The Emergence of an Effective National and International Spaceport Regime of Law

by

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Abstract

There was a time when flying beyond airspace entailed orbital launches from government-owned sites. Those days are behind us. Suborbital commercial transportation is now in test phase. Commercial companies deliver cargo to the International Space Station in Lower Earth Orbit, soon to transport crew there as well. Spaceports are often privately owned and operated. Currently, no overarching authority administrates the regulation of these facilities. Instead, governance falls within domestic law.

The thesis contains a number of original contributions. Little has been written about spaceports in general. This is the first in-depth study comparing and contrasting the multiple regulatory regimes that govern them. The thesis examines national law to determine the sources and elements of spaceport regulations, even in the absence of direct facilities law. Also original are the identification of appropriate policy goals for spaceport regulation as well as the creation of a benchmark designed to aid in determining regulatory effectiveness. The benchmark is used to analyze the laws of multiple jurisdictions.

Next, the two most developed regimes, the US system and the EASA proposal now under consideration in Europe, are studied for effectiveness and compared with one another. This comparison results in an understanding of the commonalities between them as well as recognition of where they conflict and where both are lacking.

Various responses to the current state of spaceport law are explored. The next contribution the study makes is in using various social theories (normative relativism, pluralist theory, norm emergence theory, and theories of intersystemic interaction) to answer the questions of how best to integrate elements of different systems of regulation and by what entities. There is currently no scholarship applying these

theoretical frameworks to spaceport regulation.

Résumé

Il y avait un moment où voler au-delà de l'espace aérien a entraîné lancements orbitaux à partir de sites appartenant au gouvernement. Ces jours sont derrière nous. Transport commercial suborbital est maintenant en phase de test. Les sociétés commerciales offrent fret vers la station spatiale internationale en orbite basse de la Terre, bientôt transporter équipage aussi. Spaceports sont souvent détenus et exploités en privé. Actuellement, aucune autorité suprême administre la réglementation de ces installations. Au lieu de cela, la gouvernance s'inscrit dans le droit interne.

La thèse contient un certain nombre de contributions originales. Peu de choses ont été écrites sur spaceports en général. Il s'agit de la première étude en profondeur comparer et contraster les régimes réglementaires multiples qui les régissent. La thèse examine la législation nationale afin de déterminer les sources et les éléments de la réglementation de spaceport, même en l'absence de loi sur les installations directs. D'origine sont également l'identification des objectifs de politiques appropriées pour la réglementation de port spatial ainsi que la création d'un indice de référence conçu pour aider à déterminer l'efficacité de la réglementation. L'indice de référence est utilisé pour analyser les lois de plusieurs juridictions.

Ensuite, les deux régimes les plus développés, le système américain et la proposition de l'EASA actuellement à l'étude en Europe, sont étudiés pour l'efficacité et comparés entre eux. Cette comparaison se traduit par une compréhension des points communs entre elles ainsi que la reconnaissance de l'endroit où ils sont en conflit et où les deux font défaut.

Diverses réponses à l'état actuel du droit de port spatial sont explorées. La prochaine contribution de l'étude fait est l'utilisation de diverses théories sociales (relativisme normatif, la théorie pluraliste, la théorie de l'émergence de la norme, et les théories de l'interaction intersystémique) pour répondre aux questions de la meilleure façon d'intégrer des éléments de

différents systèmes de régulation et par quelles entités. Il n'existe actuellement aucune bourse application de ces cadres théoriques de Spaceport règlement.

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Figures and Tables

Acronyms

AEB	Brazilian Space Agency
Air Launch HL	Air Launch Horizontal Landing
ARTWG	Advanced Range Technical Working Group
ATC	Air Traffic Control
ANS	Air Navigation System
ANSI	American National Standards Institute
APA	US Administrative Procedures Act
ATS	Air Traffic Services
AST	US Office of Commercial Space Transportation
ATA	Air Transport Association
CAA	Civil Aviation Authority; Civil Aeronautics Act of 1938
CCAS	US Cape Canaveral Air Station
CCF	Central Coordinating Facility; Command & Control Facility
CEQ	US Council on Environmental Quality
CFR	Code of Federal Regulations
CIL	Customary International Law
COE	Center of Excellence
COMSTAC	US Commercial Space Transportation Advisory Committee
CSLA	US Commercial Space Launch Act
CSLAA	US Commercial Space Launch Amendments Act of 2004 CST Commercial Space Transportation
DOD	US Department of Defense
DOT	US Department of Transportation
EASA	European Aviation Safety Agency
EC	Expected Casualty or European Commission (depending upon context)
EFTA	European Free Trade Association
ELV	Expendable Launch Vehicle
EU	European Union
FAA	US Federal Aviation Administration
GII	Global Information Infrastructure
HTHL	Horizontal Takeoff Horizontal Landing
IAASS	International Association for the Advancement of Space Safety
IADC	Inter-Agency Space Debris Coordination Committee
IATA	International Air Transport Association
IASB	International Accounting Standards Board
ICAO	UN International Civil Aviation Organization
ICJ	International Court of Justice
IGO	Intergovernmental Organization; International Organization
IISL	International Institute of Space Law
IMAX	Immersive Theatre
IOSO	International Organization of Securities Commissions
IR	Implementing Regulations
ISO	International Standards Organization

ISS	International Space Station
ISU	International Space University
ITAR	US International Traffic in Arms Regulations
ITU	UN International Telecommunications Union
JAXA	Japanese Space Agency
KSC	US Kennedy Space Center
LCC	Launch Command & Control
LEO	Lower Earth Orbit
LSC	UN COPUOS Legal Subcommittee
MPL	Maximum Probable Loss
MOU	Memorandum of Understanding
NAP	US National Airport Plan
NASA	US National Aeronautics and Space Administration
NASP	US National Airport System Plan
NEPA	US National Environmental Protection Act
NGO	Non-governmental Organization
NPIAS	US National Plan of Integrated Airport Systems
NPRM	Notice of Proposed Rulemaking
NRC	US Nuclear Regulatory Commission
NTSB	US National Transportation Safety Board
OECD	Organisation for Economic Cooperation and Development
OOSA	United Nations Office of Outer Space Affairs
OR	Operational responsibilities
OSHA	US Occupational Safety & Health Act
OST	Outer Space Treaty
PCA	Permanent Court of Arbitration
PCN	ICAO pavement classification
PKNDS	Selangor State Development Corporation, Malaysia
PLR	Transport Canada Pavement Load Rating
PLS	Private Legal Systems
PtF	EASA Permit to Fly
QRA	Quantitative Risk Assessments
RCofA	EASA Restricted Certificate of Airworthiness
Roscosmos	Russian Space Agency
RLV	Reusable Launch Vehicle
RTC	EASA Restricted Type Certificate
SARP	ICAO Standard and Recommended Practice
SCAA	Swedish Civil Aviation Authority
SEC	US Securities and Exchange Commission
SHK	Swedish Accident Investigation Board
SRB	Suborbital reusable vehicle
SSP	Space Studies Program (International Space University)
SSTO	Single Stage to Orbit
STSC	UN COPUOS Science &Technical Subcommittee
STSMC	Malaysian Space Tourism Society
TC	EASA Type Certificate; Technical Committee

TFEU	Treaty on the Functioning of the European Union
TSTO	Two Stage to Orbit
TT&C	Telemetry, Tracking & Command
UAE	United Arab Emirates
UAW	United Auto Workers; The International Union, United Automobile, Aerospace and Agricultural Implement Workers of America
UK	United Kingdom
UK CAA	United Kingdom Civil Aviation Authority
UN	United Nations
UN COPUOS	United Nations Committee for the Peaceful Uses of Outer Space
US	United States of America
USG	US Government
USAF	United States Air ForceUSC United States Code
USG	United States Government
VAB	Vehicle Assembly Building
VTOL	Vertical Takeoff or Landing
VTVL	Vertical Takeoff Vertical Landing
WG	Working Group
WWI	World War II
XCOR	US company

Part One: Context

Chapter One: Introduction

Senator Gore said, "Outer space is not a new subject, just a new place where old subjects come up."[1] This is somewhat true of spaceports, the terrestrial element of space transportation. Launch sites and spaceports have been around for some time, first emerging in the United States in the 1940s when the federal government began building and operating launch ranges.[2] The past few years have shown significant activity in the modification of existing facilities and the siting and build-outs of new ones all over the world. The topography of spaceports is undergoing an enormous shift, moving from strictly federal facilities used by the Department of Defense (DOD) and NASA, to public private partnerships,[3] bi-state partnerships,[4] and even thoroughly private endeavors.[5]

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[1] Senator Albert Gore Sr., December 1962, at the UN, cited by E.W. Hughwey in "Criminal Responsibility in Outer Space", Proceedings on the Conference on Space Science and Space Law, 1963 p. 150 and K. Tatsuzawa "Regulation of commercial space activities by non-governmental entities in space law", IISL 88-083. Eilene Galloway opined that "Outer space has simply been added as a new environment in which existing and projected human activities are being extended." Eilene Galloway, "The United Nations Ad Hoc Committee on the Peaceful Uses of Outer Space Accomplishment and Implications for Legal Problems", U.S. Congress, Senate Committee on Aeronautical and Space Sciences, *Legal Problems of Space Exploration, A Symposium*, 87th Cong., 1st Sess., Doc.26, Washington, Government Printing Office 22 March 1961, pp. 613-25.

[2] U.S. Federal Aviation Administration *2011 U.S. Commercial Space Transportation Developments and Concepts: Vehicles, Technologies, and Spaceports* (January 2011) at 47, online: http://www.faa.gov/about/office_org/headquarters_offices/ast/media/111355.pdf (date accessed: 25 January 2013).

[3] Constance M. Adams & Georgi Petrov, "Spaceport Master Planning: Principles and Precedents" [2006] AIAA Space at 20, online: http://arc.aiaa.org/doi/abs/10.2514/6.2006-7325 (date accessed: 25 January 2013).

[4] Virginia and Maryland created a bi-state agreement to operate the MARS Spaceport in July 2003. Virginia Commercial Space Flight Authority Strategic Plan 2012-2017 at 12 (1 December 2012) online: http://marsspaceport.com/files/news_pdf/VCSFA_Strategic_Plan_2012_2017.pdf (date accessed: 25 January 2013).

[5] Leonard David, "Spaceports: Building up the Space Travel Industry" [hereinafter "David I"] Space.com: online: http://www.space.com/businesstechology/060517tech_spaceport.html (date accessed: 10 August 2010); Jeff Foust, "The spaceport glut" The Space Review: available at:

Since 1996, the United States Office of Commercial Space Transportation (AST) has granted site licenses to nine non-federal launch sites serving both commercial and government launch operators.[6] Some of these are co-located with federal facilities. Internationally, spaceports are currently located in Brazil, China, French Guyana, India, Israel, Iran, Japan, Kazakhstan, North Korea, the Pacific Ocean (Sea Launch), Russia, South Korea, Sweden, and the United States.[7] Proposals for spaceports, offering at least some level of launch capability, are currently in the works in Abu Dhabi, Canada, Curacao, Malaysia, Russia, Singapore, and the UK, but in actuality, at this point in time, almost any entity with an airport could market their facilities as a spaceport.[8] The list is constantly changing. Many of the jurisdictions included in this study do not even house commercial spaceports at present.[9] Of those that do, or that have government owned sites performing commercial launches, Japan,

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http://www.thespacereview.com/article/1545/1 (date accessed: 10 August 2010); Rebecca Sprague, "Roadmap to center's future takes shape" Spaceport News 9 July 2010) Vol. 50 No. 14.

[6] "About the Office" US FAA online: http://www.faa.gov/about/office_org/headquarters_offices/ast/about/ (date accessed: 25 January 2013). Midland in Texas is the first spaceport co-located at a Part 139 airport serving commercial aviation carriers. See License Order No. LSO 14-015A at https://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/media/License%20LSO%2014-015_Midland_09_15_2014.pdf (date accessed: 23 November 2014).

[7] "Spaceports Can be Found Throughout the World" The Space Foundation, available at: http://www.spacefoundation.org/media/space-watch/spaceports-can-be-found-throughout-world (date accessed: 16 January 2013).

[8] For instance, Russia plans to build a spaceport in the far eastern Amur region. Katia Moskvitch, "Russia to kick off construction of a new spaceport" BBC News online\ http://www.bbc.co.uk/news/science-environment-10698433 (date accessed: 7 September 2010). Canada's Churchill Rocket Research range in Manitoba has seen efforts to reopen, but at the time of this writing these have not come to fruition. Space Today Online: http://www.spacetoday.org/Rockets/Spaceports/Canada.html (date accessed: 25 January 2013). On 15 October 2011, Space Tourism Society received a Letter of Intent from Selanagor State Development Corporation indicating readiness to enter into a Memorandum of Understanding, and ultimately a legal agreement, for the purpose of planning, designing, constructing, and operating a spaceport near Kuala Lumpur. Email from Norul Ridzuan to IAASS Suborbital Safety Technical Committee, dated 24 October 2011, on file with author (Norul I). The UK is the most recent addition to this list. Paul Marks "Spaceport UK: Government plan to launch spaceplanes" New Scientist: Space Section (14 July 2014). Apparently, the Virgin Galactic crash of SpaceShip Two in October 2014 is not dissuading the UK from their plans to pursue spaceport operations in the near term. "Prestwick still set on role as UK spaceport despite Virgin Galactic flight catastrophe" (2 November 2014) Herald Scotland online at: http://www.heraldscotland.com/news/transport/prestwick-still-set-on-role-as-uk-spaceport-despite-virgin-galactic-flight-catastroph.25756332 (date accessed: 23 November 2014).

[9] Only Brazil, China, France in French Guyana, Japan, Kazakhstan, Russia, South Korea, Sweden and the US have active spaceport sites at present.

Kazakhstan, French Guyana and Brazil are operational for both suborbital and orbital flight. In the US, a number of spaceports perform both types of launches.[10]

For all that airports could be marketed as spaceports and despite their similarities, there are a number of characteristics that set spaceports apart and render the relevant laws somewhat unique. Foremost among these is the dual-use nature of the technology used. Launch technology and many space activities implicate military and national security concerns in ways that civil aviation does not.[11] Treaty obligations impose ultimate international responsibility for space activities, governmental or non-governmental, upon the State. As a result, there is always a degree of State involvement in space activity and no such thing as a purely private space endeavor, a point that applies to some of the activities at the spaceport.[12] Launching States are liable in perpetuity. One way that a State is denoted a Launching State is if the launch is from its facility. The facility is the spaceport. This contrasts sharply with the reality that flying from an airport does not automatically burden the civil aviation authority with eternal international liabilities.

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[10] A number of government spaceports are operational for both orbital and suborbital activity (for example, Woomera in Australia) while Alcantara in Brazil is a government facility performing commercial launches. In the US, Spaceport America, Mojave Air and Space Port, Kennedy Space Center. Kodiak, and MARS all are operational for both. Spaceport Field Guide by Space Works software, available at: http://www.spaceworkssoftware.com/products/free/spaceport-field-guide.shtml (date accessed: 15 July 2014).

[11] For instance, Russia plans to build a spaceport in the far eastern Amur region. Katia Moskvitch, "Russia to kick off construction of a new spaceport" BBC News online\ http://www.bbc.co.uk/news/science-environment-10698433 (date accessed: 7 September 2010). Canada's Churchill Rocket Research range in Manitoba has seen efforts to reopen, but at the time of this writing these have not come to fruition. Space Today Online: http://www.spacetoday.org/Rockets/Spaceports/Canada.html (date accessed: 25 January 2013). On 15 October 2011, Space Tourism Society received a Letter of Intent from Selanagor State Development Corporation indicating readiness to enter into a Memorandum of Understanding, and ultimately a legal agreement, for the purpose of planning, designing, constructing, and operating a spaceport near Kuala Lumpur. Norul I, *supra* note 8.

[12] The states with active spaceports are Alaska, California, Florida, New Mexico, Oklahoma, Texas, and Virginia and SpaceX has performed testing at Ronald Reagan Ballistic Missile Defense Test Site, Kwajalein Atoll. At the time of this writing, there are proposals for spaceports in Colorado, Hawaii. FAA 2011 AST report, *supra* note 2 at 47-60; "SpaceX moving ahead with Texas spaceport plan" (12 April 2012) New Space Journal (online: http://www.newspacejournal.com/2012/04/10/spacex-moving-ahead-with-texas-spaceport-plan/ (date accessed: 16 January 2013); Kristen Leigh Painter, "Spaceport Colorado receives $660,000 in funding commitments" online: denverpost.com http://www.newspacejournal.com/2012/04/10/spacex-moving-ahead-with-texas-spaceport-plan/ (date accessed: 16 January 2013).

Possible application of the aviation regime to the activities of transporting humans and cargoes through space adds to the uniqueness of the legal environment surrounding spaceports. The private aviation regime affords recoveries that the public space regime does not. The proximity of airspace to outer space, and the ambiguity as to which regime is implicated by new technologies and behaviors, creates another distinction for spaceports. Do we treat spaceports as airports with launch pads? Or launch sites with runways? To get to outer space, air space must be traversed. This means that the space activity necessarily interacts with the national air space.[13] The mechanics of this interaction are only now gaining traction in serious domestic and international discussion. Galloway said that aerospace is a continuum that engineers do not divide into horizontal zones, and is subject to rapidly changing technology blurring the line between astronautics and aeronautics.[14] This observation holds true. Does it matter if more time spent is in the air space when the intention was to arrive in outer space, even if only briefly? All of these issues and questions make spaceport regulation complex. The physical jurisdictions and the legal jurisdictions touch, overlap, and defy easy categorization.

At present, there is no international or overarching authority governing either these activities or facilities, despite the fact that commercial transportation is currently delivering cargo to the International Space Station and suborbital activity is slated to begin in the very near future. It is sometimes argued that there is no current need for such an authority.[15] The early barnstormers flourished in an unregulated environment.[16] However, the introduction of safety regulations and, in the US the development of the Aeronautics Branch in the Department of

[13] Adams & Petrov, *supra* note 3 at 16.
[14] Eilene Galloway, "Law, Order, and Outer Space: How High is Up?" *Electronic Age*, Vol. 29, No.4, Autumn 1970, pp. 5-6.
[15] It is also very persuasively argued that we do. Ram S. Jakhu et. al. eds. *The Need for an Integrated Regulatory Regime for Aviation and Space: ICAO for Space? (Studies in Space Policy)* (Springer-Verlag/Wien: 2011).
[16] JetAviator7, "The History of Barnstorming" *All Things Aviation* (31 May 2011), online: http://all-things-aviation.com/flying/history-of-barnstorming/ (date accessed: 21 January 2013).

Commerce, was of key significance in actually developing commercial aviation past the novelty stage.[17] Effective regulation of commercial spaceflight has been identified as a key enabler to market development.[18]

However, even without central governance of sites, some regulation of spaceport operations exists in international and domestic law. The thesis examines these sources. Although there are as many jurisdictions with no specific site regulation, as with in the sampling used for this study, other bases for authority exist. But are the regulations governing spaceports effectively serving the space community and the global economy?

Currently, there is a scarcity of scholarship addressing spaceport law, and most that address it at all do so in reference to suborbital spaceports and space transportation as a touristic event. This study is completely original. It sets out to analyze the regulations in place, both direct and indirect, and to determine their effectiveness using a benchmark as a standard. Appropriate policy goals are identified to aid in the analysis. Two divergent approaches exist as regards the handling of suborbital spaceports; one governs suborbital and orbital sites as aspects of one regime (space) while the other contemplates division of these into the existing aviation framework (suborbital) and the space law system (orbital). These approaches are compared in depth, to reveal conflicts and synergies but also to rate for effectiveness against the benchmark.

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[17] The Air Mail Act of 1925 was instrumental in getting the fledgling commercial aviation industry off to a profitable start with the start of scheduled passenger service by Pan American Airways, Western Air Express, and Ford Air Transport Service. Air Mail (Kelly) Act of 1925, ch. 128, 43 Stat. 805 (2 Feb. 1925). As travel increased, airport operators, in the interest of safety, collaborated to provide early air traffic control based on visual signals in the form of flag-waving controllers standing on fields, communicating with pilots. The industry urged Congress to pass federal legislation to improve and maintain safety standards; this legislation was the Air Commerce Act in 1926 and it charged the Secretary of Commerce with issuance and enforcement of ATC rules, licensing pilots, certifying aircraft, establishment of airways and operation and maintenance of aids to air navigation. Air Commerce Act of 1926, ch. 344, 44 Stat. 568 (20 May 1926). The overarching legislation triggered responsible industry growth. "A Brief History of the FAA" *Federal Aviation Administration* online: http://www.faa.gov/about/history/brief_history/ (date accessed: 21 January 2013).

[18] *Evaluation of the European Market Potential for Commercial Spaceflight* (hereinafter "EC market report") prepared for the European Commission Enterprise and Industry Directorate-General (18 February 2013) at 5.

To date, no study has been undertaken to analyze these laws for effectiveness or to compare the two alternatives for regulation. This one goes further by applying social theory to spaceport law.[19] Another goal of this research is to recognize the mechanics of change in an area, such as this, which is complex and technical. Understanding the evolution of laws in this sector can provide insight and guidance for others. There are a number of alternative responses to the current state of spaceport regulation. These include leaving it to develop as it is, or harmonizing and/or integrating elements of the regulatory frameworks that exist, or creation of something new.

Methodology:

The methodology consisted of a literature review relying heavily upon Internet-based research, traditional library sources, and legal databases. The sources relied upon derive from multiple categories, including primary sources (such as treaties, customary international law, judicial decisions, international legal declarations and resolutions, and domestic law), secondary sources (primarily journal articles, conference papers, online news reports, and web-based resources), as well as other miscellaneous sources, including government reports and studies. Quite a bit of information was amassed through attendance at conferences and symposia and via participation in Expert Groups and committees, as noted in footnotes where appropriate. The Canadian Guide to Uniform Legal Citation was used to ensure uniformity in citation of references; however, when silent, the Harvard Blue Book was used as a guide.

Structure of the thesis:

Studying the dynamics of change has been described as resilience practice, which is broken down into three steps: description of a system, assessment of its resilience, and managing

[19] These theories include normative relativism, pluralism, norm emergence theory, institutionalism, and intersystemic interaction.

its resilience.[20] Using this model, the thesis is presented in three parts. The first describes context, includes an overview of existing international and domestic regimes that regulate spaceport operations in any way, and develops a standard to assist analysis of the existing regulations. Policy goals deemed appropriate to underpin spaceport governance are defined. This benchmark standard is then applied to the existing regimes.

The second part describes, analyzes and compares the most developed regimes to assess strengths and weaknesses. Interestingly, these two systems represent highly disparate approaches to the suborbital aspect of spaceports and the activities that take place on site. In Chapter Seven in the third and final part of the thesis, social theories (normative relativism, norm emergence theory, pluralism, and intersystemic interaction) are applied to help understand methods to integrate the different regulatory frameworks, if that is the desired outcome. The thesis ends with conclusions and recommendations.

Spaceflight is a technologically driven sector, defying geo-political boundaries. There is no current (or even immediate) proliferation of activity necessitating regulatory activity; these are currently domestic activities and they could stay that way, launching and re-entering without implicating international borders.[21] The vehicle launches and returns to one territory. However, this will most probably not always be the case.

Presently, in the US, the Colorado Spaceport is positioning itself at an intercontinental spaceport.[22] Though not operative at the moment, Spaceport America and Spaceport Sweden have previously entered into an MOU in anticipation of a time in the

[20] Brian Walker & David Salt *Resilience Practice: Building capacity to absorb disturbance and maintain function* (Island Press, Washington 2012).
[21] Currently, no FAA reentry license is needed for a suborbital launch. The launch license for suborbital covers it all. A reentry license is only needed when returning from orbit. These licenses and pertinent rules and regulations are covered in detail throughout the text of this thesis.
[22] Leonard David, "Spaceport Colorado 'ideal hub' for suborbital flights" Space on NBC News (22 October 2012) online: http://www.msnbc.msn.com/id/49507674/ns/technology_and_science-space/t/spaceport-colorado-ideal-hub-suborbital-flights/#.UJfFZaVVOCY (date accessed: 4 November 2012).

future when the two facilities might share business and Spaceport America is now working with Abu Dhabi on its proposed spaceport.[23] Hawaii included in its spaceport license application the first point-to-point corridor between Kona and Oahu.[24] While only a short distance as proposed, it opens the door for point-to-point between countries, an international or transnational endeavor, carrying with it the characteristics of global commercial activity. Point-to-point transportation, while not imminent, is discussed as a possible next step,[25] and considered technologically feasible by at least one important industry stakeholder.[26] For these reasons, spaceport regulation provides a good petri dish to watch dynamics change.

Regardless of what those changes may be, the effectiveness of the regulations now in place and to be promulgated is an issue that should be of concern. The intention is to aid in the ongoing process of developing appropriate policies driving responsible legislation of sustainable activities in spaceports and ultimately in space.

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[23] Leonard David, "Virgin Galactic Partners With New Mexico on Spaceport" SPACE.com (14 December 2005) online: http://www.space.com/news/051214_spaceport_newmexico.html (date accessed: 8 September 2010); Adam Schreck, "Abu Dhabi partners with Virgin Galactic spaceship firm" USA Today (28 July 2009) online: http://www.usatoday.com/money/industries/technology/2009-07-28-virgin-galactic- abu-dhabi_N.htm (date accessed: 8 September 2010); Peter B. de Selding, "Virgin Galactic Strikes Deal with Swedish Government" SPACE.com 28 January 2007 online: http;//www.space.com/news/070128_sweden_virgi.html (date accessed: 8 September 2010); Jeff Foust, "Space Tourism: a European perspective" The Space Review (6 July 2009) online: http://www.thespacereview.com/article/1411/1 (date accessed: 8 September 2010).

[24] Charles J. Lauer, et.al "Commercial Spaceport Development – A Case Study in Effective Public/Private Partnership" IAC-08-E3.3.9, presented in Glasgow, Scotland October 2008. Ideally, spaceports are located in stable countries with laws that enable, rather than restrict. G. Wayne Finger, et al., "Trends in Spaceport Site Selection and Operational Requirements" presented at The 27th Annual International Space Development Conference: The New Pace of Space, Washington DC, 29 May – 1 June 2008 at 3.

[25] "Point-to-point space travel will likely be the next step to creating a successful, globalized industry. For that time to come to fruition, it is important that the world have a complimentary [sic] set of standards by which it ensures safety and measures regulatory compliance." George Nield, et al., "Certification Versus Licensing for Human Space Flight in Commercial Space Transportation" Proceedings, 63rd International Astronautical Congress, Naples Italy (October 2012) at 4; *see also* Research and Innovative Technology Administration Volpe National Transportation Systems Center *Point-to-Point Commercial Space Transportation in National Aviation System: Final Report* (Washington D.C.: U.S. Department of Transportation, 2010).

[26] "We will, in the not too distant future, do point-to-point travel at the fastest times ever done," Branson was quoted as saying in "Richard Branson on space travel: 'I'm determined to start a population on Mars'" CBS News available online: http://www.cbsnews.com/news/richard-branson-on-space-travel-im-determined-to-start-a-population-on-mars/ (date accessed: 16 January 2013).

Chapter Two: Overview of existing international and domestic regimes

This chapter describes the current status of spaceport regulation as an initial point of reference. Currently, the only jurisdiction with well-developed spaceport law, actually promulgated and implemented, is the United States. However, this lack of express codification does not translate to a complete lack of law controlling the spaceports, themselves, or the activities that transpire there. For instance, while spaceports are the sites, launches are the activities taking place at the sites, vehicles are the subjects of that activity, and operators are the performers. The laws that govern both the sites and the activities derive their power from international and domestic sources. While the international sources of law are treaties, declarations, and resolutions, their domestic counterparts are found in statute as well as in implementing rules and regulations.

The chapter begins by examining the sources of law that pertain to spaceports and their operations. It then discusses the domestic laws that expressly address spaceports or launch sites in different jurisdictions, launch law and operators, issues pertaining to vehicles and operators, and, lastly, safety requirements. When a State's policy is apparent in the laws described, this, too, will be included. Analysis of these policy goals will be continued in Chapter Three

The sources of spaceport laws

The space treaties are often considered the primary source of international law pertaining to spaceports and always the source of law governing the space activities performed at these sites. However, the discussion of primary sources must also include the aviation treaties if some suborbital vehicles are classified as aircraft, flying internationally, and the launch sites are considered aerodromes or modified airports. These ideas are discussed in great detail in Chapter Five in relation to the EASA proposal. The focus here is on all spaceports, not only those serving

suborbital craft. This chapter explores launch law and, primarily, the space law regime. Although some aspects of aviation are touched upon in discussion of EASA's proposal in Europe, the private aviation liability regime will be discussed in Chapter Five.

While somewhat general in nature,[27] the space treaties impose some specific legal obligations. Among these, *inter alia,* are the ongoing obligation of the appropriate state for continuing jurisdiction and control over registered space objects,[28] the liability regime,[29] the requirement to register,[30] and the mandate to notify and to conduct activities with due regard found in Article 1X of the Outer Space Treaty.[31] Two other sources of international law are possible, custom and general principles. A number of scholars have agreed with Professor Bin Cheng's early assessment that at least some of the principles found in the initial Declaration of Legal Principles Governing Activities of States in the Exploration and Use of Outer Space and adopted unanimously by the General Assembly mere months later had achieved a nearly instantaneous status of customary international law by virtue of this brief interval and the consensus achieved.[32] Those principles include outer space as free and open for exploration and

[27] Ivan A. Vlasic "The Space Treaty: A Preliminary Evaluation" 55 Cal. L. Rev. (1967) 507 at 508.
[28] Article VIII, 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, 18 U.S.T. 2410, 610 U.N.T.S. 205 (hereinafter "Outer Space Treaty" or "OST").
[29] Convention on International Liability for Damage Caused by Space Objects, 29 March 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 (hereinafter "Liability Convention" or "LC").
[30] Article VIII, OST supra note 28; Convention on Registration of Objects Launched into Outer Space, 6 June 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 (hereinafter "Registration Convention" or "RC").
[31] Article 1X of the OST, *supra* note 28; *c.f.* Frans G.von der Dunk, "The Origins of Authorisation: Article VI of the Outer Space Treaty and International Space Law" (2011) (hereinafter "von der Dunk I") University of Nebraska – Lincoln Space and Telecommunications Law Program Faculty Publications at 16, online: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1068&context=spacelaw (date accessed: 21 January 2013); Joseph A. Burke, "Convention on International Liability for Damage Caused by Space Objects: Definition and Determination of Damages After the Cosmos 954 Incident" Fordham Int'l L J Vol. 8, No. 2 (1984) at 257; Gerardine Meishan Goh, *Dispute Settlement in International Space Law: A Multi-Door Courthouse for Outer Space* (Martinus Nijhoff Publishers: 2007) at 38; Francis Lyall & Paul Larsen, *Space Law: A Treatise* (Ashgate Publishing, Ltd.: 2009) at 88.
[32] Bin Cheng, United Nations Resolutions on Outer Space: "Instant" International Customary Law? 5 Indian J. Int'l L. 23, 35-40 (1965), c.f. Niels Petersen "Customary Law Without Custom? Rules, Principles, and the Role of State Practice in International Norm Creation" 23 Am. U. Int'l L. Rev. (2008) 275, at 281; M.P. Michael P. Scharf, "Seizing the 'Grotian Moment': Accelerated Formation of Customary International Law in Times of

use by all States, the lack of extension of State sovereignty into outer space, and that outer space is not subject to national appropriation. However, these particular principles do not directly coincide with the terrestrial concerns of the spaceports.

In time, as more States enact domestic space laws, general principles of international law will most probably be an available source of law for space activities. However, at this point in time, the sampling of States that have enacted space laws remains relatively small and not completely representative of all legal systems, leading to the conclusion that this source is yet still premature.[33]

The treaties themselves lack specific codified standards and procedures. However, States are ultimately responsible for all space activities of their nationals and for ongoing supervision and control of those activities.[34] As a result of this responsibility, more often than not it is the domestic regulatory and licensing regimes of each of the space-faring States that will take care of any lacunae, assuming there is domestic law on point.[35] States can choose their degrees of detail and specificity. For instance, the US has promulgated a developed licensing scheme for launches

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Fundamental Change" 43 Cornell Int'l L.J. 439 (2010) at 443-44; *but see* Vladlen S. Vereshchetin and Gennady M. Danilenko "Custom as a Source of International Law of Outer Space" 13 J. of Sp. L. 1 (1985) 22 at 25, fn 6 "This does not mean, however, that the practice of inter-state relations in the field of the exploration of outer space has led to the emergence of "instant" customary international law, as some authors believe." citing Bin Cheng, "United Nations Resolutions" *supra* this footnote.

[33] Diane Howard, "Are We There Yet? Extracting General Principles of International Space Law from the UN COPUOS Legal Subcommittee Work with National Legislation" (hereinafter "Howard I") ESPI Perspectives No. 67, August 2013, European Space Policy Institute; presented at 64th International Astronautical Congress Beijing 2013 as "Distilling General Principles of International Space Law" IAC-13.E7.5.2.

[34] Outer Space Treaty, *supra* note 28, Article VI. As an example, in the US this is handled through licensing of launch vehicles, launches, launch operators, and launch sites.

[35] Major Ronald L. Spencer, Jr., "State Supervision of Space Activity" 63 A.F.L. Rev. 75 (2009) at 82. For instance, how States maintain jurisdiction and control is a matter left to the States themselves. The obligation is express, the mechanics of implementation could be considered to be in a lacuna. Traditionally, the two lacunae in the Outer Space Treaty that have inspired continued discourse and scholarship are the question of lack of definition of outer space, clearly impacting the issues in this thesis, and the Article IV failure to prohibit the use of military personnel for scientific research. Martin Wright, *Power Politics* (Continuum International Publishing Group: 2002) at 285. Militarization of space as opposed to weaponization of space is a debate flowing from this last.

and reentries, commercial human spaceflight, and sites that satisfies the Article VI requirement that a State authorize and continually supervise the activities of its nationals in space.

It has been inferred that the treaties create a legal obligation for States to adopt and implement national space legislation, including safety standards and procedures.[36] As with other international treaties, the space treaties are subject to various national treaty application systems.[37] Some commentators have found aspects of the OST to be self-executing because they set out clear, concrete legal rules obliging States parties without additional legislative action.[38] For instance, some examples are the principle of free access found in Article I,[39] proscription of Article II against national appropriation through sovereignty,[40] the Article IV rule against placement in orbit of objects carrying nuclear weapons or weapons of mass destruction,[41] and the mandate found in Article VI that States bear international responsibility for the actions of their

[36] Ram S. Jakhu & Yaw O. T. Nyampong, "Are the current international space treaties sufficient to regulate space safety, and establish responsibility and liability?" at 5, Proceedings of the 2nd IAASS Conference: "Space Safety in a Global World" Chicago, USA 14 May 2007.
[37] John H. Jackson, "Status of Treaties in Domestic Legal Systems: A Policy Analysis" 86 Am. J. Int;l L. 310 (1992). Jackson offers an incisive analysis of the pros and cons of self-executing or direct application treaties, concluding that there are sound policy reasons to avoid direct application treaties, without more, where there are democratic institutions in place to avoid direct application in tandem with higher status for treaty norms than for later in time statutory law. *Ibid.* at 313. Countries permitting self-executing treaties allow the treaty to take a statute-like role in the domestic legal system without an act of transformation. *Ibid.* at 310. "Self-executing treaties are binding domestic law upon ratification whereas non-self-executing treaties require implementing legislation to become effective." Benjamin Perlman, "Grounding U.S.Commercial Space Regulation in the Constitution" 100 Geo. L.J. 929, 952 (March 2012). These States are considered monist, primarily because there is no distinction between the legal system as applied to public bodies and the system that applies to private citizens. Fiona De Londras, "Dualism, Domestic Courts, and the Rule of International Law" (16 April 2009) *IUS GENTIUM: The Rule of Law in Comparative Perspective*, Chapter 12, Mortimer Sellers and Teadusz, eds., Tomaszewski, (Wien: Springer) University College Dublin Law Research Paper No. 05/2009 at 221; John Laws, "Monism and dualism" La Revue administrative (Presses Universitaires de France: 53e Annėe, No. 2, 2000), 18-22, at 18. Monist States allow direct application of treaties. States can be dualist, requiring an act of transformation for a treaty to become effective. This is usually a government action by the State and is done in terms of incorporating the treaty norm into domestic law, perhaps via a statute that utilizes some or all of the treaty language. Jackson, *supra* this note at 315. The implementing statute may use different language and clarify or elaborate upon that found in the treaty; the domestic law is the transformatory act.
[38] Perlman, *supra* note 37 at 952; Meredith Blasingame, "Nurturing the United States Commercial Space Industry in an International World: Conflicting State, Federal, and International Law" 80 Miss. L.J. 741, 756 (Winter 2012) at 776.
[39] Barry J. Hurewitz, *Non-proliferation and Free Access to Outer Space: The Dual-Use Conflict Between the Outer Place Treaty and the Missile Technology Control Regime*, 9 HIGH TECH L.J. 211, 218 (1994).
[40] Perlman, *supra* note 37 at 952.
[41] *Ibid.*

nationals in outer space.[42] It is this last, Article VI, that carries the most direct implications for spaceport operators and the governments responsible for their activities.

Blasingame makes a good point that the OST is more likely self-executing when applied to actions of the US federal government but non-self-executing when applied to private spacefaring activities within the US.[43] She distinguishes between the two and hinges her analysis upon interpretation of the Article VI phrase "national activities". She says that if the national activities mean only activities performed for or with the involvement of the government, then nothing more is needed. However, she believes that including the concept and term "nongovernmental" renders the phrase somewhat ambiguous and that interpreting it to mean all activities by nongovernmental entities within or outside the nation necessarily implicates a Congressional obligation in enacting legislation that assumes responsibility.[44]

Hers is an apt distinction, shored up by Congress' legislation of governmental oversight over private, commercial US space activities. This dual aspect of the OST makes national space law extremely relevant for private actors. The US Commercial Space Launch Amendments Act (CSLA), described in great detail *infra*,[45] contains a provision in its Findings which addresses this issue: "Congress finds that…the United States should encourage private sector launches, reentries, and associated services and, only to the extent necessary, regulate those launches, reentries, and services to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign

[42] Blasingame, *supra* note 38 at 774-75.
[43] *Ibid.* at 775. Blasingame also assigns some Congressional law-making power for outer space law, despite its extra-territorial nature, to the US Commerce Clause. *Ibid.* at 775. See also Perlman, *supra* note 37 at 943 for a discussion of extraterritorial jurisdiction in space, analogizing to jurisdiction aboard ships on the high seas, also a non-sovereign area.
[44] *Ibid.*
[45] The statute is described in detail later in this chapter and extensively in Chapter Four.

policy interests of the United States."[46] This language accomplishes execution of the treaty for the private spaceport operator by tying the regulation of services, launches and reentries to compliance with US international obligations.[47]

Other State parties handle the space treaty obligations in a variety of ways. The Legal Subcommittee of UN COPUOS tasked a Working Group with compilation of the national regulatory frameworks for space activities now in existence.[48] In the recommendations attached as an appendix to the draft report provided to UN COPUOS in June 2012, the preamble notes the need for consistency and transparency with regard to the authorization and supervision of space activities and recognizes that States take different approaches.[49] Rather than necessarily advocating a uniform national legislation, the Working Group recommended elements for consideration by States in enacting regulatory frameworks that were appropriate to their specific needs.[50] The WG delivered both a schematic overview of those frameworks and Recommendations to be presented to the Committee as a Whole.[51] The schematic is a relatively

[46] 51 U.S.C. § 50901(a)(7) (2012).
[47] The trend in the US appears to be toward non-self-executing treaties. Lori Fisler Damrosch, "The Role of the United States Senate Concerning 'Self- executing' and 'Non-self-executing' Treaties"67 Chi.-Kent L. Rev. 515 (1991) at 526. An issue that arises in the context of whether treaty norms that are then incorporated into domestic law concern the hierarchy of norms when there is an inconsistency between a directly applicable and invocable treaty norm, and other norms present in the domestic legal system. In the US, later in time prevails, but this is not the case everywhere. Jackson, *supra* note 37 at 318.
[48] UN Report of the Committee on the Peaceful Uses of Outer Space General Assembly Doc A/62/20 (2007), para. 219. The multi-year workplan encompassed 2008-2012,
[49] UN Doc A/AC.105/C.2/2012/LEG/L.1 "Draft report of the Chair of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space" (28 March 2012) at 3.
[50] *Ibid.* at 4. This is consistent with the approach of Expert Group D of the Working Group for the Long Term Sustainability of Space Activities, Science and Technical Subcommittee, UN COPUOS, discussed in Chapter Seven. That Expert Group, tasked with drafting guidelines for space actors and for regulators of space actors, has emphasized elements for consideration, rather than a model law. The author believes that this paradigm could be pragmatic and builds upon concepts of sovereignty; when States undertake an international obligation they are entitled to determine for themselves the method for implementing or fulfilling that obligation, as long as it is done in good faith. Further, in the case of spaceports, the author asserts that a baseline of interoperability is the key and more pragmatic than harmonization of regulations or uniformity of laws.
[51] The schematic can be found in UN Doc A/AC.105/C.2/2012/CRP.8 (16 March 2012) and Add.1 and the Recommendations are contained within "Draft Report of the Chair of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space" UN Doc A/AC.105/C.2/2012/LEG/L.1 (28 March 2012).

comprehensive tool that illustrates the differences and similarities in State compliance with various treaty obligations.[52] At times, domestic laws will conflict between States by requiring more, but, for State parties, the treaties represent minimum mandatory obligations.

