the speed of delivery of government services, the clarity of expectations, the flexibility of expectations, the willingness to comply with requirements, the working relationship, etc.
Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Ineffective	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Effective

37. **Briefly, how would you describe the relationship between commercial space operators and government regulators?**

_____

38. **Have you ever experienced delays with a license application process?**
Check all that apply.

- [ ] Yes
- [ ] No
- [ ] Other: _____

39. **If you answered "Yes", please briefly explain the circumstances.**

_____

_____

_____

_____

_____

40. **Are your space activities currently regulated in another country?**
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Does Not Apply
- ◯ Other: _____

41. **If you answered "Yes", please list the country/countries in which your space activities are regulated and, briefly, describe how the non-Canadian regulation compares to Canada's regulation.**

_____

42. **Please leave any comments you wish the Researcher to consider when reviewing your answers in this section.**

The Future of Space Regulation in Canada

The answers provided in this section will provide the Researcher with insight into how Participants believe the current space regulatory framework can be improved and how such an improvement may be made.

43. **Generally, do you believe Canada's space regulatory framework can be improved?**

In answering this question, please consider the overall role and objective of the space regulatory framework and whether it is meeting those objectives. Further, please also consider whether the overall role and objective of the space regulatory framework ought to be changed.
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Other:

44. **If you answered "Yes", how do you think Canada's space regulatory framework can be improved?**

45. **In order for Canada to improve its space regulatory framework, do you believe the government ought to:**

Check all that apply.

- ☐ Repeal all existing space laws
- ☐ Repeal some existing space laws
- ☐ Amend all existing space laws
- ☐ Amend some existing space laws
- ☐ Enact specific laws for new activities before they become feasible
- ☐ Enact specific laws for new activities after they become feasible
- ☐ Create a new single law that could regulate all space activities
- ☐ Do nothing
- ☐ Other:

46. **Briefly, please discuss your choices above and explain why you believe your chosen avenue(s) would best improve the regulatory system.**

47. **Please leave any comments you wish the Researcher to consider when reviewing your answers in this section.**

Future Activities

The answers provided in this section will provide the Researcher with insights into the various beliefs Participants hold related to the development of space activities and their related regulation. Specifically, these questions will ask Participants to consider emerging space activities (whether imminent or distant) and how they believe they may/ought to be regulated.

48. **Which of the following space activities do you believe will become reality (whether in Canada or abroad) within the next 0-5 years?**

    If you believe certain space activities not listed below will become reality within the next 5 years, please list them in the "Other" option.
    Check all that apply.

- [ ] Canadian Launch Capability
- [ ] Canadian Launch Capability - Reusable
- [ ] Space Tourism - Sub-Orbital
- [ ] Space Tourism - Orbital
- [ ] Space Tourism - Lunar, Martian or other celestial body
- [ ] Space Settlement
- [ ] On-Orbit Servicing
- [ ] Space Debris Remediation
- [ ] Space Manufacturing
- [ ] Space Mining
- [ ] Solar Power Distribution
- [ ] Other:

49. **Which of the following space activities do you believe will become reality (whether in Canada or abroad) within the next 5-10 years?**

If you believe certain space activities not listed below will become reality within the next 5-10 years, please list them in the "Other" option.
Check all that apply.

- [ ] Canadian Launch Capability
- [ ] Canadian Launch Capability - Reusable
- [ ] Space Tourism - Sub-Orbital
- [ ] Space Tourism - Orbital
- [ ] Space Tourism - Lunar, Martian or other celestial body
- [ ] Space Settlement
- [ ] On-Orbit Servicing
- [ ] Space Debris Remediation
- [ ] Space Manufacturing
- [ ] Space Mining
- [ ] Solar Power Distribution
- [ ] Other: _____

50. **Which of the following space activities do you believe will become reality (whether in Canada or abroad) within the next 10-20 years?**

If you believe certain space activities not listed below will become reality within the next 10-20 years, please list them in the "Other" option.
Check all that apply.