Despite its recency in time, the conditions under which the space treaty regime evolved were markedly different from those in which current and future space activity is, and will be, transpiring. For instance, at the time of the treaties' drafting and ratification, launches were performed from state-owned and operated sites/spaceports, launch vehicles were expendable, human spaceflight was not contemplated for the paying masses, and the Cold War was raging.[53] While the world has moved on from those days, the principles and legal obligations set forth in the first treaties remain intact and in force. Every spaceport discussed in this thesis is located within a State that is a party to, or signatory of, the Outer Space Treaty.[54] As a result, the following provisions control the launch activities that will be performed from the spaceports.[55]

Of the five treaties that govern human actions in outer space, the most fundamental is the Outer Space Treaty.[56] Looking at some of the overarching provisions that directly impact spaceport operations, Article II prohibits placing in orbit any nuclear weaponry or weapons of mass destruction. Spaceports are therefore prohibited from launching any such object.[57] Articles V, VI, and VII outline the principles found in the Rescue Agreement, the Liability Convention,

[52] It is possible that some of the elements of the laws described in the schematic and in the WG's accompanying report have risen to the level of general principles of international space law. See Howard I, *supra* note 33.
[53] Mineiro, Michael C. "Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges" 73 J. Air L. & Com. 759 (Fall 2008) at 767.
[54] Sweden and the US ratified the Outer Space Treaty in 1967. The UAE acceded in 2000 and Malaysia has maintained its signatory status since 1967. Available online: http://www.oosa.unvienna.org/oosatdb/showTreatySignatures.do (date accessed: 7 November 2012).
[55] The United Arab Emirates is currently siting a proposed suborbital spaceport. As a signatory, the UAE is not legally bound by the obligations of the Outer Space Treaty *per se*, but is obliged to refrain from acts that would undermine the treaty's objective and purpose.
[56] Outer Space Treaty, *supra* note 28.
[57] *Ibid.* at Art. IV.

and the Registration Convention.[58] In the case of an emergency landing at a spaceport, astronauts are to be regarded as "envoys of mankind", granted all possible assistance, and safely and promptly returned to the State of registry of their vehicle.[59] Expenses incurred in recovery and return of a space object and/or its component parts shall be borne by the launching authority.[60] However, astronauts are not defined *per se*, and there could be a question as to whether a spaceflight participant would fall under that classification and would be entitled to the same level of obligatory aid.[61]

State parties to the treaty have a duty to immediately inform either other parties to the treaty or the United Nations of phenomena discovered in outer space that could be dangerous to astronauts.[62] This duty inheres to spaceport operators and personnel, particularly as information becomes available through TT&C.[63] Of utmost significance is Article VI of the Outer Space Treaty. States are ultimately responsible for the activities of their nationals in space, be they governmental or non-governmental. Article VI obligates States to authorize and license these

[58] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 22 April 1968 19 U.S.T. 7570, 672 U.N.T.S. 119 [hereinafter Rescue Agreement]; Liability Convention, *supra* note 29; Registration Convention, *supra* note 30.
[59] Outer Space Treaty*, supra* note 26 at Art. V; Rescue Agreement, *supra* note 58. The duty to return is not limited to emergency landings at spaceports but extends to landings on the High Seas or in a territory outside the jurisdiction of any State, such as Antarctica.
[60] *Ibid.* "Launching authority" is defined in Article 6 of the Rescue Agreement. The term refers to "the State responsible for launching, or, where an international intergovernmental organization is responsible for launching, that organization" provided the organization has declared its acceptance of the Rescue Agreement's rights and responsibilities and a majority of the organization's members are contracting States to the treaty.
[61] *See* Lesley Jane Smith & Kay-Uwe Horl, "Legal Parameters of Space Tourism" IAC-03-IISL-1.109 (AIAA 2003); Chatzipangiotis concludes that while spaceflight participants or tourists are not, strictly speaking, astronauts they are nonetheless covered by the treaty provisions regarding assistance, rescue, and salvage because of humanitarian considerations. Michael Chatzipanagiotis, *The legal status of space tourists in the framework of commercial suborbital flights* (Carl Heymanns Verlag: 2011) at 38. The issue is further conflated by the contemplated ferrying of astronauts to the International Space Station by private companies through NASA's Commercial Crew Program. Irene Klotz "NASA Astronauts To Fly as 'Participants' on Commercial Space Taxis, FAA Rules" (6 December 2013) online: http://www.spacenews.com/article/civil-space/38524nasa-astronauts-to-fly-as-'participants'-on-commercial-space-taxis-faa (date accessed: 14 May 2014).
[62] Outer Space Treaty, *supra* note 28 Article V. This provision is further developed in the Rescue Agreement; *see also* Smith & Horl, s*upra* note 61.
[63] TT&C is telemetry, tracking, and control.

activities and to supervise continually.[64] For the spaceports, the States where located are ultimately responsible as the launching states because of the fourth descriptor, the territory from whose facility an object is launched.[65] However, this risk can be allocated by virtue of domestic law.

The Registration Convention prescribes mandatory registration of space objects by launching States in both a national register and with the United Nations.[66] Spaceports contemplate launch of both Reusable Launch Vehicles (RLVs) and Expendable Launch Vehicles (ELVs). More likely than not, it will be more efficient for spaceports to keep detailed records of the launches performed from their facilities and to provide these to the State. The US meet these obligations through its licensing;[67] one of the post-license requirements found in Subpart E of 14 Code of Federal Regulations 431 is registration of space objects.

To assist the U.S. Government in implementing Article IV of the 1975 Convention on Registration of Objects Launched into Outer Space, each licensee shall provide to the FAA the information required by paragraph (b) of this section for all objects placed in space by a licensed RLV mission, including an RLV and any components, except (1) any object owned and registered by the U.S. Government; and (2) any object owned by a foreign entity.[68]

The source of power for the domestic component of spaceport laws, rules, and regulations is derived from the State's sovereignty. There are different mechanisms for promulgating these rules. In the US, a statute delegates to an administrative body the authority to oversee an activity

[64] This is a function of a States' international responsibility for its nationals' activities in space. *See also* UN GA Resolution 59/115. The obligation includes the elements of licensing and modification, suspension or revocation of license; conditions for granting licenses; and is connected to other issues such as registration, liability, and safety.
[65] Outer Space Treaty, *supra* 28 at Article VII.
[66] Registration Convention, *supra* note 30.
[67] 14 CFR § 431.83 (2011).
[68] §431.85 Registration of space objects. The information must be submitted not later than thirty days following the mission and must include: the international designator; date and location of the RLV mission initiation; general function of the space object; final orbital parameters (nodal period, inclination, agogee, and perigee). As described in notes 74 and 401, Article II of the RC requires registration by Member States of space objects placed in orbit.

and enact necessary rules and regulations via enabling legislation.[69] Similarly, in the EU, the European Parliament and Council establish an administrative agency and can include in its mandate development and issuance of implementing rules.[70] Rulemaking procedures vary by jurisdiction but generally include mechanisms for notice to affected parties, opportunity for comment, and review of the rules and their impacts.

The elements of laws governing spaceports

The Outer Space Treaty places international responsibility for national activities in space squarely upon launching States, regardless of whether those activities are performed by private entities or arms of the government.[71] Both the Outer Space Treaty and the Liability Convention define a launching State as one that launches or procures a launch and each State party from whose territory or facility the launch is performed.[72] Spaceports equate to the facility from which the launch is performed and automatically implicate the State where located as a launching State, a status which carries with it profound responsibilities and liabilities.

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[69] "Federal Administrative Law" available online: http://law.duke.edu/lib/researchguides/fedadminlaw/ (date accessed: 18 July 2014).

[70] Decision of the Management Board Amending and Replacing Decision 08-2007 Concerning the Procedure to be Applied by the Agency for the Issuing of Opinions, Certification Specifications and Guidance Material ('Rulemaking Procedure'), EASA Management Board Decision 01-2012, online: http://www.easa.europa.eu/management-board/docs/management-board-meetings/2012/01/EASA%20MB%20Decision%2001-2012%20Revised%20MB%20Decision%20RM%20Process%20.pdf (date accessed: 14 February 2014).

[71] Outer Space Treaty, *supra* note 26 at Article VI.

[72] *Ibid*. at Art. VII; Liability Convention, *supra* note 29 at Art. I (c). Actually, this language closely mirrors that found in the *travaux preparatoires* of the treaty in a letter dated 11 July 1966 from the USSR to the Chairman of the Legal Subcommittee, to wit:

Each State Party to the Treaty which launches or organizes the launching of an object into outer space and on to celestial bodies, and each State from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical person by such object or its component parts on the earth, in air space, in outer space or on the celestial body.

UN Doc A/AC.105/C.2/L.13 available at: http://www.oosa.unvienna.org/oosa/en/SpaceLaw/treatyprep/ost/index.html (date accessed: 1 September 2012). The US proposal contains no such language. UN Doc A/AC.105/C.2/L.12 . *Ibid.* The text of the article proposed by the USSR was slightly modified ("procures" was substituted for "organizes") and accepted by the Working Group of the LSC at its second meeting on 28 July 1966. UN Doc A/AC.105/35.

The facility from where objects are launched is tied to international liability for damages as early as in the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space.[73] This is the first place where the four methods of attaching this liability are found; the Convention on International Liability for Damage Caused by Space Objects is the first official place that the term "launching State" is used to describe these four alternatives, thus raising them to the status of a legal definition.[74] Further, "[t]he State from whose territory **or facility** a space object is launched shall be regarded as a participant in a joint launching."[75] (emphasis added) Examination of the *travaux preparatoires* of the 1962 Declaration reveals that establishment of who could be authorized to launch the "new flying machines" and the "localities and locations from which they could be launched" was considered one of the first indispensable issues to be considered in trying to eke out an appropriate framework for early space activity.[76] Telling, in fact almost prescient, is the item found in the Mexican delegation's submission to the Ad Hoc Committee, asking "What legal regime should apply to the areas of outer-space flight covering the launching site of the satellite and its passage through the atmosphere?"[77] The rationale behind inclusion of the launch facility in discussion of authorization and liabilities in these early discussions is not readily apparent. However, it is the author's opinion that it may be because of the high-risk nature of the launch itself and an implicit

[73] Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space 13 December 1963 (hereinafter "Declaration") at 8.
[74] Liability Convention", *supra* note 29, Article I (c). The term continued in usage in the Registration Convention and was the subject of Resolution 59/115 of 10 December 2004 "Application of the concept of the "launching State", which dealt primarily with issues flowing from joint missions and on-orbit transfer of ownership. However, the term "launching State" is found in the earliest documents comprising the *travaux preparatoires* of the Declaration. See A/AC.98/L.7 at 3 (27 May 1959).
[75] *Ibid.* Article V (3).
[76] "Relationship Between Missilies, Satellites Rockets and Conventional Aviation" A/AC.98/L.6 at 3 (21 May 1959) describing events at the Ad Hoc Committee of 7 May 1959.
[77] "Working paper submitted by the delegation of Mexico" A/AC.98/L.8 at 3 (30 May 1959).

understanding that the entity controlling the launch facility wields some influence on the launch activity itself.

Because of the definition of launching State, States that house active spaceports are internationally responsible and can have a duty to authorize and continuously supervise the launches as the state of registry. This provides spaceport operators with a deep-seated interest in ensuring that the facilities are consistent with that supervision. However, whether suborbital assets are subject to the Registration Convention is a subject of debate, to be discussed in more detail in the subsection on vehicles.

The focus of this study is spaceport regulation; hence, the first subsection deals with licensing of the site itself. Some jurisdictions have promulgated domestic laws and criteria for spaceports while others have not. The laws analyzed in this chapter are sourced from the United Nations Office of Outer Space Affairs National Space Law Database. All laws provided with English translations were included.[78] In addition to these, the chapter also addresses the new Indonesia Space Act and the French Space Act.[79]

Jurisdictions with express spaceport law are not necessarily launch capable. For instance, Australia has facility law and guidance but is not currently launching. Next, is a subsection listing and describing laws governing the launches as the activities taking place at the sites. Launch law often includes the operators as performers of the activity. The table found at the end of this section presents information regarding the linkage between site licenses, launch licenses, and operator licensing. Lastly, the vehicles are the subjects of that activity. Regulation of the

[78] Available at: http://www.oosa.unvienna.org/oosa/en/SpaceLaw/national/state-index.html (date accessed: ongoing - fill in at end)

[79] It was possible to work with an unofficial English translation of the French Space Act provided by the University of Mississippi Faculty of Law. Available at: http://www.spacelaw.olemiss.edu/library/space/France/laws/LOI_no_2008--518_E.pdf (date accessed: 18 April 2014). The Indonesian delegate presented an overview of the Indonesia Space Act at the UN COPUOS Legal Subcommittee meeting held in March 2014, attended by the author.

vehicles is primarily handled through the launch license. This final subsection addresses classification of the vehicles as a space object, as an aircraft, or as an aerospace object, and the ensuing ramifications.

Domestic licensing or certification of the site itself

There are varying degrees of specificity in those countries whose laws regulate launch sites or spaceports. Only those countries that expressly address spaceport facilities in any manner will be included in the immediate section.

Australia requires a standard space license for the launch facility. The applicant must provide, in writing, information regarding employee function, qualifications, duties, background employment history, contact information for all employed at the launch facility and all individuals directly connected with the facility or its operations.[80] However, these are the same requirements imposed upon all license applicants and do not include anything specific to the facilities. Specifics for the spaceport facility are found in the Space Activities Regulations 2001 and include requirements pertaining to its safety, environmental, management plans, security plans, and emergency plans.[81]

China maintains three launching sites and performs commercial launches from these.[82] However, the government operates the sites and performs the launches.

In Europe, the European Union has competence over space activities, to a degree. This is a shared competence; for space activities promoting research and industry, Member States are not precluded from exercising their own competence.[83] However, for transport such as aviation,

[80] Space Activities Regulations 2001 at 2.04B *et seq*.
[81] *Ibid.* at Reg. 2.06.
[82] China's Space Activities (White Paper dated 15 December 2003) available at: http://www.cnsa.gov.cn/n615709/n620681/n771967/69198.html (date accessed: 19 April 2014).
[83] Treaty on the Functioning of the European Union, OJ C115, 9.5.2008 (hereinafter "TFEU") at 4(3).

Union law suppresses national law.[84] This is a key point because the European Aviation Safety Agency (EASA) has a proposal before the European Commission that would treat suborbital spaceports as aerodromes regulated by EASA proposal and implemented through NPA 2011-20 (combined) and Annex 14 of the Chicago Convention.[85] European spaceports could be subject to the exact same process as aerodromes, if they are considered commercial operations of suborbital vehicles, which EASA proposes to certify as aircraft.[86] Regulation (EC) No 216/2008 as amended by Regulation (EC) No 1108/2009 (hereinafter the "Basic Regulation") includes aerodromes in the European aviation safety regulatory system and assigns EASA to develop Implementing Rules (IRs) to ensure safety. The IRs are based upon the SARPs found in Annex 14, Volume 1, Aerodromes.[87]

The rules are structured in three parts. The first, Part-AR, contains requirements for the competent authority in three sections: General Requirements, Management and Oversight, and Certification and Enforcement.[88] The next two parts are to be fulfilled by the aerodrome/spaceport operator. The second, Part-OR, is in five sections: General Requirements, Certification – Declaration, Operator Responsibilities, Management, and Manuals. The last, Part-OPS, contains three sections and includes Aerodrome Data, Aerodrome Operational Services, and Equipment and Installations and Aerodrome Maintenance. Cognizant of the challenges of the transition period, EASA has developed procedures to convert existing certificates and licenses into the new aerodrome certificate based upon the Basic Regulation and attendant IRs. Flexibility is built into the system, as EASA is able to accept deviations that predate the

[84] TFEU Article 4(2).
[85] The European Economic Community is tasked with establishment of a common policy and common rules for transport. Articles 90 – 100, TFEU, *supra* note 83, p. 47.
[86] *Ibid.* at 16.
[87] NPA 2011-20(A) at 2. "ICAO Annex 14, Volume 1, Aerodromes (Fifth edition, July 2009), has been used as the baseline, but not exclusively for all future European rules." *Ibid.*at 6.
[88] EASA NPA 2011-20(A) *Authority, Organisation and Operations Requirements for Aerodromes* at 2.

Certificate Specifications.[89] Hence, spaceports serving winged suborbital craft in Europe would be certified when compliant with their certification basis, as with aerodromes, founded upon as yet undecided specifications.[90]

The aerodrome/spaceport certification basis has a local component in that special detailed technical specifications may be necessary because of the design features of a particular aerodrome.[91] As a result, the national authority with competence for the territory where the spaceport is located will be responsible for its certification according to Article 8a of Regulation (EC) No 216/2008. For instance, the Swedish Civil Aviation Authority (SCAA) is responsible for Spaceport Sweden. Furthermore, Member States, as signatories to the Chicago Convention, are the parties obliged to adopt the SARPs and to certify and oversee their aerodromes in accordance with the Basic Regulation and all associated rules and specifications. Again, the SCAA will certify and oversee the facility. The EASA rules standardize procedures for certification, oversight, management, and operation of the aerodrome/spaceports and the SCAA will, in turn, implement these.

However, the proposal to include suborbital spaceports in the existing aviation scheme is simply that – a proposal. In its most recent incarnation, it includes a range of alternatives that range from leaving the regulation and supervision of suborbital aircraft to Member States to extending the scope of the regulations to high altitude/high speed transport and orbital aircraft.[92]

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[89] *Ibid.* at 3.
[90] Jean-Bruno Marciacq, et.al., "Establishing a Regulatory Framework for the Development & Operations of Sub-Orbital & Orbital Aircraft (SoA) in the EU" (hereinafter "Marciacq I") Proc. Sixth IAASS Conference – Safety is Not an Option, Montreal Canada 21-23 May 2013 (ESA SP-715, September 2013).
[91] Article 8a 2.(b)(iii) Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulation (EC) No 216/2008 in the field of aerodromes, air traffic management and air navigation services and repealing Directive 2006/23/EC.
[92] Marciacq I, *supra* note 90.

The Austrian law contains provisions that are on point for orbital sites and/or facilities.[93] In the absence of adoption of the EASA by the EC, Austria's national law will control all launch sites and facilities. Austria requires authorization for space activities, which include the operation of a launch facility.[94] Again, like Australia, the requirements for the facility license are general but do address the operator's competence, the safety of the space activity, Austria's obligations under international law, foreign policy interests, and insurance.

The countries with either no domestic space law or with space law that is silent regarding launch sites will be situated much like Sweden. Sweden's space law does not address regulation of launch sites. Because Sweden (like Austria) is a Member of the European Union, the EASA proposal would govern the process for suborbital spaceports, if adopted. Chapter 6, Sections 1 to 16 of the Swedish Aviation Act, outline the establishment and operation of aerodrome/spaceports which require a permit from the government or designated authority, in this case the SCAA. The Act also allows for the promulgation of regulations for obstacle-free zones, requires coordination with the owners of property contiguous to the spaceport, and sets forth regulations regarding maintenance and operations. All of these must be in compliance with EC regulations pertaining to aerodromes, which, in turn, are compliant with ICAO SARPs. In Sweden, the SCAA is the supervisory authority for all aerodromes.[95]

Indonesia enacted its Space Act in 2013.[96] The law includes spaceport operation in its list of regulated space activities. The purposes of the act include achievement of self-reliance and

[93] Regardless of whether the EC adopts some form of EASA's proposal, the jurisdiction of the EU ends wherever it is that outer space begins or an activity is deemed to be a space activity and the State is responsible. OST *supra* note 28, Article VI; Marciacq I, *supra* note 90 at 7.
[94] Austrian Federal Law on the Authorisation of Space Activities and the Establishment of a National Space Registry (Austrian Outer Space Act, adopted by the National Council on 6 December 2011, entered into force on 28 December 2011) at §2.1., §3.
[95] *Ibid.* at 3.1.1.15. This is very similar to the role of the FAA in the US.
[96] Space Act of the Republic of Indonesia No. 21/2013 Part C.

improved competitiveness of the country, and provision of safety and security in space activities.[97] However, the law is silent on details.

Kazakhstan's law gives the government competence to define arrangements for the development and support of the Baikonur cosmodrome.[98] Chapter 4 of the national law deals with space infrastructure, which includes cosmodromes. Article 23 speaks of the Baikonur cosmodrome in particular and deems it a strategic object not subject to privatization. From this, it can be inferred that is possible that privatization of other cosmodromes would be permissible as the definition of cosmodrome is not limited to Baikonur. In addition, Article 25 allows utilization of facilities that are currently out of service, in accord with governmental procedures.

The Kazakhstan law propounds clear policy goals. Safety is assured in Article 27. International obligations are addressed in Articles 2 and 3, international cooperation in Article 8, and development of a national market of space services and expansion of space services in the world market. However, the law does not give specifics of what procedures the government would or could implement in the repurposing of out-of-use facilities nor what is entailed in the privatization of any of these cosmosdromes (other than Baikonur). There is a disconnect between the policy goals listed and the legal requirements. How do we get from one to the other?

The Republic of Korea does not require a site-specific license but in the section describing its basic plan for space development, the need for policies is listed first and the Article says that plans for expanding infrastructure should be included in the basic plan.[99]

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[97] Mardianis, LAPAN "The Indonesian Space Act NO. 21/2013" presented at 53rd Session UN COPUOS Legal Subcommittee, March 2014 Vienna, Austria.

[98] Law of the Republic of Kazakhstan on Space Activities, 6 January 2012 No. 528-IV at Chapter 2. Article 8. 8. Cosmodromes are defined in the law as "a complex of technical facilities, devices, buildings, constructions and land plots that is intended to provide preparation and implementation of space objects launches." Chapter 1, Article 1.1.

[99] Space Development Promotion Act, 31 May 2005, Article 5.

Russia includes cosmodromes and launching complexes and installations in the definition of space infrastructure found in Section IV, Article 18 of the Law on Space Activity. Ground and space infrastructure are "considered."[100] Ostensibly, this means regulated by the law, to the extent that they are used for ensuring or carrying out space activity, tying regulation of infrastructure back to the launch activity.

In Ukraine, the ground segment and infrastructure of space activities used for exploring and using outer space are included in the definition of space facilities.[101] The regulations include operating standards for these facilities, as well as their certification and registration.[102] Also regulated are the construction, operation, maintenance and repair of installations and ground infrastructure. Any space facility engaging or intending to engage in space activities either in, or under the jurisdiction of, Ukraine is required to be licensed and registered in Ukraine's State Register of Space Facilities and after this registration, Ukraine will not recognize any prior registration of the facility with another State.

US licenses must be issued for launch sites.[103] The license requires the same foundational reviews as other licenses for commercial spaceflight activities: policy, safety, and environment, although there is no financial responsibility requirement for maximum probable loss. The reasons for this will be discussed in more detail in the launch law section of this chapter and Chapter Four. The FAA is primarily concerned with regulation of the activities at sites (launches), but "believes that a launch site location analysis is necessary in order to

[100] No. 104 Statute on Licensing Space Operations.
[101] Ordinance of the Supreme Soviet of Ukraine, on Space Activity, Law of Ukraine of 15 November 1996, Article 1.
[102] *Ibid.* at Article 8, Article 12, 13.
[103] 14 CFR 420 *et seq*. contains the requirements for a launch site license. Reentry license requirements are found in 14 CFR 433.

determine whether a launch could safely take place from the location selected."[104] The US regulations are the most specific enacted law regarding spaceport licensing and operation.

Various factors are reviewed for the launch site location review, including its boundaries,[105] flight corridors,[106] and a risk analysis.[107] Information provided with the location review is, *inter alia,* comprised of maps, launch vehicles type/s and class/es, trajectory data, wind data for each month and percent wind data used in the analysis, populated areas located within flight corridors or impact dispersion areas, estimated casualty expectancy calculated for each populated area within a flight corridor or impact dispersion area, effective casualty areas used in the analysis, and information regarding the presence or absence of the general public from populated areas located within overflight exclusion zones as well as agreements to evacuate the public during a launch.[108] The risk analysis, also referred to as a quantitative risk assessment or QRA, is integral to the license and described in detail in the safety section of this chapter. The FAA's concern in evaluating the location site is to assess the safety of the launch point.[109] This is an evaluation of the geographic placement of the site with respect to the elements listed *supra* in this paragraph. However, the launch site operator (spaceport operator) bears *de minimus* responsibility for the safety of flight operations, including significant portions of the ground safety.[110] The launch operator bears these responsibilities, which are tied to that license; this is another reason that launch licensing is included in the instant chapter. While the US provides the most detailed methods of this distribution of responsibility in its spaceport licensing and

[104] 14 CFR Parts 401, 417, and 420 Licensing and Safety Requirements for Operation of a Launch Site, Rule at 62816. (19 October 2000).
[105] 14 C.F.R. § 420.21 (2012).
[106] 14 C.F.R. § 420.23(b) (2012) for guided sub-orbital ELVs, (c) for unguided sub-orbital ELVs, and (d) for RLVs.
[107] 14 C.F.R. § 420.25 (2012).
[108] 14 C.F.R. § 420.27 (2012). Agreements are with the US Coast Guard and the FAA and deal with Notices to Mariners and to Airmen.
[109] Federal Register Vol. 65, No. 203 at 62831 (19 October 2000).
[110] *Ibid*. at 62815.

launch/operator licensing, the logic of the rationale can be inferred to apply in other jurisdictions choosing to license only the activity.

Additional components of the spaceport operator's license require the licensee to develop and implement an accident plan containing procedures for the reporting, response to, and investigation of launch site accidents and to develop an explosive site plan.[111] The launch operator is required to maintain records until investigation of an accident or incident are completed.[112] The accident plan must pledge cooperation with federal officials and requires the signature of a person authorized to sign and certify the application. Currently, the National Transportation Safety Board (NTSB)[113] does not have explicit statutory jurisdiction over commercial space accidents.[114] It does, however, have signed Memoranda of Understanding with the FAA and the USAF regarding the investigation of launch accidents, allowing the agency to lead investigations of certain commercial space launch accidents.[115]

The explosive site plan deals with quantity-distance requirements providing minimum separation distances between explosive hazard facilities, surrounding facilities, and areas where the public may be. However, much of the handling of propellants falls within the launch operator's safety review. Again, the spaceport operator's concern is geographic or locational safety of the public; the launch operator's interest is the safety of the launch as it relates to the public. The explosive site plan was initially included in the application requirements but was

[111] 14 C.F.R. § 420.59 (2012; Fed Reg Vol 65 No 203 at 62818.
[112] 14 C.F.R. § 417.15 (2012).
[113] The NTSB is an independent federal agency tasked by Congress with investigating accidents involving aircraft, trains, ships, and highway vehicles in the US. Online: www.ntsb.gov (date accessed: 17 May 2012).
[114] GAO-11-629T report, *supra* note 72 at 20.
[115] Memorandum of Understanding Between the National Transportation Safety Board, Department of the Air Force, and Federal Aviation Administration Regarding Space Launch Accidents (2004). The investigation of Virgin Galactic's October 2014 crash in the Mojave Desert heralded the first instance that NTSB took the lead investigating a commercial space anomaly. Mike Wall, "NTSB Begins Investigation of Virgin Galactic Spaceship Crash", Space.com available at: http://www.space.com/27631-virgin-galactic-crash-investigation-begins.html (date accessed: 23 November 2014).

moved to the subpart of the rule that explains licensing responsibilities. This is because the spaceport operator has an ongoing duty to comply with the plan.[116]

Security issues are implicit in the US license to operate a spaceport. The FAA will only grant the license if it determines, after an interagency review,[117] that issuance will not jeopardize foreign policy or national security interests, implicitly involving ITAR considerations.[118] The licensee shall utilize security personnel and surveillance systems to prevent unauthorized access to the launch site or any areas of the spaceport deemed hazardous, such as explosive facilities.[119] From a safety perspective, this is different than the explosive site plan. The means of restricting access must be approved as part of the license. The FAA will advise applicants, in writing, of issues arising during review that would preclude granting the license.[120] The applicant can then respond in writing with more information or amend the license. It is for these reasons that the incremental application approach is more flexible and creates more transparent, open lines of communication between the FAA and the applicant.[121]

Tables 2.1 and 3.1 break out elements of spaceport and launch laws and shared policy values respectively. The former, presented *infra* this chapter, provides perspective on the current trends in spaceport law. While the US law goes into the most depth, the law here under discussion includes parallel values.

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[116] FR Vol 65 No 203 at 62818.
[117] The interagency review includes the FAA, The DoD, DoS, NASA, NOAA, and any other federal agencies that may be authorized to deal with national security, foreign policy, or international issues. 14 C.F.R. §420.15(a)(3) (2012).
[118] §420.17(7). For a thorough discussion of ITAR, see Michael C. Mineiro, *Space Technology Export Controls and International Cooperation in Outer Space* (hereinafter "Mineiro II") (Space Regulations Library: November 2011). ITAR is also implicated when vehicles with a US nexus are designed, fabricated, or operated outside of the US. For instance, a Virgin Galactic vehicle licensed to launch and reenter in the US at Spaceport America and also in Spaceport Dubai would go through ITAR scrutiny for all aspects of its operations, not just the portion transpiring in the US.
[119] 14 C.F.R.. §420.53 (2012).
[120] 14 C.F.R. §420.17(7)(b) (2012).
[121] 14 C.F.R. §420.15(a)(3) (2012).

The activities: domestic commercial launch law

While fewer countries actually address spaceports, launch sites, or facilities in their national law, more expressly set forth requirements for launching or space activities. Some of these laws are extra-territorial in nature; some are limited to activities taking place from the territory of the State. These laws are relevant to spaceports because they regulate activities taking place on site. The interrelationship between laws governing facilities and laws governing launch activities and operators is supported by the US delegation of operational responsibilities, described in the immediately preceding section of this chapter. Even in the US, where there is more detail to the spaceport regulations than anywhere else on the planet, the launch operator and launch licensee carries the responsibility for much of the operations at the launch site.

Launching from a spaceport implicates the State where it is located as a launching State, as well as any and all State parties that have an interest in the facility, regardless of the degree of State involvement in the operations of the spaceport.[122] Whether the State licenses the site or not, it is internationally responsible for all liabilities that flow from the launch.[123] Even though the facility can trigger responsibility, it is the launch that is of primary concern. The facility is determinative by the launch. In the US, only operations that take place after the vehicle arrives, that are temporally proximate, and that are connected to the launch, are considered launch activities. It may be sufficient that the activities themselves be properly authorized and controlled, not the spaceports. The hole in the US risk-sharing regime as per spaceports is tacit acknowledgment that spaceports are not the same as launches, operators, or even vehicles. They are a part of the launch chain only when certain elements are satisfied – the launch vehicle is present, ultrahazardous activities have commenced, and the activity is proximal in time to the

[122] Kai-Uwe Schrögl, "Is the legal concept of 'launching State' still adequate?" Proceedings of the Third ECSL Colloquium, Perugia, Italy 6-7 May 1999, ed. R.A. Harris (ESA SP-442, ESA/ESTEC:1999) at 327.
[123] Outer Space Treaty, *supra* note 28 Article VII.

launch. Even the issue of RLV versus ELV does not change this test. Launch activities at the spaceport are part of the risk-sharing scheme regardless. Non-launch spaceport operations are simply terrestrial activities. It is the activity that brings the spaceport into the space regime, not the facility.

The instant section concludes with a quantitative assessment of the launch laws available in the UN Office of Outer Space Affairs online repository of national space laws. A qualitative assessment of the laws described will be found in Chapter Three, as a component of the analysis for effectiveness of these regulations.

In Australia, the launch permit is granted only when the applicant holds a space license for the launch facility and the same type of vehicle, exhibits competency, satisfies statutory insurance and financial responsibility requirements, and demonstrates a satisfactory level of safety to the public.[124] The object to be launched may not contain a nuclear weapon or a weapon of mass destruction, nor can it contain fissionable material without prior written approval. Parameters for the return of launched space objects are detailed and sanctions for breaches, including imprisonment, are delineated.

The Australian law does not allow for a launch permit within Australia without a space license for the spaceport facility. Launch permits factor in the specified launch facility as well as the specific launch vehicle. Extra-territorial launches are permitted, but these require a certificate, instead of a permit. The two are similar in that they require insurance/financial requirements to be met, safety to the public, and, in addition, the certificate considers national security ramifications. Overseas launch certificates could involve agreements between Australia and other launching States managing the liabilities between them.

[124] Space Activities Act of 1998 Article 26 (3).

Brazil licenses territorial commercial launches.[125] The license is administered by the Brazilian Space Agency (AEB) and requires the licensee's commitment to protect technology transfer. The license will only be granted to legal persons or entities associated or affiliated with business or legal representation in Brazil who demonstrate technical and administrative competence to perform launching activities.[126]

Canada requires authorization to launch a rocket and will grant this only when it is in the public interest and not likely to affect aviation safety.[127] The requirement is framed in general terms with no other specifics.

China performs some commercial launches.[128] Chinese launch law encompasses territorial launches and those performed jointly abroad.[129] Licenses apply to launch projects that can be undertaken by natural or juridical persons or by organizations after an examination for qualifications. It is possible to incur criminal sanctions in connection with a launch project.

A number of European countries have promulgated space laws that include regulation of launch activities. Regardless of what the European Commission decides regarding suborbital flight activities, countries remain internationally responsible for the space activities of their nationals.[130] Launching is a space activity and this is true regardless of whether the launch is successful, or merely attempted.[131]

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[125] Administrative Edict n. 27 of June 20, 2001; Administrative Edict n.5 of February 21, 2002; Administrative Edict n.96 of November 30, 2011.
[126] As Brazil's law dealt with this one discrete issue which is far afield from the subject matter of the thesis and no others, it was not included in the table or the analysis.
[127] Canada Aviation Regulations 602.43 and 602.44.
[128] FAA AST "Commercial Space Transportation 2013 Year in Review" at 6.
[129] Interim Measures on the Administration of Permits for Civil Space Launch Projects of 21 December 2002.
[130] Precisely what a space activity entails continues to be a subject for discussion at the Legal Subcommittee, UN COPUOS. In March 2014, the Chair of the Working Group on Delimitation presented a draft proposal attempting to redirect the focus of delimitation from location and classification of vehicle, to a definition of "space activity". This issue will be discussed in Chapter Four.
[131] Liability Convention, Article 1(b), *supra* note 29. However, to be considered a launch such that the Liability Convention would be triggered in the event of damage, Gorove asserts that a degree of intentionality must be present. For instance, preparation is not sufficient. It must also involve perpetration or execution. Stephen Gorove.

Austria authorizes space activities, which include launch and operation or control of a space object. The same parameters exist as for authorization of launch facility operations. [132] Belgium authorizes launches with its space law. [133] These authorizations must align with international law and the principles in the Outer Space Treaty as well as Belgium's treaty obligations.[134] Authorizations place a premium on safety, environmental protection, optimal use of air space and outer space and protection of Belgium's national security and financial/economic interests.[135] The applicant must provide a minimum of information that is expressly listed in the law but the King may add to these on a case-by-case basis.[136]

The French Space Act requires authorization for either any operator launching from French territory or any French operator launching from territories of other States or not subject to any State's sovereignty or for any French national, natural or juridical, intending to procure a launch or command an object once launched.[137] Authorizations are granted based upon moral, financial, and professional guarantees and after determination of compliance with the law's technical requirements.[138] The technical requirements are in place to protect safety of persons, property, and the environment. National security interests are addressed. [139] Unauthorized launches can result in a fine.[140]

Toward a Clarification of the Term "Space Object" – An International Legal and Policy Imperative" 21 J. Sp. L. 11 (1993) at 19.

[132] Austrian Outer Space Act, §2.1, §3

[133] Law of 17 September 2005 on the Activities of a Launching, Flight Operation or Guidance of Space Object, Article 3.1(a). This law has been revised by the Law of 1 December 2013 (entered into force on the day of its publication in the Belgian Official Journal, on 15 January 2014), which clarifies the issue of control for small satellites, citing as responsible the entity that places into or beyond orbit, regardless of whether the launched object can be controlled.

[134] *Ibid.* Article 4.§1, §3, Article 5.§1

[135] *Ibid.* Article 5.§1

[136] *Ibid.* Article 5. §§1,2

[137] France LOI no 2008-518 du 3 juin 2008, Article 2.

[138] *Ibid.* article 4

[139] *Ibid.*

[140] *Ibid.* Chapter IV

The Netherlands licenses space activities, including launches.[141] The Space Activities Act applies to launches from within the Netherlands or on from Dutch ships or aircraft and for activities performed by Dutch natural or juridical persons in territory (or from ships or aircraft under the jurisdiction of) States that are not parties to the Outer Space Treaty.[142] Regulations can be connected to the license for non-governmental launches for the purposes of safety, protection of the outer space environment, establishing financial security, protection of public order, security of the State, and fulfillment of international obligations.[143] Further requirements may be imposed to ascertain appropriate knowledge and experience of the applicant.[144] Administrative penalties can be levied.[145]

Spanish law sets forth registry requirements for objects launched by or promoted by the Spanish State or from a Spanish facility (spaceport) but past the data needed to register, no other specifics are provided.[146]

In Sweden, the national space law requires a license for space activity carried on entirely in outer space as well as launching of objects to outer space.[147] Consistent with EASA's proposed rules and regulations, the Swedish National Space Board has ruled that operating suborbital commercial space vehicles is not "space activity" as contemplated by the Swedish Space Act.[148] Swedish civil aviation is governed by national legislation and EC regulations,

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[141] Rules Concerning Space Activities and the Establishment of a Registry of Space Objects (Space Activities Act) (2006)
[142] *Ibid.* at Section 2.
[143] *Ibid.* at Section 3.
[144] *Ibid.* at Section 4.
[145] *Ibid.* at §§ 21, 22.
[146] 6058 Royal Decree 278/1995 date 24 February 1995, establishing in the Kingdom of Spain of the Registry foreseen in the Convention adopted by the United Nations General Assembly on 2 November 1974 at Article 5.
[147] Swedish Act of Space Activities (1982:963).
[148] Mattias Abrahamsson, "Operating Commercial Space Tourism Vehicles from Sweden – Regulatory Challenges" Abstract, Paper ID: 8576, 61st Int'l Astronautical Congress 2010, Prague CZ September 2010; see also *The Swedish National Space Board's long-term strategy* available at: http://www.snsb.se/Global/Strategi%20i%20eng%20sammanfattning%2020101115_2.pdf (date accessed: 23 November 2014).

implemented by EASA. EU regulations are automatically binding to Sweden and take precedence over Swedish national law.[149] Although Sweden has its Aviation Act[150] and Aviation Ordinance,[151] in discussion of promulgation of regulations related to civil aviation safety, they bow before ICAO standards and any other international agreements entered into by Sweden.[152]

However, commercial orbital launches in Sweden are space activities governed by the Act on Space Activities and require a launch license; launch without a license results in either a fine or imprisonment up to a year.[153] Swedish natural or juridical persons must obtain a license if launching "anywhere else."[154] If the EC does not accept EASA's proposal, Swedish law will not regulate suborbital activities under this law. This is a lacuna.

In its Outer Space Act of 1986, the United Kingdom states the purpose of the law conferring launch licenses is to maintain compliance with international obligations.[155] Licenses are required for performing the launch or procuring the launch and apply to UK nationals and corporate entities.[156] Licenses are for launches in the UK or elsewhere.[157] Considerations when granting a license include public safety and national security.[158] Failure to comply can result in fines.[159]

Japan's national laws pertain to the activities of its space agency, JAXA, rather than commercial launches.[160] Nigeria enacted a law in 2010 that formed the National Space Research

[149] Final Safety Oversight Audit Report – Sweden, ICAO (August 2009) at 3.1.1.1
[150] Swedish Aviation Act (1957:297)
[151] Statute for the Swedish Civil Aviation Authority (2007:959).
[152] Sweden Audit, *supra* note 149 at 3.1.1.2-3.1.1.3
[153] Act on Space Activities (1982:963), §§ 1, 5
[154] *Ibid.* §2.
[155] Outer Space Act 1986 Chapter 38
[156] *Ibid.* at 1, 2
[157] *Ibid.*
[158] *Ibid.* at 4.
[159] *Ibid.* at 12.
[160] Basic Space Law (Law NO. 43, 2008 of 28 May 2008); The Law concerning Japan Aerospace Exploration Agency (Law NO. 161 of 13 December 2002).

and Development Agency, and established the National Space Council.[161] The Council, relying on the Agency's recommendations, grants licenses for "space data related matters" and satellite data, presumably encompassing the launch of assets.[162] However, the language is vague and does not address launch activity *per se*. Norway forbids unauthorized launch into outer space from Norwegian territory, vessels, and aircraft as well as launches by Norwegian citizens or residents from areas not subject to any State's sovereignty, creating an inference that launch can and must be authorized.[163]

Russia licenses space operations but does not include the actual site in the definition.[164] As noted in the preceding subsection, Russia requires regulation of infrastructure only to the extent that it relates back to the space activity.[165] On the other hand, launch is included in the definition.[166] Roscosmos issues the license,[167] which is required for activities of natural and juridical citizens of the Russian Federation and those of foreign nationals and organizations when their activities fall under its jurisdiction. Performance of space activities without a license or in willful violation of the terms of the license is punishable in accord with Russian legislation.[168]

All licenses require documents confirming the activities' safety and the reliability of the equipment. [169] Safety of space activities is delegated to the Russian Space Agency (Roscosmos)

[161] National Space Research and Development Agency Act, 2010.
[162] I*bid*., Part III, Article 8.
[163] No. 38, 13 June 1969, Act on Launching Objects from Norwegian Territory into Outer Space.
[164] Included in the definition are the making (encompassing production and testing) of space-rocket complexes and their component parts, storage, readying for launch, launching and utilizing space vehicles, and also the control of space missions. Russian statute, *supra* note 100 at 3.
[165] See text accompanying note 100.
[166] Russian statute, *supra* note 100 at 3.
[167] Regulations of the Russian Space Agency of 15 May 1995 at 3.
[168] Russian statute, *supra* note 100 at 33.
[169] *Ibid.* at 5(h) and 6(b).

and the Ministry of Defense, the appropriate state services, and organizations and citizens actually performing the activities.

South Korean launches require a permit if launched from a South Korean area or facility or when a South Korean citizen (or the government) launches a South Korean launch vehicle elsewhere.[170] The factors under consideration by the granting Ministry (Science and Technology) include the use and purpose of the launcher, safety management, financial responsibility and liability insurance, and other items relating to the launch vehicle and launch preparation. The Act includes policy directives, both direct and inferred. *Inter alia*, Article 18 specifically says that the Minister shall adopt policies to promote private space development activities.

In addition to its regulation of the ground infrastructure and facilities associated with space activities, the Ukraine also regulates space activities, which include use of outer space and organization and execution of space launches and flights, through issuance of a license.[171] The State ensures the safety of the space activity through its supervision of compliance with safety requirements, and appropriate training and certification of individuals responsible for monitoring that compliance.[172]

Launch law in the US is codified in the Commercial Space Launch Act of 1984 and its progeny, [173] as well as the implementing regulations found in 14 CFR 400 *et seq*.[174] US launches must be licensed by the Office of Commercial Space Transportation (AST) in the FAA under the Commercial Space Launch Act of 1984 as amended.

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[170] Korean Act, *supra* note 99 at Article 11.
[171] Ukraine Space Law, *supra* note 101 at Article 1, 8.
[172] *Ibid*. at Article 20.
[173] Commercial Space Launch Act, Pub. L. No. 98-575, 98 Stat. 3055 (1984) (codified at 49 U.S.C. §§ 2601-2623 (1984)).
[174] 14 CFR §§ 400 *et seq*.

A launch or reentry-specific license authorizes the holder to conduct one or more launches or reentries with the same operational parameters of one type of vehicle operating at one launch/reentry site. Regulation of the launch vehicle occurs here. The license lists either the name or the mission of each activity authorized by the license. Once those named launches/reentries are performed, the license terminates. Otherwise, the license terminates upon the expiry date. Launch specific licenses are granted for expendable launch vehicles (ELVs) and for reusable launch vehicles (RLVs), regardless of whether orbital or suborbital.[175]

Like the spaceport license, the launch licensing process involves reviews for policy (national security, foreign policy, ITAR, international obligations), safety, environmental impact, and continued compliance post-licensing, but also requires reviews of payload, and financial responsibility. Launch operator licenses differ from the launch/reentry specific license in that the operator license will allow an operator to perform multiple launches or reentries of the same type within a given time frame, not merely the missions named in the license. Timeframes are two to five years from issuance.

Launch law is intrinsic to spaceport regulation in the US, not only because launches are the activities conducted at the sites, but also since the spaceport's inclusion in the US risk-sharing scheme is coextensive with the launch and licensed activities. In addition, this carve-out has implications for jurisdictions without specific spaceport regulations. As a result, it is essential to determine precisely what comprises the launch in the US. This is instructive in establishing whether the regulatory status quo is effective and even to what extent it is necessary. The definition is nuanced and codified in 14 CFR 401.5:

> Launch means to place or try to place a launch vehicle or reentry vehicle and any payload from Earth in a suborbital trajectory, in Earth orbit in outer space, or otherwise in outer space, and includes preparing a launch vehicle for flight at a launch site in the United

[175] 14 C.F.R. § 413.

States. Launch includes the flight of a launch vehicle and **includes pre- and post-flight ground operations** as follows:

(1) Beginning of launch.

(i) Under a **license**, launch **begins with the arrival of a launch vehicle or payload** at a U.S. launch site.[176]

(ii) Under a **permit**, launch **begins when** any pre-flight ground operation at a U.S. launch site meets all of the following criteria:

(A) Is **closely proximate in time** to flight,

(B) Entails **critical steps preparatory to initiating flight**,

(C) Is **unique to space launch**, and

(D) Is **inherently so hazardous** as to warrant the FAA's regulatory oversight.

(2) End of launch.

(i) For launch of an orbital expendable launch vehicle **(ELV)**, launch **ends after the licensee's last exercise of control** over its launch vehicle.

(ii) For launch of an orbital reusable launch vehicle **(RLV) with a payload, launch ends after deployment of the payload**. For any **other orbital RLV**, **launch ends upon completion of the first sustained, steady-state orbit** of an RLV at its intended location.

(iii) For a **suborbital ELV or RLV** launch, launch **ends after reaching apogee** if the flight includes a reentry, **or** otherwise after **vehicle landing or impact on Earth, and after activities necessary to return the vehicle to a safe condition on the ground**. (emphasis added)[177]

Close reading of the Final Rule gives insight into the rationale behind this definition of a launch, and as a result, which activities come under the bailiwick of the US risk-sharing scheme.[178] Prior to the Final Rule, the FAA released a notice of proposed rulemaking (NPRM) in which it proposed to narrow its definition of "launch" from the broad "gate to gate", which was then in application, to a narrower "vehicle at the gate".[179] "Gate to gate" licensing resulted in all activities taking place at the launch site, which, at the time of the rulemaking, were federal

[176] This begs the question of how to determine the commencement of the launch if the vehicle is manufactured on site and not launched under a permit but under a license.

[177] 14 CFR § 401.5. It is interesting to note the difference in how launch is defined for licensees as opposed to permittees. The elements described in (1)(ii) more clearly illustrate the rationale behind the definition. However, even though the licensee definition is less detailed, it is inclusive of these elements. For instance, a licensed launch vehicle and/or payload would likely be traveling from another location, hence arriving soon before the hazardous critical steps were to be performed, while the permitted launches often take place at a launch location where an experimental technology is under development (Mojave, for instance). Hence, the need to isolate out the proper elements that set the launch activity apart from the design and development activity.

[178] Final Rule 14 C.F.R. Parts 401, 411, 413, 415 and 417 (Docket No. 28851) RIN 2120-AF99.

[179] *Ibid.*

launch ranges, be they NASA or DoD. This meant that all commercial launch related activities by a launch operator operating within the gates, or most ground operations, were covered. The launch vehicle did not have to be present. The notes to the Rule discuss the argument that pre-launch licensing authority, or authority to license and include in the risk-sharing regime those activities in preparation of a launch, arose from the CSLA's directive to license launch sites. At the time this definition was put into the Rule, the FAA took the opinion that "a person requires a license to operate a launch site only if offering the site to customers for their launch. Otherwise, activities related to preparation for flight are part of a launch license rather than a license to operate a launch site."[180]

There was concern that the broad approach was luring the launch industry into a false sense of security that indemnification was in place when, in fact, it might not be. The second tier states that indemnification is subject to appropriations by Congress. Funds may or may not be forthcoming. The FAA felt that the more prudent approach was to clean up the definition of "launch" and, by so doing, narrow the issue of what was actually included in the provisional indemnification. As a result, the definition of "launch" would not include all pre-flight activities by a launch operator at a launch site because not all activities are part of the actual launch and may have nothing to do with the launch vehicle that is to be launched. For instance, construction activities could be taking place but they would not be included in eligible activities.

Instead, the new definition of "launch" would be "vehicle at the gate" and while not as broad as the previous characterization, would still authorize the FAA to license preparatory activities that may be considered part of the launch based upon the statutory definition of launch found in 49 USC 70102(3)(c):[181] "otherwise in outer space, including activities involved in the

[180] *Ibid.* at 16.
[181] After disposition, this definition can now be found at 51 USC § 50902(4).

preparation of a launch vehicle or payload for launch, when those activities take place at a launch site in the United States."[182] Based upon this definition, and upon the rationale that it is charged by statute with protection of the public, the FAA defined the commencement of a launch as "the moment at which hazardous activities related to the assembly and ultimate flight of the launch vehicle begin."[183]

The FAA sought clarity in order to simplify administration of the Rule. As a result, it avoided an activities test, which would analyze different activities for potential hazard and that held the undesired potential for multiple tests related to a single event, in favor of a single test – the vehicle's arrival. Because the arrival of the launch vehicle signaled the onset of hazardous activities that could or would put the public at risk, this became the test. The FAA should ensure safe launch practices and financial responsibility for ensuing damage from the point at which activities become so hazardous as to pose a threat to third parties.[184] This point was figured to be shortly after the vehicle components were to arrive at the launch site, regardless of whether it was a federal range and regardless of whether the launch was to occur from there.[185] Furthermore, the FAA relied upon the 1998 statutory definition, whereby launch was defined by entry of the launch vehicle onto a launch site in the US, a geographic element.

Lastly, the Rule's new definition included a time element with regard to permits, to wit, the ground operation must be closely proximate in time to flight.[186] This means that fueling for flight is considered a component of launch under the Act and the Rule and that fuel storage or

[182] 49 USC § 70102 has been disposed to 51 USC § 50902.
[183] Final Rule, *supra* note 178 at 12.
[184] Hazardous activities included in the launch license include, without limitation to, fuel tank wet testing ordnance installation, spin balancing and the stacking of motors.
[185] During the public meetings that resulted from the NPRM (notice of proposed rulemaking), the definition was expanded to include ground operations of launch operators at commercial launch sites NOT on a federal launch range.
[186] 14 CFR § 401.5(1)(ii)(A) (2012).

component storage for extended periods of time is not. Only activities that are part of the launch, and space-related, are included in the permit or the launch license.

The following table reveals some interesting trends. Removing jurisdictions that performed all launches by the government (China, Japan, Kazakhstan) as well as Canada, who was completely silent on all but two issues (one for this table – safety - and one for the table found in Chapter Three – integration with airspace), the balance of States were analyzed for relationships between site and launch licenses, whether operators were licensed as part of the launch or if they required a separate license in addition to the launch license, and, lastly, to discover if a separate licensing scheme existed for the vehicles.

Of the fourteen remaining States examined, seven (50%) addressed site regulation in their national space laws. Of those seven, two (29%) completely connect launch licensing to site licensing, while three (43%) do so in limited fashion. Also utilizing the breakout of States performing government launches from those allowing private activities, 77% license the vehicle as part of the launch and 69% license the operator with the launch.

The balance of elements analyzed showed that safety was the most common value (71%), followed by operator financial responsibility (65%), with the same level of incidence for extra-territoriality (53%), operator competence (53%), and availability of sanctions for violations (53%).

The following subsection examines issues surrounding the vehicles, as these are subsumed by the launch license. The subsequent section will address safety, as the most shared value.

State	Site licensing	Site license tied to launch license	Vehicle licensed as part of launch	Operator licensed as part of launch	Extra-territoriality	Safety is a driver	Operator competence a driver	Operator financial responsibility a driver	Sanctions levied
Australia	Y	Y	Y	Y	Y	Y	Y	Y	Y
Austria	Y	Y	Y	Y		Y	Y	Y	Y
Belgium			Y	Y	Y	Y	Y	Y	Y
Canada*						Y			
China**		Gov't	Gov't	Gov't	Y		Y		Y
France			Y	Y	Y	Y	Y	Y	Y
Indonesia	Y					Y			
Japan		Gov't	Gov't	Gov't					
Kazakhstan	Y	Gov't	Gov't	Gov't					
Netherlands			Y	Y		Y	Y	Y	Y
Nigeria			Y	Y					
Norway			Y	Y	Y				
Russia	Y	Limited	Y		implied	Y		Y	
South Korea			Y	Y	Y	Y		Y	Y
Sweden			Y		Y				Y
Ukraine	Y	Limited				Y	Y	Y	
United Kingdom			Y		Y	Y	Y	Y	Y
United States	Y	Limited	Y	Y	Y	Y	Y	Y	Y

Table 2.1 Showing Relationship Between Site License and Launch License by Jurisdiction w Key Elements

The subject of the activity: Vehicles

The launch activity is the nexus between the facility and the vehicle/object because this activity is the subject of spaceport operations. It is the *raison d'etre* of the launch facility. The preceding table makes it apparent that States provide oversight of both launches and space transportation vehicles through their domestic launch-licensing regimes. From the days of the earliest space activities, actual definition of those vehicles has been problematic. The treaties offer only a partial definition of a space object, and one containing a circular reference, at that.[187] "The term 'space object' includes component parts of a space object as well as its launch vehicle and parts thereof."[188]

The implications have been discussed in a number of contexts, primarily, the linkage between the space object and international rights and obligations as regards issues of jurisdiction and control and registration, as well as liability flowing from a launching State's space debris.[189] Space objects that go into Earth's orbit or beyond must be registered.[190] But what does this really mean? As noted by von der Dunk, the issue of what objects or vehicles fall within the purview of the Registration Convention goes beyond discussion of suborbital as opposed to orbital flights, activities, and vehicles. "Operators and governments – those licensing the flights as well as others potentially impacted thereby – need to know to what extent the Registration Convention applies to them *de jure*, what the results are in terms of jurisdiction, who is responsible and/or

[187] Frans von der Dunk, "? Beyond Earth Orbit?...! The Applicability of the Registration Convention to Private Commercial Manned Sub-Orbital Spaceflight" (hereinafter "von der Dunk II") 43 Cal. W, Int'l L.J. 269 (2012-2013) at 298.
[188] Liability Convention, *supra* note 29 at Article I (d); Registration Convention, *supra* note 30 at Article I (b).
[189] von der Dunk II, *supra* note 187; Jerzy Sztucki "Some Aspects of the Legal Status of Space Objects" 1 Polish Y.B. Int'l L. 149, at 157 (1966-67); Gorove *supra* note 131 at 13.
[190] Registration Convention, *supra* note 30 Article II(1).

liable, and if applicable, how such results would have to be addressed specifically in the context of vehicles to be used for dozens, if not hundreds, of individual flights."[191]

Quite simply, the number of different types of vehicles currently in design and testing, as well as those contemplated, looks less and less traditional. Some vehicles are hybrid; the US Shuttle is a good example.[192] It launched like a rocket and re-entered like a glider. Some travel to outer space, albeit briefly, and do not achieve orbit ; some launch from an aircraft or a balloon. Virgin Galactic is close to flying customers on its two-part air-launch vehicle. While commentators have noted the confusing impact that space tourism vehicles may have on the historical dichotomy between aircraft and space objects,[193] the dilemma is more far-reaching because, ultimately, these vehicles can be used for more than touristic joy rides.[194]

Issues include that of which liability regime would apply to a damaging event. Could the private rights found in the air law regime control? Or will the State-to-State system outlined in the Outer Space Treaty and the Liability Convention govern? How is the spaceport operator affected if the vehicle is deemed an aircraft, a space object, an aerospace object, or something not-yet envisaged? And, certainly not the least, how best to coordinate air and space traffic?

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[191] von der Dunk II, *supra* note 187 at 326.
[192] In fact, a number of States refer to the US Shuttle in their responses to the questionnaire, and from the timing, 1996, it is not a huge leap to realize that the continued use of the shuttle from 1982 – 2011 was most likely an instigator.
[193] Yanal Abul Failat "Space Tourism: A Synopsis on its Legal Challenges" Vol. Irish L. J. at 120 (2012);.von der Dunk II, *supra* note 187.
[194] Norul Ridzuan Zakaria, et al "The Design and Operation of Suborbital Low Cost and Low Risk Vehicle to the Edge of Space (SOLVES)" Proc. Sixth IAASS Conference – Safety is Not an Option, Montreal Canada 21-23 May 2013 (ESA SP-715, September 2013), describing a suborbital vehicle, propelled by rockets, contemplated to launch small satellites as well providing zero gravity flight, and ultimately, point-to-point flight.

The idea of space object/aerospace object/aircraft is also related to the delimitation issue: where airspace ends and outer space begins. However, delimitation may be an issue that defies resolution because it was possibly obsolete from inception. Trying to mark the boundary between air and space, or one regime and another, is a somewhat artificial construct. Certainly, Felix Baumgartner's feat, jumping from 39 km[195] in a spacesuit, pushes the boundaries of traditional activity at altitude.[196] Likewise, in 2013 the US FAA issued an advisory letter declaring that World View, a high-altitude balloon operator, required a license for its activities from the Office of Commercial Space Transportation, despite the fact it would operate in the Earth's atmosphere. Since the days of the Ad Hoc Committee and in the beginning of UN COPUOS, States have voiced appreciation for the role that technology plays in space related law-making. Attempts to tie regulation to things that will continue to change, like vehicle design or a geographic location, will ultimately be frustrated by progress and innovation.

In 1996, the Legal Subcommittee of UN COPUOS began addressing the increasingly complex issue of how best to deal with vehicles/objects that are not easily categorized. The Working Group on agenda item 4, matters relating to the definition and delimitation of outer space, formulated a questionnaire regarding issues pertaining to aerospace objects, in efforts to poll States members on their perspectives.[197] In fact, Finland characterized the questionnaire as "the last thread in the debates on the delimitation of outer space."[198]

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[195] 24 miles.
[196] "Mission to the Edge of Space" available online: http://www.redbullstratos.com (date accessed: 14 July 2014).
[197] Questionnaire on Possible Legal Issues with Regard to Aerospace Objects: Replies from Member States, Introduction A/AC.105.635 (15 February 1996).
[198] Explanatory memorandum to Finland's reply: study of the questionnaire on possible legal issues with regard to aerospace objects, AAC.105/635.Add.11 (January 2005) at 15.

It originated with nine questions ranging from defining the vehicles that defy easy classification, to which regime is applicable to the flight of these vehicles. A tenth question, asking for the differences between the air law regime and the space law regime was added later. Is the regime in control dependent upon the location at a given point in time? Or does it depend upon the purpose of the mission – space exploration versus transportation? And, if the mission is transportation, does Earth-to-Earth transportation differ from Earth to a location in outer space and back to Earth?

These questions are pertinent to discussion of spaceports because there is, at least in some of the jurisdictions listed in the preceding table, a trend that States often authorize or license the launch rather than the site and always regulate the vehicle/objects as part of that launch. This is the traditional method that States have utilized in authorizing space activities since the 1960s.

Close reading of the State Members' responses to the questionnaire illustrates the near-frustration inherent in trying to classify vehicles in one taxonomy or another and the challenge in attempting to carve out a new niche – aerospace object. The definition proposed by the Working Group is "an object which is capable both of traveling through outer space and of using its aerodynamic properties to remain in airspace for a certain period of time."[199] However, a number of States attempted improvements to this definition. One suggested that moving or traveling through airspace was more fitting than remaining in airspace.[200] Another asked that the word "object" be replaced with "vehicle" so as to not to be conflated with naturally occurring objects.[201] One State noted that a definition should distinguish the element of human control since this was a key difference

[199] Questionnaire, *supra* note 197 at 3.
[200] Argentina's response to Question 1, A/AC.105/635/Add.4 at 4 (April 1997).
[201] Finland response, *supra* note 198 at 19.

between traditional aircraft and the idea of aerospace craft – the capability to control the latter for altitude, direction, and speed despite location.[202] Including the element of human control would also exclude natural objects or debris.

The Working Group compiled its first comprehensive analysis of the first fourteen State responses in 1997. Several analyses were performed for subsequent responses as they were submitted. While more variations of the positions were presented, the essential views expressed were relatively consistent with those first compiled. Common elements described in responses included the ability to fly in airspace, travel in outer space, perform a space activity or mission, and design characteristics that would permit a landing on Earth after re-entry that was similar to an airplane landing.[203]

Which regime would control a vehicle's activities could hinge upon its location at a given time.[204] Or, it could be determined by intentionality: the ultimate destination of an object, which is related to its purpose or mission.[205] Another form of intentionality could be found in the function/purpose of design of a vehicle and could dictate the regime governing.[206] Respect for the constraints placed upon travel or flight through airspace, regardless of whether the vehicle was deemed an aerospace or space object, was voiced by a number of delegations.[207] States noted that there was an ongoing need to link a

[202] The Netherland's response to Question 1, A/AC.105/635/Add.8 (February 2003) at 3.
[203] Comprehensive analysis of the replies to the questionnaire on possible legal issues with regard to aerospace objects A/AC.105/C.2/L.204 (18 February 1997) at 4.
[204] Analytical summary of the replies to the questionnaire on possible legal issues with regard to aerospace objects A/AC.105.C.2/L.249 (January 2004) at 4-5.
[205] A/AC.105/635/Add. 3 at 5 (Greece); A/AC.105/635/Add.13 at 4 (Nigeria); Questionnaire, *supra* note 198 at 3 (Czech Republic); A/AC.105/635/Add.9 at 4 (Slovakia).
[206] Analytical summary, *supra* note 204 at 6.
[207] A/AC.105/635/Add.3 at 5 (Greece, Turkey); A/AC.105/635 at 8 (Italy).

definition with developing technology, so much so that any legal definition would necessarily require some input from the Science and Technical Subcommittee.[208]

On one hand, this detailed discussion of the vehicle seems a step removed from analysis of the spaceport regulation. However, because a number of jurisdictions choose to authorize and control only the launches, not the facilities, and because virtually all jurisdictions exert authority over vehicles through that very same launch license process, the vehicle and the spaceport are related, to a degree.

The issue arises in the context of the Registration Convention because it prescribes mandatory registration of space objects, as noted previously.[209] Complications are probable because some domestic law includes suborbital and/or aerospace vehicles in their space law regime, while other national law does not (US does, Sweden does not). Aircraft are certified in accord with domestic law and in compliance with the Chicago Convention and Annexes. Suborbital vehicles, not going to orbit or beyond, fall to a grey area as far as registration or certification.[210]

However, past the obvious questions regarding the need for registration, what impact does the lack of resolution on the orbital/suborbital vehicle issue have on spaceports themselves? Frankly, the idea that classification will provide any meaningful relief in perpetuity is naïve. Similarly, the delimitation issue continues to baffle scholars and diplomats in the Legal Subcommittee. The Chair of the Working Group on the Definition and Delimitation of Outer Space presented a draft proposal at the LSC meeting

[208] Comprehensive analysis, *supra* note 203 at 4; see also Russian Federation response to Question 1, A/AC.105/635/Add.1 (March 1996) at 3. The idea that provision need be made for technological developments is fundamental to discussions regarding space law, from the days of the Ad Hoc committee to the present.
[209] Registration Convention, *supra* note 30.
[210] Tanja Masson-Zwaan & Steven Freeland, "Between heaven and earth: The legal challenges of human space travel" Acta Astonautica 66 (2010) 1597-1607, at 1602

in March 2014. The proposal suggests refocusing the work from defining and delimiting outer space from a geographic perspective to, instead, considering the definition of space activities.[211]

The US advisory group to the AST, COMSTAC, provided a good break out of the four types of spaceports that are currently being licensed in the US.[212] The taxonomy hinges upon the vehicles the spaceports service: 1) traditional range, launching from a fixed point vertical takeoff expendable launch vehicles (either suborbital or orbital);[213] 2) hybrid range/aerospaceport, mixed-use supporting vertically launched (ELV and RLV) and/or horizontally launched vehicles;[214] 3) aerospaceport (onsite ignition), supporting horizontal RLV launch vehicles that ignite rockets and begin suborbital profile from the spaceport property and that are either located at, or contemplate close resemblance to, airports;[215] and 4) aerospaceport (offsite ignition), supporting horizontal RLV launch vehicles that ignite somewhere other than on site at the spaceport, also resembling airports.[216] In its report, the Working Group found that the current US regulations are most relevant to the traditional range type of spaceport and range from moderately relevant to not at all relevant for the other three. Again, the vehicles determine a great deal about the scope and purpose of the regulations in place at the launch site.

For the spaceport, in many places supervised under a jurisdiction's licensing via the launch license, perhaps an appropriate role is that of a coordinator of launch services, an operations-driven approach. The specifics of the vehicles are the concern of the

[211] Draft Proposal of the Chair of the Working Group on the Definition and Delimitation of Outer Space, ¶ 6, informally distributed at UN COPUOS Legal Subcommittee Meeting, March 2014.
[212] Commercial Spaceport Licensing Review and Recommendations White Paper, COMSTAC 10 October 2012 at 8.
[213] SLC-36 and SLC-46 at Cape Canaveral, Florida.
[214] Mojave Air and Space Port in California and Spaceport America in New Mexico.
[215] Midland, Texas.
[216] Cecil Field, Florida.

operators, as long as certain minimum requirements are in compliance with those imposed by its governing authority. For example, at a bus terminal, buses of many manufacturers, with different sizes and types of engines, are able to utilize the facility. The vehicle is not the issue. Maintaining an approved facility from which buses can arrive and depart and be maintained is. Buses can cross borders or travel within them. The destinations may impose different limitations, but the terminal's operations differ from those that fall to the purveyors of the driving activity. This analogy is shored up by the treatment of flight safety operations and spaceport safety operations by the FAA in licensing spaceport operators and launch operators in the US.

Much of the scholarship to date does not deal specifically with spaceports and when it does, it has focused upon suborbital spaceports and what the suborbital vehicle is and which regime should govern.[217] The issue is present in the dichotomy between how suborbital transportation is handled in the US (Chapter Four) and proposed for Europe (Chapter Five). The implications of whether a vehicle is aircraft, spacecraft, or some new class of craft, such as aerospace, have a broad enough reach to influence how spaceports are currently regulated. However, this is shortsighted. It might be more practical to take the view that suborbital travel and orbital travel represent different modalities, much like rail and motor and marine and aviation represent different modes of transport. A systemic approach could be better aligned with policy goals for spaceport infrastructure, an idea to be developed in the next chapter.

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[217] A number of the articles cited in this thesis support the statement made. *C.f.* Charles Larsen, "Development of Guide to Commercial Space Transportation Reusable Launch Vehicle Operations & Maintenance" Space 2005 AIAA 2005-6795; Véronique Ziliotto, "Relevance of the futron/zogby survey conclusions to the current space tourism industry" Acta Astronautica 66 (2010), 1547-1552; Michael Mineiro, "An Intersection of Air & Space Law: Licensing and Regulating Suborbital Commercial Human Space Flight Operations" (hereinafter "Mineiro III") (January 2010) ABA Air & Space Lawyer, Vol. 22 No 4.

Safety considerations and requirements

Safety is one of the regulatory goals identified for spaceport regulation in the table *supra* and an intrinsic component of most authorizing processes.[218] Safety is a component of facility licenses as well as launch licenses. Although there is no specific treaty mandate regarding safety, the Liability Convention implicates, by necessity, safe activities of a launching State. The launching State is responsible in perpetuity for damage from its space object.[219] Similarly, both Article VIII of the OST, along with the Registration Convention itself, have been viewed as implicit legal links to assigning responsibility for safe space activities.[220] The Outer Space Treaty Article VI provides a legal basis for a safety requirement by putting the onus on the State granting the spaceport license to authorize, or endorse the activities from the facility, and then to continually monitor and supervise.[221]

International obligations to conduct space activities safely are implicit in Article IX of the Outer Space Treaty.[222] These activities certainly include launch and reentry. Article IX of the Outer Space Treaty requires avoidance of harmful interference with activities in the peaceful use and exploration of outer space.[223] This obligates States to ensure that the spaceport operators perform operations from their facilities safely, at least with sufficient due diligence expended to reasonably avoid actions that will have adverse

[218] Other than the listed jurisdictions that dealt with government-only activities, all others in the table included safety as a driver of regulation.
[219] Once again, the use of the term "space object" reveals the problems inherent in this statement. Liability Convention, *supra* note 29 at Article I.
[220] Jakhu & Nyampong, *supra* note 36 at 2.
[221] "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." Outer Space Treaty, *supra* note 28 at Article VI.
[222] Article IX directs States Parties to conduct their space activities with due regard to the corresponding interests of all others, to avoid harmful contamination of the Moon and other celestial bodies and adverse changes to Earth's environment, and a duty to consult if there is some indication of harmful interference with activities of other parties. Outer Space Treaty, *supra* note 28 at Article IX.
[223] *Ibid.*.

effect on the activities of other State parties.[224] The safety component of a US spaceport license fulfills the international obligations found in Article IX of the Outer Space Treaty, as does that found in the other national laws, launch and launch site, that are described in this chapter.[225]

The first set of principles and guidelines pertinent to space that set forth an express safety obligation is the 1992 *Principles Relevant to the Use of Nuclear Power Sources in Outer Space.*[226] The Preamble recognizes that thorough safety assessment, including probabilistic risk analysis, is the necessary basis for reducing risk to the public from the use of nuclear power sources. Principle 3 delineates guidelines and criteria for safe use while Principle 4 describes the general elements of safety assessment and obligates launching states to make public the results of the safety assessment prior to launch as per Article XI of the OST. Safety assessment and risk analysis continue to play the most crucial role in all aspects of safe space activities. Spaceports are responsible for the safety assessment, as the facility from which the nuclear power source would be launched, along with others falling within the definition of launching State.[227] The safety assessment is to cover all "relevant phases of the mission" including launching.[228]

Other than the countries that showed only government action in space, each of the domestic laws analyzed for this study and the immediate chapter included safety as a key

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[224] For a wonderful analysis of the obligations found in Article IX, see Michael C. Mineiro, "FY-1C and USA-193 ASAT Intercepts: An Assessment of Legal Obligations Under Article IX of the Outer Space Treaty" (hereinafter "Mineiro IV") (2008) 34 J. Space L. 321, 332-40.
[225] 14 C.F.R. §§ 420 *et seq*; J. Randall (hereinafter "Repcheck I"), "Safety and Promotion in the Federal Aviation Administration – Enabling Safe and Successful Commercial Space Transportation" Proceedings Fourth IAASS Conference Huntsville AL May 2010.
[226] *Principles Relevant to the Use of Nuclear Power Sources in Outer Space* (UN General Assembly resolution 47/68 of 14 December 1992).
[227] *Ibid.* Principle 4(1).
[228] *Ibid.*

element of their space law. That said, safety is assessed using different methodology and standards in different jurisdictions.[229]

The European Basic Regulation includes aerodromes in the European aviation safety regulatory system and assigns EASA to develop Implementing Rules (IRs) to ensure safety. [230] European aerodrome spaceport specifications provide for a predetermined level of safety with a local component, based upon the specifics of a particular location and in concert with the requirements of Article 8a of (EC) No. 1108/2009.[231] As regards the safety component of certifying suborbital craft, European experts propose to calculate safety metrics for second parties as well as third parties using an EC of $1x10^{-4}$ for the loss of vehicle and/or all those on board.[232] This metric is the point at which the US system and the European proposal diverge on the safety issue.

Safety assessments are a big part of the US site location review, and also necessary to obtain either a launch or launch operator license or an experimental permit. "To gain approval for a launch site location, an applicant shall demonstrate that for each launch point proposed for the launch site, at least one type of expendable or reusable

[229] To date, the US system currently in use and the EASA proposal under consideration are the most developed sets of regulations applicable to spaceport operators. For this reason, these two systems will be explored and compared in greater detail in subsequent chapters. However, for the purposes of this chapter, it is sufficient to note that there is a disparity in the metric used in relation to safety assessments.
[230] EASA NPA 2011-20(A) *Authority, Organisation and Operations Requirements for Aerodromes* at 5.
[231] Marciacq, *supra* note 90 at 16.
[232] « The operational constraints are much more severe (e.g. : differential pressures, kinetic heating) and SoAs would be much more complex than a single piston engine CS-23 aircraft, therefore it is the opinion of the authors and consulted experts that the SoA overall safety target should be better than 10^{-4}, as mentioned in AC23.1309-ID for reference as the rate of catastrophic event for General Aviation aircraft below 6.000 lbs (<2,7t) operating in IMC. » Marciacq, *supra* note 90 at 8; *c.f.* FAA AC23.1309-ID ; International Association for the Advancement of Space Safety, Independent Space Safety Board, *Space Safety Standard for Commercial Human-Rated Systems*, March 2010.

launch vehicle can be flown from the launch point safely."[233] The US Congress, through the CSLA, directs the Office of Commercial Space Transportation (AST) to regulate private sector launches, reentries, and related services (this includes spaceport operations) "only to the extent necessary…to ensure compliance with the international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States."[234]

It is only when the AST finds that these safety interests are properly protected that the license is issued. Hence, the requirements to receive a license include meeting the AST's parameters of acceptable or tolerable risk.[235] Safety assessment is part of the licensing process.[236] FAA AST oversight is imposed in the form of quantitative risk analyses regarding Expected Casualty rates to third parties.[237] The FAA makes safety

[233] 14 CFR § 420.19 (2012). Some commercial spaceports expect to launch both RLV and ELVs and some government facilities already do. 14 CFR §§ 400 *et seq*. pertains to ELVs and 14 CFR 431 *et seq*. to RLVS; while 420 CFR §§ 420 *et seq*. applies to the sites that launch both. It categorizes launch vehicles into orbital expendable launch vehicles, guided sub-orbital expendable launch vehicles, unguided sub-orbital expendable launch vehicles, and reusable launch vehicles and goes on to further classify orbital ELVs by weight class, based on the weight of the payload the launch vehicle can place in a 100-nm orbit, as defined in Table 1 of § 420.19.

[234] 51 U.S.C. § 50901(a)(7) (2012).

[235] Paul Wilde correctly asserts that serious injury and/or death are not acceptable outcomes and that no US agency would deem them routine or permissible. Rather, since it is virtually impossible to completely eliminate all risk, he says that the term "tolerable risk" is a more correct description of the risks that would past muster in an oversight of launch safety. Paul Wilde, *et al.*, "Public Safety Standards for the Launch and Entry of Spacecraft" (hereinafter "Wilde I") Proceedings of the First IAASS Conference "Space Safety, a New Beginning" 25 – 27 October 2005 Nice France (ESA SP-599, December 2005).

[236] J. Randall Repcheck, "FAA's Implementation of the Commercial Space Launch Amendments Act of 2004 – the Experimental Permit" Proceedings of the First IAASS Conference "Space Safety, a New Beginning" (hereinafter "Repcheck II") December 2005 Nice, France. Although the paper describes a different aspect of the CSLAA of 2004, the experimental permit, than that with which we are here concerned, the FAA's role in quantifying risk levels is the same.

[237] These quantitative standards only go as far as the uninvolved public are concerned. As Dr. Quinn notes, the FAA mandates no acceptable levels of risk for spaceflight participants or passengers and qualitative requirements for the crew. Andy Quinn, "Acceptable Levels of Safety for the Commercial Space Flight Industry" (hereinafter "Quinn I") IAC-12-D6.1.2, presented at the 63rd International Astronautical Federation Naples, Italy October 2012 at 3.

approval determinations related to commercial spaceflight based upon performance-based criteria, which it applies in hierarchical order, as seen in Table 2.2.[238]

Severity / Likelihood	Catastrophic I	Critical II	Marginal III	Negligible IV
Frequent (A)	1	3	7	13
Probable (B)	2	5	9	16
Occasional (C)	4	6	11	18
Remote (D)	8	10	14	19
Extremely Remote (E)	12	15	17	20

Table 2.2: FAA AST AC 437.55-1 Risk Matrix

Currently, in granting a US license (spaceport or launch), the significantly lower probability of risk 10^{-6} is used for Expected Casualty for third parties on the ground.[239] The US focuses upon the protection of the uninvolved public's persons and property, not the safety of those on board.[240] This limit represents that which has been statistically determined to ensure as high a level of public safety as practicable. The limit is applied differently for RLVs and ELVS. Without getting overly technical, a single limit of 30E-6 E_c applies to the launch/reentry of an RLV or RV (reentry vehicle) while with an ELV, separate E_c limits of 30E-6 pertain to inert and explosive debris, toxic materials, and distant focusing of blast overpressure risks.[241]

The quality risk assessment (QRA) is integral to achieving the AST's overarching policy goal of public safety and is used to identify and characterize the risks posed by a

[238] It uses these criteria to assess the effect on the health and safety of the uninvolved public. In order, they are: 1) FAA or other appropriate Federal regulations; 2) Government-developed or adopted standards; 3) Industry consensus performance-based criteria or standard; and applicant-developed criteria. 14 C.F.R. § 420.19 (2012). The last category allows manufacturers to define its own performance standards and, could carry some potential risk or conflict of interest according to Flores. Mark Flores, "Blast Off? – Strict Liability's Potential Role in the Development of the Commercial Space Market" 17 Rich J.L. & Tech. 2, 30. In August, 2014, the FAA published its *Recommended Practices for Human Spaceflight Occupant Safety* which do not yet rise to the level of adopted standards (2) but do invite industry to develop consensus criteria (3) based upon a sharing of applicant-developed criteria (4).
[239] 14 CFR §420, Appendix C Risk Analysis.
[240] Quinn I, *supra* note 237 at 1.
[241] Wilde I, *supra* note 235 at 6.

launch/reentry site, using the risk-informed model used by the Nuclear Regulatory Commission (NRC) in making its regulatory decisions.[242] The risks and tolerable limits are identified to achieve specific goals. Wilde, Flight Safety Analysis Team Lead at the FAA, suggest that these goals should be: 1) ensuring public safety and financial responsibility; 2) understanding risk drivers and identifying prudent risk reduction measures; 3) understanding sources of uncertainty and means to reduce same; 4) helping to "fully inform" the decision-maker, ostensibly the AST, using the best available data and methods, and 5) providing transparency to facilitate commercial space transportation in an effort to create some objective certainty.[243]

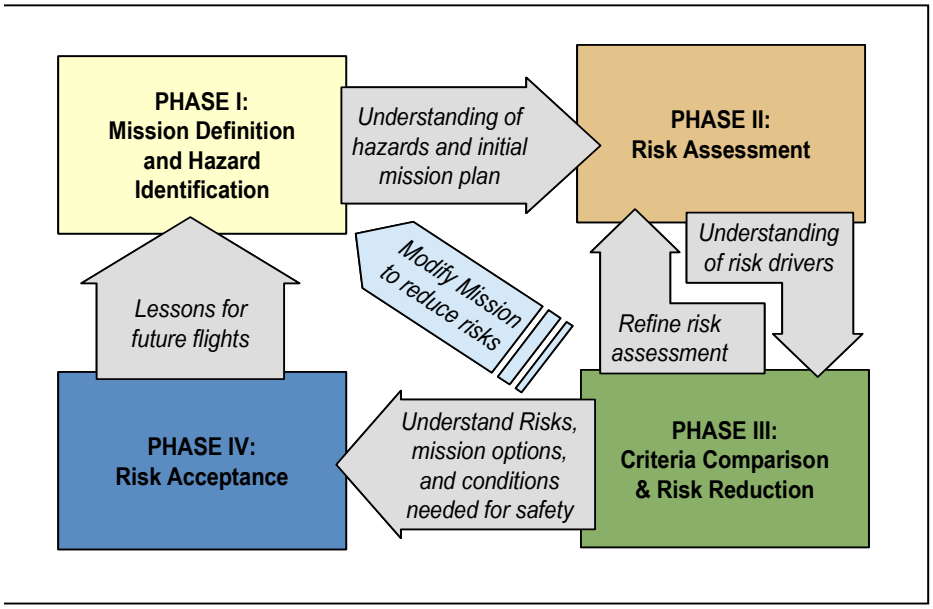

Figure 2.1: Risk Management Process

[242] Wilde I, *supra* note 235 at 2; *c.f.* "The NRC Risk Assessment Paradigm" online: http://www.epa.gov/ttn/atw/toxsource/paradigm.html (date accessed: 8 May 2012). The risk to all members of the public, excluding those on waterborne vessels and aircraft, cannot exceed 3 $x10^{-6}$ casualties for each of named hazard while the risk to an individual member cannot exceed 1 x 10^{-6}. 14 C.F.R. §417.107(b)(1) (2012). 14 C.F.R. §417 sets forth the parameters of a safe launch. Undoubtedly, the exception for occupants of aircraft and vessels is related to the inherent risks associated with those activities.

[243] Wilde I, *supra* note 235 at 2 – 3. Fully informing becomes quite important in the US as a key test under the Federal Tort Claims Act asks whether the decision-making official was fully advised and informed of risks prior to making the subject decision. If not, liability can attach to the USG or its officials. The underlying policy is to prohibit the courts from second-guessing well-informed, authorized officials when determining acceptable operational risk.

Accurate assessment of risk also plays a role in calculating Maximum Probable Loss for the purposes of the CSLA and all amendments. The issue of liability assessment is currently under review in the US by COMSTAC.[244]

The AST QRAs are performed according to procedures resulting from the US administrative rule-making process.[245] Those procedures are culled from the experiences of the safety community and represent what have come to be called "best practices" in the parlance of the day.[246] Best practices and standards are used with increasing frequency, particularly in technological sectors, such as aerospace, and where more codified law is either not the goal or believed to be premature. The reliance on best practices in the absence of more positive law has been envisaged as symptomatic of emerging norms in either nascent or fast-changing areas of regulation.

Standards, often considered more onerous than best practices, are agreed upon benchmarks of quality or attainment, "established by authority, custom, or general consent as a model or example" or for "the measure of quantity, weight, extent, value, or quality."[247] A standard is an "agreed, repeatable way of doing something," often published and containing technical specifications or criteria that can be used by

[244] COMSTAC discussed GAO report GAO-12-899, "Commercial Space Launches: FAA Should Update How It Assesses Federal Liability Risk" at its 10 October 2012 meeting in Washington DC. Specifically, the report recommended a review of the methodology used by the AST to calculate MPL. At present, COMSTAC is initiating discussion regarding defining the task, identifying parties to perform the analysis for the AST, and to provide alternatives to the AST. Email from Christopher T,W. Kunstadter to COMSTAC Business/Legal Working Group, dated 22 January 2013 11:38 am, on file with author.
[245] Prior to agency action, each proposed requirement must be justified, subject to economic analysis, and put before the public for comment. Exec. Order No. 12866, 58 Fed. Reg. 51735 (4 October 1993).
[246] Daniel P. Murray & Andre Weil, "The FAA's Approach to Quality Assurance in the Flight Safety Analysis of Launch and Reentry Vehicles" Proceedings Fourth IAASS Conference "Making Safety Matter" Huntsville AL May 2010.
[247] Merriam-Webster Dictionary online, *s.v.* "standard", online: http://www.merriam-webster.com/dictionary/standard (date accessed: 9 September 2011)

others consistently as a guideline or a rule.[248]

The Standards and Recommended Practices (SARPs) in the eighteen technical annexes to the Chicago Convention, are an excellent example of standards.[249] ICAO defines standards as "those specifications where uniform application is necessary for the safety or regularity of international air navigation and to which contracting States will conform in accordance with the ICAO Convention. A 'standard' contains a statement specifying an obligation through the use of the verb 'shall'."[250] International standards are those developed by international standards organizations, such as the International Organization for Standardization (ISO), for consideration and use worldwide, and are developed through formal procedures set in place by credible and recognized standards organizations such as the International Standards Organization (ISO)[251] or the American National Standards Institute (ANSI).[252]

Best practices have been defined as "a method of regulation that works

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[248] "What is a standard?" online: http://www.bsigroup.com/en/Standards-and-Publications/About-standards/What-is-a-standard/ (date accessed: 10 September 2011). Another good definition of a standard is
found on the ANSI website: "A standard is a document, established by consensus that provides rules, guidelines or characteristics for activities or their results. (As defined in ISO/IEC Guide 2:2004). Online: http://www.ansi.org/about_ansi/faqs/faqs.aspx?menuid=1 (date accessed: 11 September 2011).

[249] Convention on International Civil Aviation, signed at Chicago, on 7 December 1944 [hereinafter "Chicago Convention"] at 25.

[250] *Ibid*. Annex 14, *supra* note 87 at 9.

[251] The protocol involved in standards development at the ISO is relatively formal. Most often, the private sector (industry) communicates its need for a standard to a national member body (of the ISO) that, in turn, then proposes the agenda item to the entire ISO. "How does ISO develop standards?" ISO online: http://www.iso.org/iso/standards_development/processes_and_procedures.htm (date accessed: 26 January 2013).