- [ ] Canadian Launch Capability
- [ ] Canadian Launch Capability - Reusable
- [ ] Space Tourism - Sub-Orbital
- [ ] Space Tourism - Orbital
- [ ] Space Tourism - Lunar, Martian or other celestial body
- [ ] Space Settlement
- [ ] On-Orbit Servicing
- [ ] Space Debris Remediation
- [ ] Space Manufacturing
- [ ] Space Mining
- [ ] Solar Power Distribution
- [ ] Other: _____

51. **Do you believe appropriate government departments currently exist to oversee the above space activities?**

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Other: _____

52. **Briefly, please explain your answer above.**

When answering this question, please consider which emerging activities may fall within a specific department's existing mandate while others would either straddle different departmental mandates or fall outside all existing departmental mandates.

53. **Do you believe the creation of a "Department of Space" would be appropriate or effective in the regulation of new and emerging space activities?**

In answering this question, please consider how a new government department would interact with other government departments, whether it would offset regulatory burden from unspecialised departments, whether it would increase or decrease regulatory bureaucracy, the relationship it would form with industry, the role it would play in publicly promoting space activities, etc.
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Other: _____

54. **Please justify your answer above.**

When answering this question, please consider the consequences of such an answer. For example, if you answered yes, what ought to be the mandate for a "Department of Space"? If you answered no, what department would oversee emerging space activities that do not currently fit the mandate of any existing departments?

55. **Please leave any comments you wish the Researcher to consider when reviewing your answers in this section.**

New Canadian Space Law

The answers provided in this section will provide the Researcher with insight into the Participants' general attitude toward the creation of a new, comprehensive space law or new, activity-specific space laws. In addition, the information provided in this section will provide the Researcher with insight into what kinds of regulatory changes would be viewed positively or negatively and how the implementation of such changes can have positive or negative effects.

56. **Do you believe a new, comprehensive space law would improve Canada's regulation of existing and emerging space activities?**

Check all that apply.

- [ ] Yes
- [ ] No
- [ ] Other: _____

57. **Please justify your answer above.**

_____

58. **Do you believe multiple new space laws (each specific to one space activity) would improve Canada's regulation of emerging space activities?**

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Other: _____

59. **Please justify your answer above.**

_____

60. **Would a new law(s) be better if it was/they were reactionary or proactive?**

In answering this question, please consider that in this context "reactionary" means a law that is created to address an activity that has been demonstrated or is nearly-ready for demonstration and "proactive" means a law that would oversee new space activities that are still very early in the conceptualisation stages. For example, a law on space mining coming into force today would be proactive (since the activity is still being conceptualised) whereas creating a law after a company demonstrates space mining capabilities would be reactionary.

_____

61. **If tomorrow, the government announced that it would be creating a new space law(s), how would you react?**

In answering this question, please consider the effects a new new law would have on providing legal certainty to certain activities, promoting or hindering investment, increasing oversight, clarifying rules, complicating existing business practices, etc.

_____

62. **What message might the government's creation of a new space law(s) send to the commercial space industry?**

63. **What kinds of things ought a new, comprehensive space law cover?**

Check all that apply.

- [ ] Ownership Specifications
- [ ] Financing for Projects
- [ ] Insurance for Activities
- [ ] Liability for Damage
- [ ] Registration of Space Objects
- [ ] Debris Mitigation
- [ ] Environmental Safety
- [ ] Import/Export Controls
- [ ] Licensing Costs
- [ ] Fines/Sanctions for Violation
- [ ] Public Outreach and Educational Initiatives
- [ ] All of the Above
- [ ] Other:

64. **What recommendations would you have for the drafters of such a law?**

65. **Are you aware of any existing foreign national space laws upon which a new Canadian space law ought to be modelled?**

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Other:

66. **If you answered "Yes", please provide the country and space law you believe would be appropriate to consider.**

67. **Should Canada take an international leadership role in the regulation of space activities?**
Mark only one oval.

- Yes
- No
- Other: _____

68. **Please justify your answer above.**

_____

69. **Should Canada pursue new (or reinvigorate old) international opportunities for treaty making?**
Mark only one oval.

- Yes
- No
- Other: _____

70. **Please justify your answer above.**

_____

71. **Please leave any comments you wish the Researcher to consider when reviewing your answers in this section.**

_____

_____

_____

_____

_____

Comments

The purpose of this section is to allow the Participant to leave any general comments they wish for the Researcher to consider. They can relate to the questionnaire generally, to specific sections, to specific questions, to the Researcher's overall project, etc.