[252] ANSI's process includes 1) the balanced representation of interested parties, 2) a required public comment period, 3) a formal process to respond to comments, 4) the availability of an appeal procedure, 5) a balloting group broadly representative of the industry, 6) consensus defined as a super majority of the balloting group, and 7) a formal way to respond to requests for interpretations of or changes to the standard. "How does APTA Develop Standards?" American Public Transportation Association website, online: http://www.aptastandards.com/AboutUs/DevelopingStandards/tabid/88/language/en-US/Default.aspx (date accessed: 11 September 2011).

through horizontal modeling rather than hierarchical direction."[253] They are generally accepted, informally standardized, and thought to have proven themselves over the course of time, hence earning the moniker "best".[254] The term "best practices" is tricky. Sometimes, best practices refer to industry practices, rendering them voluntary and informal, while other times they are found in public laws and are mandatory.[255]

Best practices can develop outside judicial supervision and the framework of the US Administrative Procedures Act (APA).[256] Or, they can be included in a statute or rule and courts may interpret them as needed.[257] The FAA Production and Airworthiness Division (AIR-200) maintains a website that catalogs a number of compiled best practices in the US.[258] The FAA Center of Excellence for Space Transportation is funding an initiative titled the "Body of Knowledge for Commercial Space Transportation" in acknowledgement of the absence of an overarching space access scheme employing and imposing standard systems that would foster interoperability between spaceports, launch

[253] David Zaring "Best Practices" 81 NY L Rev 294 (April 2006) at 297.
[254] "Best practice" Wikipedia online: http://en.wikipedia.org/wiki/Best_practice (date accessed: 11 September 2011).
[255] Zaring, *supra* note 253, 297 – 98. Best practices are referenced in both US and European airport/spaceport regulations. NPA 2011-20(A) para. 13 at 6, para. 6 at 26; EC 1108/2009 Article 8a 6(a); "Known 'Best Practices' for AIRFIELD SAFETY – Pilots" online: http://www.faa.gov/airports/runway_safety/pilots/best_practices/ (date accessed: 25 November 2012).
[256] Pub. L. 79-404, 60 Stat. 237; 5 U.S.C. Chapter 5 (enacted 11 June 1946). For instance, industry best practices develop as a matter of company policy. Judicial interpretation of the role, status, or legal effect of these practices would only come up in cases such as those cited later in this sub-section. It is also possible for governmental agencies to develop best practices outside of the scope of the US Administrative Procedures Act, 5 U.S.C. Chapter 5, as discussed *infra* in *Brock v. Cathedral Bluffs Shale Oil Co.*, 796 F.2d 533 (D.C. Cir. 1986).
[257] Many examples of jurisprudence interpreting practices and standards can be found in the author's article, Diane Howard, "A rose by any other name: despite what we call best practices or standards, the goal is the same – to foster safety and limit liability in the context of commercial space transportation" (hereinafter "Howard I") IAC-11 presented at the International Astronautical Congress Cape Town South Africa 2011.
[258] Memorandum from Manager, Production and Airworthiness to All Directorate Managers, etc., dated 31 January 2001, Subject: INFORMATION: Re-issued: Best Practices, online: http://www.faa.gov/aircraft/air_cert/production_approvals/mfg_best_practice/media/BestPractices Memo.pdf (date accessed: 26 January 2013).

ranges, and launch operators.[259] It contains a Framework for Spaceport Operations. The Body proper is an organic collection of documents and information that is constantly acquiring and updating data, including best practices.

The AST refers to its best practices as those that are based upon the collective experience it has gleaned from the safety community, including analytical methods and safety standards found in guides, handbooks, or used by other USG agencies.[260] On the other hand, ICAO uses the term "recommended practices" to mean "specifications for which uniform application is desirable in the interest of safety, regularity or efficiency of international air navigation, and to which contracting States will endeavor to conform in accordance with the ICAO Convention. 'Recommended practices' use the verb 'should'."[261]

Best practices are often procedures, technical or otherwise, implemented by a private company or a governmental agency, and then imitated by other entities in similar circumstances, regardless of whether they are truly the best solution available. As a result, best practices proliferate via networks and are subject to the foibles of informational cascades.[262]

When best practices function as rules but are vague, informal, or unwritten they can be found to violate US due process by providing "insufficient notice, opaque

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[259] Center of Excellence for Commercial Space Transportation "Body of Knowledge for Commercial Space Transportation" online: http://contentdm.nmsu.edu:2011/cdm/landingpage/collection/NMSGCBOK (date accessed: 6 November 2012).
[260] Murray & Weil, *supra* note 246 at 2. Once the AST has identified a best practice, it then documents it in internal procedures that are included in guides for use by the commercial space transportation industry and online: http://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/ (date accessed: 26 January 2013).
[261] EASA Aerodromes, *supra* note 230 at 7; *c.f.* Assembly Resolution A36-13, Appendix A. ICAO Doc 9902, Assembly Resolutions in force as of 28 September 2007, online: http://www.icao.int/icaonet/dcs/9902/index.html (date accessed: 21 May 2012).
[262] Howard I, *supra* note 257.

standards of review, and undetectable procedure."[263] In the US, when best practices are found in voluntary federal agency guidelines, even appended to a federal law, they remain subject to other, already existing federal laws.[264] Best practices can have legal status. When they do, they often resemble standards in that they have been formalized to some degree, they have achieved a modicum of objectivity, and are accessible to those subject to their regulation via notice. Under some circumstances, best practices can impute a legal duty and protect third parties from negligence.

Although the FAA does not yet impose functional safety targets or physical safety targets, another aspect of safety at the spaceport concerns human factors related to the crew and passengers.[265] Although these are integrally related to issuance of licenses for launch, a number of the requirements must be performed at the spaceport. While it is possible that the FAA will be drafting proposed rules for safety of crew and spaceflight participants in the near future (second parties),[266] the calculations for expected casualty, as described, remain in place.

This represents the current state of safety assessments in the US and proposed by EASA. Disparate safety metrics create a hurdle to performing international activities between transportation regimes. Different thresholds for acceptable risk mean that what is

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[263] *Lightfoot v. District of Columbia*, 355 F.Supp. 2d 414, 419 (DC Dist. 2005).
[264] *Palmer v. BNSF Railway Company*, 2010 WL 3798952 Cal. App. 3 Dist.).
[265] 14 C.F.R. § 460 *et seq*.; see also *FAA Commercial Space Transportation: 14 CFR Parts 413 and 437 Experimental Permit Checklist*, online: http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/sub_orbital_rockets/media/Experimental%20Permit%20Checklist.pdf (date accessed: 25 January 2013), including human safety checklists. An issue engendering some controversy is that surrounding who should be included in the safety assessments. Should the risk only be calculated for the uninvolved public? Or should those on board be factored in as well? These questions have been framed in the context of human factors. See also *Recommended Practices for Human Space Flight Occupant Safety* (published by the FAA in August 2014).
[266] Statement of Dr. George C. Nield, Associate Administrator for Commercial Space Transportation of the Federal Aviation Administration, before the House Committee on Science, Space, and Technology, Subcommittee on Space, on necessary updates to the Commercial Space Launch Act, February 4, 2014 (available: http://testimony.ost.dot.gov/test/nield1.pdf) (date accessed: 25 May 2014).

considered safe and therefore legal or licensable in one jurisdiction is not in another. This is an issue even now, before commercial transportation is a regularly performed activity between jurisdictions. For instance, when presented with draft guidelines proposed by the International Association for the Advancement of Space Safety in May 2014, COMSTAC members vociferously balked at the use of the 10^{-4} metric, claiming it to be arbitrary and onerous. The UK CAA is exploring the possible effects this lack of alignment might have upon its plans for future space transportation. Curacao is negotiating a proposed spaceport that will fly XCor vehicles on wet lease. XCor is a US company, subject to US licensing requirements. Curacao is an autonomous country within the Kingdom of the Netherlands, a European country. How this will resolve is still unclear.

Conclusions

Spaceports located in different countries may or not be subject to the same overarching international legal regime at some point in the future. And, not all jurisdictions agree that spaceports are even spaceports.[267] However, launches of space objects into outer space are subject to one overarching regime – that governing space. For instance, spaceports are prohibited from launching nuclear weapons and weapons of mass destruction. It is possible that a State could delegate to the spaceport operator record-keeping and reporting as per the Registration Convention. Spaceports implicate the State where they are sited as a launching State.

While the space treaties impose obligations, they lack specific standards and directives. Despite this, other sources of spaceport law exist in domestic law. These

[267] EASA offers as one of its proposed courses of action treatment of SoA as part of the aviation regime and certification of aerodromes consistent with ICAO Annex 14 and the domestic laws of the CAA where the facility is located.

national laws display a wide range of methods to regulate activities at a spaceport or launch site. Some States expressly regulate facilities, some only launches.

Domestic laws of eighteen States were examined. Three of these conducted only government space activities (China, Japan, Kazakhstan) and one had only skeletal regulation (Canada). Of the remaining States (14), seven (50%) addressed site regulation in their national space laws. Of those seven, two (29%) completely connect launch licensing to site licensing, while three (43%) do so in limited fashion. Removing from the statistical analysis States performing only government launches, 77% license the vehicle as part of the launch and 69% license the operator with the launch.

Launches are more usually the subject of a license or authorization process; spacecraft are regulated as a component of the launch activity. Vehicles are symptomatic of the difficulties that arise because of the conflict of laws between the aviation and space law regimes. These difficulties are most vividly expressed when contrasting the EASA proposal for suborbital vehicles (considered aircraft) with the US system, which makes no distinction between orbital and suborbital vehicles, treating both as spacecraft.

Further analysis of elements of domestic space laws showed that safety was the most common value (71%), followed by operator financial responsibility (65%), with the same level of frequency level of occurrence for extra-territoriality (53%), operator competence (53%), and availability of sanctions for violations (53%). However, despite this shared value for safety, different methods of assessment and different standards for acceptable risk are indicators of potential problems going forward. Of these, the fact of different standards presents more problems. Different methodologies could be tolerated, as long as accuracy is verified.

This, then, is the status quo for spaceport regulation. Clearly, the most developed system in place is found in the US, where the Office of Commercial Space Transportation handles spaceport licensing and activities at the spaceport are considered space activities. The second most evolved body of potential law relevant to spaceports is found in Europe. Currently, Europe's spaceports fall to the local authority; however, the EASA proposal has been refined over the last six years and contemplates a range of alternatives for the European Commission to choose from in the management of some of its launching sites. Chapters Four and Five will explore these two systems in detail and the possible outcomes that arise if spaceports are included in a purely space-driven regime or in an aviation-based framework.

The next chapter will provide a theoretical frame for the laws described in the instant chapter.

Chapter Three: Determining the Effect of the Status Quo[268]

The stage is set. The prior chapter described the laws that govern either the spaceports themselves or the activities performed on site. The current chapter includes a broad discussion of regulatory philosophy, looking into the elements of effective regulations in general and the requirements and objectives of spaceport regulations in specific. This examination concludes with the creation of a benchmark to be applied to the policies discussed in the next section of the chapter.

One of the elements of effective regulation demands clearly identified policy goals. The chapter looks at applicable policy goals extracted from domestic space law of different jurisdictions,[269] as well as the US National Space Policy and the recent US National Space Transportation Policy. To aid in identifying appropriate policy goals for spaceport regulations and noting some similarity between spaceports and airports, US airport law and its underlying policies are considered. The policies determined to be appropriate for spaceport regulation are included in the benchmark created in the first section of the chapter and then applied to the laws described in Chapter Two.

The philosophy underlying effective regulations

An administrative entity receives its delegated mandate from the relevant legislative body and is tasked with developing and promulgating rules and regulations. Currently, there is global interest in defining regulatory goals or articulating underlying regulatory philosophies in order to keep rules focused and effective and to advance

[268] "Status quo is Latin for "the mess we are in." Ronald Reagan available online: http://www.inspirational-motivational-success-quotes.com/ronaldreaganquotes.html (date accessed: 10 April 2014).
[269] These policy goals must be somewhat applicable to spaceports; they must pertain to transportation.

sustainable global economic growth.[270] For instance, the Organisation for Economic Co-operation and Development (OECD), [271] the Asia-Pacific Economic Cooperation (APEC),[272] and the World Trade Organisation (WTO)[273] have explored these issues for a number of years in a variety of forums and formats. The quality of regulations becomes more important in light of the increasing international aspect of economic growth and the resulting impact of national regulations upon the world market.[274] There is alignment between this high-level understanding of the interaction between regulation and economy and the US mandate found in the Commercial Space Launch Act of 1984, where Congress first enunciated the two goals for then, the Department of Transportation and now, the Office of Commercial Space Transportation (AST) in the FAA. The US Congress, through the CSLA, directs the AST to regulate private sector launches, reentries, and related services (this includes spaceport operations) "only to the extent necessary…to ensure compliance with the international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States"[275] while also encouraging, facilitating, and promoting the commercial space transportation industry.[276] In similar fashion, seven

[270] This interest is expressed at the national level, as in Canada and the United Kingdom, or at the international level via IGOs. *See Self-Regulated Professions: Balancing Competition and Regulation*, COMPETITION BUREAU CANADA (2007) available at http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/vwapj/Professions%20; *Better Regulation,* U.K. DEP'T FOR BUS. INNOVATION & SKILLS (BIS), http://www.bis.gov.uk/betterregulation.
[271] *Regulatory Reform*, OECD, http://www.oecd.org/topic/0,3373.en_2649_37421_1_1_1_1_37421,00.html.
[272] *The APEC-OECD Co-operative Initiative on Regulatory Reform*, OECD, http://www.oecd.org/document/25/0,3343,en_2649_34141_2397017_1_1_1_37421,00.html.
[273] General Agreement on Trade in Services art. 6.4, Marrakesh Agreement Establishing the World Trade Organisation, Annex 1B, Apr. 15, 1994, 1869 U.N.T.S. 183, 189-90.
[274] *Recommendation of the Council of the OECD on Improving the Quality of Government Regulation* (adopted 9 March 1995, Paris) OECD, Foreword.
[275] 51 U.S.C. § 50901(a)(7) (2012).
[276] George C. Nield, et. al. "*Certification Versus Licensing for Human Spaceflight in Commercial Space Transportation"* New Space 1:1 (March 2013) at 46; *see also* CSLA of 1984.

other countries of the eighteen analyzed in Chapter Two and this chapter that authorize non-governmental space activities (53%, 8 of the 15 included in analysis) include the State's economic interests in either its domestic space law or the policies underpinning that law.[277]

In 1995, the OECD embarked upon a multi-year plan to aid member countries in developing appropriate regulations that would foster cooperation between countries and could address the needs arising from new technologies.[278] The result of this initiative was a reference checklist for regulatory decision-making containing ten questions to be applied at all levels of policy-making in order to improve the quality of the regulations being enacted.[279] This study and checklist are interesting as they relate to spaceport regulation because there is an international aspect to space law, the spaceports may someday serve an international market or simultaneously service operators in different States, and the technology is constantly improving.

The Council held the term "regulation" to refer to "the full range of legal instruments by which governing institutions…impose obligations or constraints on private sector behavior."[280] The checklist was designed to assist the decision-making process. Over the next decade, increasingly aware of the risk that overly cumbersome

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[277] See table 3.1, *infra*. Using the entire 18 countries instead, 39% include the State's economic interest.
[278] The idea for the resulting checklist was first explored by OECD's Public Management Committee in May 1993.
[279] OECD Recommendations, *supra* note 275 at 9. These questions are:
1. Is the problem correctly defined?
2. Is government action justified?
3. Is regulation the best form of government action?
4. Is there a legal basis for regulation?
5. What is the appropriate level (or levels) of government for this action?
6. Do the benefits of regulation justify the costs?
7. Is the distribution of effects across society transparent?
8. Is the regulation clear, consistent, comprehensible, and accessible to users?
9. Have all interested parties had the opportunity to present their views?
10. How will compliance be achieved? *Ibid.*.
[280] OECD Recommendations, *supra* note 274 at 20.

regulation could inhibit innovation or create barriers to trade, OECD took the work further and commenced discussing regulatory reform.[281] Reform was possible in degrees. It could encompass simple revision of a single regulation, complete replacement of an entire regulatory regime, or improvement of processes for making regulations and managing reform.[282] The goals of reform included reduction of business burdens and increased transparency to facilitate more robust economies better positioned to meet public interests while assisting governments in dealing with the social issues they sought to manage. Discussion evolved into the OECD Guiding Principles for Regulatory Quality and Performance. To be effective, regulations should: 1) serve clearly identified policy goals and be effective in achieving those goals; 2) have a sound legal and empirical basis; 3) produce benefits that justify costs, considering the distribution of effects across society and taking economic, environmental and social effects into account; 4) minimize costs and market distortions; 5) promote innovation through market incentives and goal-based approaches; 6) be clear, simple, and practical for users; 7) be consistent with other regulations and policies; and 8) be compatible as far as possible with competition, trade, and investment-facilitating principles at domestic and international levels.[283]

Not much direct spaceport regulation exists at the present time. In the ensuing section, what is currently in effect (the status quo) is examined against the relevant guiding principles. In addition, because the lion's share of regulation at spaceports and launch sites is indirect, those laws pertaining to activities and/or vehicles and operators, will also be held to this same inquiry.

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[281] *The OECD Report on Regulatory Reform: Synthesis* (Organisation for Economic Co-operation and Development, Paris 1997) at 5.
[282] *Ibid.* at 6.
[283] http://www.oecd.org/dataoecd/19/51/37318586.pdf "OECD Guiding Principles for Regulatory Quality and Performance"

Policy goals in space laws

The first guiding principle of effective regulation documented in the prior section is foundational; hence, to be effective, spaceport regulation needs clearly identified policy goals. In addition, States can express social values in the policy goals underlying the regulations they promulgate. An example of this is the US mandate to protect the public while encouraging the commercial spaceflight industry. The immediate section begins by looking at the overarching policy references found in the space laws studied in Chapter Two. Some of these are very general policy directives, which can be implied to direct the regulation of a country's spaceports through either patently obvious legislation or through regulation of activities and/or actors. The following table illustrates the most common policy values found in these domestic space laws.

The values most common to domestic space policy in order of rank are: international obligations and cooperation (80%), safety (75%), environment/sustainability (60%), national security tied with the State's economic interests (both 53%), the public's interest (20%) and the integration between air and space (13%).[284]

[284] These percentages are calculated using the fifteen countries that authorize non-governmental launch activities/spaceport facilities, and including Canada only for the goals of air/space integration and safety. Using the entire sampling of nineteen, the statistics are: safety and international obligations/cooperation (61%), environment/sustainability (50%), national security (44%), State's economic interests (39%), public's interest (11%) and integration between air and space (11%). Australian Space Activities Act of 1998, Article 3, Division 2.2 Criteria for launch facility (2); China's Space Activities (White Paper) 15 December 2003 available: http://www.cnsa.gov.cn/n615709/n620681/n771967/69198.html (date accessed: 6 April 2014); Space Act of the Republic of Indonesia No. 21/2013 Part C; Mardianis, LAPAN "The Indonesian Space Act NO. 21/2013" presented at 53rd Session UN COPUOS Legal Subcommittee, March 2014 Vienna, Austria; Republic of Korea, Space Development Promotion Act, 31 May 2005, Article 5; Russia: Law of Space Activity, Article 26, Article 22; Ukraine: Ordinance of the Supreme Soviet of Ukraine on Space Activity, Law of Ukraine of 15 November 1996 (VVRU, 1997, p.2) Article 3; U.K. Outer Space Act 1986 Chapter 38.

State	International Obligations & Cooperation	National Security	State's Economic Interests	For Public's Interest	Safety	Environment/ Sustainability	Integration between air space
Australia	Y				Y	Y	
Austria	Y	Y			Y	Y	
Belgium	Y		Y		Y	Y	Y
Brazil	Y		Y	Y			
Canada					Y		Y
China							
France	Y	Y			Y	Y	
Indonesia	Y		Y	Y	Y	Y	
Japan							
Kazakhstan							
Netherlands	Y	Y			Y	Y	
Nigeria							
Norway							
Russia	Y	Y	Y		Y		
South Korea	Y	Y	Y		Y		
Sweden							
Ukraine	Y	Y	Y	Y	Y	Y	
United Kingdom	Y	Y	Y		Y	Y	
United States	Y	Y	Y		Y	Y	

Table 3.1 Policy Components of Site/Launch Laws by Jurisdiction

The US addresses its policy goals for space activities and space transportation in two recent directives issued by the executive branch.[285] The first, and broader, of these is the US National Space Policy, containing both principles and goals for US space activities. The principles clearly commit the US to encouraging and facilitating (mirroring the statute's language) the robustness and global competitiveness of the US space sector (the State's economic interests).[286] Spaceports and spaceport operations are addressed both directly and as components of infrastructure. The goals and underlying social values in the parts of the document that touch upon launch activities and facilities include participation in global markets and development of domestic commercial markets,[287] expansion of international cooperation,[288] and safe and responsible operations.[289] The US government is instructed to transfer routine operational space functions to the private sector if safety and national security will not be compromised and to encourage the use of US commercial space services in international arrangements.[290]

The more recent edict also includes discussion of spaceports. This policy is more specific, focusing upon space transportation as a system of capabilities.[291] Facilities may be modernized when necessary to maintain both access to space as well as US leadership.[292] Space is discussed in terms of "regions of space", including suborbital,

[285] US National Space Policy (28 June 2010); US National Space Transportation Policy (21 November 2013).
[286] National Space Policy *supra* note 285 at 3.
[287] *Ibid.* at 4, 6
[288] *Ibid.* at 4.
[289] *Ibid.*
[290] *Ibid.* at 10, 11.
[291] National Space Transportation Policy, *supra* note 285 at 1.
[292] *Ibid.* at 6. US leadership in space activities is a value long held dear.

through Earth's orbit, and to deep space.[293] Governmental departments and agencies, such as NASA and DoD, are to develop, operate, and enhance infrastructure and support activities and to do so extending encouragement for participation by the private sector, state and local governments.[294] Further, those departments and agencies are told to pursue policy and regulatory measures for space transportation that factor in public safety while promoting commercial development.[295] The Secretary of Transportation "shall coordinate" with DoD and NASA to establish and/or refine common public safety requirements and standards for launches from all sites (commercial spaceports, Federal and state ranges) while working toward international adoption of US safety regulations, standards and licensing measures.[296] Global interoperability and safety of international commercial space transportation activities are expressly stated goals.

Guidance from airport policy

Most jurisdictions do not even have regulations pertaining to spaceports, much less do they clearly set forth policy goals such as those in the US. Furthermore, most of the policy goals enumerated in the table pertain to all of a country's space activities and are not goals tailored to the regulation of its spaceports. The benchmark created in the next section of this chapter asks two questions about policy. Is the policy within a country's spaceport/activity law clear? And, is it consistent with the policies identified in this thesis as appropriate for spaceport regulation? These two questions deal with coherence; the first asks whether the State's spaceport regulation is internally coherent and the second asks whether it is externally coherent.

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[293] National Space Transportation Policy, *supra* note 285 at 2.
[294] *Ibid*. at 2, 6.
[295] *Ibid* at 4.
[296] *Ibid* at 5.

The subsequent section extracts goals from domestic space law but these are not adequate. They are culled from space laws that are themselves rather general and not targeted to launch sites. As a result, they do not clearly identify goals for the governance of spaceport facilities. It is possible to garner some insight into possible higher-level goals for spaceport regulation by looking at some overarching goals for transportation law, intermodality, and early US laws pertaining to airports. The history of early US airport construction and financing can serve as a cautionary tale for spaceports now in use and in development. Airports, like spaceports, are on the ground but house the operations necessary to prepare for flight and landing, as well as navigation. One early author noted, "Public airports form a part of the navigation facilities along public airways."[297] In similar fashion, spaceports are the terrestrial element of the launch and sometimes reentry, and it is contemplated that they will also participate in the navigation of vehicles.

Speculators and investors, looking to capitalize on the sensationalism resulting from Lindbergh's early aviation accomplishments, developed early US airports.[298] They were built in one-off fashion, piecemeal, apparently without consideration of anything past adventure and certainly without benefit of a cohesive master plan. Early legislation carved airports out of the US federal regulatory scheme.[299] Control was given to local bodies with exceptions made for airways under the jurisdiction of the Postmaster

[297] J.C.D.Blaine "The Development of a National Airport Plan" 30 Land Economics No.3 (Aug. 1954) 270.
[298] *Ibid.* at 271.
[299] *See* US Air Commerce Act of 1926. 44 Stat. 568 (May 20, 1926), since repealed. The Federal Airport Act, referred to in text, is Act May 13, 1946, c. 251, 60 Stat. 170, as amended, which was classified to chapter 14 (section 1101 *et seq.*) of Title 49, Appendix, Transportation. The Act was repealed by section 52(a) of the Airport and Airway Development Act of 1970 (Pub.L. 91-258, Title I, May 21, 1970, 84 Stat. 235). See chapter 25 (section 1701 *et seq.*) of Title 49, Appendix.

General, emergency landing fields and navigation facilities. Airports themselves were expressly excluded.[300]

Despite this, during the mid-1930s, federal funds were often used to build and improve airports as part of the government initiative to manage mass-scale unemployment.[301] These airport projects were constructed without consideration of the current or future needs of the air transport industry. Often, they were built to accommodate only one type of aircraft, quickly rendering them obsolete.[302] Eventually, the Civil Aeronautics Act of 1938 (CAA of 1938) broadened the reach of the federal legislation to include "air navigation facilities at and upon any municipally owned or other landing area approved for such installation, operation, or maintenance by the Administrator."[303] This Act also directed the Administrator to survey the existing system of airports and to make recommendations to Congress dealing with the construction, improvement, development, operation, and maintenance of a national system of airports. Ultimately, the resulting report found that development of an adequate system was worthy of federal funding, and preference should be given to projects essential to the maintenance of safe and efficient air transportation that met a number of specified requirements. These findings helped articulate the early regulatory policies applied to airports in the US. The report recommended the National Airport Plan, which took a backseat during WW II.

[300] *Ibid*. at 5(b).
[301] See Airport Survey, House Document No. 245, 76th Congress, 1st Session, p. 12-13 ceding responsibility for airport projects to the Works Progress Administration.
[302] This fact is eerie in its foreshadowing of the situation at Spaceport America in New Mexico, originally built to Virgin Galactic's specifications and only recently modified to accommodate other craft.
[303] Act of 23 June 1938, 52 Stat. 973, Section 302(a) Proviso.

After the war, this plan returned to the Administrator's focus. The Federal Airport Act of 1946 first established the requirement that a five-year National Airport Plan (NAP) be formulated and that it be revised annually. This mandate is ongoing although it has evolved. The NAP and its funding were first replaced by the Airport and Airway Development Act of 1970 which established requirements for a coordinated National Airport System Plan (NASP) and an aid program. Subsequent legislation has amended this federal requirement for an ongoing systemic plan, now called the National Plan of Integrated Airport Systems (NPIAS). These requirements are found in Title 49 of the United States Code Chapter 471. There we find the policies that drive the legislation governing airports in the US.

The highest priority is given to safe operation. Responsive development, taking into consideration the needs of the surrounding communities, is emphasized. 49 USC 47101 (a)(5) states that it is the policy of the United States "to encourage the development of intermodal connections on airport property between aeronautical and other transportation modes and systems to serve air transportation passengers and cargo efficiently and effectively and promote economic development." This statement represents treatment of the airport as a part of a larger system, not just of airports, but integrated with other modalities, a position hinted at in the system of capabilities discussed in the US National Space Transportation Policy.[304]

The regulatory goal of integration is further expanded in section (b), which states that the development of a national intermodal system that coordinates with other

[304] Further down the list, this law acknowledges non-aviation usage of the navigable airspace within certain parameters. Non-aviation usage generally refers to industrial parks or hotels or storage of motorcycles in a hangar. Could this provision be more broadly interpreted to allow for uses such as suborbital transport? National Space Transportation Policy, *supra* note 285 at 1.

complementary modes of transportation is an express goal, allowing the US to compete in the global marketplace. Intermodality is implicit in the US National Space Transportation Policy use of the term "regions of space" when discussing access to space.[305] Additionally, US leadership in the world economy is considered at stake if this goal is not met and a complete overhaul of the existing airport infrastructure is contemplated as a potential necessity. "Intermodality and flexibility are paramount issues in the process of developing an integrated system that will obtain the optimum yield of United States resources."[306] In keeping with this prioritization, integration of the NAS into imminent space transportation coordination and management is an issue currently under advisement at the FAA.[307]

The reshaping of US infrastructure is presented in mandatory terms ("must be reshaped") to allow the country to compete in the "21st century global economy." These are very strongly worded regulatory policies found in US statute. They refer to airports, not spaceports, but they contemplate several issues that are pertinent to this study. First, that transportation is intermodal and second, that in order to engage with the global economy, airport systems must be reshaped in order to be integrated. These policy goals should be extrapolated to apply to spaceport regulation in the US and beyond. The policies found in the legislation governing US spaceports and in the two policy statements discussed in this section are not nearly as developed as those propounded in US airport law. Although space launch ranges are given a sub-section in the space

[305] *Ibid.* at 2.
[306] (b)(6).
[307] Daniel Murray, "The FAA's Current Approach to Integrating Commercial Space Operations into the National Airspace System" available online: https://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/media/REMAT-Murray-FAA-FINAL.pdf (date accessed: 8 June 2014).

transportation policy, the discussion focuses upon interagency coordination and cooperation with the private sector, rather than coordination among different modes of transportation. Spaceport infrastructure is acknowledged as a component of the space transportation system but not a focus of the policy.

Furthermore, in the Airport statutes, the USC states that the Secretary of Transportation shall consider the needs of each segment of civil aviation and the relationship of the airport system to forecasted technological developments in aeronautics.[308] While aeronautics is used to describe activities in air, the nature of the technologies involved in suborbital and orbital activities and some aviation activities are leading many to use the term aerospace more often than aeronautics, *supra* the debate described in Chapter Two.[309] While the statute says what it says, limiting its reach to air, it contemplates that technological developments can be the driver for change to the plan for integrated airport systems. It is possible to envisage orbital and suborbital activities as different modalities of space transportation, and space transportation and aviation as different modalities of transportation in the big picture.

Intermodality, or coordination between transportation modes, came under discussion prior to the timeframe that the CAA of 1938 was enacted, when motor and water transport were significantly impacting rail transport. Ultimately, the ICC managed both rail and highway carriers, while air and motor carriers coordinated their operations in order to maximize the benefits of expeditious air service. Fair and Wilson describe coordination as "the act of regulating and combining so as to give harmonious results, and the harmonious adjustment of the persons or things coordinated" and state that in this

[308] 49 USC 47101 (a)(2).
[309] The *travaux preparatoire* of the Declaration and the OST and many of the questionnaire responses mirror this sentiment.

coordination, each type of facility has its place.[310] Nelson identifies several goals of coordination. First, that it is necessary to shape a public transport policy better designed to provide a more efficient transportation system and stating the "task of coordination by regulation, then is to find the proper economic sphere of each competing agency and give it the transport work to do for which it is most economically adapted."[311] Chapter Seven will explore further the task of finding an appropriate agency.

The need for coordination between different methods was eloquently expressed by Henry Newman, Regional Director of the Southwest Region of the FAA when Dallas-Fort Worth airport was built, at the airport's dedication. He said "We can't afford economically, nor will society tolerate any more hit-or-miss random action designed perhaps to benefit all of aviation or some segment of it which is unmindful of other transportation modes or of society as a whole."[312] And in Europe, "Transport has historically been an area, where the Community has been empowered to establish common policies and common rules."[313]

What identified policy goals are appropriate for spaceport regulation?

Gathering policy values from domestic space law, illustrated in the table, a State's spaceport law would ideally seek to establish compliance with international obligations and enhancement of international cooperation, while also meeting regulatory goals furthering social interests such as safety, and fostering innovation and robust economic growth. These should be expanded upon with transportation goals such as coordination

[310] Marvin Fair & G. Lloyd Wilson, "Coordination in Transportation: A National Economic Problem" Annals of the American Academy of Political and Social Science Vol. 171 Banking and Transportation Problems (Jan. 1934), 268-276 at 270.
[311] James C. Nelson, "Coordination of Transportation by Regulation" The Journal of Land & Public Utility Economics Vol 14 No 2 (May 1938) pp 167-181 at 169, 171.
[312] Henry L. Newman, "An Innovative Approach to Airport Planning" 39 AJ. Air L. & Com. 353 (1973) at 359.
[313] Marciacq, *supra* note 90 at 3.

and alignment.

Coordination is a worthy goal of spaceport regulation for several reasons. First, cooperation in space activities is a legacy principle first found in the preamble and principles 4 and 6 of the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space and again in the preamble of the Outer Space Treaty and in Articles I, III, and IX. Cooperation is a function of coordination.

Second, Galloway identified coordination as the main organizational problem in early space activities and regulation because of the division of responsibility between agencies with separate mandates but similar programs simultaneously operating with joint activities.[314] We see this situation still today, with UN COPUOS and ICAO and between FAA AST in the US and possibly the EASA in Europe. Chapter Seven will explore this idea in greater depth. For the purposes of this chapter, suffice it to say that interoperable coordination of at least spaceport operations, if not coordination of regulation, is a worthy goal in keeping with Galloway's initial insight.

Third, OECD has implicated coordination in the articulation of two of its guiding principles that require consistency with other regulations and policies and demand that regulations should afford the greatest degree of practicable compatibility with competition, trade, and investment drivers at domestic and international levels.[315]

Last, there is a high value on integration and coordination, internally and intermodally. This can be seen in the high rank for international cooperation and treaty compliance in the table. The US airport legislation is another good example and lends

[314] Creating Space Law: Selected Quotations from Articles by Eilene Galloway: 1957- 1991. Published as Chapter 18 of Space Law: Development and Scope, Nandasiri Jasentuliyana, ed. Westport CT and London, Praeger, 1992. pp. 230-256 at 240.
[315] "OECD Guiding Principles for Regulatory Quality and Performance" available at: http://www.oecd.org/dataoecd/19/51/37318586.pdf (date accessed: 14 July 2014).

itself well to the concept of spaceports. Intermodality can be applied to spaceport operations that service orbital and suborbital activities as well as to the goal of including space activities in a larger global transportation network. This makes sense. Suborbital companies are including cargo capabilities and scientific exploration into their business plans. Reliance on tourism is now seen as shortsighted. However, without some coordination with the extant transportation system, the possible benefits accruing from fast travel, point-to-point suborbital flight could be lost trying to get to the spaceport itself.[316] As with the early days of airport system planning, prime routes need to be set up.

In the recent study commissioned by the European Commission to evaluate the European market potential for commercial spaceflight, the short-term interest for European spaceports was to garner US-produced vehicle operations at their facilities and, as a result, a regulatory framework aligned with the US regime would facilitate this goal with greater ease.[317] The US operators, in turn, would operate from EU spaceports, but preferred those spaceports in jurisdictions that have some national legislation. Alignment is another aspect of coordination.

To summarize, spaceport regulations should seek to 1) comply with international obligations and enhance international cooperation; 2) preserve social interests such as safety, innovation, and robust economic growth; 3) encourage intermodality between other transportation modes and systems; 4) compete in the global marketplace. These goals, combined with the guiding principles describing effective regulation, will be the benchmark against which the current laws applicable to spaceports are held in this thesis.

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[316] Derek Webber, "Point-to-point sub-orbital space tourism: Some initial considerations" Acta Astronautica 66 (2010) 1645-1651 at 1649.

[317] European report, *supra* note 18 at 57. The report makes the point that US operators at European spaceports would still be subject to ITAR and this is another hurdle to clear.

Safety as a shared value/driver/ policy goal

While safety is a shared driver of regulation, both as a social value underlying policy and a goal, there is disagreement about methods of assessment of risk. The goal of safety may not be universal but it is widely acknowledged and implicit in space treaties, as described in Chapter Two. However, the disparate approaches in assessment indicate differences in social values (uninvolved public safety valued over participants) and may challenge interoperability of regulatory systems. Because safety is a common policy goal, some discussion is warranted in the immediate section.

The US FAA's Wilde has written extensively on improving methods of assessment.[318] He recommends four safety goals to guide decision-making regarding acceptable, or tolerable, risk and recommends quantitative safety objectives, mostly in the context of risk limits for launch and reentry activities. The first of these goals sets the chances for an individual member of the general public, uninvolved with the launch activity, at less than 1% of the average annual individual risk of becoming a casualty due to any other type of transportation accident for the uninvolved general public in the US.[319] The second goal limits exposure of the uninvolved public to casualty risks greater than risks associated with other comparable involuntary activities, which are defined as manmade activities that are 1) subject to government regulation or control by government

[318] See Wilde I, *supra* note 236; Wilde, Paul D. "Public Risk Criteria and Rationale for Commercial Launch and Reentry" Proceedings 5th IAASS Conference "A Safer Space for a Safer World" Versailles France October 2011; Paul Wilde & Jim Duffy, "How Many Significant Figures are Useful for Public Risk Estimates?" Proceedings 6th IAASS Conference – Safety is Not an Option, Montreal QC Canada 21-23 May 2013 (ESA SP-715, September 2013); Paul Wilde, et.al., "Probability of Failure Analysis Standards and Guidelines for Expendable Launch Vehicles" Proceedings 6th IAASS Conference – Safety is Not an Option, Montreal QC Canada 21-23 May 2013 (ESA SP-715, September 2013).

[319] Wilde I, *supra* note 235; *See also* Joram Verstraeten & Alfred Roelen "Safety Risk Management for the Emerging Commercial Suborbital Space Industry" Proceedings 6th IAASS Conference – Safety is Not an Option, Montreal QC Canada 21-23 May 2013 (ESA SP-715, September 2013); Michael Brett, "Risk Hazard Analysis for Commercial Spaceflight Activities Using Range Safety Template Toolkit" IAC-11-D6.1.2, 62nd International Astronautical Congress, Cape Town, South Africa October 2011.

agency, 2) of vital interest to the US as launching state, and 3) involuntarily expose the public to risk of, *de minimis*, serious injury if not more.[320]

The third goal contemplates the risk for those individuals that voluntarily involve themselves with a risky activity but who are uninvolved with the commercial space activity *per se* (as in an aircraft or ship passenger) and states that this risk must be proportional to the background risk associated with that voluntary activity.[321] Lastly, the chances of an accident resulting in five or more casualties must be thoroughly mitigated.[322]

From these objectives, Wilde posits policy questions regarding the difference in treatment for RLVs, asking whether there should be separate risk limits for each phase of flight, launch and reentry, instead of treating the entire event with one collective limit, and whether separate risk limits should be set for each source of hazard or the total risk of all hazards combined. Significantly, he asks whether the collective risk limit should include those people in the vehicle or only those on the ground. This is the place where there is divergence between the method proposed by European experts who would include them and the current US expected casualty calculations which does not. If the latter, then a separate method would be necessary to calculate and control the risks to people in the vehicle.

Wilde makes recommendations related to the treatment of these quantitative objectives as they relate to collective launch missions. Some would be more difficult to

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[320] This definition of comparable involuntary activities is derived from the *Common Risk Criteria Standards for National Test Ranges*, Standard 321-10 at 2-2, put out by the Range Commanders Council (December 2010).
[321] Wilde, *supra* note 236 at 7; *c.f.* Advisory Circular 431.35-1 US DOT FAA "Expected Casualty Calculations for Commercial Space Launch and Reentry Missions" (30 August 2000) online: http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/media/Ac4311fn.pdf (date accessed: 9 May 2012).
[322] Wilde, *supra* note 235 at 7.

apply to the spaceport operator and others make great sense and are very applicable. For instance, he suggests the application of equal risk limits for both RLVs and ELVs by setting separate launch and reentry limits, something that could standardize spaceport operations at facilities launching both types of vehicles. Wilde also advocates for a single limit on the total collective risk from all hazards associated with a particular launch/reentry event, no matter the type and class of vehicle, because it is a more flexible approach while still ensuring consistency and because it would provide the benefits of a common standard among organizations overseeing launch/reentry operations, whether they were commercial, civil, or military.[323]

For the subsequent assessment, any indication that a State's spaceport/activity regulations include safety as a factor will be sufficient. How that State assesses safety and for whom it is assessed are issues that beg further discussion.

Determining whether spaceport regulations are effective

Following are the principles that will serve the thesis as a litmus test in evaluating the effectiveness of the regulations currently governing spaceports, both as a location and also denoting the activities performed therein.[324]

- Does the spaceport regulation serve clearly identified goals? (internal coherence)
- Is it consistent with the policy goals identified in this thesis? (external coherence)
    - Compliance with international obligations, enhancement of international cooperation
    - Preservation of social interests such as safety, innovation, and robust economic growth

[323] *Ibid.* at 11.
[324] Interestingly, Galloway noted that unique to space law was the fact that it evinced four characteristics: it was national, international, referred to a location (outer space) and to the functions performed in outer space. Galloway II, *supra* note 314 at 243. These characteristics also apply to spaceport regulation, despite the fact that the location is terrestrial, not extra-terrestrial.

    - Encouragement of intermodality between other transportation modes and systems
    - Competition in the global marketplace
- Does it have a sound legal basis?
- Do the benefits justify the costs?
- Is it clear, simple, and practical for users?
- Is it compatible with trade on domestic and international levels?

Some of these principles are difficult to assess; others are far more visible. It is crucial to remember that this benchmark is intended to analyze the effect of the **spaceport** laws in a jurisdiction, not its entire space law. When no direct spaceport regulation exists, the benchmark is applied to the activities regulation, for the activities performed at the spaceport most likely by the spaceport operator. The countries included in Chapter Two are discussed in this next section. European countries and the US will be discussed at the end as they have more regulation to examine and the next two chapters will be devoted to them.

Immediately following is an excerpt of a table developed by the International Space University SSP in 2008. In the accompanying paper, the team assessed viability of spaceport sites based upon criteria that ranged from environmental considerations to the legal climate. This table includes the regulatory issues that factored into the assessment and provides a reasonable basis for assessing whether a jurisdiction's spaceport regulation has a sound legal basis.

Table 1 *– Spaceport Evaluation Mechanism (SEM)* **Number**	**Criterion**	**Description**
Regulatory Issues		
13	Is the Spaceport subject to a regulatory framework?	Lack of a regulatory framework may cause uncertainty in planning and operations. If there is no regulatory framework specific to spaceports or space activities, regulations applicable to aviation should be used as guidelines, and/or consultation with aviation sector/aerospace sector regulators would be necessary.
14	Does the Spaceport operate in accordance with principles of international and national aviation regulations, concerning, amongst other things, minimizing the effects of operations on air traffic, and obtaining rights of overflight from neighboring States?	Issues that aviation regulations govern include: air traffic management to ensure the space access vehicle has a free and safe airspace corridor, access to space without endangering local communities, and absence of conflict with civil aviation activities. Aviation regulations at national or international level also (depending on the type of space transport) pertain to: infrastructure requirements, warning signage and markings, wind indicators, building evacuation plans; and, the sovereignty of states over their airspace.
15	Are the international obligations of the State within which the Spaceport is located taken into consideration by the Spaceport management?	International obligations (UN Space Treaties) of states often impact space activities and actions of private entities. In the event that there is no specific framework for regulation of space activities, the regulatory authority ought still to respect such obligations in their approach to Spaceports (requiring authorization and supervision through licensing).
16	Are all local, regional and national laws, including those required for licensing considered?	Environmental and planning laws, health and safety regulations,employment law, and ultimately licensing requirements (if provided for) should be taken into account.
17	Does the Spaceport provide for communication radio frequency allocation, tracking and telemetry in accordance with international requirements (ITU) with respect to the spaceport airspace?	The spaceport should have its own assigned frequency, and appropriate tracking infrastructure.

[325]

Table 3.2
Tool for Assessing Sound Legal Basis

[325] Jose Marian Lopez Urdiales, et al., "Spaceports: The Necessary Infrastructure for Private Spaceflight" IAC-08.D2.2.8 Glasgow Scotland Ocotber 2008.