72. **Please leave any comments you wish the Researcher to consider:**

_____

_____

_____

_____

_____

A copy of your responses will be emailed to the address you provided

Google Forms

Appendix II

Jurisdictional Comparison of Comprehensive National Space Laws														
Jurisdiction	**Year of Enactment**	**Territorial Application**	**National Application**	**Authorisation**	**Transfer**	**Supervision**	**Liability**	**Insurance**	**Indemnification**	**Registration**	**Environmental Protection**	**Debris Mitigation**	**Delimitation**	**Consequences for Violations**
Norway	1969	x	x	x										
Sweden	1982	x	x	x		x	x		x	x				I
USA	1984	x	x	x	/	x	x	/	x	x	/	x		F and I
UK	1986	x	x	x	/	x	x	/	x	x	/	/		F and I
Argentina	1991	x		x	/			/		x		/		
Russia	1993	x	x	x		x	x	x	x	x				
South Africa	1993	x		x		x	/							
Ukraine	1996	x		x		x	x	x		x	x			F and I
Hong Kong	1997	x	x	x	/	x	x	/	x	x	/	/		F
Australia	1998	x	x	x	/	x	x	x		x	x	x	x	F and I
Belgium	2005	x	x	x	/	x	x	/	/	x	x	x		F or I
South Korea	2005	x	x	x			x	x		x		x		F or I
Netherlands	2007	x	-	x	-	x	x	x	/	x	/			F
France	2008	x	x	x	/	x	x	x	/	x		/		F
Austria	2011	x	x	x	/	x	x	x	/	x		x		F
Kazakhstan	2012	x		x		x				x	x		x	
Indonesia	2013	x	x	x	x	x	x	x	x	x	x			F and I
Denmark	2016	x	x	x	/	x	x	x	/	x		x	x	F and I
Japan	2016	x		x	/	x	x	x	/					
New Zealand	2017	x	x	x	/	x		/	x			x		F and I
Finland	2018	x	x	x	/	x	x	x	/	x	x	x		F
Portugal	2019	x	x	x	/	x	x	x	/	x		x		F
UAE	2020	x	x	x	x	x	x	x	x	x		x	x	F and I
x = Required/Permitted | - = Prohibited | / = Discretionary | [blank] = Unclear or Unaddressed							**Legend**		F = Fine | I = Imprisonment | F or I = either | F and I = either or both					

Appendix III

Comprehensive Canadian Space Law

S.C. 2020, c. A-1

An Act respecting space activities and other outer space related matters

Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

Short Title
Short Title
1. This Act may be cited as the *Space Activities Act*.

Interpretation
Definitions
2. In this Act,

damage means damage to persons, property, the public health or the environment, caused by a space object in the course of a space activity
fund means External Market Maturation Assistance Fund
launching State means a State which launches or procures the launching of a space object or from whose territory or facility a space object is launched
licence means the documentation provided by the Minister to a licensee demonstrating the authorisation of a specific space activity
licensee means a natural or legal person who intends to carry out, carries out or continues space activities or is effectively responsible for such activities
Minister subject to section 5, means the Minister of Innovation, Science and Industry
outer space means an area beyond the distance of 100 km above mean sea level on Earth, including celestial bodies, or as defined by international consensus
space activity means an activity related to the exploration and use of outer space, including, but not limited to, launching a space object into outer space, the operation and other control of a space object in outer space, as well as measures to return a space object and the return of a space object to Earth
space object means any object launched or intended to be launched into outer space, including the component parts of such an object, and any device used or intended to be used for launching an object into outer space, including the component parts of such a device

Canadian Space Policy
Objectives
3. In the regulation of space activities, the objectives of this Act are:
    3.1. To ensure space activities are safely carried out;
    3.2. To ensure the national security interests of Canada are maintained;
    3.3. To ensure the international obligations of Canada are upheld;
    3.4. To promote the common interests of all humankind in the continued exploration and use of outer space on a sustainable basis and for peaceful purposes;
    3.5. To stimulate the research and development of Canadian space activities;
    3.6. To stimulate the commercialisation of Canadian space activities;
    3.7. To enhance the efficiency and competitiveness of Canada's commercial space activities in national and international domains; and
    3.8. To encourage innovation in the provision of space related services.

Designation of Minister

Delegation of Power

4. The Minister may delegate to any officer or class of officers the exercise of their powers under this Act.

Power of Governor in Council

5. The Governor in Council may designate a member of the Queen's Privy Council for Canada to be the Minister for the purposes of this Act.

Application of Act

Territorial Application of Act

6. This Act applies to all space activities taking place from within Canada or on board:
    - 6.1. Any ship, vessel or aircraft that is
        - 6.1.1. Registered or licensed under an Act of Parliament, or
        - 6.1.2. Owned by, or under the direction or control of, Her Majesty in right of Canada or a province;
    - 6.2. Any spacecraft that is under the direction or control of
        - 6.2.1. Her Majesty in right of Canada or a province,
        - 6.2.2. A citizen or resident of Canada, or
        - 6.2.3. A corporation incorporated or resident in Canada; and
    - 6.3. Any platform, rig, structure or formation that is affixed or attached to land situated in the continental shelf of Canada.

National Application of Act

7. This Act applies to all space activities taking place outside Canada by the following persons:
    - 7.1. Canadian citizens;
    - 7.2. Permanent residents within the meaning of subsection 2(1) of the *Immigration and Refugee Protection Act*;
    - 7.3. Corporations that are incorporated or continued under the laws of Canada or a province; and
    - 7.4. Members of any prescribed class of persons having a substantial connection to Canada related to space activities.

Non-Application to Department of National Defence

8. The provisions of this Act do not apply to space activities carried on by the Department of National Defence.

9. The Minister of Defence shall submit an unclassified annual report to the Minister with respect to the space activities carried on by the Department of National Defence.

Authorisation of Space Activities

Requirement for Licence

10. No person shall, except under and in accordance with an appropriate licence, undertake a space activity.

11. The Minister may, by order, create and administer distinct licences for specific space activities including, but not limited to:
    11.1. On-orbit servicing activities;
    11.2. Debris remediation activities;
    11.3. Space tourism activities;
    11.4. Temporary habitation activities;
    11.5. Permanent settlement activities;
    11.6. Space resource exploitation activities;
    11.7. Solar power satellite activities;
    11.8. Planetary protection activities;
    11.9. Extraterrestrial life form contact activities; and
    11.10. Any other space activity.

12. The Minister may, by order, subject to any terms and conditions that the Minister may specify, exempt any person, class of persons or entity from the application of section 10.

Radiocommunication Licence

13. Any person seeking to undertake radiocommunication activities, as defined in the *Radiocommunication Act*, using a space object shall obtain an appropriate licence under the *Radiocommunication Act*.
    13.1. If a radiocommunication activity is deemed to not fall within the scope of the *Radiocommunication Act*, a licence shall be sought under this Act.

Broadcasting Licence

14. Any person seeking to undertake broadcasting activities, as defined in the *Broadcasting Act*, using a space object shall obtain an appropriate licence under the *Broadcasting Act*.
    14.1. If a broadcasting activity is deemed to not fall within the scope of the *Broadcasting Act*, a licence shall be sought under this Act.

Telecommunication Licence

15. Any person seeking to undertake telecommunications activities, as defined in the *Telecommunications Act*, using a space object shall obtain an appropriate licence under the *Telecommunications Act*.
    15.1. If a telecommunications activity is deemed to not fall within the scope of the *Telecommunications Act*, a licence shall be sought under this Act.

Remote Sensing Licence

16. Any person seeking to undertake remote sensing activities, as defined in the *Remote Sensing Space Systems Act*, using a space object shall obtain an appropriate licence under the *Remote Sensing Space Systems Act*.
    16.1. If a remote sensing activity is deemed to not fall within the scope of the *Remote Sensing Space Systems Act*, a licence shall be sought under this Act.

Launch Licence

17. Any person seeking to undertake launch activities using a space object shall obtain an appropriate licence under the *Aeronautics Act*.

17.1. If a launch activity is deemed to not fall within the scope of the *Aeronautics Act*, a licence shall be sought under this Act.