Australia

Australia is one of the jurisdictions that require a separate facility license for the spaceport operator, as well as requiring that a launch license be granted only in conjunction with a facility license. The Space Activities Regulations of 2001 promulgate the rules necessary to implement the Space Activities Act of 1998. The Act identifies policy goals in its Objects of Act.[326] While these are clear, they are not completely aligned with the goals identified as appropriate for spaceport regulation *per se*. For instance, the Act is concerned with an operator's ability to cover compensation for liability (in the State's economic interest) and also with international obligations and cooperation. Both the Act and the Regulations are replete with safety requirements and considerations. However, neither addresses innovation or economic growth, intermodality and coordination, or competition in the global marketplace. Both have a sound legal basis when held against the schematic found in Table 3-2.[327] They are clear, simple and practical. In fact, Australian law provides more clarity than almost any other jurisdiction on the subject of delimitation, defining launch of a space object as launching into the area beyond 100 km above mean sea level and a launch vehicle as one that can carry payloads into or back from that area.[328] However, the facility and launch license regulations operate in standalone mode for Australia. The Act does deal with the extra-territorial reach of a license, but does not provide any evidence of State will or means to connect the country's space activities to a larger transportation system. Australia's spaceport regulations are relatively effective (positive assessment for

[326] Space Activities Act, *supra* note 124 at Part I, Section 3.
[327] An Australian spaceport is subject to a regulatory framework, operates in accordance with international regulations taking into consideration international obligations as well as local, regional, and national laws, and provides for spectrum management as per the ITU.
[328] Space Activities Act, *supra* note 124 at Part 2, Section 8 Definitions.

four of the benchmarks, marginal assessment for two – consistency with thesis goals and compatibility with international trade).

Brazil

Brazil does not grant site licenses, but does regulate activities at sites via commercial launch licenses.[329] The law establishing the Brazilian Space Agency (AEB) contains policy goals for the agency that are clear and that are coherent with the external goals for spaceport regulation.[330] International cooperation, encouragement of the private sector, integration and rationalization of resources, stimulation of entrepreneurship are clearly identified. However, there is no spaceport regulation past this, not for the site nor with any detail for the licensing of activities. Hence, while the space agency itself has a sound legal basis, regulation of the launch sites from a commercial perspective does not. Brazil's legislation is not effective from the standpoint of the site or site operations.

Canada

Canadian law does not provide sufficient guidance for analysis, for either launch sites or activities. Although two sections of the Canadian Aviation Regulations state the need for ministerial authorization when launching a rocket (other than a model rocket or firework display) and that the launch be in the public interest and unlikely to adversely impact aviation safety, there is nothing else. There are no clear goals and, past the reference to safety and the public interest, no other express objectives to align with appropriate goals for spaceport facilities and operations. The rocket launch license requirement is found in aviation regulations, not domestic space law. It is possible to impute a *de minimis* nod to intermodality in the reference to aviation safety but it is a stretch to interpret that as the

[329] Law No. 8.854 of 10 February 1994, Law Establishing the Brazilian Space Agency; Administrative Edict n. 27 of June 20, 2001; Administrative Edict n.5 of February 21, 2002; Administrative Edict n.96 of November 30, 2011.
[330] *Ibid.*

foundation for an intermodal transportation system. There is not enough of a regulatory framework for spaceports or even launches to find a sound legal basis. Canada does not have effective spaceport regulation.

China

The Chinese government maintains three launching sites, although commercial launches are performed there. The White Paper describing Chinese space activities is couched in general terms. Chinese space policy is clearly expressed; spaceport policy, on the other hand, is not included. Furthermore, the launch activity, while available for hire, is also a government function and regulations are not readily available. For these reasons, quantitative analysis was calculated without this jurisdiction. Like Canada, China lacks sufficient legal basis for spaceport regulation.

Indonesia

Indonesian law incorporates spaceports in the regulatory scheme.[331] The Act serves clear objectives – the State's economic interest in self-reliance (robustness) and its ability to compete globally, as well as achievement of safety in its space activities and compliance with international treaties and conventions. These are set forth within the law. Space activities are framed in terms of a space system, which includes services, infrastructure, ground stations for tracking telemetry and control as well as spaceports, and launching vehicles. The regulation appears to make no distinction between suborbital or orbital activities; however, lower earth orbits are defined as those beneath 2000 km. The regulation is available for public online access in summary form, as opposed to full text. It is difficult to assess the level of clarity and detail, which would facilitate implementation. That said,

[331] The Indonesian Space Act No. 21/2013.

Indonesia's spaceport regulation has the potential to be reasonably effective if it allows for integration of modalities of transportation and coordination with international trade.

Japan

Japan's national space law applies to establishment of its civil space agency and is silent on spaceport regulation as well as the licensing of site launch activities. Development of facilities necessary to launch satellites is within the scope of the law; however, nothing further is proposed. The data is inadequate for examination against the benchmark.

Kazakhstan

The law governing space activities in Kazakhstan speaks to some spaceport issues, including the development of Baikonur cosmodrome and privatization of other cosmodromes. The law itself is clear on its policy objectives: safety, compliance with international obligations, global competition, and a healthy national market. These goals align with most of the external policy goals in the benchmark. The law has some legal basis, setting the scope of its competence and remaining in alignment with international obligations, allowing the latter obligations to trump national requirements if in conflict. Whether benefits outweigh costs is difficult to discern, but the regulation describes a compensation scheme for risk allocation.

However, the regulations pertaining to cosmodromes, or spaceports, are not particularly clear or pragmatic. They lack specifics, only allowing for regulation by the republic but not providing detail. This detracts from the legal basis because the legal framework is not clear. There is some discussion of integration with other launch sites in the acknowledgement of the authorized body's need to develop coordination and protocol between launches from within Kazakhstan territory and those performed elsewhere,[332] but

[332] Kazakhstan law, *supra* note 98 at Article 9.1.4

there is no mention of intermodality or spaceports as part of a transportation system and the lack of specificity of Kazakhstan's national law renders it less effective.

Nigeria

In its national law, Nigeria alludes to licensing of launches only by inference and it is silent on spaceport or facility licensing or regulation. It is not possible to evaluate regulations that do not exist.

Russia

Russian space law contains separate provisions for cosmodromes and launching complexes and installations as space infrastructure in definitions found in Section IV, Article 18 of the Law on Space Activity,[333] and the regulation of this infrastructure is linked back to the launch activity, which is licensed as space operations[334]

The Russian law identifies goals of international cooperation and compliance, safety, and the State's economic interests, all of which are consistent with appropriate spaceport goals. However, Russian space goals are silent on intermodality. The various laws fail to provide a meaningful framework for the cosmodromes or their operations and launch activities, stating only that they are to be "considered". This is not a sound legal basis. Russian launching activities are performed by Roscosmos. The jurisdiction's spaceport regulations would not be particularly efficient or effective applied to a non-governmental operator.

South Korea

South Korea does not license the launch site but regulates activities at South Korean facilities through a launch permit that links the activity to the site or through a permit for a

[333] "Considering" ground and space infrastructure…Russian Statute, *supra* note 100 at 3.
[334] *Ibid.*

South Korean launch vehicle launched elsewhere.[335] The Act is relatively clear in its policy objectives although some are indirect or implied. These include international cooperation and compliance with obligations, economic growth including that of the private sector, and safety. The goals are coherent, both internally and externally, but there is no mention of spaceports or launch activities as part of a system integrated with either other modes or other jurisdictions. As in the majority of States discussed in this section, the legal basis for the spaceport regulation suffers without a clear framework that provides ease of use to operators.

Ukraine

The Ukraine is one of the jurisdictions that does license and regulate sites directly.[336] The facilities license is linked to, but not completely dependent upon, the launch license.[337] These regulations are more specific than most, including operating standards and requirements for certification, which is interesting considering the lack of an actual spaceport in the Ukraine.[338]

The jurisdiction's domestic space law contains a host of well-expressed goals demonstrating both internal and external coherence; virtually every tracked policy objective compiled in the table is present save integration between aviation and space activities, or intermodality.[339] Ukrainian spaceport regulations have a sound basis in law, and provide sufficient detail to be clear and implementable. The regulations clearly apply to one type of launch, vertical take off expendable launch vehicles destined for orbit. The lack of

[335] Korean Act *supra* note 99 at Article 11.
[336] Ukraine Space Law, *supra* note 101 at Article 1.
[337] *Ibid.* at Article 1, 8.
[338] *Ibid.* at Article 8, Article 12, 13. Even construction, operation, maintenance and repair of installations and ground infrastructure are included in the regulatory framework. This specificity can only be partially rationalized by Ukrainian participation in Sea Launch as the Ukrainian space law lacks provision for extraterritoriality.
[339] *Ibid.* at Article 20.

intermodality, or any acknowledgement of other possible space transportation activities, handicaps the effectiveness of these spaceport regulations.

Europe: including Austria, Belgium, France, the Netherlands, Norway, Sweden, UK

The European Aviation Safety Agency (EASA) proposal would regulate suborbital spaceports as aerodromes, if they were considered commercial operations of suborbital vehicles, which EASA proposes to certify as aircraft.[340] There is also a local component to this framework; the national authority with competence for the territory where the spaceport is located will be responsible for its certification.[341] The EASA rules standardize procedures for certification, oversight, management, and operation of the aerodrome/spaceports and the national civil aviation authority would, in turn, implement these. The proposal includes a range of alternatives that range from leaving the regulation and supervision of suborbital aircraft to Member States to extending the scope of the regulations to high altitude/high speed transport and orbital aircraft.[342]

The EASA proposed regulations are based upon the perceived need for a common transport policy.[343] The regulation pertaining to airports that could be applied to suborbital spaceports states that its objective, or its policy goal, is to ensure increased safety levels while increasing use in a "total system approach".[344] The regulations internally identify this goal, which, in turn, aligns with some of the external goals (international cooperation, safety, economic growth, intermodality between jurisdictions, global competitiveness). The

[340] The European Economic Community is tasked with establishment of a common policy and common rules for transport. Articles 90 – 100, TFEU, *supra* note 83 at p. 16, 47.
[341] Article 8a 2.(b)(iii) Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulation (EC) No 216/2008 in the field of aerodromes, air traffic management and air navigation services and repealing Directive 2006/23/EC.
[342] Marciacq, *supra* note 90.
[343] European Aviation Safety Agency Handbook (USA International Business Publications 2009) at 12: "Why do we need a community air transport policy? The air transport sector in the European Union is fragmented as a result of the national approaches to international relations, particularly bilateral air agreements negotiated individually by each Member State with third countries."
[344] Regulation 1108/2009, Extending EASA Remit to Airports, ATM and ANS, at 1.

regulation falls short on the prong of intermodality between transportation modes, in particular between suborbital transportation activity and orbital activity. Currently, these regulations do not have a completely sound legal basis since the proposal to apply them to suborbital activity has not been adopted by the European Commission. Much care has been taken in applying the proposed aviation regulations to suborbital activity, as will be established in Chapter Five. If adopted, at least for suborbital spaceports, these would be clear and effective. However, there could be basic interoperability, or incompatibility, issues on an international level between this proposed framework and one that includes suborbital spaceports in the space regime.

Regardless of what the European Commission decides regarding suborbital flight activities, countries remain internationally responsible for the orbital space activities of their nationals.[345] Austrian space law does allow for a spaceport or site license, and links that license to the launch license. Austrian spaceport regulations are relatively effective, showing internal goals that align with the external policy objectives of international cooperation/compliance, and safety. However, the regulation does not address a systemic approach or demonstrate a view that spaceports or launch sites are part of a transportation system.

Belgium, France, the Netherlands, and Norway, license both the operator and the vehicle as part of the launch license. The United Kingdom and Sweden simply license the vehicle through the launch license. There are no on point spaceport regulations *per se*; regulation is of the activities. Sweden currently launches from Esrange and for years has been keen on developing the nearby Kiruna Airport as a suborbital spaceport. Yet, Sweden

[345] Precisely what a space activity entails continues to be a subject for discussion at the Legal Subcommittee, UN COPUOS. In March 2014, the Chair of the Working Group on Delimitation presented a draft proposal attempting to redirect the focus of delimitation from location and classification of vehicle, to a definition of "space activity".

has the least developed spaceport regulation. Swedish law specifically carves suborbital out of its domestic space law. The cursory space law is silent on policy goals, both internal and external, and provides no legal framework in practical terms. On the other hand, none of the other iterated countries currently house launch facilities.[346] That said, the space laws of these jurisdictions reveal some interesting facts. First, Belgium alone cites integration between modalities as a policy goal. The United Kingdom is clearest on its policy goals and these align with all but the goal of intermodality/coordination. French space law holds to nearly the same policy goals as the United Kingdom. Norway's regulations are as silent on policy as Sweden's. It is no doubt the piecemeal quality of these regulations, as they pertain to spaceport operations, that motivated EASA to work to include suborbital transportation and facilities in its comprehensive safety plan.[347]

US

The US regulates spaceports through the issuance of licenses for launch and reentry sites, and the activities that occur onsite through launch and launch operator licenses.[348] The US regulations are the most specific enacted law regarding spaceport licensing and operation. Space policy objectives are set forth in the governing statutes (to encourage, facilitate, and promote the commercial sector while protecting the safety of the general public) and expanded upon in both policy directives discussed earlier in this chapter. These policy goals are internally cohesive and also align well with the overarching goals deemed as appropriate for spaceport regulations in general.

[346] This may change to an extent in the future. The Netherlands is discussing possible spaceport locations both within the country and in its territory, Curacao.
[347] Masson-Zwaan & Freeland, *supra* note 210 at 1601.
[348] 14 CFR 420 *et seq*. reentry in 14 CFR 413; 14 CFR Parts 401, 417, and 420 Licensing and Safety Requirements for Operation of a Launch Site, Rule at 62816. (19 October 2000).

However, despite this external coherence, the policy documents speak of intermodality only in the vaguest terms, to wit "regions of space" and systems of capability. Still, the US policies treat facilities and infrastructure as a necessary component of a larger transportation system, and one that warrants overhaul of the infrastructure now in existence in order to bring space transportation forward and continue US access to space for transportation purposes. There is a sound, legal basis for the US regulations. Every criterion listed in the tool is met.

The benefits of regulation must justify the costs. The Commercial Space Launch Act and its amendments require the AST "to regulate only to the extent necessary…to ensure compliance with the international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States."[138]

The US spaceport regulations, as well as those in place for the launch and the operator, are clear, explicit, and sufficiently detailed to provide practical guidance to the licensee or applicant. They provide for allocation of accountability between parties. For instance, the launch site operator (spaceport operator) bears responsibility for clearly delineated aspects of the ground safety while the launch operator's duty includes the safety of flight operations, including the balance of safety on the ground.[349] The spaceport operator's concern is geographic or locational safety of the public; the launch operator's interest is the safety of the launch as it relates to the public.

Currently, the US regulations are compatible with domestic trade policies, quite likely because of the FAA's involvement of stakeholders in its advisory group, COMSTAC. The degree of international compatibility is less clear. It is still too soon to

[349] *Ibid*. at 62815; 14 C.F.R. § 420.59 (2012; Fed Reg Vol 65 No 203 at 62818.

extrapolate all of the problems that may result from disparate systems in the US and other jurisdictions, like Europe, hoping to participate in commercial space transportation in the near future.

Conclusion: Is the status quo effective? Does it serve the identified policy goals?

The current state of spaceport regulation serves many of the external goals relatively well. For instance, the regulations found in most jurisdictions (80%) include compliance with international obligations and international cooperation in their objectives. Social values such as safety and robust economic health are prevalent. Safety is an element of the policy of 80% of the States analyzed and serves as a driver of the regulatory framework in the same percentage. The State's economic interests are cited as a policy goal for more than half (53%).

However, intermodality is under-represented. This is reminiscent of the situation in early airport history in the US, when airports and landing fields were built without a plan, with no vision for the future. The status quo is also less than effective on other key points. For instance, Brazil, Canada, China, Japan, and Nigeria do not have a sound legal basis for spaceport regulations. Kazakhstan, Russia, and South Korea have some legal basis but it suffers for lack of specificity. Australia, EASA and some of the European countries, possibly Indonesia, the Ukraine, and the US represent more effective regulation. Of these, the EASA proposal and the US regulatory framework are not only the most specific, they are also the two that struggle with the idea of intermodality. The idea is there but it is not thriving.

Yet, intermodality and coordination are the policy values that could prevent spaceport development from falling into a trap of shortsightedness. This is the takeaway from early US airport law. This is the *raison d'etre* behind the OECD principles. The

inherent difficulties that arise in the face of attempts to classify suborbital transportation are illustrative of the artificiality of trying to assign activities to either an aviation regime or a space regime or vehicles to one category or another. It is not a zero sum game. It is not either or. At some point, technology will change again and these constructs will continue to fail our rather desperate efforts to neatly package transportation into one or another.

That said, the immediate thesis is concerned with regulation of spaceports. The next two chapters will further expound upon the details of the laws found in the US and the specifics of the EASA proposal for Europe. The chapters will explore the two treatments of suborbital spaceports and each will identify strengths and weaknesses. However, spaceports do not serve only suborbital markets. This differentiation, too, is artificial. Ultimately, the discussion is about transportation. Going back to the hypothetical at the end of Chapter Two, the bus terminal is concerned with providing an appropriate venue for safe transportation, properly linked up with other terminals. It can service any number of vehicle types. It must comply with many levels of regulation (local, regional, State, perhaps international) and it can serve more than one modality. The example can be extended further, in support of the argument for intermodality. Many modern airports also house rail stations, bus depots, rental car centers, taxi stands, and parking for private automobiles, coordinating multiple modes of transportation although each individual method of transit often falls to different regulatory authorities and is subject to different practices and rules. The transportation center is not dependent upon one regime or another. It manages the space where the train or the metro or the bus or the taxi picks the passenger up or drops them off, and how to achieve ingress and egress for personnel. This analogy seems to be a more pragmatic starting place, at least for the spaceports where these activities are transpiring.

Part Two: Analysis and comparison of specific legal regimes

When studying the status quo for spaceport regulation, it is apparent that the most developed system in place is found in the US. The prior chapter assessed regulations in nineteen jurisdictions and found US spaceport regulation to be reasonably effective, certainly more so than that found virtually anywhere else. Still, it falls short in meeting its stated policy goals of remaining competitive globally, fostering international cooperation, and continued access to space with an intermodal system of capabilities.

The shortfall does not become apparent while the US system stands alone as a silo, performing domestic launches from and to its territory. But it could cause complications that are likely because of the current international disagreement in how best to manage suborbital transportation and how to calculate safety. Part Two of the thesis holds two regimes up to the benchmark created in the last chapter -- the US system, in place already with licenses granted and operational, and the EASA proposal. The US system assigns orbital and suborbital activities to one regime founded in space law. The EASA proposal separates suborbital activity from orbital activity, including suborbital flight and aerodromes in the aviation regime and leaving regulation of orbital spaceports and activities to EU Member States.

Part Two of the thesis analyzes both of these systems to illustrate the weaknesses and strengths of these two silos, the US spaceport regime and the EASA proposal. The result for spaceport operators in these two jurisdictions could be stymied intermodality, challenged international cooperation, and possible global interoperability rather than competition.

Chapter Four: Spaceport regulation as part of the space law regime

This chapter begins with deeper analysis of the effectiveness of US regulations. Each prong will include some historical context and describe the relevant regulations. Certain consequences flow from a decision to treat both orbital and suborbital as aspects or modes of space transportation.[350] The chapter will next revisit the delimitation issue and will look at some of the problems that arise from a liability standpoint if spaceports are included in a purely space-driven regime. It will ask whether the fact that that a State becomes a launching State because the spaceport facility is located in its territory makes a meaningful difference to the regulation of a spaceport. It examines the effect of indemnifying only launch activities instead of the spaceport operations themselves and what this says about the true nature of spaceports and the appropriate reach of their regulation. It ends by touching upon the implications for space and air traffic coordination under the current US system.

The US system

In the US, suborbital transportation and suborbital spaceports are licensed in precisely the same manner as orbital transportation and launch sites. Both suborbital and orbital launches can occur from the same spaceport.

Effectiveness analysis of the US system

Does the US system serve its own clearly identified internal goals? Yes.

The statute, CSLA and all amendments, clearly expresses social goals/policy

[350] Significant issues demanding attention include second-party liability, third party liability, legal status of crew and participants, registration of vehicles, airworthiness and safety, licensing v. certification to authorize, and air and space traffic coordination and management. Tanja Masson-Zwaan & Rafael Moro-Aguilar, "Regulating private human suborbital flight at the international and European level: Tendencies and suggestions" Acta Astronautica 92 (2013) 243-254 at 243.

objectives.[351] These goals are expanded in the US National Space Policy and the US National Space Transportation Policy. The primary objectives in US licensing are to protect public safety as well as to promote US interests, while remaining in compliance with the US' international obligations, including those arising under the Outer Space Treaty.[352]

Identification of internal goals is the first step. Implementation is necessary to serve them. One of the methods utilized in the US is through the policy review that is required for a spaceport license. The FAA will only grant the license if it determines, after an interagency review,[353] that issuance will not jeopardize foreign policy or national security interests. Also serving these goals, the spaceport regulations hinge upon risk assessments calculated for the safety of the general public. Whenever feasible, commercial capabilities are to be utilized. Spaceports are not burdened with operational accountability for activities that fall within the launch operator's responsibility. The US system exhibits internal coherence.

Is the US system externally coherent with the goals identified in Chapter Three as appropriate for spaceport regulation? Partially.

***Compliance with international obligations*: Yes.**

US licensing satisfies the Outer Space Treaty's Article VI requirement that a State authorize and continually supervise the activities of its nationals in space.[354] The safety component of a US spaceport license fulfills the international obligations

[351] 51 USC § 50901(b). For an interesting read on the subject of safety for commercial spaceflight with a view to both regulator actions and industry actions, see Rand Simberg, *Safe is Not an Option: How a Futile Obsession With Getting Everyone Back Alive is Killing Our Expansion Into Space* (Interglobal Media LLC 2013).

[352] 51 USC § 50901 (a)(7); 51 USC § 50903(b); Statement of Esta Rosenberg, Attorney, Office of Chief Counsel, Federal Aviation Administration, Before the House Committee on Science, Subcommittee on Space and Aeronautics (21 April 1999) online: http://testimony.ost.dot.gov/test/pasttest/99test/Rosenberg1.htm (date accessed: 1 April 2012); *c.f* Repcheck I, *supra* note 225.

[353] The interagency review includes the FAA, DoD, DoS, NASA, NOAA, and any other federal agencies that may be authorized to deal with national security, foreign policy, or international issues. 14 C.F.R. §420.15(a)(3) (2012).

[354] Outer Space Treaty, *supra* note 28.

found in Article IX of the Outer Space Treaty,[355] as well as those found in the Registration Convention.[356] And though spaceports themselves are not included in the statutory risk-sharing scheme *per se*, they can be as a part of the launch license, thus including them in the US method of compliance with the Liability Convention.[357] The CSLA directs the Secretary of Transportation (and the AST) to maintain compliance with international obligations assumed by the US through treaty, convention, or agreement.[358] US regulations do not contradict any of these obligations; it can be inferred that they serve them.

***Enhancement of international cooperation*: Partially**

Stated allegiance with this goal is not equivalent to actually serving it. While the statute directs the AST to consider the laws of other jurisdictions, the reality is that the US is far ahead of other jurisdictions developmentally, thus creating a vacuum. It may be premature to determine whether international cooperation will be enhanced by the regulations enacted by the AST in 14 CFR 400 *et seq.* However, the regulations themselves do not contain incentives for working with spaceports in other jurisdictions, such as found in the Ukraine. Furthermore, the safety metrics discussed in the next prong of analysis are not aligned with the metrics in the United Kingdom and under discussion by EASA. The FAA is currently revisiting the issue of regulation of safety for the crew and participants, second-parties to the activity.[359] If these established guidelines become regulations, they

[355] *Ibid.*
[356] Registration Convention, *supra* note 30; 14 CFR § 431.83.
[357] Liability Convention", *supra* note 29. Arguably, the US Congress may now or will someday have authority to regulate spaceports through its Commerce Clause power, as sites of activities substantially affecting interstate commerce. For now, the authority comes via the Supremacy Clause. Blasingame, *supra* note 38 at 776-77. It is through the Commerce Clause that the US Congress legislates regarding air commerce and the national airspace. *Ibid.*
[358] 51 USC § 50919(e).
[359] Nield testimony, *supra* note 267. 14 C.F.R. § 420.23(b) (2012) for guided sub-orbital ELVs, (c) for unguided sub-orbital ELVs, and (d) for RLVs.

will serve this goal of enhanced cooperation. If efforts to create some minimum baseline of interoperability are not made, then the regulations pay only lip service to this goal.

Lastly, ITAR is an aspect of the US regulations that does not align well with international cooperation. Although the regulations have been reformed recently, the fact that US vehicles require export clearance to operate out of a European spaceport could have a deleterious affect on international cooperation and development of business, much like ITAR helped build the European communication satellite sector, when it marketed itself as "ITAR-free". This has more of an effect on the ability of launch operators to work outside of the US (hence the US regulations rate a positive score on this prong) but could potentially affect who is able to launch out of US spaceports if, during the policy review, it is ascertained that non-US personnel would have access to US technology or systems that are on the US Munitions List.

Preservation of social interests: **Yes.**

Safety is a social interest valued by the US (in its internal goals) as well as by the international community. It is one of the key social goals associated with this prong. In the US, the review of the launch site takes a number of safety factors into consideration, such as its boundaries and flight corridors, in order to perform a risk analysis.[360] This analysis depends upon maps, launch vehicles type/s and class/es, trajectory data, wind data for each month and percent wind data used in the analysis, populated areas located within flight corridors or impact dispersion areas, estimated casualty expectancy calculated for each populated area within a flight corridor or impact dispersion area, effective casualty

[360] It uses these criteria to assess the effect on the health and safety of the uninvolved public. In order, they are: 1) FAA or other appropriate Federal regulations; 2) Government-developed or adopted standards; 3) Industry consensus performance-based criteria or standard; and applicant-developed criteria. 14 C.F.R.§ 420.19 (2012). The last category allows manufacturers to define its own performance standards and, could carry some potential risk or conflict of interest according to Flores. Flores, *supra* note 238 at 30; 14 C.F.R. § 420.21 (2012);14 C.F.R. § 420.25 (2012). *See also* text in Chapter Two.

areas used in the analysis, and information regarding the presence or absence of the general public from populated areas located within overflight exclusion zones.

If the spaceport operator contemplates launching more than one type of vehicle, the applicant must demonstrate that each type flown can be flown safely from the launch point. Likewise, if more than one weight class is proposed, the applicant shall demonstrate safe flight for the heaviest weight class intended.[361] The Code of Federal Regulations (CFR) defines a safe launch as one with an estimated risk level not in excess of an expected average number of 0.00003 casualties (E_c) to the collective member of the public exposed to hazards from the flight.[362] This is the codified level of acceptable risk in the US at present. However, this limit represents that which has been statistically determined to ensure as high a level of public safety as practicable. The limit is applied differently for RLVs and ELVS. A single limit of 30E-6 E_c is applied to the launch/reentry of an RLV or RV (reentry vehicle), while with an ELV, separate E_c limits of 30E-6 pertain to inert and explosive debris, toxic materials, and distant focusing of blast overpressure risks.[363] This is one area where RLVs and ELVs are handled differently. The safety review also includes exit strategies and agreements in place to manage evacuation on land and water during a launch.[364]

The safety component of the license hinges upon more than assessment of risk. The operator must also maintain and document a safety organization identifying lines of communication and chain of command for all decisions with impact upon public safety, including operations performed by and interface with the spaceport operator.[365] A

[361] 14 CFR § 420.19 (b), (c) (2012).
[362] Quinn I, *supra* note 237 at 1. The calculation does not factor in safety for those on board.
[363] Wilde I, *supra* note 235 at 6.
[364] 14 C.F.R. § 420.27 (2012).
[365] 14 C.F.R. § 417.103 (2012).

person with document-approval authority must articulate these requirements in writing. The spaceport license safety review also requires the licensee to develop and implement an accident plan containing procedures for the reporting, response to, and investigation of launch site accidents.[366] The launch operator is required to maintain records until investigation of an accident or incident are completed.[367]

Sustainability of the environment, both Earth and space, is also a social value. The US spaceport license application contains an environmental component, requiring the applicant to provide the FAA with enough information for the agency to conduct an analysis of the environmental impacts that could result from operation of the site and reasonable alternatives to any actions that may have adverse environmental consequences.[368] These impacts will be assessed from the standpoint of the National Environmental Protection Act (NEPA),[369] the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA,[370] and the FAA's Procedures for Considering Environmental Impacts, but the FAA has the last word on the breadth of information needed to make its determination.[371] To that end, the FAA has

[366] 14 C.F.R. § 420.59 (2012).
[367] 14 C.F.R. § 417.15 (2012). This procedure is presented in greater detail in Chapter Two, *supra*.
[368] 14 C.F.R. §420.15(b) (2012).
[369] NEPA establishes national environmental policy and goals and provides a uniform process for implementation of those goals within the appropriate federal agencies.
[370] The Act also established the Council on Environmental Quality (CEQ), which oversees NEPA and with whose procedural requirements the FAA must also comply in performing the analysis of the environmental impacts.
[371] See FAA Office of Commercial Space Transportation Environmental Policy and Environmental Management System; Executive Order 13148, online: http://ceq.hss.doe.gov/nepa/regs/eos/eo13148.html (date accessed: 7 November 2011); *c.f.* For the terms of the interagency agreement regarding environmental and safety compliance see *Memorandum of Agreement Among Department of Defense Federal Aviation Administration and National Aeronautics and Space Administration on Federal Interaction with Launch Site Operators* (21 August 1997) available from Space Systems Development Division of FAA Office of Commercial Space Transportation (AST). 42 USC 4321 *et seq*. These goals are essentially to facilitate harmonious coexistence between man and nature to be achieved by the incorporation of environmental considerations in interdisciplinary planning and decision-making. All federal agencies are required to prepare environmental impact statements (EISs) assessing environmental impacts of and alternatives to proposed actions.

developed its own Procedure for Considering Environmental Impacts.[372] Environmental issues at a spaceport would include fuel storage, siting of explosives, handling and storage of all hazardous materials including nuclear materials (when applicable).

In addition to the safety of the general uninvolved public, worker safety is also regulated. In the US, this comes under the Occupational Safety and Health Act (OSHA).[373] Spaceport operations fall within the purview of the Act. OSHA can be very relevant for activities that are not launch-related, and not a part of the US indemnification scheme.[374]

OSHA ensures that workers are properly informed about hazards in the workplace and are given training about those hazards as well as methods to prevent harm. There are standards that apply to different industries, i.e. construction or maritime,[375] and those that apply to activities, such as handling hazardous materials or the use of powered platforms and lifts.[376]

The US regulations are driven by safety considerations, although there is some disparity in how acceptable levels of risk are assessed, both in the metric used (10^{-6}) and for whom (general uninvolved public only).[377] Innovation is a primary value as is robust

[372] 40 C.F.R. parts 1500 – 1508; FAA Order 1050.1D. The applicant is responsible for submission of any other environmental information pertinent to the proposed spaceport that may exist outside the parameters of already existing documentation. 14 C.F.R. §420.15(b) (2012). The FAA can ask for additional information as it sees fit. It is only after the FAA has concluded its analysis of the environmental impacts as described that it will issue a license. 14 C.F.R. §420.17(a)(2) (2012).
[373] Occupational Safety and Health Act of 1970 [OSHA], 29 U.S.C. § 653 (2004).
[374] OSHA is a federal law; however, the Act encourages states to develop and implement their own job safety programs. In turn, OSHA approves and monitors the plans and provides up to half of an approved plan's operating costs. *Ibid.* § 18 of the OSHA. State OSHA programs must be at least as effective as federal. Alaska, California, and New Mexico maintain their own complete state OSHA programs, covering both private sector and government employees. Coverage is for state and local government employees, while federal OSHA covers federal government employees. Online: http://www.osha.gov/OSHA_FAQs.html (date accessed: 11 May 2012).
[375] 29 C.F.R.§1910.12; §1910.15-16 (2011)
[376] 29 C.F.R.§1910 Subpart H, 29 C.F.R. §1910.101 *et seq.*; 29 C.F.R. §1910 Subpart F, 29 C.F.R. §1910.66 *et seq*.
[377] EASA proposes to use the metric utilized by the UK CAA, 10^{-4}, and to calculate safety for the crew and participants as well as third-parties.

economic health. The regulations now in place serve these goals. They are responsible without being onerous.

***Encouragement of intermodality between other transportation modes and systems*: Partially**

Application of different safety limits for RLVs and ELVs but within the same system of licensing does encourage intermodality between these two aspects of transportation even though this is one area where RLVs and ELVs are handled differently.[378] The spaceport safety review also includes an element of intermodality in its exit strategies to manage evacuation on land and water during a launch,[379] and in the consideration of flight corridors and air traffic flow when performing the site location review.

Another indicator of US effort toward intermodality can be found in an additional type of activity, also slated to take place from and return to a spaceport. This is the proposed operation of a helium-balloon that includes a manned capsule instead of a traditional gondola.[380] In a letter prompted by the inquiry of Paragon Space Development Corporation's legal counsel, the Office of the Chief Counsel of the FAA explained the agency's rationale for why the company's proposed activity, going up to an altitude of 30 km, would fall under 51 U.S.C. Chapter 509, the FAA's statutory authority for licensing launches, re-entries, and sites.[381] The FAA deemed the activity a launch, basing its interpretation upon the fact that the vehicle (capsule) was built to operate in outer space, specifically a low Earth orbit (LEO) environment, because of the duration of its mission

[378] Wilde I, *supra* note 235 at 6.
[379] 14 C.F.R. § 420.27 (2012).
[380] Irene Klotz, "Ride with a view: U.S. firm to offer balloon excursions to stratosphere" Reuters online (22 October 2013) available: http://www.reuters.com/article/2013/10/22/us-space-ballooning-idUSBRE99L1BU20131022 (date accessed: 15 June 2014).
[381] Letter to Pamela Meredith, Zuckert Scout & Rasengberger, LLP from Mark Bury, Assistant Chief Counsel for International Law, Legislation and Regulations Division, AFC-200, dated 26 September 2013.

and its "shirt-sleeves environment".[382]

There is general discussion of intermodality in the policy directives. However, the AST has functioned in a silo of its own within the FAA up until the current time. Systems intermodality warrants some discussion of the U S airport certification process. Suborbital transportation and spaceports are under the purview of the AST, but both are within the authority of the FAA.[383] Currently, the airport certification scheme is undergoing a transition because of the broadening of the FAA's authority.[384] Although suborbital vehicles as currently configured may not seat more than 9, it is possible that spaceports could come under this regime as "airports requiring certification as per the FAA Administrator" which could facilitate a transition to increased intermodality between spaceports and airports. However, despite the fact that spaceports can and sometimes do launch both vertically and horizontally, no efforts are in place to treat spaceports as part of a system, or to utilize the guidance currently available for horizontal takeoff and landing in aviation. US spaceport licenses are granted in an ad hoc manner without concern for any baseline standardization even within the US.

Other developments within the FAA align with the intermodality prong, to wit the advent of satellite-based navigation services for aviation and early discussions regarding integration of space traffic through the national air system (NAS).

***Competition in the global marketplace*: Partially**

[382] *Ibid*. A shirt sleeves environment is one where no special clothing or equipment, like a spacesuit, need to be worn.
[383] The FAA derives its authority to regulate airports under Title 49 of the United States Code §44706 and issues requirements for certification and operation of certain airports in Part 139 of Title 14, Code of Federal Regulations. The FAA's original statutory authority has been broadened by amendment to include scheduled and non- scheduled air carrier aircraft with more than 30 seats, scheduled air carrier operations with more than 9 seats but less than 31, and airports that the FAA Administrator requires to have a certificate. Public L. No. 104-264, [1996], amending 49 U.S.C. § 44706.
[384] *See* Part 139 Airport Certification FAA online: http://www.faa.gov/airports/airport_safety/part139_cert/?p1=classes (date accessed: 25 January 2013).

The CSLA was amended in 1988 to include a risk-sharing regime, illustrated in the graphic to follow, in order to ensure competitiveness for the US space launch industry in the global market.[385] Enabling the US government to meet its international obligations under the space law treaty regime with minimal cost to the taxpayer,[386] the Amendments authorized government indemnification for third-party liability in the context of commercial space transportation and required launch providers to buy insurance. While spaceports and their operators are not included in the risk-sharing scheme, they can be brought in through the launch license as sub-contractors.[387]

The Act set out three tiers. In the first tier, the launch/reentry licensee would either obtain insurance to cover third-party claims for injury, loss, or damage or demonstrate the ability to meet financial responsibility requirements. The FAA was tasked with setting insurance requirements based upon its determination of the maximum probable loss (MPL) that would result from licensed launch/reentry activities, not to exceed the lesser of $500 million US for third party liability, or the maximum available on the world market at reasonable cost and $100 million US for USG range property, or the maximum available on the world market at reasonable cost.

The second tier extended catastrophic loss protection, or what has come to be known as government indemnification, for the payment of claims in excess of those

[385] 49 U.S.C. § 70112 and 70113, disposed into 51 U.S.C.§ 50914 and 50915. *Cf* U.S. Dep't of Transportation: Federal Aviation Administration, *Liability Risk Sharing Regime for US Commercial Space Transportation: Study and Analysis (*April 2002) at ES-4.
[386] The US, as launching State, is ultimately liable for any third-party damage caused by its space objects, with degree of liability apportioned in accord to the location where caused. Liability Convention, *supra* note 29 Art. II, III, IV.
[387] However, this exclusion means that the spaceport license does not require a financial responsibility review, unlike a launch-specific or launch operator license.

Current U.S. Liability Risk-Sharing Regime Under 49 U.S.C. Subtitle IX, Chapter 701, (popularly known as the CSLA)

The U.S. liability risk-sharing regime for commercial space transportation is comprised of three tiers:

Tier I: Maximum Probable Loss (MPL)-Based Financial Responsibility Requirements

- Launch or reentry licensee obtains insurance to cover claims of third parties, including Government personnel, for injury, loss or damage, against launch or reentry participants. Participants include the licensee, its customer, and the U.S. Government and its agencies, and the contractors and subcontractors of each of them.
- Launch or reentry licensee obtains insurance covering damage to U.S. Government range property.
- The Federal Aviation Administration (FAA) sets insurance requirements based upon the FAA's determination of the MPL that would result from licensed launch or reentry activities, within statutory ceilings, not to exceed the lesser of:
  - $500 million for third-party liability, or the maximum available on the world market at reasonable cost.
  - $100 million for U.S. Government range property, or the maximum available on the world market at reasonable cost.
- Participants enter into no fault, no subrogation reciprocal or cross-waivers of claims under which each participant accepts its own risk of property damage or loss and agrees to be responsible for injury, damage or loss suffered by its employees, except that claims of Government personnel are covered claims under the licensee's liability insurance coverage.

Tier II: Catastrophic Loss Protection (Government Payment of Excess Claims, Known as "Indemnification")

- Subject to appropriations, the U.S. Government may pay successful third-party liability claims in excess of required MPL-based insurance, up to $1.5 billion (as adjusted for post-1988 inflation) above the amount of MPL-based insurance.
- U.S. Government waives claims for property damage above required property insurance.

Tier III: Above MPL-Based Insurance plus Indemnification

- By regulation, financial responsibility remains with the licensee, or legally liable party.

Exceptions

- The government does not indemnify a party's willful misconduct.
- The government may pay claims from the first dollar of loss in the event of an insurance policy exclusion that is determined to be "usual."

Figure 4.1: US Liability Risk-sharing Regime[388]

[388] Liability Risk-Sharing study, *supra* note 385 at ES-2

amounts. In actuality, the payment of excess claims is a provisional agreement by the USG subject to conditions, including Congressional appropriation of funds.[389] The statutory limit was set at $1.5 billion US (as adjusted for post-1988 inflation) above the amount of MPL-based insurance. This amount is now approximately $3 billion. The third tier placed on the licensee financial responsibility in excess of MPL-based insurance plus indemnification. MPL has become a term of art in the industry. The FAA makes this determination for every launch or launch operator license or permit application it receives. Assessment is based upon analysis of submitted information relating to the proposed mission, personnel (private and government), and payload to calculate the maximum monetary losses to be incurred by government and third parties at risk from the launch.[390]

In the Commercial Space Competitiveness Act of 2000, the US Congress directed the Secretary of Transportation to study and analyze the US liability risk-sharing regime with regard to commercial space transportation.[391] Congress was aware of the development of the reusable launch vehicle (RLV) and sought clarification as to whether extension of the regime already in place would be beneficial from the standpoint of international competitiveness for the US industry. COMSTAC recommended leaving the

[389] Final Rule 14 C.F.R. Parts 401, 411, 413, 415 and 417 (Docket No. 28851) RIN 2120-AF99 online: http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/media/14cfr-401-417.pdf (date accessed: 12 November 2012).
[390] Brent M. Timberlake, "To Boldly Go Where Only a Select Few Have Gone Before: Exploring the Commercial Space Launch Act and the Legal Risks Associated with Reaching for the Stars" (2009) 44 U. Rich L. Rev. 81 at 93. The FAA will assess MPL for an applicant early in the process to allow determination of financial responsibility requirements. See "Launch Data and Information: Maximum Probable Loss" online: http://www.faa.gov/about/office_org/headquarters_offices/ast/launch_license/mpl_values/ (date accessed: 25 May 2012); see also "Testimony Before the Subcommittee on Space, Committee on Science, Space, and Technology, House of Representatives: Commercial Space Launches FAA's Risk Assessment Is Not Yet Updated" GAO-14-328T (February 2014).
[391] U.S. Public L. 106-405 [2000].

indemnification provision in place to avoid disruption of the nascent RLV industry.[392] No changes to the then-current scheme were recommended.[393] Consultation with industry stakeholders is evidence the FAA AST is working to promote global competitiveness.

The ITAR issue factors into analysis of this portion of the benchmark. Marketing "ITAR-free" assets helped build the European satellite manufacturing industry. It is conceivable that ITAR issues could prove to be obstacles to optimum spaceport utilization in the US.

Again, because current commercial spaceflight activities are domestic in nature, it is difficult to assess whether the regulations serve this goal. Certainly, the objectives, of promoting, encouraging, and facilitating the commercial space sector, do support competition in all marketplaces, including global. Again, because of the current state of the industry, it may be premature to determine whether or not the regulations as promulgated will actually serve this goal once other jurisdictions are performing commercial spaceflight launches as a function of transportation.

Do the US spaceport laws have a sound legal basis? Yes.