18. The Minister may, by order, provide alternate licensing procedures with respect to sections 13-17.

Licensing Applications for Space Activities

19. A licensee's application to the Minister to issue, amend or renew a licence shall be made in the prescribed form and manner, including, but not limited to:
    19.1. Information demonstrating technical and financial capacity of the licensee to carry out the proposed space activities;
    19.2. Information describing the specific space activities for which a licence is sought;
    19.3. Information describing how the safety of people and property is to be ensured;
    19.4. Information demonstrating an assessment of the environmental impacts of the proposed space activities on Earth, in the atmosphere and in outer space;
    19.5. Information explicitly denoting an intention to use nuclear or other potentially radioactive or hazardous materials in the space object or the proposed space activity;
    19.6. Information demonstrating a proposed system disposal plan;
    19.7. Information demonstrating the appropriate procurement of, or agreement to procure, insurance;
    19.8. Any other information of which the licensee is aware and which may be relevant to the Minister's decision to grant the licence;
    19.9. Any other prescribed information, documents or undertakings; and
    19.10. Any prescribed application fee.

20. A licensee's application for a licence may apply to multiple space objects, so long as the multiple space objects function together in relation to a single space activity.

21. The Minister may request the licensee to provide any additional information, documents or undertakings the Minister may deem necessary and relevant to the Minister's decision to grant the licence.

22. Within sixty (60) days of receiving a licensee's application for licence, amendment or renewal, the Minister shall, in writing, notify the licensee as to whether the Minister considers the application complete or whether any additional information, documents or undertakings are necessary before the application may be considered complete, specifying the additional information, documents or undertakings required by the Minister.

Licensing of Space Activities

<u>Granting of Licence</u>

23. When considering an application for a licence under this Act, the Minister shall take into consideration:
    23.1. The safety of people and property;
    23.2. The protection of the Earth and outer space environments;
    23.3. The national security interests of Canada; and

23.4. The international obligations of Canada.

24. When considering an application for a licence under this Act, the Minister may take into consideration:
    24.1. The technical capacity of the licensee;
    24.2. The financial capacity of the licensee;
    24.3. The nature of the space activity for which a licence is sought;
    24.4. The proposed end-users or clients of the space activity for which a licence is sought;
    24.5. The nature of the proposed system disposal plan;
    24.6. The nature and extent of the proposed insurance procurement; and
    24.7. Any other considerations relevant to the regulation of Canadian space activities.

25. Within one-hundred and eighty (180) days of receiving a licensee's complete application for a licence, the Minister shall, in writing, either grant or refuse to grant a licence.

26. A licence is valid for the period that the Minister considers appropriate and specifies in the licence.

Amendment or Renewal of Licence

27. When considering an application to amend or renew a licence granted under this Act, the Minister may, in addition to the prescribed requirements under section 19, take into consideration:
    27.1. The licensee's previous applications for licenses, amendments or renewals; and
    27.2. The licensee's compliance with its previous and existing licence conditions.

Transfer of Licence

28. A licence granted under this Act shall not be transferred to any other person except with the prior written approval of the Minister.

29. In determining whether to authorise the transfer of a licence, the Minister shall take into consideration:
    29.1. The continued safety of people and property;
    29.2. Maintaining the national security interests of Canada;
    29.3. Upholding Canada's international obligations; and
    29.4. The technical and financial capacity of the transferee to carry out the licensed space activity.

30. In determining whether to authorise the transfer of a licence, the Minister may take into consideration:
    30.1. The nationality of the transferee;
    30.2. The Canadian licensing history of the transferee; and
    30.3. The economic opportunities and risks to the Canadian space industry.

Suspension of Licence

31. The Minister may suspend a licence granted under this Act if:
    31.1. The licensee fails to comply with a licence condition;

31.2. The licensee fails to comply with a rule made under this Act;
31.3. The suspension is necessary for protecting the interests of Canada, including, but not limited to:
31.3.1. The public health and safety of Canada or Canadians;
31.3.2. The national security interests of Canada; or
31.3.3. The international obligations of Canada.