The US treats both suborbital and orbital flight as space activities. Differentiations exist for expendable and reusable vehicle launch licenses, but whether the flight is suborbital or orbital does not impose much difference in the licensing to launch or the site license.[394] In the US, the 1984 Commercial Space Launch Act (CSLA) established

[392] *Ibid.* at ES-5.
[393] *Ibid.* at 10-7.
[394] The author is relying upon the statutory definition of suborbital flight found in 51 USC 50902 (19), (20). An argument could be made that airplanes fly suborbital; however, they are flying within acknowledged airspace, and not in accord with the statutory definition of suborbital flight. ELVs can be launched from a non-federal site with a launch specific license or with an operator's license good for up to five years for unlimited launches of the same or similar vehicle under the same conditions. 14 CFR 417. RLVs can also be launched under a launch specific license or an operator's license, also unlimited for the same or similar vehicle under the same conditions but good for two years. 14 CFR 431 (launch)

the Department of Transportation (DOT) as the regulatory agency over space launches, with the mandate to promote economic growth and entrepreneurial activity, to encourage the private sector to provide launch and reentry vehicles and related services, to simplify and expedite issuance of commercial licenses, and to facilitate and encourage the use of government developed space technology.[395] This included suborbital activities as well as orbital.[396] As an acknowledged component of the infrastructure necessary to support US spacefaring capability, the DOT's authority extended over activities necessary to develop commercial spaceports.[397] The DOT delegates this authority to its agency, the Federal Aviation Administration (FAA). The FAA, through the Office for Space Transportation, is responsible for licensing launch and reentry activities and launch sites (spaceports),[398] authority which was extended to include reentry of reusable launch vehicles in the Commercial Space Act of 1998.[399] This law also expanded the financial responsibility/risk allocation scheme of the CSLA to include licensed reentry operations.

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14 CFR 437 re-entry. The spaceport license includes a safety review which is calculated based upon the type of vehicles and where launched to what trajectory.

[395] In February 1984, President Reagan in Executive Order 12,465, named the Department of Transportation the lead agency within the Federal Government for encouraging and facilitating commercial ELV activities within the private sector. Exec. Order No. 12,465, 49 Fed. Reg. 7211 (1984). Less than eight months later, Congress passed the Commercial Space Launch Act which gave legislative authority to the Department of Transportation's role as the principle oversight agency for the regulation and licensing of commercial space transportation systems. Commercial Space Launch Act, Pub. L. No. 98-575, 98 Stat. 3055 (1984) (codified at 49 U.S.C. §§ 2601-2623 (1984)). The Commercial Space Launch Act was later codified at 49 U.S.C. Chapter 701 until recently, when it was included in the positive law codification of space programs via the enactment of Title 51, United States Code. The new disposition for the Act is 51 U.S.C. § 50901.

[396] The first licensed US commercial launch took place in 1989. A Starfire suborbital vehicle carried the Consort-1 payload, launching from White Sands Missile Range in New Mexico. Office of Commercial Spaceflight Frequently Asked Questions "When did the first licensed US commercial launch take place?" online: http://www.faa.gov/about/office_org/headquarters_offices/ast/about/faq/ (date accessed: 12 November 2012).

[397] U.S. Dep't of Transportation: Federal Aviation Administration, *Liability Risk Sharing Regime for US Commercial Space Transportation: Study and Analysis (*April 2002) at 8-1.

[398] The FAA's authority, carried out by the Office of Commercial Space Transportation (AST) derives from the CSLA of 1984, described *supra*. 51 USC § 50901 *et seq*. Launch is defined in 14 CFR § 401.5 and for an RLV ends after reaching apogee if the flight includes a reentry or after the vehicle lands on or impacts Earth and after the completion of activities necessary to effect the safe return of the vehicle on the ground.

[399] U.S. Bill H.R. 1702/P.L. 105-303.

The AST accomplishes its objectives via its thorough rulemaking process. Prior to agency action, each proposed requirement must be justified, subject to economic analysis, and put before the public for comment.[400] The benefits of the proposed regulation must justify its costs. This also factors into the next prong. The rules establish the requirements for spaceport (launch/reentry site) operators to obtain a license as well as post-license obligations.[401]

The Commercial Space Launch Amendments Act of 2004 (CSLAA) is the first piece of U.S. legislation to address suborbital flight and space flight participants. It introduced the concept of informed consent, and allowed experimental flight permits without as lengthy, cumbersome, and expensive a process of licensing.[402] Tier one remains the same as in its predecessor. The second level offers less protection for liability risks to the entire first-party[403] chain including *inter alia* launch providers, customers, contractors and subcontractors, and spaceflight participants. This is accomplished through mandatory reciprocal waivers of claims.[404] The third tier of the CSLAA's scheme requires reciprocal waivers between the USG and commercial launch providers and crew and spaceflight participants for harm suffered during flight above the

[400] Exec. Order No. 12866, 58 Fed. Reg. 51735 (4 October 1993). The fact that rules are subject to economic analysis relates to the cost-benefit prong of the benchmark used in Chapter Three and applied in the immediate chapter.
[401] 14 CFR § 431.83 (2012). However, registration under Article II of the Registration Convention is a mandatory requirement for States with regard to space objects launched into Earth orbit or beyond. Registration Convention, *supra* note 90 at Art. II. Suborbital vehicles do not launch into orbit.
[402] Title 49 U.S.C. § 70101 *et. seq*. re-codified at 51 U.S.C. § 50901 *et. seq.*; 42 U.S.C.A. § 2451; U.S. Public L. 108-492 [200]; Randy Hancock, "Provisions of the Commercial Space Launch Act (CSLA)" Space Policy 21 (2005) 227 – 29.
[403] First parties are individuals directly involved with spacecraft operation (flight crew), while second parties are those individuals involved in supporting the spacecraft (maintainers) and individuals participating in flight that are not crew (spaceflight participants or passengers). Lastly, third parties are the general public, uninvolved in the spacecraft and the flight. Andy Quinn & Paul Maropoulos "Safey Criteria for the Private Spaceflight Industry" Proceedings Fourth IAASS Conference "Making Safety Matter" Huntsville AL May 2010 at 7.
[404] "under which each party to the waiver agrees to be responsible for property damage or loss sustained by its own employees resulting from an activity carried out under the applicable license" for harm suffered by the USG, launching parties and their customers and contractors. 51 USC § 50914(b)(1) (2012).

amount of insurance or demonstration of financial responsibility, but does not impose any requirement for reciprocal waivers between the launch providers, the spaceflight participants and the crew.[405] In addition, the requirements for a license or permit to launch or reenter a spaceflight participant also include a "fly at your own risk" provision that mandates informing the spaceflight participant, in writing, of the risks and obtaining that participant's written informed consent.[406]

Because Congress characterized commercial space transportation as an "ultrahazardous" activity in the CSLAA,[407] finding it "inherently risky"[408] "a clear legal, regulatory, and safety regime"[409] was necessary to allocate risk.[410] Informed consent, a form of limitation of liability, is the method used.[411] The congressional intent behind the informed consent requirement appears to be to inform a spaceflight participant about the risks that might affect his or her decision regarding whether the risks inherent in the contemplated activity (the launch) are understood and acceptable.[412] This is tantamount to a codified duty to warn.[413] It is also indicative of Congress' intent that participants not

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[405] 51 USC § 50914(b)(2) (2012).
[406] 51 USC § 50905 (b)(5) (2012); 14 CFR § 460.45 (2008), *c.f.* Rebekah Davis Reed "Ad Astra per Aspera: Shaping a Liability Regime for the Future of Space Tourism" (Spring 2009) 46 Hous. L. Rev. 585, 593.
[407] Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (codified as amended at 51 U.S.C. §§ 50901 *et seq.*) (2012).
[408] *Ibid.* § 50901(a)(12).
[409] *Ibid.* and accompanying notes; 70 F.R. 249 at 77269 (29 December 2005). §50901(a)(14).
[410] *Ibid.*
[411] One commentator describes "informed risk and consent" as one limb of the FAA's three-limbed approach to risk management. Shane Chaddha, "CSLAA and FAA's Rules: Incorporating a "Risk Management Framework" to Minimize Human Space Flight Risks" Proceedings 5th IAASS Conference "A Safer Space for a Safer World" Versailles France (17 – 19 October 2011); *see also* Zhao Yun, "A Legal Regime for Space Tourism: Creating Legal Certainty in Outer Space" 74 J. Air L. & Com. 959 (Fall 2009) at 970.
[412] APT Research for the FAA, *Study on Informed Consent for Spaceflight Participants* Document Number: APT-CFA=230-0001-02F (26 Sept 2008) at 10.
[413] *Ibid.* at 10. What precisely is the duty to warn? Negligence denotes a failure to use ordinary care or to do what a reasonable person would do under the same or similar circumstances to avoid injury to another. *Hoy* ex rel. *Brown v. Simpson*, 182 F.3d 908 (4th Cir. 1999) at *7. The test is whether the operator, doctor, guide, or purveyor of the service for which consent is sought could or should have recognized risk and taken

benefit from financial security extended from the indemnification limb as they undertake the activity with eyes open to its inherent risk.

This is pertinent to spaceports for several reasons. First, the spaceport will likely be the location where consent is obtained. The law of the state in which the spaceport is located is significant with regard to the requirements of the consent obtained. Second, the spaceport is only a part of the CSLAA risk-sharing scheme as a part of a licensed launch. Statutorily required informed consent is a prerequisite to obtain a license, but it may or may not be necessary for cross-waivers and contractual waivers of liability to be valid and enforceable in the context of human space flight. These are separate issues.[414]

There is some question of soundness in the CSLAA treatment of the issue of informed consent. In particular, it does not address the extent of disclosures necessary to properly inform a participant. Another unresolved question concerns the potential for conflict between U.S. laws and those of other countries, such as Sweden or the United Arab Emirates.[415] Informed consent is an issue for spaceport operators because

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adequate measures to reduce or eliminate the risk. *Brown v. Crown Equipment Corp.*, 554 F.3d 34, 36 (1st Cir. 2009). As one court has noted, "[a] manufacturer's duty to warn arises when there is a need to inform consumers of dangers of which they are unaware."
Space flight is a situation in which the inherent risks are not common knowledge, hence the need to properly and sufficiently inform participants of these risks. The sufficiency of this information bears upon the validity of the consent given. It has been suggested that by creating a statutory duty to obtain informed consent, Congress and the FAA may have created a separate independent tort or cause of action beyond simple negligence, with breach of that duty an element of proof. *C.f. McDermott v. Carie*, 124 P.3d 168 (Mont. 2005) (holding that the practical effect of statutory provisions enumerating inherent risks in horseback riding limited liability for unavoidable or expected risks of which the participant should be aware and if an injury was due to such an inherent risk, there could be no breach of the duty to warn.)

[414] Reed, *supra* note 406 at 602. Most of the literature and case law on the subject of informed consent arises in a medical context; contractual waivers of liability are usually found in extreme sports.

[415] Dep't of Eng'g & Pub. Policy, Dep't of Soc. & Decision Scis. & Heinz Sch. of Pub. Policy, Carnegie Mellon Univ., "Policy Dimensions of Manned Suborbital Spaceflight" (Final Report, Undergraduate Project Course, Spr. 2008), online: http://www.andrew.cmu.edu/user/mk08/NewSpace%20Final%20Report%20Spring%202008.pdf (date accessed: 18 January 2013); *see also* Tracy Knutson, "What Is "Informed Consent" for the Space-Flight Participants in the Soon-to-Launch Space Tourism Industry?" 33 J. Space L. 105 (2007); Diane Howard, "The Elephant in the Room: Informed Consent from the Spaceport Operator's Perspective" (hereinafter "Howard II") ABA The Air & Space Lawyer Vol. 25, No. 2 (2012) at 9. At the time this was written, the MOU between Virgin Galactic and Spaceport Sweden has expired and has not been renewed. The

they are implicated in the risk-sharing scheme via the launch license. If the indemnifications are ineffective because the informed-consent provision has no legal basis in a given jurisdiction, that failure will also inure to the spaceport operator.

Perhaps in efforts to shore up the legal soundness of the statutory requirement, the FAA commissioned a research project to examine the requirements of an effective informed consent in the context of this statute and the commercial space industry.[416] It revealed that 1) courts favor operator consents that conform to the statutory language; 2) material risks must be disclosed, meaning those risks that would influence a reasonable person's decision to undertake an activity or consent to it; and 3) an opportunity should be provided for participants to request information and orally ask questions and receive answers.[417] The oral question and answer session must be acknowledged in writing.[418]

CSLAA contained within it a sunset provision that would cause the Act to expire in 2009 and a mandate to conduct a study of the continued need and viability of the risk allocation scheme set out by statute. In fulfillment, a study was commissioned to update the analysis and report previously issued by the Secretary of Transportation for Congress in 2002. The inquiry focused upon whether to maintain support of the US commercial space launch industry by continuing the government risk-sharing of liability or to phase-out that support, and the risk to the USG and ultimately the taxpayers, for what was essentially a hazardous private-sector activity. The analysis found that the US regime had become the industry standard. Complete elimination of the risk-sharing scheme could make the US commercial launch industry less competitive in the international marketplace. Furthermore, the number of participants was still not of sufficient size to build reserves in a trust or insurance pool and many participants were too small themselves to have the wherewithal to make a significant contribution. Like the 2002 report, the 2006 analysis concluded that expiration in 2009 would be disruptive to the industry with nothing positioned to take its place and, instead, suggested that the maintenance alternative 1) include modifications that made indemnification permanent and 2) remove the $1.5 billion US (1988 dollars) cap since payment of a catastrophic claim would, by necessity, be subject to the congressional appropriations process. In the alternative, Congress could phase-out the sharing of risk but should take a number of steps in so doing. These would include *inter alia* such actions as directing the FAA to initiate a plan gradually changing/reversing responsibility in tiers two and three; an FAA requirement for industry to create a pool or trust to cover tier three risk exposure and, ultimately, tier two once the pool reached a pre-determined limit; and FAA oversight of the appropriate minimum value of the industry pool with recommendations to Congress to make necessary changes to that requirement. In February 2012, Congress passed an FAA reauthorization bill that contained an extension of the sunset provision found in the CSLAA through 1 October 2015. Risk Liability-Sharing Study, *supra* note 385.

[416] Informed Consent Study, *supra* note 412.

[417] *Ibid.* at 11. Actually, this last is required by most jurisdictions.

[418] The report identified areas needing clarification. For instance, the statute requires disclosure of each known hazard and the fact that there are unknown hazards. One key hazard is the fact that this industry is

A more recent report by the U.S. Government Accountability Office identified additional areas of uncertainty associated with the current use of informed consent and cross-waivers for space flight participants.[419] The informed consent language in use does not indemnify or release, much less address, possible litigation by the heirs of an injured or deceased space flight participant or crew member against the U.S. government.[420] While it would likely be difficult to successfully recover in such an action, there is nothing to prevent the action being brought, thereby increasing costs to the industry for litigation defense and insurance.

Although the efficacy of waivers executed by spaceflight participants indemnifying operators for liability is questionable, courts probably would hold the same participant competent to indemnify other parties by contract since the statute and the FAA regulations require the participant to indemnify the US government. This indemnification is implicitly valid. Different states in the US extend limited waivers of liability to operators under certain conditions.[421]

Yet another level of spaceport guidelines exists in the US, in the form of best practices. The immediate chapter and Chapter Seven explore the legitimacy of best

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in the very early stages of development. As yet there are no accepted safety standards regarding the spaceflight participant's physical condition, the appropriate gear to be worn, safety equipment in the vehicle, how to handle safety briefings, vehicle performance over time, or instrument ratings for pilots. This lack of regulation should be communicated to the potential participant as a risk in order to ensure the understanding that the activity is not like the more established modes of transportation with which participants are familiar. Informed Consent Study, *supra* note 413 at 12. Significantly, the warnings must be explicit regarding past accidents and human space flight accidents. Debate on this issue preceded passage of the bill. Congressman Oberstar asked, "Is the gentleman going to include on the space flight ticket the disclaimer there has been no safety provided until after you are dead?" to which Congressman Rohrabacher replied that people have the right to waive safety requirements when doing business with a developing industry, something they might not waive if the industry were more developed. Blasingame, *supra* note 38 at 753-54 citing 150 CONG. REC, H10,048 (daily ed. 19 November 2004) (statements of Mr. Oberstar and Mr. Rohrbacher).

[419] U.S. Gov't Accountability Office, GAO-12-899, *Commercial Space Launches: FAA Should Update How It Assesses Federal Liability Risk* (July 2012).

[420] *Ibid.* at 20.

[421] Howard II, *supra* note 415; Frans von der Dunk, "Federal *versus* State: Private Commercial Operator Immunity Regulation in the United States" (hereinafter "von der Dunk III") IAC-13,E7,5.9x18368, Proceedings International Astronautical Federation, Beijing China.

practices in depth. Best practices are used in all areas of aviation and space operations and safety.[422] They are usually, but not always, voluntary.

Supplementing the federal licensing required for a launch/reentry site, there may also be state, county, and municipal licenses required for different aspects of the spaceport operations. For instance, different amenities and aspects of operations may require state licensing. In Florida, a state license is required for all aspects of food, alcohol, and hospitality service as well as health providers and facilities, laboratories, travel registration sellers, emergency medical technicians, firefighters, for fire prevention equipment, amusement rides, and all facets of fueling, from sales to storage.[423] Each of the licensed activities just listed corresponds to an operation likely to be found at a spaceport. It does not stop there. Other licenses and permits are also necessary at the county and municipal level, depending upon the ownership structure of the spaceport. These can include business licenses. This example is given to illustrate the fact that the spaceport exists within an intricate chain of interwoven and interconnected laws and regulations that interact from the furthest, most abstract reaches of space to the most local grassroots level on even so basic an issue as licensing.[424]

A very detailed framework is in place, and it has been utilized in granting actual licenses for spaceports. It is in accord with international obligations. Attempts are still in

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[422] A good example of best practice application to airports can be found in a 2008 FAA publication "Improving the Quality of Airport Projects: ACC/FAA Best Practices" (Airport Consultants Council/FAA 2008). For an example of some aerospace applications, see "Manufacturing Best Practices" online: http://www.faa.gov/aircraft/air_cert/production_approvals/mfg_best_practice/ (date accessed: 16 November 2012). *See also* George C. Nield, speech "Before This Decade is Out", Washington DC (26 May 2012)) available at: http://www.faa.gov/news/speeches/news_story.cfm?newsId=13612 (date accessed: 16 November 2012).

[423] *Florida Regulated Industries Guide* online: http://www.stateofflorida.com/Portal/DesktopDefault.aspx?tabid=25 (date accessed: 18 May 2012).

[424] Please see Sallie Middleton's article for an interesting read about the lasting changes made to the development of infrastructure in this region of Florida by the spaceports and attendant personnel. Sallie Middleton, "Space Rush: Local Impact of Federal Aerospace Programs on Brevard and Surrounding Counties" 87 The Florida Historical Quarterly 2 (Fall 2008) 258-89.

the earliest stages to integrate operations with air traffic, but awareness of basic principles of international and national aviation regulations exists. Local, regional, and national laws are not only considered, they manage different aspects of the site operations simultaneously. Spectrum management is addressed within the regulations with respect to telemetry, tracking and control.[425] The regulations require interagency consultation, also serving this goal.

Do the benefits justify the costs? Yes.

The FAA found it better to hold the launch operator responsible as the party with control over employees, contractors, and sub-contractors, one of which would be the spaceport operator, even though the "launch" definition has been expanded to include commercial launch sites.[426] In this way, the FAA could avoid the dilemma of having to apportion responsibility between the launch operator and the launch site operator. Furthermore, non-launch activities would not implicate the international treaty obligations as a launching State (no launch, no launching State), hence there would be no need for the government to extend existing risk-management procedures.

The exposure to spaceports is only for activities not associated with a licensed launch. This provides incentive to operators to obtain appropriate insurance for ground operations not falling within the FAA scheme and to limit liability through careful selection of customers and activities with which to participate. In other words, it behooves the spaceport operator to perform only properly licensed launches and to complete due diligence with regard to entities it may choose to house. Further, the legislative history of the CSLAA reveals Congressional intention to find balance between the need to manage

[425] This is part of the Interagency Consultation, discussed in the section of the benchmark about clarity for the user.
[426] See text accompanying Chapter Two, notes 176 through 179, for background.

or deter risk and the desire to allow the private sector latitude to innovate and create new technologies.[427]

In the US, the benefits must justify the costs because of the statutory language directing the AST to regulate "only to the extent necessary" to preserve public safety. Also, the economic analysis during public comment while the agency is in the NPRM (Notice of Proposed Rulemaking) stage of a rule ensures attempts to balance cost and benefit.

Are the regulations clear, simple, and practical for users? Yes.

Pre-application consultation is available prior to formal submission of an application and includes meetings, communications, and draft submittals that pre-date the actual official application.[428] Consultation, and the ability to submit incrementally rather than only all at once, allows both the FAA and the applicant to become familiar with the vagaries of the application process and the site in particular and to address any questions proactively.

The applicant is responsible for providing information about the launch site operator, the launch site,[429] foreign ownership,[430] environmental impacts associated with the proposed launch site,[431] the location of the launch site,[432] the explosive site plan,[433]

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[427] 150 CONG. REC. H10,048 (daily ed. 19 November 2004); *see also* Blasingame, *supra* note 38 at 753.
[428] "Launch Site Pre-Application Consultation" FAA Office of Commercial Space Transportation online: http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/launch_site/preapp_consult/ (date accessed: 7 November 2011).
[429] This includes the name and address of the applicant, and the name, address, and telephone number of the contact person to whom inquiries and correspondence regarding the application should be directed. 14 CFR § 420.15(a)(1) (2012).
[430] A sole proprietorship or partnership requires disclosure of all foreign owners or partners. §420.15(a)(3)(i). A corporation requires disclosure of all foreign ownership interests of 10 percent or greater. §420.15(a)(3)(ii). Joint ventures and other entities require disclosure of any foreign entities participating in the entity. §420.15(a)(3)(iii)
[431] This information must be adequate to satisfy the compliance with the National Environmental Policy Act, 42 USC 4321 *et seq.* (NEPA), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA 40 CFR 1500-1508, and the FAA's Procedures for Considering Environmental Impacts FAA Order 1050.1D. The FAA can require information for sites not already falling under environmental regulation and other additional information, as it deems necessary. §420.15(b).
[432] Lesser requirements inhere to a site co-located at a federal launch range in that safety assessments

and certain launch site operations. The launch site operations deal with security and safety.[434] The application must contain all of the information listed in 14 CFR 420.15; however, as noted, it can be submitted in increments. The FAA will issue a license under §420.17 after satisfying the rule's requirements, which include a launch site location review.

The FAA will advise applicants, in writing, of issues arising during the policy review that would preclude granting the license.[435] The applicant can then respond in writing with more information or amend the license. It is for these reasons that the incremental application approach is more flexible and creates greater transparency and open lines of communication between the FAA and the applicant.[436]The requirements for a license to operate a reentry site are relatively simple. The same safety and environmental standards apply for reentry as for launch.[120] The site must be able to support reentry of a vehicle for which the three-sigma footprint of that vehicle can be wholly contained within the reentry site.[437]

Post-license, the FAA continues to ensure compliance with the CSLA, all licensing regulations, and terms and conditions of a specific license through monitoring.[438] The explosive site plan is maintained as part of the licensing responsibilities

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already performed for a the same type and class of vehicle proposed from the same launch point will waive compliance with §420.19-420.29 as duplicative. §420.15(c)(2).

[433] §420.15(d). Explosive siting is described in §420.63. It deals with storage and handling of propellants and other explosives. The plan requirements are set forth in §420.65-420.69 and include a map with actual and minimal allowable distances between each hazard and all other hazards, a listing of the maximum quantities, and a description of the activities conducted in each facility.

[434] §420.15(e). The listed operations include control of public access (security and safety), scheduling, notification, launch site accident plan, record keeping, and lightning protection.

[435] 14 C.F.R. §420.17(7)(b) (2012).

[436] 14 C.F.R. §420.15(a)(3) (2012).

[437] Three-sigma footprint means within three standard deviations of the mean impact point. 14 C.F.R. §420.15 (2012).

[438] 14 C.F.R. §420.49. Since the US treats suborbital flight as space activity, this is consistent with the requirements of the US treaty obligation to continuously supervise.

with which the operator has an ongoing duty to comply.[439] The spaceport operator must cooperate with and allow access to federal officers, employees, and FAA-authorized individuals in order to observe activities and conduct associated with licensed activity at a licensed site. This includes the operator, contractors, and/or subcontractors.

Other activities, such as those concerning human factors related to crew and passenger/participants, take place at a US spaceport. [440] The requirements apply to launch/reentry with either crew aboard operating the vehicle or with a remote operator and human/s aboard.[441] There are also requirements applicable to spaceflight participants, those individuals aboard not operating the vehicle or serving in a crew capacity.[442]

Clarity and practicality are strengths of the US regulatory scheme for spaceports. The rules are organized, specific, and organic. Rationales for the rules can be found in the

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[439] Final Rule Vol 65 No 203 at 62818.

[440] 14 C.F.R. § 460 *et seq*.; see also *FAA Commercial Space Transportation: 14 CFR Parts 413 and 437 Experimental Permit Checklist*, online: http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/sub_orbital_rockets/media/ Experimental%20Permit%20Checklist.pdf (date accessed: 25 January 2013), including human safety checklists. An issue engendering some controversy is that surrounding who should be included in the safety assessments. Should the risk only be calculated for the uninvolved public? Or should those on board be factored in as well? These questions have been framed in the context of human factors.

[441] 14 C.F.R.§ 460.3 (2012).

[442] 51 USC § 50902(17) (2012). For instance, the launch operator is responsible for training each member of its crew regarding proper execution of her role on board the vehicle, wherever it is located, so that the public is not harmed. Training must encompass conditions that are nominal and non-nominal, including abort scenarios and emergency operations. Crewmembers must demonstrate the ability to withstand the stresses of space flight and continue to perform duties as necessary to prevent harm to the public. Pilots and remote operators must hold an FAA pilot certificate with an instrument rating, and exhibit the requisite skills and experience (e.g., flight hours) to control the reusable launch vehicle through the national airspace system.[442] Training must be vehicle- and mission-specific for each phase of flight and can use flight simulators (that are similar to the vehicle that will be launched), flight testing, or equivalent methods; however, training devices and requirements must realistically represent the vehicle's configuration and mission and crew members must be informed of the differences between the two. 14 C.F.R. § 460.5 *et seq*. (2012). Crewmembers with safety-critical roles must also hold an FAA second-class airman medical certificate, issued no more than twelve months prior to the month of flight. Spaceflight participants must be trained for emergency situations, albeit far less extensively; but the statute does not require medical screening or certification of participants. The facilities for training and medical screening are likely to be located at the spaceport. Proper administration of the human factor requirements is essential to the launch license, through which the spaceport becomes indemnified, to be discussed in the subsequent liability sub-section. These human factors also require informed consents and cross-waivers. 14 C.F.R. § 460.5(e) (2012). Currently, COMSTAC is examining the issue of whether it would be more appropriate for the rule to require an FAA first-class airman medical certificate, representing only slightly more monitoring for mission-critical personnel.

supplemental materials of the final rules. Public comment is invited and incorporated, and often included in the rationales. The regulations may not look simple by virtue of the depth of detail but this feature, specificity, is what supports their clarity.

Are the US regulations compatible with international and domestic trade policy?

Partially

For the most part, the US regulations are compatible with domestic trade policy. There may be upcoming issues arising from conflicts between the informed consent requirement in the CSLAA and the Code of Federal Regulations, and various state laws.[443] These laws differ from the federal law in that they also limit liability to the spaceflight entity or operator, primarily as an enticement to the commercial space industry to make use of the launch infrastructure in the state.[444] There is some concern that these state laws may be giving priority to industry interests over those of injured passenger/participants and their ability to obtain fair and equitable recovery.[445] It is possible that courts could find for federal preemption if states challenge.[446]

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[443] The CSLA contains a savings clause:
[a] State or political subdivision of a State –
(1) may not adopt or have in effect a law, regulation, standard, or order inconsistent with this chapter; but may adopt or have in effect a law, regulation, standard, or order consistent with this chapter that is in addition to or more stringent than a requirement of, or regulation prescribed under, this chapter, 51 U.S.C. § 50919(c) (2012). This savings clause forbids states from enacting laws inconsistent with the CSLA. However, Blasingame asserts that while the CSLA is legitimate use of Congress' power to legislate in a manner necessary to comply with the OST's non-self-executing provisions, any state law that could be found to be inconsistent with international law, regardless of whether found valid under the CSLA's savings clause, would likely be invalid. Blasingame, *supra* note 38 at 782; *see also* von der Dunk III, *supra* note 422.

[444] Timberlake, *supra* note 391 at 97-98. California, Colorado, Florida, New Mexico, Texas, and Virginia have enacted space laws that address the issues of liability waivers and informed consent. Antoine Pitts, "Space Tourism Policy: Why the World's Space-Faring Nations Should Adopt a Code of Conduct to Control Outer Space Activities" 18 SW. J. Int'l L. (2012) 687, 695-96. Howard II, von der Dunk III, both *supra* note 422.

[445] Vernon Nase, "Delimitation and the Suborbital Passenger: Time to End Prevarication" 77 J. Air L. & Com. 747 (2012)at 757; Blasingame, *supra* note 38 at 780.

[446] Paul Eckert, et. al., "Liability Limitation in Commercial Human Spaceflight: Benefits for Entrepreneurship, Partnership, and Policy" (The Boeing Company © 2009) available: http://www.pbl.com/media/pnc/6/media.216.pdf (date accessed: 16 June 2014).

The informed consent requirement in the CSLAA also has the potential for conflict between U.S. laws and those of other countries, such as Sweden or the United Arab Emirates.[447] Another source of potential incompatibility exists with the difference in assessment of risk employed by the US from that used in the UK and potentially in all EU Member States. Whether the US spaceport regulations are truly compatible with international trade remains to be seen since these are currently domestic activities. Much as is the case for determining the extent to which US regulations support international cooperation, until there is interaction between spaceports in different jurisdictions, it is more difficult to assess compatibility.

Summary of the US system

To summarize this part of the chapter, the US treats all launch vehicles and launch sites, suborbital and orbital, as part of the space regime. Although the Office of Space Transportation (AST) is a part of the FAA, it functions separately. The AST issues licenses for sites and all launches (suborbital and orbital, for both ELVs and RLVs) and operators in compliance with the international obligations the US bears under the space treaties. Each license is granted on a case-by-case basis.

The US is internationally liable under the Liability Convention. The USG requires a launch licensee to prove either insurance or financial resources to cover risk up to a specified point in order to subrogate any payouts and the USG then provisionally indemnifies above that specified point to a capped amount. While FAA policy requires

[447] Policy Dimensions, *supra* note 415; *see also* Tracy Knutson, "What Is "Informed Consent" for the Space-Flight Participants in the Soon-to-Launch Space Tourism Industry?" 33 J. Space L. 105 (2007); Howard II, *supra* note 415 at 9. At the time this was written, the MOU between Virgin Galactic and Spaceport Sweden has expired and has not been renewed.

all launch licensees to insure third-party risk,[448] it does not extend this requirement to spaceport operators, nor does it require the spaceport operator to prove financial responsibility.[449]

Spaceports do not enjoy the complete benefit of the risk allocation scheme extended by the CSLA. Instead, the FAA has interpreted the law to preclude government indemnification for launch and/or reentry site operators (spaceports), despite the fact that the FAA licenses them. In other words, the site operators are not indemnified but the carriers or launch providers/licensees would be. It is through the launch or reentry license that the spaceport operator receives the benefit of the statutory liability risk-sharing regime. This is accomplished through its role as a contractor to the launch/reentry and provider of launch property and service. The spaceport operator can be named an additional insured under the launch licensee's liability insurance and in the scheme of reciprocal waivers in place.[450] Non-launch related operations performed at the spaceport, such as motor-balancing, can expose the spaceport to liability for third-party claims outside of the CLSA regime.

The US framework regulating spaceport operations and activities is the most developed in the world. Analyzing it for effectiveness reveals strengths and weaknesses. It is strongest with regard to its clarity, specificity, and practicality and its sound legal basis. It is also strong in balancing costs against benefits and in furthering the social values of safety, though limited here, innovation and robust economic growth. The regulations display potential weakness on the prongs of intermodality, with regard to international cooperation, interoperability and interconnection with other transportation modes, as well

[448] This can be in the form of self-insurance, after proving to have the financial reserves necessary to meet or exceed MPL.
[449] Risk-Sharing Study, *supra* note at 385.
[450] "Financial Responsibility", 63 FR 45592-45625, at 45994 issued 26 August 1998.

as global competitiveness (in part due to disparate safety metrics and application).

Including spaceports in a space law regime

The title of this chapter is not US law. It is "Spaceport regulation as part of the space law regime". This next section will take the discussion past US law. Scholars have written very little about spaceports. Most of what has been written in the last ten years has been with a view to space tourism and the various issues it presents. An evolution of terms of art can be seen in the more recent past.[451] Now, it is as, if not more, common to see papers and articles framed in terms of commercial spaceflight, which includes both orbital and suborbital activities.[452] Space tourism is a subset of the larger set of commercial spaceflight (and also includes both suborbital and orbital)[453] while space transportation is broader yet and includes commercial spaceflight as well as civil and military.[454] Peeters comments that there is an evolution from adventurous space tourism to space travel as a means of transport.[455] He includes connectivity between airports and space travel infrastructures as a key difference. In other words, intermodality distinguishes commercial spaceflight for transportation purposes from space tourism as a one-off thrill-seeking

[451] Walter Peeters, "From suborbital space tourism to commercial personal spaceflight" Acta Astronautica 66 (2010) 1625-1632.
[452] For instance, Virgin Galactic is a suborbital commercial spaceflight company and SpaceX is an orbital commercial spaceflight company.
[453] Virgin Galactic is a suborbital space tourism operator while Space Adventures is an orbital space tourism operator. Space Adventures is the company responsible for flying seven private citizens over the course of eight missions to the International Space Station. Space Adventures: Clients – Completed Missions available: http://www.spaceadventures.com/index.cfm?fuseaction=orbital.Clients (date accessed: 17 June 2014). Space tourism has been defined as "any commercial activity offering customers direct or indirect experience with space travel." Steven Freeland, "Up, Up and …Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space" 6 Chi. J. Int'l L. 1 (2005-2006) (hereinafter Freeland I) at 6 citing Stephan Hobe and Jürgen Cloppenburg, "Towards a New Aerospace Convention? – Selected Legal Issues of 'Space Tourism'" presented at 47th Colloquium of the International Institute of Space Law, Vancouver 2004).
[454] Maason-Zwaan & Freeland, *supra* note 210 at 1599. Maason-Zwaan and Freeland describe the developmental chronology of space transportation as evolving from relatively simple suborbital events to orbital spaceflight, then intercontinental rocket transport through outer space to fully reusable orbital launch vehicles.
[455] Peeters, *supra* note 451 at 1631.

experience performed only for the sake of it. Significantly, the US Transportation Research Board Commercial Space Transportation Subcommittee lists Intermodal Infrastructure under Spaceports in its proposal for a workshop session at next year's annual meeting.[456]

A number of issues surrounding suborbital travel have been identified as problematic in the least.[457] One of these is registration. Von der Dunk discusses the problems that arise from the Registration Convention's apparent silence regarding suborbital flights, requiring registration (and allowing jurisdiction and control to flow from that registration to the state of registry) for objects launched into Earth's orbit or beyond.[458] If a vehicle is launched on a trajectory that extends past the Earth's atmosphere but does not achieve orbit, does the Registration Convention apply? How does registration affect the rights and responsibilities of the spaceport operator? Does regulation of the spaceport have any bearing on this issue? Does the registration issue impose any constraints or mandate any actions on the part of the spaceport? It may.[459] As described in Chapter Two, spaceport operators may be the most logical entities to keep records of launches and provide information to the appropriate State for registration. So, this issue could impact the responsibilities of the spaceport operator. To date, the legal duty is not imputed to that party (spaceport operator). For spaceports launching both orbitally and suborbitally, perhaps no differentiation need be made for internal purposes. But, things could get pretty dicey with

[456] Email from Wil Laska, Chair CST Subcommittee, TRB to Ken Davidian (FAA); Derek Webber (Executive Director, Spaceport Associates; Marcus Smith (FAA); and the author, dated 18 June 2014 (on file with author).
[457] Stephan Hobe, "Legal Aspects of Space Tourism" 86 Neb. L. Rev. 2 (2007) 439, at 440. Professor Dr. Hobe recognizes these issues to be delimitation, authorization to conduct space tourism, registration of the aircraft or space object, liability to passengers and third parties, and the status of passengers. Freeland identifies the need for international safety standards, the status of spaceflight participants, ethical considerations and the issue of property rights in space as others of great import to commercial space. He believes that a uniform and comprehensive regime, at least in the area of passenger liability, is desirable. Freeland I, *supra* note 454 at 15; Steven Freeland, "Fly Me to the Moon: How Will International Law Cope with Commercial Space Tourism?" 11 Melbourne J. Int'l L. (2010), 1 (hereinafter "Freeland II") at 18.
[458] von der Dunk II, *supra* note 187 at 326.
[459] Or as the common lawyer joke goes, it depends…

regard to international cooperation and global competitiveness with different methods of taxonomy in place and different record-keeping responsibilities in different States.

Chief among the conundrums presented by the lack of demarcation is that of jurisdiction. In other words, which regime's laws apply where? Hobe identifies the delimitation issue as seminal "in every legal examination of issues regarding space tourism." [460] As Freeland posits, "Should air law apply for part of the journey and space law then be applied at some (undefined) point in the overall space tourism activity?"[461] These are the idealogical underpinnings of the aerospace object controversy illustrated by the Legal Subcommittee's questionnaire, described at length in Chapter Two. However, does this issue truly impact liability at a spaceport? Certainly it directly affects liability for any party impacted adversely as a result of a launch. But, a launch, even an incomplete one or unsuccessful one, is necessary. No launch, no launching State.

The Liability Convention imposes on the launching States absolute liability for any damage caused to persons or property on the surface of the earth by a space object.[462] This would appear to include property in or contiguous to a spaceport, but might not because the Liability Convention does not apply to damage caused to nationals of the launching State.[463]

Freeland finds that uncertainty is the biggest problem confronting commercial spaceflight, particularly because of the lack of uniformity in recovery for injured parties.[464] This is enigmatic regardless of whether damage occurs on a sub-orbital or orbital mission,[465] or even whether it is touristic or transporting cargo to the International Space

[460] Hobe, *supra* note 457 at 441.
[461] Freeland I, *supra* note 453 at 9.
[462] Liability Convention, *supra* note 91, Art. II.
[463] *Ibid.* at Art. VII(a). However, damage to the person or property of some non-nationals could be included.
[464] Freeland II, *supra* note 457 at 18.
[465] The suborbital issue only makes it worse.

Station. This uncertainty arises because the Liability Convention is concerned only with international third-party liability.[466] For instance, damage caused by a space object, no matter where it occurs, is only for the general uninvolved public, for parties uninvolved in the activity.[467] There are no second-party rights of recovery. There are also no private rights of recovery.[468] Damage is only recoverable against a launching State.

As noted, the provisions of the Liability Convention do not apply to nationals of the launching State whose space object caused the damage and/or foreign nationals participating in the event.[469] However, the State where the spaceport is located is responsible and the provisions will be applied as a launching State for claims. If the spaceport is a government-owned facility, it seems discussion would end there. However, if a private entity, the State, motivated by its ultimate liability/responsibility can choose to impose financial responsibility requirements, including insurance, in order to subrogate this exposure to the spaceport operator.

Earlier this chapter examined in depth the financial ramifications of a license in the US. These financial responsibility requirements are included in the licensing process whereby the State fulfills its obligation to provide authorization and continuing supervision

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[466] Frans von der Dunk, "Passing the Buck to Rogers: International Liability Issues in Private Spaceflight" (hereinafter "von der dunk IV") (2007) 86 Neb. L. Rev. 400 at 412; Art. III Liability Convention; *see also* Lesley Jane Smith, "Facing Up to Third Party Liability for Space Activities: Some Reflections" Proceedings 52nd Colloquium on the Law of Outer Space, Glasgow Scotland 2009. The Outer Space Treaty did not even address third-party liability, only liability between States. *See* Maason-Zwaan & Freeland, *supra* note 211 at 1598.

[467] Although this is reminiscent of the US focus on third-party liability it bears no relation. A US citizen can claim against a US company, which could in turn be indemnified by the US government. A claimant under the Liability Convention can only claim, through diplomatic channels not as a private party, against a launching State that it is not a national of and it cannot even claim against that launching State if it a foreign national that participated in the launch in any way.

[468] While liability as a whole is a serious subject clearly demanding much more work, in both diplomatic and academic fora, the focus here must remain on liability for the spaceport operator. However, private rights of recovery could certainly be made available in outer space without disturbing some of the basic tenets of space law, to wit no sovereignty, no national appropriation, State responsibility for non-governmental activities, freedom of exploration and use.

[469] Liability Convention, *supra* note 29 at Art. VII.

of space activities. Spaceports are not themselves included in the statutory risk sharing scheme but can be as a part of the launch license. Hence, it is through the launch that spaceports are included in the US method of compliance with the Liability Convention.[470] This carve-out is somewhat intuitive in nature and may contain within its ramifications some clarity as to liability concerns for the spaceport operator. Maybe the status as launching State is somewhat irrelevant for the spaceport operator.

The FAA chose to hold the launch operator accountable for the launch since it is the party with control over employees, contractors, and sub-contractors. The spaceport operator is one of the sub-contractors. This choice simplified the apportionment of responsibility between the launch operator and the launch site operator. Furthermore, non-launch activities would not implicate the international treaty obligations as a launching State (no launch, no launching State), obviating government involvement.