32. Prior to suspending a licence, the Minister shall provide written notice to the licensee outlining the Minister's intention to suspend the licensee's licence and the reason or reasons for the suspension of the licensee's licence. The licensee has seven (7) days from receiving the Minister's written notice of the intended suspension of its licence to submit responses or propose alternatives to the intended suspension of its licence to the Minister in writing. After seven (7) days from which the Minister provided written notice of the intention to suspend the licensee's licence, the Minister shall, taking into account, if any, the licensee's submitted responses or proposed alternatives to the suspension of its licence, provide in writing to the licensee the Minister's decision on whether to suspend the licensee's licence.

33. In situations of emergency, the Minister may immediately suspend a licensee's licence on written notice, notwithstanding the requirements related to licence suspensions as provided in section 32.

34. A licence is suspended for the period that the Minister considers appropriate and specifies in the Minister's written decision to suspend a licence.

35. Following the suspension of a licence, the Minister may lift the suspension before the period for which the licence was suspended has elapsed if, in the opinion of the Minister, the reason for suspending the licence has been appropriately addressed and/or rectified.

Termination of Licence

36. The Minister may terminate a licence granted under this Act if:
36.1. The licensee fails to comply with a licence condition;
36.2. The licensee fails to comply with a rule made under this Act;
36.3. The suspension is necessary for protecting the interests of Canada, including, but not limited to:
36.3.1. The public health and safety of Canada or Canadians;
36.3.2. The national security interests of Canada; or
36.3.3. The international obligations of Canada.

37. Prior to terminating a licence, the Minister shall provide written notice to the licensee outlining the Minister's intention to terminate the licensee's licence and the reason or reasons for the termination of the licensee's licence. The licensee has seven (7) days from receiving the Minister's written notice of the intended termination of its licence to submit responses or propose alternatives to the intended termination of its licence to the Minister in writing. After seven (7) days from which the Minister provided written notice of the intention to terminate the licensee's licence, the Minister shall, taking into account, if any,

the licensee's submitted responses or proposed alternatives to the termination of its licence, provide in writing to the licensee the Minister's decision on whether to terminate the licensee's licence.

38. The Minister may terminate a suspended licence.

39. The termination of a licence is permanent and cannot be reverted. A licensee whose licence is terminated is permitted to submit a new application for licence to the Minister in accordance with the requirements provided in section 19.

Making Use of Expertise

40. The Minister may designate and make use of governmental and non-governmental experts in assisting the Minister to carry out the Minister's responsibilities under this Act.

Licensee's Obligations

Liability for Damage Caused by Space Activities

41. Licensees shall be liable for damage caused by the licensee's space activities, whether such damage is caused in outer space, to an aircraft in flight or on Earth.

Insurance for Damage Caused by Space Activities

42. Licensees shall procure insurance to protect against liability the licensee may incur with respect to damage or loss arising out of space activities carried out by the licensee.

43. The Minister may establish the amount of insurance to be procured by a licensee with respect to a specific space activity.

Indemnification for Damage Caused by Space Activities

44. Licensees shall indemnify the government against any claims brought against the government with respect to damage or loss arising out of space activities carried out by the licensee.

45. The Minister may establish the maximum amount of the licensee's liability to indemnify the government as a condition of the licensee's licence.

45.1. The maximum amount established as the licensee's liability to indemnify the government is void if the damage caused by the licensee was intentional or a result of gross negligence or recklessness.

Ongoing Obligations

46. The expiration, suspension or termination of a licence does not affect the licensee's obligations under the conditions of the licence.

Space Activities in the Public Interest

Licence Exemption

47. The Minister may, by order, exempt certain scientific, academic or educational space activities that are in the public interest from requiring prior authorisation. The Minister

may also, by order, exempt certain scientific, academic or educational entities that are in the public interest from requiring prior authorisation.

48. The Minister may consider the following non-exhaustive list of characteristics in determining whether such scientific, academic or educational space activities should be exempt from prior authorisation:
    48.1. The status and nature of the licensee;
    48.2. The financial status of the licensee;
    48.3. The nature of the potential benefits to the licensee; and
    48.4. The nature of the potential public interest.

Insurance Exemption

49. The Minister may, by order, exempt certain scientific, academic or educational space activities that are in the public interest from requiring insurance prior to the scientific, academic or educational space activity being carried out.

Indemnification Exemption

50. The Minister may, by order, choose not to seek indemnification for certain scientific, academic or educational space activities that result in Canada being found internationally liable for damage caused by the scientific, academic or educational space activity.

Safety and Sustainability of the Environment

Safety

51. Licensees shall carry out their space activities without causing any particular risk to persons, property or public safety. Any person undertaking space activities shall have the requisite knowledge and experience required to safely carry out the space activity under his or her responsibility.

Protection of Earth and Space Environments

52. Licensees shall carry out their space activities in a manner that is environmentally sustainable and that promotes the sustainable use of outer space.

53. The Minister shall, by order, establish requirements related to environmental sustainability and the sustainable use of space. In establishing such requirements the Minister shall be informed by international guidelines and norms, including, but not limited to, the United Nations Long-Term Sustainability Guidelines.

Space Debris Mitigation

54. Licensees shall ensure their space activities do not generate unnecessary space debris and shall carry out their space activities in such a way as to limit the creation of space debris. In particular, the licensees shall:
    54.1. Restrict the generation of space debris during the normal operations of the space object;
    54.2. Reduce the risks of in-orbit break-ups of the space object;
    54.3. Reduce the risks of in-orbit collisions with other space objects or space debris; and

54.4. Remediate, de-orbit or move to a less used orbit the space object once it has reached, or is expected to reach, the end of its life.

55. The Minister shall, by order, establish requirements related to the mitigation of space debris. In establishing such requirements the Minister shall be informed by international guidelines and norms, including, but not limited to, the United Nations Debris Mitigation Guidelines.

Supervision of Space Activities

Role of Minister

56. The Minister shall ensure licensees comply with the conditions of their licence.

Annual Reporting Requirement

57. Licensees shall prepare and submit to the Minister by 31 January of each year a report specifying the space activities carried out by the licensee over the previous year.

58. The Minister may, by order, establish requirements related to the information that licensee's shall provide in their annual report.

Making Available Premises, Documents and Information

59. Upon written request from the Minister, licensees shall make available for investigation any and all premises from which they undertake the space activities for which they are licensed.

60. Upon written request from the Minister, licensees shall make available for investigation any and all documents related to the space activities for which they are licensed.

61. Upon written request from the Minister, licensees shall make available for investigation any and all information related to the space activities for which they are licensed.

Registration of Space Objects

Creation and Maintenance of Registry

62. The Minister shall create and maintain a public registry of space objects.

Registration Requirements

63. Each licensee shall provide the Minister, within six (6) months from the date of launch, with information concerning the space object launched into earth orbit or beyond into outer space, including, but not limited to:
    - 63.1. The name of the launching State or States;
    - 63.2. The date and place of launch and launch vehicle;
    - 63.3. The name of the licensee;
    - 63.4. The designator or registration number of the space object;
    - 63.5. The general function of the space object;
    - 63.6. The orbital parameters of the space object, including:
        - 63.6.1. The nodal period;
        - 63.6.2. The inclination;

63.6.3. The apogee;
63.6.4. The perigee; and
63.7. Any other information prescribed by order of the Minister.

64. The Minister shall furnish to the United Nations Secretary General the information provided in subsections 63.1-63.6 for each space object entered into the registry created under section 62.

External Market Maturation Assistance Fund

Creation of Fund

65. The Minister shall establish a fund for the purposes of disseminating the benefits of commercial space activities to non-Canadian non-space faring communities that have not directly benefited from the commercialisation of space activities.

66. The primary purpose of the fund is to ensure that communities that have not directly benefited from the commercialisation of space activities benefit from such activities.

67. The secondary purpose of the fund is to provide assistance to immature space markets external to Canada so as to develop such markets for Canadian commercial space technologies and services.

Creation of Advisory Board

68. The Minister shall create an advisory board to provide advice to the Minister on how the Minister ought to carry out their responsibilities with respect to the fund.

69. The advisory board shall be comprised of eleven (11) individuals chosen by the Minister: three (3) from the commercial space sector, two (2) from academia, two (2) from development-related not-for-profits, two (2) from the federal government, one (1) from the provincial governments and one (1) from Indigenous groups located in Canada.