Even without conventions or treaties, an injured party can claim in court under traditional theories of tort. If there is a loss at the spaceport or somewhere along the launch timeline, the spaceport operator can still be brought in as a part of the supply chain. The US handles much of the liability for these issues with cross-waivers of liability between the launch operator, contractors, and subcontractors (spaceport operators).[471] However, as Langston observes the "waiver scheme does not eliminate the need for liability protection, but acts to enhance collaboration by providing a system of self-responsibility amongst

[470] *Ibid.* Arguably, the US Congress may now or will someday have authority to regulate spaceports through its Commerce Clause power, as sites of activities substantially affecting interstate commerce. For now, the authority comes via the Supremacy Clause. Blasingame, *supra* note 38 at 776-77. It is through the Commerce Clause that the US Congress legislates regarding air commerce and the national airspace. *Ibid.*
[471] Hobe, *supra* note 458 at 450.

parties."[472] As it stands now in the US, the spaceflight participant may even limit liability of the spaceport further, depending upon the state where the site is located.[473]

From the spaceport operator's perspective, if hauled into court as part of the supply chain of a launch, and not directly involved, the action could quite likely be dismissed or disposed of through summary judgment. Insurance is available for events that are not part of the launch.[474]

Conclusions

To conclude, the US has a rather effective system of regulation in place. It falls somewhat short with regard to intermodality, between modes of transportation, and perhaps international cooperation. It has developed in standalone fashion since space travel is currently a domestic activity, taking off and reentering within the US. The US system relegates licensing of its spaceports to the same authority that licenses all commercial space activity in the US. However, the US distinguishes between the spaceport operator and the launch operator in significant ways. The spaceport operator does not have the same financial responsibility requirements and only enjoys indemnification as a subcontractor of a launch. The implications for a spaceport's liability come into play only when there is a launch, triggering uncertainty flowing from jurisdictional questions (does air or space law control) and issues about rights of recovery (second-party liability, third-party liability,

[472] Sara Langston, "Suborbital Flights: A Comparative Analysis of National and International Law" 37 J. of Space L. 2 (2011) at 324.
[473] See the previous section discussing informed consent and state limits to liability.
[474] Insurance for suborbital activities is not without its challenges. Bensoussan suggests that the aviation market is not suitable for suborbital covers since the new technologies lack relevant historical data allowing underwriting by statistic. Instead, he offers that the space insurance market would serve better, at least for the time being, as it relies upon a more technical analysis and coverage designed for unique situations. Denis Bensoussan, "Space tourism risks: A space insurance perspective" Acta Astronautica 66 (2010) 1633-1638 at 1635; *see also* Ana Cristina van Oijhuizen Galhego Rosa, "Aviation or space policy: New challenges for the insurance sector to private human access to space" Acta Astronautica 92 (2013) 235-242.

private rights of recovery, no claims of nationals or involved foreign participants against a launching State).

Another subject that implicates the dialog between air and space regimes is that of traffic coordination. Peeters states that "increased use of space for commercial transportation will even lead to more advanced regulations such as the ones proposed in Space Traffic Management proposals."[475] The need for coordination or management goes beyond national air systems; it also involves debris and situational awareness between assets in orbit.

Some jurisdictions are not as settled about, or as committed to, what authority should control. The next chapter will explore the EASA proposal for EU Member States in depth. Perhaps the idea is that spaceport operators should be making facilities as flexible and able to respond to as many modes of transportation as possible. The appropriate regime would be activated by the activity, be it a flight or launch.

There is nothing intrinsically wrong with managing spaceport operations as part of a space-based regime or with licensing suborbital and orbital activities in similar fashion. The point is only that silos can be counterproductive, whether they are between countries or between modes of travel. It is also somewhat inefficient to fail to accommodate the differences between these two aspects of spaceflight, at least operationally, on the ground, at the spaceport.

Eilene Galloway notes four characteristics of space law: that it is 1) national and 2) international and it applies to both to 3) outer space as a geographic area and to the 4)

[475] Peeters, *supra* note 451 at 1627-28, referencing K-U. Shrogl, "Space traffic management: the new comprehensive approach for regulating the use of outer space. Results from the 2006 IAA cosmic study" Acta Astronautica 62 (2008) 272-276; *see also* Masson-Zwaan & Moro-Aguilar, *supra* note 350 at 249.

functions performed in that area.[476] It is only through the launch that the spaceport is linked. It is neither in the geography of outer space, nor are its non-launch related functions performed there. This link, the launch, is what brings spaceports into the space law realm. However, all of the issues that render spaceport regulations effective are relevant regardless of which regime controls or where outer space physically begins. Perhaps that is the ultimate issue. Going back to our now expanded hypothetical, that of the multi-modal transportation hub – what makes for an efficient facility is not that it is governed by one set of regulations as opposed to another. It is that the facility is safe, that it is not a drain on the economy, that it coordinates the various modes of transport efficiently, the regulations that are in effect, whatever they may be, are clear and practical, and that there is some degree of interoperability allowing for connection to other hub facilities.

[476] Eilene Galloway, "Law and Security in Outer Space: The Role of Congress in Space Law and Policy" Journal of Space Law, Vol. 22, Nos. 1 and 2, 1983, pp. 35-50.

Chapter Five: Including spaceports in the existing aviation regime

As yet, the European Union (EU) has not taken an official position on suborbital flight.[477] However, the European Aviation Safety Agency (EASA),[478] the EU's common initiative in place to maintain safe, sustainable air transport, has suggested a completely different approach than the US on the issue of regulating suborbital flight. This would directly impact the regulation of suborbital airports. Depending upon the Commission's action, suborbital spaceports in Europe may be subject to an entirely different regime than orbital spaceports and governed by completely different authorities. The regulations discussed in Chapter Two govern European orbital spaceport activities.

After first providing some background information on the EASA proposal to regulate suborbital spaceports and activities, this chapter then applies the benchmark to that proposal. Next, it delves into public and private international aviation law to illustrate methods of integration with current aviation regulation and rights of recovery under EASA's proposal. The chapter will also address the interaction between orbital and suborbital transportation in Europe and the implications for spaceports wishing to serve all modalities of commercial spaceflight.

[477] Perhaps because of the unsettled nature of this regulation, there is a paucity of published information on the topic. The most comprehensive information comes from Jean-Bruno Marciacq's papers and presentations of the past few years. The author cites the most recent throughout, although it is fast becoming anything but. *See also* Aron Lentsch, et al., "The Future Regulation of Suborbital Flight in Europe" IAC-12-D2.9/D6.2.5 Presented in Naples Italy October 2012. "It is to be noted however that in September 2011, the European Commission put EASA's suborbital activity on hold, due to a new directive from the Commissioner's Cabinet to investigate a lighter process, similar to the FAA/AST 'Launch Licensing' procedure." *See* Marciacq I, *supra* note 90.

[478] "What we do" EASA website online: http://easa.europa.eu/what-we-do.php (date accessed: 19 January 2013). It remains possible that the European Commission will not give EASA the necessary mandate and resources to proceed with the approach outlined in this section. In that case, it is possible that each country will regulate suborbital flight for themself, perhaps in a similar manner to the US.

The EASA proposal

The proposal for a regulatory framework for suborbital reusable vehicles (SRVs) currently before the European Commission contains eight options: 1) leave the regulation and supervision to Member States (the status quo described in Chapter Two); 2) EASA participation and support to national initiatives such as between the UK-CAA and the UK Space Agency; 3) participation in international groups similar to JARUS (Joint Authorities Rulemaking for Unmanned Systems); 4) EU policy drafted with EASA technical expertise to offer guidance while formal regulation is pending; 5) creation of a licensing process similar to the US FAA AST license and permit regime; 6) development of a full set of rules under the EASA framework (this is the proposal described in this chapter); 7) a phased approach, progressing from the second option listed here to the sixth which would utilize bilaterals between Member States advanced enough to be performing suborbital activities; and 8) definition of a regulatory framework encompassing both orbital and suborbital transportation as elements of a full-spectrum of integrated operations (complete intermodality between aviation, suborbital and orbital activities from its inception forward).[479]

Europe 2020, the Commission's 2010 strategy for economic growth after the worldwide financial crisis, committed the EU to development of a space policy equipped to address global challenges.[480] In 2013, the EC published the EU space industrial policy,[481]

[479] Marciacq, *supra* note 90 at 7.
[480] Communication from the Commission, Europe 2020 Brussels, 3.3.2010, COM(2010) 2020 final at 17. Although Galileo and GMES are specifically identified as important deliverables, the policy is to address all of space policy.
[481] EU Space Industrial Policy: Releasing the potential for economic growth in the space sector, Brussels, 28.2.2013 COM(2013) 108 final.

clearly expressing goals of industry competitiveness,[482] improvement of legal framework conditions,[483] and safety and predictability[484] through five specific objectives, which are: 1) establishment of a coherent and stable regulatory framework; 2) furtherance of a competitive, solid, efficient, balanced industrial base including small to medium businesses; 3) global competitiveness and cost-effectiveness along the supply chain; 4) development of markets for space applications and services; and 5) technological non-dependence and independent access to space.[485]

The EC addressed the need to explore issues concerning commercial spaceflight in the initiatives listed to improve the legal framework.[486] Interestingly, the Commission appears to limit commercial spaceflight to suborbital activities while at the same time acknowledging that these activities encompass more than tourism, to wit scientific experiments, training, and, ultimately, point-to-point transport. It is here in this part of the space policy directive that the issue of "certification rules derived from aeronautic best practices" is found, in the context of European stakeholders calling for a stricter regulatory framework.[487] The policy does not prioritize embedding commercial spaceflight activities in a legal framework as far as EASA's rulemaking programme, but a study is determined to be the next step.[488]

[482] *Ibid*. at 3.
[483] *Ibid*. at 11.
[484] *Ibid*. at 14.
[485] *Ibid*. at 4.
[486] *Ibid*. at 13.
[487] *Ibid*.
[488] *Ibid*. at 21, Annex: Measures Envisaged for the Space Industrial Policy.

The EC commissioned Booz & Company to perform the study in 2013.[489] It explored the various options described earlier in this section; however, the two main approaches it detailed are the US system presented in Chapter Four and the proposal EASA drafted and advocated since 2008, which has now stalled.[490] That proposal corresponds with option 6 in the preceding paragraph and option 2.1 in Figure 5-1 below. The aviation rules are the starting point but can be modified by amendment in order to attempt balance between costs and benefits.[491]

The underlying rationale for choosing to regulate suborbital activities as part of aviation appears to have its genesis in stakeholders' interest in passenger safety and predictability of the proven aviation certification framework for private investors.[492] Experts involved in the drafting of the EASA process have stated that the "main objective of the development of a rulemaking framework suitable to SoA Operations in the EU shall be to provide a consistent and harmonized set of regulatory material, in a timely manner, enabling the development and safe operations of Sub-orbital Aircraft in Europe."[493] Perhaps the timeliness is perceived to be more easily achieved by utilizing the extant framework governing aeronautical activity instead of creating an entire new framework from scratch, particularly since the European stakeholders are investing in suborbital systems at present and those industry actors have expressed willingness to comply with the aviation regime

[489] European report, *supra* note 18.
[490] *Ibid*. at 39. The report refers to it as "the EASA process".
[491] *Ibid*. at 44.
[492] EU Space Industrial Policy, *supra* note 481 at 14.
[493] Marciacq I, *supra* note 90 at 5.

with which they are already familiar. Because aviation is an accepted form of transport, EASA competence is established.

The following graphic illustrates EASA actions if the EU chooses some form of coordination of regulation.

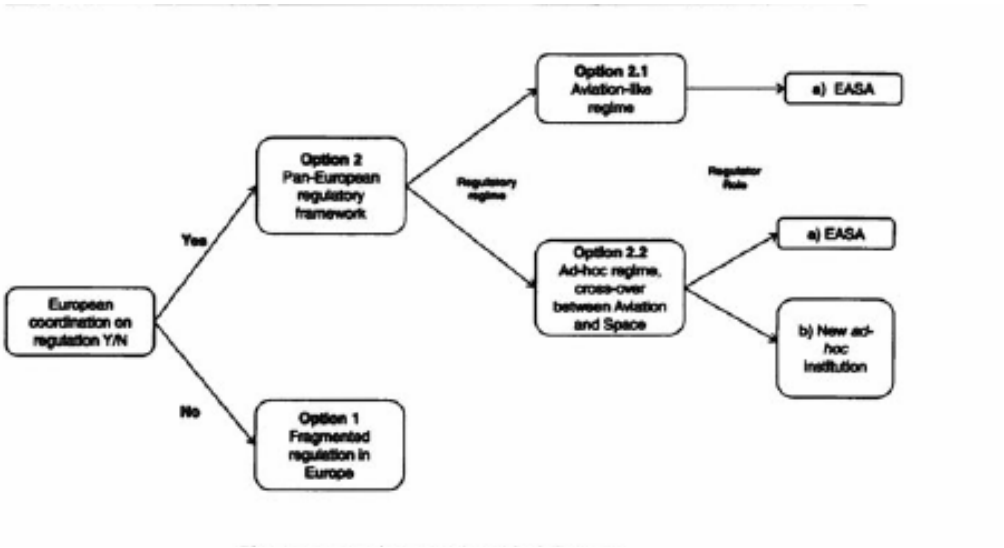

Figure 5-1 Action tree illustrating EASA actions[494]

The focus of the thesis is on spaceports, but the EASA proposal to certify the vehicles is entwined with the decision to certify spaceports as aerodromes and would place the spaceports within the international aviation system.[495] European designers of suborbital craft such as Airbus Defence & Space (formerly EADS-Astrium), DASSAULT/Swiss Space Systems (S3), Booster Industries, and Reaction Engines Ltd. are prepared and willing to apply for certification under the proposed EASA regime, hoping to extend the guarantee of an agreed upon level of safety to both

[494] European report, *supra* note 18 at 62.
[495] There appears to be a special regime available for vehicles manufactured in the US which will be "semi-automatically" provided with an airworthiness certificate, although the article does not specify which one and close reading of the decree appears to leave that open for determination based upon the facts of the particular case or instance. Frans von der Dunk, "Trying to Fit a Square Peg into a Round Hole? Applying Air Law to Manned Commercial Spaceflight – the Case Study of Curaçao" at 6, IAC-12, D-2,9-D6.2,3,x12819 Presented at IAC Naples Italy October 2012.

passengers and crew while providing some assurance to investors and insurers.[496] The rationale is that the companies would avoid putting their own reputations on the line by acceding to EASA's process.

Effectiveness analysis of the EASA proposal

Does the EASA proposal serve its own clearly identified internal goals? Partially.

In Regulation (EC) 216/2008, the Commission states that its policy goals for the development of common rules of aviation, including extension of the agency's mandate to operations, are based upon a commitment to a "high and uniform level of protection of the European citizen" and methods of ensuring compliance to rules.[497] The Commission amended that regulation the next year with adoption of Regulation (EC) No 1108/2009, further extending EASA's tasks "with a view toward a 'total system approach' to aerodrome/airport safety and interoperability, air navigation services (ANS) and air traffic management (ATM)."[498] Together these regulations comprise the Basic Regulation. Economic growth is to be facilitated through risk mitigation ensuring safety through a "harmonized, holistic regulatory approach".[499] The benefits of flexibility are acknowledged and used to balance rules with methods of compliance.[500] Safety is the key consideration throughout the Basic Regulation.

The EU Space Industrial Policy is very clear that its goals include creation of a coherent framework, development of economic robustness, and support for global competitiveness. The proposal to regulate suborbital spaceports separately from orbital

[496] Marciacq I, *supra* note 90 at 1.
[497] Regulation (EC) No 216/2008 (20 February 2008) (1).
[498] Regulation (EC) No 1108/2009 (21 October 2009) (1).
[499] *Ibid*. at (2).
[500] *Ibid*. at (7).

does not completely serve these ideals.[501] The regulations do make safety a chief consideration, both on the EASA supranational level and also, where applicable, on the local level. However, the proposal does not assist in its objective of harmonization because it lacks a mechanism to facilitate interoperability between suborbital spaceports/activities and orbital launch sites/activities. This conflict arises because of the competence issue, discussed *infra* in the legal basis prong. The issue of robust growth and global competitiveness will be addressed below.

Is the EASA proposal externally coherent with the goals identified in Chapter Three as appropriate for spaceport regulation?

***Compliance with international obligations*: Limited.**

The Basic Regulation focuses on the Chicago Convention and the obligations it contains but not the space treaties. Even the International Civil Aviation Organization (ICAO) remains undecided about the inherent obligations that are triggered by suborbital transportation.[502] Failure to address the possibility that other international obligations may be implicated is myopic.

***Enhancement of international cooperation*: No.**

The EASA proposal does not enhance all aspects of international cooperation. A certain degree of cooperation is facilitated by the imposition of a common regime on this type of transport, however there is no acknowledgment of other regimes outside of Europe. As a result, interoperability is only as between aviation and this limited type of suborbital transportation and between EU Member States.[503] Potential conflict exists for XCOR and

[501] In actuality, the EASA proposal seems to go further, separating winged, horizontal take-off/landing or air-launch/horizontal landing from vertical rocket launches.
[502] "Concept of Sub-orbital Flights: Information from the International Civil Aviation Organization (ICAO)" (19 March 2010).
[503] European countries do not agree on how to approach suborbital flight. Sweden, long a State that expressly did not include suborbital activity within the purview of its space law, is considering a regime similar to that

its proposed Curacao operation, or for Virgin Galactic if it chooses to fly from a European spaceport.[504] The UK is aware of this discord and currently has a working group examining options.[505] The US is farther ahead with vehicle development and commercial operations are more imminent. A more similar regulatory framework to the US or, at the very least, some baseline interoperability would create a better environment for international cooperation.[506] This issue also factors into global competitiveness and intermodality.

Preservation of social interests: **Partially.**

The EASA proposal aligns with the external value for safety, as it is the primary driver found within the Basic Regulation. EASA is assigned to develop Implementing Rules (IRs) to ensure safety in the design of the vehicle to be certified.[507] Aerodrome spaceport specifications provide for a predetermined level of safety. The EASA approach integrates structure and design elements regarding airworthiness and crashworthiness, as well as training and qualification of crew.[508]

There is a local component to the safety framework, which is based upon the specifics of a particular location in concert with the requirements of Article 8a of (EC) No. 1108/2009.[509] Article 8a para 2(a) states that a certificate to operate an aerodrome/spaceport will only be granted upon a showing that it has no unsafe feature or

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utilized in the US because it is perceived that it would facilitate easier operations between Spaceport Sweden and Spaceport America. European report, *supra* note 18 at 56.

[504] European report, *supra* note 18 at 45.

[505] *Ibid*.

[506] European report, *supra* note 18 at 57.

[507] Quinn & Maropoulos, *supra* note 403, EASA Aerodromes, *supra* note 230 at 5.

[508] Article 7 Regulation (EC) No 216/2008; Opinion No. 04/2010. The safety assessments falling within EASA's competence only go to the airworthiness of the suborbital vehicle, not its space worthiness. Because liability for events in outer space ultimately falls to States, national legislation is the logical place for treatment of space worthiness of a space object. Hence, many States include a need for approval on this issue in their national space legislation, as they should. As for medical clearances for spaceflight participants and crew, private entities now exist that provide this service in Toulouse France and Cologne, Germany.

[509] Marciacq I, *supra* note 90 at 16.

characteristic.[510] Measures designed to amend non-essential elements are to reflect "state of the art and the best practices in the field" and default to ICAO SARPs found in Annex 14.[511] Great effort has been invested in maintaining agreement between the European rules for aerodromes and the ICAO SARPs.[512] The transposition of ICAO Annex 14 SARPs into workable EASA Certification Standards (CSs) sometimes necessitated combining the language of both a standard and a recommended practice into one rule that reflected the spirit of the law.[513]

Special conditions requiring case-by-case treatment that implicate the local component include stipulations regarding the storage and handling of explosives and toxic propellants, as well as special fire fighting procedures. It is recommended that airport design take into account land-use and environmental control requirements and

[510] Admittedly, this is a somewhat circular directive as it requires the proving of a negative but the text above tracks the actual language of the regulation.

[511] Regulation (EC) 216/2008 Article 8a 6.(a); Those measures shall specify in particular:
(a) the conditions for establishing and notifying to an applicant the certification basis applicable to an aerodrome;
(b) the conditions for establishing and notifying to an applicant the detailed specifications applicable to aerodrome equipment;
(c) the conditions for issuing, maintaining, amending, suspending or revoking certificates for aerodromes and certificates for aerodrome equipment, including operating limitations related to the specific design of the aerodrome;
(d) the conditions for operating an aerodrome in compliance with the essential requirements set out in Annex Va and, if applicable, Annex Vb;
(e) the conditions for issuing, maintaining, amending, suspending or revoking the certificates referred to in paragraph 2(d);
(f) the responsibilities of the holders of certificates;
(g) the conditions for the acceptance and for the conversion of aerodrome certificates issued by Member States, including measures which are already authorised by the Member State concerned on the basis of notified deviations from Annex 14 of the Chicago Convention before the entry into force of this Regulation;
(h) the conditions for the decision not to permit exemptions referred to in Article 4(3b), including criteria for cargo aerodromes, the notification of exempted aerodromes and for the review of granted exemptions;
(i) the conditions under which operations shall be prohibited, limited or subject to certain conditions in the interest of safety;
the conditions and procedures for the declaration by and for the oversight of service providers referred to in paragraph 2(e). Article 8a5.(a) *et. seq*.

[512] EASA Aerodromes, *supra* note 230 at 7; *c.f.* Cross References to Annex III – Part-OPS Table NPA 2011.

[513] For an example of this, see the technical requirements for the runway end safety area where the CS reflects the complete SARP. Appendix C of NPA 2011-20 is very helpful in comparing and contrasting the ICAO SARPs with the EASA safety IRs.

constraints.[514] Environmental impacts are subject to national legislation where the spaceport is situated.[515] Under the EASA proposal, national laws also contribute to safety oversight through their comprehensive regulatory framework[516] and accident investigations and worker safety are managed on this level.[517]

EASA's Operator Responsibilities require that EASA and the competent authorities of Member States establish coordination arrangements with a security agency to ensure that measures are integrated into the design and infrastructure of aerodromes.[518] No EASA-wide rules have been proposed regarding medical fitness and training of suborbital passengers, although private training is available.[519]

The EASA proposal does not facilitate innovation.[520] Certification of vehicles takes a long time in order to acquire the requisite historical data. Standardization is necessary to fly commercially and this can squelch creative technologies. The high cost of certification

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[514] *Ibid.* at 1.5.2

[515] Regulation (EC) No 1108/2009 Article 1 1.(c).

[516] For instance, Sweden manages this through the SCAA. Sweden Audit, *supra* note 149 at 3.1.2.2. There is a formal procedure for reviewing ICAO letters, consultation, and maintaining compliance with the SARPs. Differences are published in the *Aeronautical Information Publication (AIP) of Sweden* as per Annex15, Chicago Convention. The requirements are outlined in the BCL-F regulation, which covers all Annex 14 related issues. Luftfartsstyrelsens föreskrifter om ändring i Luftfartsverkets föreskrifter Bestämmelser för Civil Luftfart– Flygplatser (BCL-F) 1.2 (Swedish Civil Aviation Authority) LFS 2005:8.

[517] Continuing the Swedish example, the Swedish Accident Investigations Act and the Accident Investigation Ordinance govern accident investigations. The Act makes mandatory government investigation of all transportation related, including aviation, accidents and incidents. This applies to spaceport/aerodromes as well. The Ordinance assigns to the Swedish Accident Investigation Board (SHK) the authority for that investigation.

EU action in health and safety in work environments has as its legal basis Article 137 of the EU Treaty. Accident Investigation Act (1990:712); Accident Investigation Ordinance ((1990:717). Both were promulgated on 23 May 1990, entered into force on 1 July 1990 and last amended on 1 July 2007. For information regarding worker safety, *see* Consolidated Version of the Treaty Establishing the European Community art. [], 2006 O.J. C 321 E/37, at [Part Three] [hereinafter EC Treaty]. - Part Three: Community policies - Title XI: Social policy, education, vocational training and youth - Chapter 1: Social Provisions, Article 137.

[518] This is compliant with the requirement found in Annex 14 that international civil aviation security measures shall be integrated into architectural design and infrastructure when designing and constructing new facilities and when modifying those already in existence at an aerodrome. NPA 2011-20 (B.I) Annex II – Part-OR Subpart C – Additional Operator Responsibilities ADR.OR.C.005(b)(7), 1.5.1.

[519] Marciacq I, *supra* note 90 at 11.

[520] European report, *supra* note 18 at 45.

can be a barrier to entry for start-ups and smaller operations.

There are several aspects to how the EASA proposal affects economic growth. Customer perception that vehicles are safer and the resulting insurer confidence could be beneficial, but the increased costs and timeframe could deter growth, leaving only legacy stakeholders in the market. The lack of regulatory clarity and institutional support has an adverse affect on business development.[521] The increased regulatory burden in Europe could deter US operators from performing operations as European sites.

***Encouragement of intermodality between other transportation modes and systems*: Some, but limited.**

Modifying and integrating existing aviation SARPs to spaceport/aerodromes supports intermodality between at least suborbital transportation and aviation. However, suborbital transportation is separated from orbital activity creating a silo or stovepipe and this could create limits to the activities that could be performed at a spaceport under the EASA proposal (option 6).

Option 8 (2.2 in Figure 5-1) presents the goal of a completely synergistic regime, incorporating all aspects of transportation into a new *sui generis* regime.[522] The downside to this option is the length of time anticipated for negotiation, drafting, and consensus.

***Competition in the global marketplace*: Limited.**

This policy goal is somewhat conflated with international cooperation and economic growth. The EASA proposal does not align with this objective since most of the global marketplace is in the US.

Does the EASA proposal have a sound legal basis? Yes.

Arguably, EASA has competence to regulate these activities as a part of

[521] *Ibid* at 54.
[522] Masson-Zwaan & Moro-Aguilar, *supra* note 350 at 2. See text accompanying note 635 in Chapter Seven.

transport,[523] since this is an area where "the Community has been empowered to establish common policies and common rules."[524] EASA's jurisdiction over the activity ends where outer space begins.[525] At that point, Member States' national responsibility takes over, in accordance with Article VI of the Outer Space Treaty requiring States to authorize and continually supervise the activities of their nationals in space.[526] That obligation cannot be delegated to EASA.[527] However, assuming *arguendo* that commercial spaceflight, even orbital, is envisaged as transport it is possible that EASA competence could be extended to the activity.

EASA proposes to apply to suborbital craft the ICAO definition found in Annex 8 of the Chicago Convention: "an aircraft is any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface."[528] This would necessitate certificates of airworthiness as per the rules set forth by the European Aviation Safety Agency (EASA) and ICAO.[529] Aerodromes are regulated by EASA and implemented through NPA 2011-20 (combined) and Annex 14

[523] Modes of transport such as aviation allow Union law to trump or to suppress national law. TFEU, *supra* note 83 at 4(2). The European Economic Community must establish common policy and common rules for transport. *Ibid*. at Articles 90-100, p. 47. There is an implicit distinction made by the TFEU, allowing shared competence for space activities not as part of transport, that runs counter to intermodality between space transportation and other modes of transport. No distinction is made for commercial activities as opposed to exploration or science, simply between space and transport.
[524] Marciacq I, *supra* note 90 at 3.
[525] Registration Convention, *supra* note 30 at Art. 2(1). A very persuasive argument could be made for the idea that 100/110 km above sea level is recognized as the delimitation in customary international law. Nase, *supra* note 446 at 762; von der Dunk II, *supra* note 187.
[526] These are the national laws addressed in Chapter Two.
[527] The European position with regard to registration of suborbital vehicles appears to be that it is unnecessary as they are launched into outer space, but not into orbit, the parameter set forth in Article II of the Registration Convention in order to keep track of objects remaining in outer space, particularly in a certain orbital position. Marciacq I, *supra* note 90 at 14.
[528] This leaves out hovercraft as well as rockets.
[529] There are several choices available for certifying the suborbital craft: 1) a Type Certificate (TC), which assumes volume not yet achieved in the industry; 2) a Restricted Type Certificate (RTC) which EASA envisages as the best fit for volume-produced suborbital craft; 3) a Restricted Certificate of Airworthiness (RCofAs) for vehicles produced in limited numbers are based upon Specific Airworthiness Specifications and are issued by Member States; or 4) a Permit to Fly (PtF) that cannot be utilized in the commercial operation of complex aircraft and it is not a good fit for suborbital vehicles, as contemplated. Regulation (EC) No 216/2008, Art. 5 (2)(a) (c); Art. 5 (4)(b); Marciacq I, *supra* note 90 at 5, 6.

of the Chicago Convention.[363] This includes aerodromes launching suborbital vehicles.

EASA collectively implements ICAO SARPs on behalf of the Member States.[530] EU law and the logistics of the internal market do not permit usage of minimum requirements, but only of a baseline requirement to which no additional requirement may be appended.[531] The certification basis for the aerodromes also includes a local component. Special detailed technical specifications may be necessary because of the design features of a particular aerodrome.[532] As a result, the national authority with competence for the territory where the spaceport is located will be responsible for its certification according to Article 8a of Regulation (EC) No 216/2008.[533]

Using Sweden to illustrate, Chapter 6, Sections 1 to 16 of the Swedish Aviation Act, outline the establishment and operation of aerodrome/spaceports which require a permit from the government or designated authority, in this case the SCAA. The Act also allows for the promulgation of regulations for obstacle-free zones, requires coordination with the owners of property contiguous to the spaceport, and sets forth regulations regarding maintenance and operations. All of these must be in compliance with EC regulations pertaining to aerodromes, which, in turn, are compliant with ICAO SARPs.

Do the benefits justify the costs? No

The benefits to the EASA proposal are primarily in bootstrapping spaceport operations into existing airports, creating assurance to investors and insurers, and the public

[530] *Ibid.* at 3. SARPs will be described in far greater detail later in this section.
[531] Ostensibly, this is to avoid interoperability issues.
[532] Article 8a 2.(b)(iii) Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulation (EC) No 216/2008 in the field of aerodromes, air traffic management and air navigation services and repealing Directive 2006/23/EC.
[533] For instance, the Swedish Civil Aviation Authority (SCAA) is responsible for Spaceport Sweden. Furthermore, Member States, as signatories to the Chicago Convention, are the parties obliged to adopt the SARPs and to certify and oversee their aerodromes in accordance with the Basic Regulation and all associated rules and specifications. The SCAA will certify and oversee the facility. The EASA rules standardize procedures for certification, oversight, management, and operation of the aerodrome/spaceports and the SCAA will, in turn, implement these.

perception of a safer experience. However, these benefits come at great cost. The certification process is very expensive and takes a long time.[534] And, lost opportunity with the US could be costly.

Are the regulations clear, simple, and practical for users? Partially

The rules for aerodromes are not entirely clear because they delegate certain aspects to EASA and others to the local authorities. The EASA-level regulation is structured in three parts. The first, Part-AR, contains requirements for the competent authority in three sections: General Requirements, Management and Oversight, and Certification and Enforcement.[535] The next two parts are to be fulfilled by the aerodrome/spaceport operator. The second, Part-OR, is in five sections: General Requirements, Certification – Declaration, Operator Responsibilities, Management, and Manuals. The last, Part-OPS, contains three sections and includes Aerodrome Data, Aerodrome Operational Services, and Equipment and Installations and Aerodrome Maintenance. Cognizant of the challenges of the transition period, EASA has developed procedures to convert existing certificates and licenses into the new aerodrome certificate based upon the Basic Regulation and attendant IRs. Flexibility is built into the system, as EASA is able to accept deviations that predate the Certificate Specifications.[536]

The Manual on Certification of Aerodromes is very practical; it provides guidance to States in establishing the regulatory system for certification to ensure that the facilities, equipment, and operational procedures are in compliance with the SARPs in Volume I of Annex 14.[537] The great effort EASA has invested in maintaining accord with Annex 14 can be seen in the Part-OPS Table of NPA 2011-20(C).

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[534] European report, *supra* note 18 at 45.
[535] EASA NPA 2011-20(A) *Authority, Organisation and Operations Requirements for Aerodromes* at 2.
[536] *Ibid.* at 3.
[537] UN Doc 9774 AN/969 (ICAO First Edition 2001)

Masson and Moros-Aguilar find the segmentation in the EASA proposal undesirable on grounds of practicality as it would mean completely different regimes not only for suborbital and orbital transportation but also for horizontal takeoff or air launch/horizontal landing and vertical rocket launches (regardless of destination).[538] The EASA proposal is silent on how to accommodate both suborbital and orbital transportation from the same site and for this reason it is not clear whether a multi-modal spaceport is possible or even legal under this option and how an operator would proceed.

Is the proposal compatible with international and domestic trade policy? Partially

EASA officials and consulted experts opine that the overall safety target should be better than 10^{-4} for the vehicle loss and those on board.[539] This is a completely different assessment of risk than used for a US license, where the significantly lower probability of risk 10^{-6} is used for Expected Casualty for third parties on the ground. The disparity between the US and the proposed metric for Europe creates some dissonance between the two. Also, the increased regulatory burden imposed by a certification regime denotes a basic incompatibility internationally.[540]

Summary of the EASA proposal

In sum, the European model treats suborbital winged vehicles as aircraft, relying on the ICAO definition. As a result, EASA has so far proposed to certify for airworthiness, (though the EU has not yet committed to suborbital policy and rule making), which would certify spaceports (aerodromes) as commercial operations of these suborbital

[538] Masson-Zwaan & Moros-Aguilar, *supra* note 350 at 251.
[539] « The operational constraints are much more severe (e.g. : differential pressures, kinetic heating) and SoAs would be much more complex than a single piston engine CS-23 aircraft, therefore it is the opinion of the authors and consulted experts that the SoA overall safety target should be better than 10^{-4}, as mentioned in AC23.1309-ID for reference as the rate of catastrophic event for General Aviation aircraft below 6.000 lbs (<2,7t) operating in IMC. » Marciacq I, *supra* note 90 at 8; *c.f.* FAA AC23.1309-ID; International Association for the Advancement of Space Safety, Independent Space Safety Board, *Space Safety Standard for Commercial Human-Rated Systems*, March 2010.
[540] 14 CFR § 420 Appendix C, Risk Analysis; Quinn, *supra* note 108 at 1.

vehicles. Aerodromes are included in the European aviation safety regulatory system. The European regulations assign EASA to promulgate Implementing Rules for the aerodromes, which are based upon the SARPs found in Annex 14, Volume 1, Aerodromes. Safety is a factor in the design and certification of the vehicles as well as certification of the spaceports. However, it is considered in context of its local component while in concert with the requirements of the ICAO SARPs. Liability for the European spaceport operator, and for at least a portion of suborbital flight as now contemplated, appears to fall outside the scope of the space regime and would likely be handled in similar fashion to airport operator liability.[541]

The strengths of the EASA proposal lie in its attempts to integrate with aviation and the work done to utilize Annex 14 SARPs in regulating suborbital spaceports. However, this represents a double-sided sword. Severing this type of suborbital activity so completely from other suborbital activity (vertical, rocket) and from all orbital activity creates limitations and conflicts. There are questions regarding how to accommodate different modes of space travel from one spaceport in Europe and how US operators could work within the proposed framework.

Relevant public international air law

In 2008/216 of the Basic Regulation, the Chicago Convention is acknowledged as a source of proven minimum standards successfully utilized internationally to ensure safety and protect the environment. The international air law regime has been in place and viable for many years and contains a potential wealth of information that can be used as a baseline when either building out a spaceport, converting one from an airport, or simply certifying it according it to the EASA proposal.

[541] A question arises as to what could happen if a damaging event happens during the time, however brief, in outer space, if the vehicle is not considered a space object.

The Chicago Convention has its origins in the Paris International Conference of 1910 and the Paris Convention of 1919, adopting most of the latter's primary principles to develop international civil aviation "in a safe and orderly manner".[542] The International Civil Aviation Conference produced more than the Convention. It also generated technical annexes, which would ultimately be incorporated into the Convention.[543] However, even after incorporation, the annexes would not be absolutely binding upon the member states.[544]

The annexes dealt with issues such as airways systems, air traffic control practices, and standards.[545] The annexes were a work in progress; their refinement continued long after the Conference ended, and the ICAO council adopted the Standards and Recommended Practices for Aerodromes, known as Annex 14, on 29 May 1951.[546] The Annex 14 Standards and Recommended Practices (SARPs) flowed from recommendations of the Aerodromes, Air Routes and Ground Aids Division in its third (1947) and fourth (1949) sessions.[547] SARPs are technical specifications adopted in accordance with Article 37 of the Chicago Convention. "Each contracting State undertakes to collaborate in securing the highest practicable degree of uniformity in

[542] Malgorzata Polkowska, "The Development of Air Law: From the Paris Conference of 1910 to the Chicago Convention of 1944" (2008) 33 Annals of Air and Space Law 59, 60; H. Alberta Colclaser "The New International Civil Aviation Organization" 31 Vir. L. Rev. 2, (March 1945), 457; Chicago Convention, *supra* note 250 at Preamble.
[543] Richard Kermit Waldo "Sequels to the Chicago Aviation Conference" Vol. 11 No. 3 Aviation Transport (Winter – Spring 1946) 609, 614.
[544] *Ibid.* at 614.
[545] The complete list of draft technical annexes follows: A) Airways Systems; B) Communications Procedures and Systems; C) Rules of the Air; D) Air Traffic Control Practices; E) Standards Governing the Licensing of Operating and Mechanical Personnel; F) Log Book Requirements; G) Airworthiness Requirements for civil Aircraft Engaged in International Air Navigation; H) Aircraft Registration and Identification Marks; I) Meteorological Protection of International Aeronautics; J) Aeronautical Maps and Charts; K) Customs Procedures and Manifests; and L) Search and Rescue, and Investigation of Accidents. *Ibid.*
[546] International Standards and Recommended Practices, Annex 14, *supra* note 87 at vii.
[547] "All Assembly Sessions" ICAO online: http://legacy.icao.int/icao/en/trivia/ass_sess.htm (date accessed: 26 January 2013).

regulations, standards, procedures, and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation."[548] Included in the Article's list of covered subjects are *inter alia* (b) Characteristics of airports and landing areas; (d) Licensing of operating and mechanical personnel; (h) Log books; (k) Aircraft in distress and investigation of accidents.[549]

Annex 14 is central to EASA's proposal to certify spaceports as aerodromes in accord with ICAO SARPs.[550] The annex is concerned with the physical characteristics and obstacle limitation surfaces of aerodromes, not with the operation of aircraft.[551] "The intent of these specifications is to ensure the establishment of a regulatory regime so that compliance with the specifications in this Annex can be effectively enforced. It is recognized that the methods of ownership, operation and surveillance of aerodromes differ among States."[552] States are mandated to certify aerodromes used for international operations through an appropriate regulatory framework in accord with Annex 14 and all other relevant ICAO specifications.[553] The State's regulatory framework must include certification criteria and guidance for these criteria can be found in the

[548] Chicago Convention, *supra* note 249 at Article 37.
[549] *Ibid*. Article 38 allows a State to depart from the SARPs if it finds it "impracticable to comply in all respects", but that State shall (mandatory) give immediate notification to ICAO of the differences between its own practice and that established by the international standard. When a State does not make appropriate amendments to its own regulations or practices after amendment to a SARP, that State shall (again, mandatory) give notice to the Council within 60 days of the adoption of the amendment OR indicate the action that it proposes to take. No matter what, the Council shall immediately notify all other States of the difference between the existing standard and the corresponding national practice of the non-compliant State.
[550] Jakhu & Nyampong also acknowledge the SARPs role in safe operation of spaceports. Jakhu & Nyampong I, *supra* note 36 at 4. As of this writing, EASA is still on the fence as to how to proceed with regulation of Suborbital Aircraft and the facilities from where they launch and return.
[551] Annex 14, *supra* note 87 at Chapter 1, at 1-1.
[552] *Ibid.* at 1.4, Certification of Aerodromes at 1-6. The quoted paragraph continues with the statement that the most effective and transparent means to achieve compliance is availability of a separate safety oversight entity and well-defined oversight mechanism, two things that would benefit spaceflight immeasurably but which appear ambitious in today's international climate.
[553] *Ibid.* at 1.4.1

Manual on Certification of Aerodromes.[554]

It is recommended that certified aerodromes have operational safety management systems in place.[555] Prior to issuance of certification for the aerodrome, the State shall ensure that the applicant compiles and submits as part of the process a manual including all pertinent information regarding the site, facilities, services, equipment, operating procedures, organization and management (including safety).[556] The use of these SARPs can be useful for spaceports. They are proven, viable minimum standards in place to maintain safety for a number of facilities and elements found in spaceports.[557]

Private air liability

Several issues could implicate the private air liability regime. First, EASA is proposing to treat suborbital vehicles as aircraft. Second, spaceflight participants fall into a very grey area. They are not the same as first parties, but are more like passengers.[558] Third, some recovery must be available if public international law fails and no recovery for claimants is accomplished through diplomatic channels. Additionally, the Liability Convention does not allow nationals of a launching State to recover against the launching

[554] ICAO Doc 9974, AN/969.
[555] Annex 14, *supra* note 38 at 1.4.4 Safety management systems were required as of 24 November 2005. *Ibid.* at 1.4.6.
[556] *Ibid.* at 1.4.5
[557] Please *see* Diane Howard, "Points of Connection: Relating ICAO Annex 14 to Spaceports" Annals of Air & Space Law Vol. 38 (2013), 281 for further discussion of how Annex 14 could be modified for spaceport interoperability, also presented at the Manfred Lachs Conference on the Regulation of Emerging Modes of Aerospace Transportation, 25-26 May 2013, McGill University Montreal Canada.
[558] Even in the US system, an argument could be made that the term spaceflight participant is illusory, at best, and that no adequate recovery is available. Whether or not that argument could prevail is another matter entirely. See also the potential for lawsuits against spaceflight participants described in Mineiro, Michael "Assessing the Risks: Tort Liability and Risk Management in the Event of a Commercial Human Space Flight Vehicle Accident" (hereinafter "Mineiro V") (2009) 74 J. Air L. & Com. 371 at 378. Additional ammunition for the argument that the term "spaceflight participant" fails to satisfy neat definition is the FAA's rationale for its choice to frame its recent Recommended Practices in terms of occupant safety, grouping both crew and participants together and imposing different levels of care depending upon the safety critical nature of activities to be performed.

State itself.[559] Elements of the international air law regime could be applied to suborbital commercial transportation.[560] Liability for a spaceport certified under the EASA proposal would be handled in much the same way as it is managed for airport operators. Insurance is available.

Liability (second party) for international air passengers and cargo is addressed by the international aviation law regime. The issue was first controlled by the Warsaw Convention of 1929 and its amendments, collectively referred to as the Warsaw System. [561]

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[559] Article VIII of the Liability Convention, *supra* note 29, states: "1. A State which suffers damage or whose natural or juridical person suffer damage, may present to a launching State a claim for compensation for such damage." Contrast this with the following articles from the Warsaw Convention:
Article 17:
The carrier is liable for damage sustained in the even of the death or wounding of a passenger or any other bodily injury suffered by a passenger, if the accident which caused the damage so sustained took place on board the aircraft or in the course of any of he operations of embarking or disembarking.
Article 28:
1. An action for damages must be brought, at the option of the plaintiff, in the territory of one of the High Contracting Parties, either before the Court having jurisdiction where the carrier is ordinarily resident, or as his principal place of business, or has an establishment by which the contract has been made or before the Court having jurisdiction at the place of destination.
2. Questions of procedure shall be governed by the law of the Court seised of the case.
Convention for the Unification of Certain Rules Relating to International Carriage by Air, signed at Warsaw, on 12 October 1929 (Warsaw Convention) at Articles 17, 28. From these two articles we see that the carrier is liable, not the State, and injured plaintiff can bring the claim in various named venues. These venues are expanded by Article 33 of Montreal 1999 to include the place of the plaintiff's domicile so long as the carrier operates there. Paul S. Dempsey & Michael Milde, *International Air Carrier Liability: The Montreal Convention of 1999* (Centre for Research in Air & Space Law, McGill University: 2005) at 220.