Dissemination of Fund

70. The Minister shall disseminate at least one-quarter (25%) and at most three-quarters (75%) of the funds annually in a manner that, in the opinion of the Minister, would address the priorities of underserved non-space faring communities including, but not limited to:
70.1. Financial support for indigenous space capabilities;
70.2. Capacity building for space entrepreneurs;
70.3. Training individuals in specific space capabilities;
70.4. Educational activities related to the benefits of space capabilities;
70.5. Business partnerships with local companies; and
70.6. Other activities that, in the opinion of the Minister, would contribute to the benefit of underserved communities.

71. The Minister may seek consultations from the advisory board on how to best disseminate the funds.

72. The funds not disseminated in any given year shall be added to the total funds to be disseminated the following year as per the formula in section 70.

Contributions to Fund

73. The fund shall be supported by licensees licensed to carry out space activities in the form of financial contributions totalling 1% of a licensee's annual revenues, averaged over the previous three years.

74. In lieu of financial contributions, the Minister may, by order, establish alternative forms of contributions equalling 1% of a licensee's annual revenues, averaged over the previous three years, including, but not limited to:
    74.1. The sharing of specific technical expertise;
    74.2. The provision of specific space-based services; or
    74.3. Any other form of contribution that, in the opinion of the Minister, would be appropriate.

75. Licensees are required to contribute to the fund annually, beginning in the fourth year following the Minister's authorisation of the licensee's space activity.
    75.1. Licensees may volunteer to contribute to the fund before the fourth year following the Minister's authorisation of the licensee's space activity.

Ongoing Maintenance of Space Program

Long-Term Space Plan

76. The Minister shall prepare and publish a long-term space plan every ten (10) years that outlines the overall objectives of the Canadian space program.

77. The long-term space plan shall include, but is not limited to:
    77.1. A retrospective analysis of the previous ten years;
    77.2. An examination of the specific objectives identified in the previous long-term space plan;
    77.3. A list of recommendations on how the objectives identified in the previous long-term space plan could have been better achieved;
    77.4. An examination of the needs of the country;
    77.5. A list of new objectives for the next long-term space plan;
    77.6. A discussion of how the new list of objectives can be achieved including, but not limited to:
        77.6.1. Necessary investments related to space infrastructure;
        77.6.2. Programs focusing on the development of specific activities;
        77.6.3. Financial mechanisms to incentivise growth;
        77.6.4. Coordination between government departments;
        77.6.5. Canada's approach to engaging the international community;
    77.7. Short-term and long-term economic forecasts related to the proposed space plan; and
    77.8. A list of approximate budgetary requirements to achieve the new list of objectives.

78. The Minister shall prepare and publish the first long-term space plan within one (1) year of the coming into force of this Act. The Minister is not required to include in the first long-term space plan the information required in subsections 77.2-77.3.

Review and Report

79. The Minister shall cause an independent review of the provisions and operation of this Act to be conducted every five (5) years in order to assess, in particular, its impact on the objectives of this Act, as provided in section 3.

79.1. The independent reviewer shall publish a report of its review within one (1) year of the Minister's assignment of the review.

80. The Minister shall provide each House of Parliament with the report of the independent review within two (2) months of receiving the report of the independent review.

81. The Minister shall initiate the first independent review within five (5) years after the coming into force of this Act.

Offences for Violation

Contravention

82. Any person who contravenes this Act or an order made under this Act is guilty of an offence and liable on summary conviction:

82.1. In the case of an individual, to a fine not exceeding $100,000 or to imprisonment for a term not exceeding 18 months, or to both; and

82.2. In any other case, to a fine not exceeding $500,000.

83. Any person who contravenes this Act or an order made under this Act is, subject to the Minister's discretion, prohibited from submitting any future applications for a licence under section 19 of this Act.

Injunctions

84. If a court of competent jurisdiction is satisfied, on application by the Minister, that a contravention of a provision of this Act is being or is likely to be committed, the court may grant an injunction, subject to any conditions that the court considers appropriate, ordering any person to cease or refrain from any activity related to that contravention, or ordering the person to take any measure that a licensee could, under this Act, be required to take.

Coming into Force

85. This Act comes into force on a day to be fixed by order of the Governor in Council.