[560] *See* Nase, *supra* note 445 at 760-62 for a creative approach to this idea; *see also* Chatzipanagiotis, *supra* note 61 at 95-101.

[561] The system includes nine instruments, to wit: Warsaw Convention, *supra* note 446; Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air, signed at Warsaw on 12 October 1929, done at The Hague on 28 September 1955 (The Hague Protocol 1955); Convention Supplementary to the Warsaw Convention, for the Unification of Certain Rules Relating to International Carriage by Air Performed by a Person Other than the Contracting Carrier, signed in Guadalajara, on 18 September 1961 (Guadalajara Convention 1961); Protocol to Amend the convention for the Unification of Certain Rules relating to International Carriage by Air, signed at Warsaw on 12 October 1929, as Amended by the Protocol done at The Hague on 28 September 1955, signed at Guatemala City, on 8 March 1971 (Guatemala City Protocol 1971); Additional Protocol No. 1 to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air, signed at Warsaw on 12 October 1929, signed at Montreal, on 25 September 1975 (Additional Protocol No. 1); Additional Protocol No. 2 to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air, signed at Warsaw on 12 October 1929, as Amended by the Protocol done at The Hague on 28 September 1955,signed at Montreal, on 25 September 1975 (Additional Protocol No. 2); Additional Protocol No. 3 to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air, signed at Warsaw on 12 October 1929, as Amended by the Protocol done at The Hague on 28 September 1955 and at Guatemala City on 8 March 1971, signed at Montreal, on 25 September 1975 (Additional Protocol No. 3); Montreal Protocol No. 4 to Amend the Convention for the Unification of Certain Rules Relating to International

The Montreal Convention of 1999 supplanted it when it came into force in 2003. The Warsaw system including the Montreal Convention remains in force and continues to govern international air carrier liability.[562] These instruments share a common goal, to institute a uniform scheme in assigning liability for death or bodily injury of passengers or damage to property taking place on board an aircraft, or during the operations associated with embarking or disembarking.[563] Liability falls to the air carrier, not the State of registration. This is a huge difference from the liability regime in place for space. The biggest differences among the various incarnations of this line of treaties are in the amounts available for recovery by passenger claimants.[564]

The Warsaw System first came into existence during the early years of commercial aviation,[565] ostensibly to avoid unlimited liability for new, risky technology as it was just gaining traction. There exists a similar rationale behind tier 2, government indemnification, in the US risk-sharing regime for space. The aviation treaties set monetary limits no matter where the accident or the damage occurs.[566] Although the limit is different between the Warsaw System and Montreal 1999, within the capped amount the claimant does not have to prove fault, only damages.[567] In this way, some of the risk was allocated to the passenger. The cap could be excepted by proof that the damage was caused by willful

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Carriage by Air, signed at Warsaw on 12 October 1929, as Amended by the Protocol done at The Hague on 28 September 1955, signed at Montreal, on 25 September 1975 (Montreal Protocol No. 4); and last, but not least, the Convention for the Unification of Certain Rules for International Carriage by Air, signed at Montreal on 28 May 1999 (Montreal Convention).

[562] A table comparing articles from these different instruments can be found in Volume XXX Part I Air Law Documents of the Annals of Air & Space Law (McGill: 2005) at 479. The table is useful in showing the interplay between the various conventions and protocols. Some of these distinctions are discussed in the text above.

[563] Dempsey & Milde, *supra* note 559 at 1.

[564] *Ibid.* at 5.

[565] "The Pioneering Years: Commercial Aviation 1920- 1930" U.S. Centennial of Flight Commission online: http://www.centennialofflight.gov/essay/Commercial_Aviation/1920s/Tran1.htm (date accessed: 27 May 2012).

[566] Article 1 states, "This Convention applies to all international carriage of persons, luggage or goods performed by aircraft for reward." Warsaw Convention, *supra* note 561 at Art. 1.

[567] Warsaw Convention, *supra* note 563 at Article 17; Montreal 1999, *supra* note 559 at Article 17.

misconduct.[568] By voluntarily agreeing to fly, the passenger implicitly assumed some risk and agreed to a limit in damages. Again, this is similar to waivers and informed consent, both of which were discussed in the preceding part of this section. By removing the liability issue up to this amount, claims compensation could proceed more expeditiously.

Prior to Montreal 1999, IATA and ATA inter-carrier agreements removed liability limits for the second tier.[569] This unlimited liability was carried forth in Montreal 1999. The airline can be exonerated to the extent that the injured party contributed to the damage, comparative or contributory negligence, and a carrier is permitted the defense that the damage was solely due to the negligence or other wrongful act or omission of a third party. By this time, the aviation industry was fully mature and stepped up to assume the mantle of unlimited liability. Montreal 1999 allows five fora for venue. Within the US, the FAA requires carriers to purchase minimum levels of insurance.[570]

The first tier notwithstanding, most aviation accidents result in claims filed in tort, in an effort to recover more than the cap.[571] The US is a desirable forum because of the range of available damages. There, tort law is a matter of state law. Even in instances where the case is filed in federal court due to diversity of parties and size of claim, relevant substantive state law is applied.[572] In these air cases, the issue of applicable law is more

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[568] Flores, *supra* note 238 at 42. Flores analyzes the Warsaw system for its potential as a liability scheme that would better protect the interests of second parties in commercial space flight and considers the effect of the term "experimental trial" aircraft in Article 34. He does not find it dispository. However, his conclusion that a finding that the entire commercial space industry was experimental would subject it to limitless liability seems counterintuitive. That seems to be the point when one applies the space regime to this industry because it falls outside the purview of the Warsaw system, including Montreal 1999.

[569] "A Presentation of The Montreal Convention 1999: A History of Int'l Air Treaties" online: http://www.cargolaw.com/presentations_montreal_cli.html#IATA_carrier (date accessed: 27 May 2012). As of 2000, 122 carriers (more than 90% of air transport at that time) had signed the agreement.

[570] 14 CFR § 205 (1992).

[571] The greater percentage of these are settled prior to final adjudication.

[572] Diversity jurisdiction is subject matter jurisdiction under Article III,§ 2 of the US Constitution and codified at 28 U.S.C. § 1332. In *Erie v. Tompkins,* the US Supreme Court held that federal courts did not have the jurisdiction to create a federal common law and must instead apply the substantive law of the state where sitting in diversity cases. 304 US 64 (1938).

complex than that of standard tort cases because of the availability of multiple fora where the claim could be brought. Negligence is the prevalent theory of recovery for most aviation cases; however, many plaintiffs file product liability suits against manufacturers as well.

As with space law, the air liability regime also addresses damage to uninvolved third parties on the ground. The 1952 Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface (Rome Convention) limits liability of air carriers by imposing strict liability for damage caused in the territory of a Contracting State by an aircraft registered in the territory of another Contracting State.[573] The registration triggers the liability, not the international nature of the flight. The US and Malaysia are not parties to the Rome Convention; however, Sweden and the UAE are.[574]

Alternative private rights of recovery

In jurisdictions that do not permit recovery under strict liability, *res ipsa loquitur* is a negligence theory that has been applied to cases where uninvolved third parties on the ground suffered injury as a result of debris falling from an aircraft.[575] "Its effect, where applicable, is to declare that from the happening of the accident in question an inference arises that the proximate cause of the occurrence was some negligent conduct on the part of the defendant."[576] The three most prevalent elements of *res ipsa loquitur* are "the event must be of a kind that ordinarily does not occur in the absence of someone's negligence, it

[573] Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface [Rome Convention], signed at Rome 7 October 1952, entered into force 4 February 1958.
[574] Sweden signed the Rome Convention 11 August 1954; the UAE ratified it 12 February 1990. Online: http://www.icao.int/secretariat/legal/List%20of%20Parties/Rome1952_EN.pdf (date accessed: 26 January 2013).
[575] Fowler V. Harper, "Res Ipsa Loquitur in Air Law" (1930) Yale Law School Legal Scholarship Repository: Faculty Scholarship Series, online: http://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=4522&context=fss_papers (date accessed: 24 January 2013).
[576] *Swanson v. United States*, 229 F.Supp. 217, 230 (6 Jan. 1964).

must be caused by an agency or instrumentality within the exclusive control of the defendant, and it must not have been due to any voluntary action or contribution on the part of the plaintiff."[577] Some jurisdictions view *res ipsa loquitur*, or the thing speaks for itself, as a shift of the burden of proof to the defendant.[578] In others, the doctrine permits the plaintiff to meet his/her burden of proof with circumstantial evidence.[579] These variances are due to the differences in state law. Because of the difficulty in proving negligence of a carrier/operator or manufacturer, *res ipsa loquitur* has proven to be a successful theory of recovery for an innocent bystander on the ground.[580] Other theories of recovery applied in air cases have been strict liability for either product liability or for ultrahazardous activity.[581]

Implications for orbital transportation in Europe

Space activities are a shared competence under the Lisbon Treaty. Both the EU and Member States can define and implement programs. It is shared competence that permits the national laws presented in Chapter Two that govern orbital spaceports and orbital space activities.[582] If the EASA proposal is accepted by the EC, each Member State retains ultimate liability and responsibility for the activities of its nationals in space. This responsibility is in addition to EASA's certification bases for the air portion. The

[577] *Backus v. Kaleida Health*, 91 A.D.3d 1284, 1285 (Jan. 31, 2012).
[578] *CSX Transp., Inc. v. Exxon/Mobil Oil Corp.*, 401 F.Supp.2d 813, 819 (22 Nov. 2005).
[579] *Cavet v. Louisiana Extended Care Hosp.*, 2012 WL 1698132 at *7 (16 May 2012).
[580] *Skeels v. United States*, 72 F.Supp 372 (La. 1947) (where an iron pipe fell from an airborne naval target and killed a man); *D'Anna v. United States*, 181 F2d 335 (Md. 1950) (where an auxiliary fuel tank fell from a Navy airplane and crushed a fruit stand, injuring bystanders); *Goodwin v. United States*, 141 F.Supp 445 (N.D. 1956) (where a practice bomb fell on a boat and sunk it).
[581] Not all states apply strict liability for ultrahazardous activities and the location of the spaceport can be a factor as to available recovery. However, Alaska, California, Florida, and New Mexico do. *State Farm Fire & Cas. Co. v Municipality of Anchorage*, 788 P.2d 726 (Alaska 1990); *Edwards v. Post Transportation Co.* 228 Cal. App. 3d 980,983 (1991); *Phantom of Brevard, Inc. v. Brevard County*, 3 So.3d 309 (Fla. 2008); and NMRA, Civ. UJI 13-1627. At least some jurisdictions in the EU also apply the strict liability standard for ultrahazardous activity. *Transco Plc v Stockport MBC*, (2001) Env. L.R. 44.
[582] At present, no European countries regulate suborbital flight with their national space law although Sweden may be working to change that. Masson-Zwaan & Moros-Aguilar *supra* note 350 at 252; European report, *supra* note 18 at 56.

proposal only harmonizes some activities and some spaceports some of the time. As a result, the fragmentation that currently exists in Europe will continue. This fragmentation exists between countries and it exists between orbital and suborbital transportation.

Under the existing proposal, it could be difficult for a spaceport to serve both markets. Although there is a local component to the certification as an aerodrome, the regimes are not integrated and the proposal fails to provide an entry point to allow for future integration. Liability is another area where the difference between orbital and suborbital transportation is sharp, providing very different theories and avenues of recovery.

Conclusions

The strongest feature of the EASA proposal is its attempt to integrate some suborbital activity with aviation, making use of reliable regulatory mechanisms. EASA has done preliminary work standardizing things like lighting and marking of runways and the handling hazardous materials, fuels, and propellants. This work could benefit crew and maintenance personnel servicing spaceports, no matter where they are located. SARPs provide these reference points.

Some aspects of Annex 14 require modification in order to address the unique requirements of spaceports. For instance, fuels and propellants have different physical properties and, as a result, differing safety requirements. Space traffic management (STM), outside the scope of Annex 14 and this thesis, is a complex logistical challenge but one that could provide more dialog between modalities, particularly as satellite-based air traffic management comes online.[583]

Revisiting our example of the intermodal transfer facility, one hub is connected to

[583] Samuel T. Durrance, et al., "Integration of Commercial Space Vehicle Traffic into the National Airspace System" FAA COE CST Publication (31 March 2012).

multiple airlines (domestic and international), fast rail and a metro, houses a bus terminal, a rental car center, services shuttles to and from local hotels, accommodates taxi stands, and contains a parking lot. From that facility, one can fly to another located in another jurisdiction. The second facility has a few gates and a bus stop, a taxi stand, and a parking lot. The fact that one facility is more advanced and serves more modes does not render them interoperable. Nor does the fact that one facility could be subject to more regulations render it off limits to passengers arriving from a facility with significantly lesser amenities. The facility is responsible for its own operations. Much of the responsibility for operations falls to the direct operator of the transport mode. The facility operator is responsible for providing a safe structure with clear and practical procedures. However, the activities that are common to both facilities benefit from a level of coordination. This coordination is what Chapter Six and Seven will examine: what aspects should serve as a baseline, how that baseline should be applied, and by whom.

Chapter Six: Synergies, Gaps and Conflicts

Introduction

This is the final chapter in this part of the thesis. It unpacks and compares the US and EASA approaches, first comparing the benchmark analyses for shared values, then acknowledging conflicts and gaps. The *raison d'etre* for this comparison is to illustrate the strengths and weaknesses that arise when assigning spaceport regulation to either a space regime or an aviation regime.

The status quo is not optimum, partly because policy goals are not entirely internally coherent in either, but also because they are not particularly well aligned with external goals deemed to be appropriate for spaceport regulation. Added to that, the US system and the EASA proposal are not synchronized with one another, creating obstacles to international trade, possible unregulated and uncoordinated development, and likely legal conflict and uncertainty for stakeholders and participants, on both international and domestic levels.

System	Regime	Lic/Cert?	Liability	Safety
US	space	licensing	Indemnified through launch license	Calculated for 3d parties
			As space object	
			Informed consents for sfps	
			Waivers, limitations for launch chain	
EASA	air	certification	Through aviation regime	Vehicle loss, 1st, 2nd, 3rd parties
			Unsettled for events outside of airspace	

Table 6-1 Comparison of frameworks

Perhaps it is not necessary to resolve the suborbital debate in order to effectively regulate spaceport activities; the discussion of strengths and weaknesses of the regulations analyzed does not completely turn on the issue of air v. space, particularly since this study examines all spaceports, serving both orbital and suborbital activities. But the discussion does open the door to further discourse on this jurisdictional issue and it also reveals the

inadequacies of the status quo, not only for spaceport regulation but also for commercial spaceflight in general.

Regardless of whether Europe decides to go forward with its original plan to treat this type of suborbital flight as a part of international aviation, it is instructive to see the manner in which it has proposed to handle the local component of safety (with an understanding of the geographic features that would render one evacuation better than another, or the climate challenges a location would pose) while plugging the spaceports into the SARPs for international standardization. The US is successfully licensing spaceports that will serve various aspects of space transportation, orbital and suborbital. It is intended that the examination in the current chapter will help determine available and appropriate responses to the status quo in the next chapter.

Shared values

A simple table comparing the policy analyses from Chapters Four and Five helps illustrate some fundamental similarities between the US system and the EASA proposal and compares effectiveness as per the benchmark analysis.[584] First, both systems have a sound legal basis. They are relatively cohesive internally, although the US appears to be stronger. The same variance exists for preservation of social interests (US Yes, EASA Partially). EASA's proposal falls down on international cooperation. This is because the US system is already in place and functioning, setting operational precedence. EASA's proposal to diverge from a system that is already in place serves to detract from the goal of international cooperation. Neither system is completely effective regarding global competitiveness and intermodality, although, again, the US is stronger. The largest discrepancy is on prong 4: the benefits justify the costs. The EASA proposal to certify

[584] The author acknowledges the subjectivity of this exercise.

bears a steep cost for individual manufacturers because of the rigors of the process, but it also costs the entire industry because of the timeline for certification. It is difficult to quantify lost opportunity costs.

Prong	Description	US	EASA
1	Internal goals	Yes	Partially
2a	Complies w intl obligations	Yes	Limited
2b	Enhance intl cooperation	Partially	No
2c	Preserve social interests	Yes	Partially
2d	Intermodality	Partially	Limited
2e	Globally competitive	Partially	Limited
3	Sound legal basis	Yes	Yes
4	Benefits justify costs	Yes	No
5	Clear simple practical	Yes	Partially
6	Compatible trade policies	Partially	Partially

Table 6-2 Comparison of Benchmarks

Assigning a numerical value to the four choices (Yes = 3, Partially = 2, Limited = 1, No = 0), the US system rates a 2.6 in effectiveness while the EASA system scores a 1.4.[585] This places the effectiveness of the US system somewhere between completely effective and partially effective. The EASA proposal falls between partial and limited efficacy.

Safety is an essential social value driving both regulatory models. However, in spite of the fact that it is key to both, there is disparity in how, and for whom, safety is calculated. It may be possible to integrate both of these metrics, since they deal with the safety of different parties. The issue of liability assessment is currently under review in

[585] There are ten prongs in total. The US system tallied 26 points over the ten criteria equaling 2.6. The EASA proposal totaled 14 with a score of 1.4.

the US by COMSTAC.[586]

Ideological differences

A key difference between the US and European approach to spaceport regulation is in the licensing/certification dichotomy. In a licensing scheme, the operator bears full responsibility for operations whereas in a certification framework, the certifying authority bears some portion of responsibility.[587] The second and more profound difference is that EASA proposes to treat suborbital flight as an aviation activity, bringing it into the ICAO regime for international air law.

Good arguments have been made for licensing of suborbital vehicles while the industry is formative. The US licenses are granted on a case-by-case basis. There is room for experimentation and innovation. Licensing, as currently handled by the AST, is flexible and cost-effective. Government and industry are in close communication, in real time.[588] These arguments are not as persuasive when applied to spaceports.

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[586] COMSTAC discussed GAO report GAO-12-899, "Commercial Space Launches: FAA Should Update How It Assesses Federal Liability Risk" at its 10 October 2012 meeting in Washington DC. Specifically, the report recommended a review of the methodology used by the AST to calculate MPL. At present, COMSTAC is initiating discussion regarding defining the task, identifying parties to perform the analysis for the AST, and to provide alternatives to the AST. Email from Christopher T,W. Kunstadter to COMSTAC Business/Legal Working Group, dated 22 January 2013 11:38 am, on file with author.

[587] Masson-Zwaan & Moros-Aguilar, *supra* note 350 at 251.

[588] This benefit could also be a liability. For an interesting perspective on agency capture, the idea that agencies go through a life cycle, where the first phase evidences independent regulation and the latter phases are "closely identified with and dependent upon the industry it is charged with regulating", compromising agency effectiveness because of undue industry influence, see, *supra* note 238 at 28- 30 (citing Marver H. Bernstein, Regulating Business by Independent Commission (1955). Another theory discussed in Flores' intriguing article is public choice theory, in which agencies cease to operate as instruments of the industries they regulate, but instead act in their own interests to preserve their existence. *Ibid.* at 30. The author is not suggesting this occurs at any of the agencies discussed in this thesis but merely proffers these ideas as a precautionary tale.

3.5.2 Comparison between the FAA-AST licensing approach and an aviation-like certification approach

Table 5 reports a comparison of the two regulatory approaches described in the previous section, outlining their main pros and cons from a market perspective, and also highlighting the main impacts along the value chain (on vehicle developers, operators and spaceports).

Regulatory Approach	Pros	Cons	Impact on Vehicle Developers	Impact on Operators	Impact on Spaceports
US Licensing approach (FAA-AST): - Treats suborbital flight as spaceflight - Informed consent for passengers - Liability to third parties	- Lean approach - Allows new entrants to get to operations quickly - Allows for continual technical improvements without the need to cease operations	- Possible fragmentation in safety levels - The licence to fly is related to the ensemble of vehicle, operator, location - Low perceived safety of flight	- Lower time and cost to market - Continual technology and system development - Lower perceived safety of flight by end customers may slow down the market after initial early adoption spike	- Higher Risk - Possibly higher insurance premiums	Requires dedicated spaceports
Aviation-like Certification: liability to manufacturer/operator and to certification authority	- Creates standard safety requirements Increases perceived safety of flight, and appeal to customers - Certification is product related	- Higher cost and time requirements may represent a barrier to entry for smaller players	- Higher time to market - Higher development CapEx - Increased perceived safety level is a competitive advantage	- Lower Risk - Lower insurance premiums - Higher OpEx	Certified vehicles may be able to fly from any conventional airport, making dedicated spaceports less strategic

Table 6-3 Comparison of US approach with EASA-like proposal[589]

Spaceport siting and design are less about innovation and more about the physical and environmental realities and constraints of a location. Although the US licenses spaceports through its authority to regulate commercial space activity, the USG already acknowledges there is something different about a spaceport in the whole launch supply chain. That is why the spaceport is not included in the risk-sharing scheme, except through the launch license. Spaceports may not benefit from the flexibility that the current ad hoc US regime provides. They may benefit more from structured operations.

Certification, as proposed by the Europeans, could be more cumbersome, expensive, and rigid for the vehicle developers and manufacturers. However, the concern here is with the spaceports that would be certified under the EASA proposal. No doubt, certification of existing airports to perform suborbital operations could be cost

[589] European report, *supra* note 18 at 45.

effective and even user-friendly. However, vertical rocket launches are left out, even when intended for a suborbital trajectory. Orbital launches are left out. Perhaps, both the US and Europe could integrate the best of both worlds – the EASA certification model for suborbital HTHL/air launch/balloon drop HL and retrofitted airports, and the US model for hybrid (orbital and suborbital) spaceports. However, the US model should also allow for the same baseline for its suborbital elements.[590] Runway lighting should be the same, no matter whether the spaceport is licensed or certified, or whether the runway is in a hybrid facility or not. Fuel storage requirements should meet a minimum safety standard.

Another intrinsic difference arising from assignment to a space regime or an air regime is that of private rights of recovery. Freeland recommends this issue as a potential point of entry for a unified regime governing all aspects of human spaceflight.[591]

The disappointing status quo

Hypothetical situations help illustrate some of the problems that arise in assigning at least this aspect of suborbital flight to the space liability regime. For instance, consider the state of affairs if a regular aircraft collides with a suborbital vehicle in airspace. The aircraft caused the accident. As a result, pieces from the suborbital vehicle fell to the Earth and caused injury to third parties. People on the aircraft were hurt. Spaceflight participants were hurt. Two completely different regimes could be implicated. Even though the aircraft caused the damage, the launching State of the suborbital vehicle could conceivably be held strictly liable for the damage on the Earth. Yes, an argument could

[590] Chatzipanagiotis, *supra* note 61 at 171. Chatzipanagiotis takes this one step further and suggests that rules on the liability of airport operators could also give guidance as to when and how spaceport operators could be held liable as well.
[591] Freeland I, *supra* note 453 at 17; Masson-Zwaan & Freeland, *supra* note 211 at 1605; Freeland II, *supra* note 457 at 18.

also be made that the damaging event occurred in airspace but that does not preclude the former argument, nor does it guarantee that it would fail. Worse, the passengers on the aircraft would have a private right of action against their carrier and the aircraft supply chain. They would be free to pursue legal remedy in a number of fora, while those suborbital claimants against the launching State would have a cumbersome diplomatic process to navigate. This is not an equitable result.

An additional example arises from the circumstance when a European suborbital winged vehicle hits a US suborbital vehicle. Again, there is no certainty for the industry. But as bad or worse, there is little in the way of equity for third parties. The Liability Convention contains within it an element of equity in the Preamble, to wit "Recognizing the need to elaborate effective international rules and procedures concerning liability for damage caused by space objects and to ensure, in particular, the prompt payment under the terms of this Convention of a full and equitable measure of compensation to victims of such damage."[592] The problems that result from these two silos attempting to govern the issue of liability for suborbital transportation in such inherently different ways give new meaning to the term of art, "conflict of laws".

Yet another disturbing feature of the status quo arises when a US operator, used to launching and re-entering at a US spaceport (Virgin Galactic at Spaceport America in New Mexico, for example) has to land and re-enter at a European aerodrome. Would the US even allow this? Would the operator's risk assessments, including analysis of flight corridors and explosive site plans, be valid under such divergent circumstances? And, if allowed, would the crew be as efficient as it could be, maneuvering in a completely different set of operational parameters than it does in its home port?

[592] Liability Convention, *supra* note 29 at Preamble.

Conclusions

The current system in the US clearly evolved from the vertical launch model. However, this method, in its current form, does not easily integrate into a commercial transportation system. It is isolationist. Understanding the evolution of both US domestic space law and the launch sites from federal ranges that were originally only orbital VTVL to commercial HTHL and air launch/balloon drop HL sites, gives some insight into the possible rationale behind the US decision to license a launch site as it does currently, instead of to certify a spaceport as it does an airport. However, commercial spaceflight in the 2000s has a different landscape than commercial launch activities in 1984 when the Commercial Space Launch Act was first enacted. Greater changes are likely in the future.

There is a benefit to standardization of common safety features like lighting and marking of runways for safety in spaceports, wherever the spaceport is located, if that spaceport is to someday function as part of an intermodal transportation system, preserving safe operations and facilitating robust international trade. Baseline standards for handling hazardous materials, fuels, propellants, etc. for crew and maintenance and servicing personnel are more easily set by using lessons learned from aviation.

The fact that the industry has not begun flying its paying customers is not a substantive rationale for putting off the inevitable. Proactive planning does not necessarily mean burdensome over-regulation. Lack of planning can be far more burdensome, in the form of litigation after a catastrophe, or with business models that fail to fulfill for want of foresight.

There are many reasons to look to the air law conventions for guidance, even if an actual hand-off as EASA suggests is deemed unfeasible. From the standpoint of the spaceport operators, anything that would provide legal certainty would be helpful. The

air conventions could address the problematic grey area of the spaceflight participant, something that the space treaties do not.[593] Some recovery must be available if international law fails and no recovery for claimants is accomplished through diplomatic channels. The Liability Convention deals with third party liability, not second party liability. Additionally, the Liability Convention does not allow the nationals of a launching State to recover against it. Again, in the long run, this would also not lead to an equitable result.[594]

Focusing on spaceports and liability from their standpoint, an injured party could claim in court under traditional theories of tort rather than before the International Court of Justice claiming via treaties and conventions. From the spaceport operator's perspective, if hauled into court as part of the supply chain of a launch, and not directly involved, the action could quite likely be dismissed or disposed of through summary judgment. Insurance is available for events that are not part of the launch in both jurisdictions.[595] As it stands now in the US, the spaceflight participant may even limit liability of the spaceport further, depending upon the state where the site is located.

Currently, there is no quick and simple answer to the question of which regime might be better positioned to govern suborbital transportation. It may not be an either-or proposition. But spaceports, as the terrestrial element of the spaceflight system, should be treated differently from vehicles and operators. The hole in the US risk-sharing regime as per spaceports is tacit acknowledgment that spaceports are not the same as suborbital vehicles. They are a part of the launch chain only when certain elements are

[593] The author is not alone in this view. Please see Nase, *supra* note 446 at 759, for an interesting discussion of one method that States could sign an agreement to suspend application of the space treaties in favor of closely-relevant private air law conventions that could provide a more equitable result to injured second parties, using Article 41 of the Convention on the Law of Treaties. Vienna Convention on the Law of Treaties, 1155 U.N.T.S. 331 (23 May 1969).
[594] Mineiro V, *supra* note 558 at 388.
[595] Coverage for airport operators is available on the market.

satisfied. It is the activity that brings the spaceport into the space regime, not the facility. And, going back to the analysis in Chapter Two, of the fourteen domestic space law regimes examined (excluding the three that were purely governmental launches and Canada), all had launch law, while only half had site or spaceport-specific law. The activities can be regulated separately or in parallel to the site locations.

Spaceports should be ordered as part of the existing global transportation system and every effort should be made, now, to integrate both orbital and suborbital spaceflight and to ensure that further developments are, at the very least, interoperable. There are advantages to synthesizing elements of a space-based regime with others from an aviation-based one, at least with respect to incorporating the basics found in Annex 14 with minor modification for spaceports.

Going back to the example of an intermodal facility, an airline passenger at the transfer facility hub has an accident on a fast rail, also at the hub. The Montreal Convention is not implicated. The laws governing the activity (rail) are triggered and recovery is available under different theories. Likewise, it may not matter to spaceports which regime ultimately governs suborbital transportation.

So, perhaps no harm no foul? This is a seductive point of view. It falls prey to the same shortsightedness that allowed these silos to develop in the first place, the complacent thinking that because the industry is quiet now, because it is not yet an issue, we need not plan ahead. Perhaps the conversation needs to be about providing a system that aligns with a long-range view for those social values of robust growth and international cooperation as well as safety and legal certainty for victims. It is possible that the focus on air vs. space is distracting from the big picture.

Sometimes, when law fails to provide an answer, public policy must demand one. And sometimes answers can be found in lessons learned in other scenarios. These are issues that demand solutions. The next chapter will attempt to tackle the preliminaries to managing the challenges inherent in the status quo.

Part Three: Potential Responses, recommendations, and conclusions

The first part of the thesis provided context, describing the status quo and determining its level of effect in regulating spaceports. The second part of the thesis examined two divergent approaches to governance. One jurisdiction, the US, has very developed spaceport regulations under which it has granted licenses, with little distinction between a license for an orbital site or a suborbital site. The other jurisdiction, via an organ of a supranational organization, contemplates regulation of suborbital sites (and activities) as part of the extant aviation regime separate from orbital activities, while orbital facilities and launches are left to the individual Member States. As the last chapter illustrated, problems can arise in either regime internally and are more probable when activities between jurisdictions commence.

This final part examines responses to the current state of regulation and applies the results of these responses to the goals deemed appropriate for spaceport regulation in Chapter Three. The gist of this is not limited to discussion of air law vs. space law as appropriate for governance of suborbital spaceports and transportation. Spaceports, even now, serve more markets than suborbital. Mojave Spaceport is a good example. While the question of suborbital governance bears some relevance on the issue of effective spaceport regulation, it is only a piece of it. The bigger questions are how does the current state of spaceport regulation inform choices for this sector going forward and what impact do those choices have upon the evolution of commercial spaceflight.

Theories and methods have evolved in other areas of international law to assist in managing conflicts where two or more systems occupy the same legal space. The next chapter will utilize some of these in understanding methods of harmonization as they apply

to spaceports and how they might affect meeting policy goals. The part will end with conclusions and recommendations regarding spaceport governance. It is hoped that these conclusions will serve to illuminate the evolution of effective rules in other technologically driven sectors that defy traditional geopolitical boundaries.

Chapter Seven: Responses

Introduction

Often, when attempting to extrapolate how best to retrofit or build-to-suit a spaceport, architects and engineers look to early airports for models.[596] The legal community also looks to other already developed systems of jurisprudence during the formative period of a new discipline or field of regulation. The challenges facing space transportation and its concomitant facilities are certainly not rare in today's world; they can be found in environmental regulation, transnational banking, prosecution and deterrence of money laundering, human rights enforcement, and governance on the Internet.[597] There is a connection across disciplines, some fundamental sameness that allows us to dissect what is working in one area and import it for use in another. This chapter will explore responses to the existing status quo.

Several issues are confronted and developed in this chapter. First, what are some alternative responses to the current governance of spaceports? Second, what methods are available to unpack and integrate the more effective elements of their regulation? And lastly, who or what has the competency to administrate that integration? Responses range from leaving spaceport regulation to develop as it is, piecemeal, with little or no

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[596] Raymond, Maj. John W. "Airports and Spaceports: A Historical Comparison" Research Paper presented to The Research Department, Air Command and Staff College (ACSC), in partial fulfillment of the graduation requirements of ACSC (March 1997) Doc. No. AU/ACSC/0368/97-03 ; Jim Pass & Albert A. Harrison, "Shifting from Airports to Spaceports: An Astrosociological Model of Social Change toward Spacefaring Societies" AIAA (2007).

[597] Edward P. Weber, *Pluralism by the rules: conflict and cooperation in environmental regulation* (Georgetown University Press, Washington D.C. 2007) ISBN 0-87840-672-7; David M. Driesen, "Linkage and Multilevel Governance" 19 Duke J. of Comp. & Int'l Law 3 (Spring 2009) 389-411; Peer Zumbansen, "The Next 'Great Transformation' of Markets and States in the transnational Space" Global Assemblages of Corporate Governance & Financial Market Regulation" (June 6, 2009) CLPE Research Paper No. 9/2009. online: SSRN: http://ssrn.com/abstract=1415463 (date accessed: 19 September 2010); Sally E. Merry, "Human Rights and Global Legal Pluralism: Reciprocity and Disjuncture" [hereinafter "Merry I"] *Mobile people, mobile law: expanding legal relations in a contracting world* edited by Franz von Benda-Beekmann, et al. (Ashgate Publishing Co., Burlington VT 2005) at 215; Joel R. Reidenberg, "Governing Networks and Rule-making in Cyberspace" 45 Emory L. J. (1996) 911.

vision for a future that includes interaction with other jurisdictions to development of a unified space transportation law encompassing all aspects of spaceflight.

The immediate thesis is focused on effective spaceport regulation. However, the study becomes part of the ongoing dialog surrounding suborbital transportation and the issue of intermodality. Modern and post-modern pluralism theory can help illustrate the dynamics between both pairs of legal cultures – air law v. space law for suborbital spaceports and transportation, and the US system as opposed to the EASA proposal. Spaceport regulation is not a *tabula rasa*. This chapter will examine different forms and methods of harmonization and integration and identify points ripe for integration of the systems now extant.

Theories of norm emergence are used to address possible tactics while the industry is nascent and the landscape still so unsettled. Models of intersystemic interaction are used to analyze international and national regulatory bodies and processes available to accomplish the task of reconciliation and/or integration as commercial spaceflight moves forward and spaceports are more fully utilized as transportation facilities.

Available responses

Both the US system and the EASA proposal contain norms required for entities to obtain either a license or certification to operate a spaceport. In order to better understand how these norms could be reconciled and by whom (or what) in an international context, a brief discussion of norm relativity is in order. There are several aspects. First, there is the interpretation of relativity that acknowledges the non-uniform application of international law; its subjects are free to develop their own conception of the law, within certain

limits, and define it as they choose.[598] This is the situation that has evolved with EASA and the AST, within Europe and the US respectively. Second, there are variances in the scope of applicability of norms, for instance, a treaty is binding upon those that ratify and accede, while resolutions of IGOs apply only to States that are members of the organization.[599]

There are also different degrees of obligation under international law, or relativity of legal authority.[600] This is not the same as the obligation to act or not, but deals, instead, with the legal effects of the norms. Instead of neatly categorizing these as hard or soft law, Sur describes norms of reinforced authority, such as *jus cogens* and peremptory norms; norms of common authority, which involve a State's responsibility and which contemplate some consequence for non-compliance; and lastly, norms of limited authority.[601] UN resolutions are an example of this final category. Despite the fact that some jurists and scholars have argued that the proliferation of resolutions results in dilution of the *res* of international law, the fact remains that resolutions have become a viable factor in international relations. One point of view allows consideration of non-binding instruments as holding the potential for legal evolution with real impact upon the behavior of States.[602] The UN COPUOS Guidelines for the Mitigation of Space Debris can be viewed in this manner. This appears to be the goal of the EU's Draft International

[598] Prosper Weil, "Towards Relative Normativity in International Law?" Amer. J Int'l Law Vol. 77, No. 3 (July 1983), 413-42; Serge Sur "Changing Fashions in International Law" *International Law, Power, Security and Justice: Essays on International Law and Relations* (Hart: 2010) at 141.
[599] Sur, *supra* note 598 at 142.
[600] *Ibid.* at 146.
[601] *Ibid.* at 146-50.
[602] Tare C. Brisibe, "Relativity of Norms and Disarmament in Outer Space – What Role will the European Draft Code of Conduct Play?" ESPI Perspectives No. 28 (October 2009) at 2.

Code of Conduct for Outer Space Activities.[603]

One last aspect of norm relativity is that of the legitimacy of non-governmental organizations and non-state actors. The idea that non-state actors might have any role in law making has been somewhat controversial.[604] However, the reality is that NGOs and non-state actors, such as industry stakeholders, have been increasingly visible in the discourse that is preliminary to rulemaking. For instance, in the US, prior to promulgation of a rule, notice is given and the public is encouraged to respond. The FAA AST has consistently queried COMSTAC for its views on a range of issues before it takes action. Further, while NGOs cannot replace States as representatives in certain fora, they are often subject to internal, self-administered benchmarks of legitimacy that are similar to, and sometimes superior to, those found within some States.[605]

This next sub-section will examine alternatives responses to current spaceport governance. These range from leaving the status quo unchanged to creation of a *sui generis* regime, or managing the disparities between the US system and the EASA proposal, either through hegemonic harmonization or integration of some elements of each regime. After each alternative response, the result will be viewed against the benchmark and its underpinning policy goals.

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[603] Tiffany Chow, "Draft International Code of Conduct for Outer Space Activities Fact Sheet" (June 2012) available at: http://swfound.org/media/83247/ICOC_FactSheet_June2012.pdf (date accessed: 24 November 2102).
[604] Math Noortmann et al. *Non-State Actor Dynamics in International Law: From Law-Takers to Law-Makers* (Ashgate Publishing Ltd. 2010) at 174.
[605] Vivien Collingwood, "Non-governmental organisations, power and legitimacy in international society" Review of Int'l Studies (2006), 32, 439-454 at 450, 452.

Et non faciunt

The current state of spaceport regulation does not render imperative any particular or immediate action. However, different actions or inactions result in a variety of outcomes. States can choose to promulgate laws and regulations pertaining to space activity. Many have. They can detail these to address those activities within a wide range of specificity that may include launch sites and spaceport facilities. Again, many have. Or, States can choose not to do anything, to remain silent as regards domestic space law. Further, those States with some spaceport regulation can decide to go no further with regard to harmonizing or integrating their existing laws. They can opt for continuing to function in standalone fashion.

However, this failure to act, to leave regulations as they are, can clearly lead to unregulated and uncoordinated development of a State's spaceflight activities. This decision would be incongruent with the policy goal of intermodality, both between other transportation modes and systems. In turn, this lack of coordination will likely lead to legal conflict internationally and, perhaps, domestically. Again, taking the decision to do nothing most assuredly would compromise international cooperation, robust economic growth, and the ability to compete in the global marketplace. Certainly, as things stand between the US and Europe, there is great legal uncertainty at least as regards exposure for private actors and third parties. On the other hand, regulatory delay (not regulatory failure) can engender at least one positive result. Braeutigam identifies uncertainty about the length of regulatory delay might increase incentives to innovation, more so if coordination costs are low.[606] And

[606] Ronald R. Braeutigam "The Effect of Uncertainty in Regulatory Delay on the Rate of Innovation" 43 Law & Contemp. Probs. 98 (1979-1980) 99, at 110.

interestingly, in the same study, increased intermodal competition (between rail and motor) had ambiguous effects on innovation.[607]

Model law

Another alternative is that of a model law, drafted to provide a guideline for States intending to promulgate national legislation. The Space Law Committee of the International Law Association accomplished this task in 2010.[608] The result defines space activities as including launch, operation, guidance and re-entry but says nothing about licensing or regulating the actual site.[609] This decision squares with the majority of the jurisdictions analyzed (7 out of 18 licensed spaceports or launch sites separately from the launch). Or, the model law could be amended to provide the option of licensing a facility depending upon the perceived needs and interests of the State. A model law, particularly if based upon the Sofia model described herein, would promote compliance with international obligations and could enhance international cooperation, particularly as between States with domestic law on point. Depending upon the text of a provision amended to address spaceport governance, this could also foster intermodality. Whether safety or innovation would be impacted is uncertain. However, legal certainty would create a more stable economic environment for growth.

Bilaterals:

Particularly, while the issues concerning the status of suborbital activity remains unsettled, bilateral agreements could manage the conflict between US and Europe, or between any other actors initiating these space activities in the near future. These

[607] *Ibid*.
[608] *Draft model law on national space legislation and explanatory notes* A/AC.105/C.2/2013/CRP.6 (26 March 2013) COPUOS LSC Information on the activities of international intergovernmental and non-governmental organizations relating to space law.
[609] *Ibid*. at 3.

agreements could assign a segment of the flight to one regime or the other for the parties involved. Article 41 of the Vienna Convention on the Law of Treaties provides procedural guidance for modifications by Member States.[610] Pertinent to this and other aspects of space activities, the Legal Subcommittee of UN COPUOS adopted a new agenda item at the fifty-second session, held in April 2013, which initiated work in April 2014.[611] The LSC agreed to include "Review of the international mechanisms for cooperation in the peaceful exploration and use of outer space" under a five-year workplan that includes bilateral agreements.[612] Bilaterals have been used as an effective mechanism with regard to space activities of Member States for many years.[613] Whether or not COPUOS extends its focus to include suborbital transportation is another issue.[614] The Suborbital Safety Technical Committee of the International Association for the Advancement of Space Safety (IAASS), an organization discussed later in this chapter, has drafted operational guidelines to address safety in suborbital activities. These procedures contemplate the use of agreements. Only three areas of approval (vehicle,

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[610] See note 593. The text of Article 41 reads:
Article 41 Agreements to modify multilateral treaties between certain of the parties only
1.Two or more of the parties to a multilateral treaty may conclude an agreement to modify the treaty as between themselves alone if:
(a) the possibility of such a modification is provided for by the treaty; or
(b) the modification in question is not prohibited by the treaty and:
(i) does not affect the enjoyment by the other parties of their rights under the treaty or the performance of
their obligations;
(ii) does not relate to a provision, derogation from which is incompatible with the effective execution of the object and purpose of the treaty as a whole.
2.Unless in a case falling under paragraph 1 (*a*) the treaty otherwise provides, the parties in question shall notify the other parties of their intention to conclude the agreement and of the modification to the treaty for which it provides.
[611] "Report of the Legal Subcommittee on its fifty-first session" Vienna, Austria 19 – 30 March 2012. UN Doc A/AC.105/1003 (March 2012).
[612] *Ibid.* It is agenda item 12. UN COPUOS Legal Subcommittee "Provisional Agenda" UN Doc A/AC.105/C.2/L.288 (11 February 2013).
[613] *See* UN COPUOS "Bilateral and Multilateral Agreements Governing Space Activities" online: http://www.oosa.unvienna.org/oosa/en/SpaceLaw/multi_bi/index.html (date accessed: 25 March 2013).
[614] The issue of suborbital transportation was raised repeatedly at the March – April 2014 Legal Subcommittee plenaries, with the awareness that ICAO was looking at the issues as well.

operator, and flight/launch) require agreement between relevant authorities.[615]

Bilateral agreements would provide an effective means to facilitate international cooperation and trade, particularly while the industry is still formative and activities only performed by a few technologically savvy States' nationals. This is a timely solution. It supports innovation in that the regulatory burden could be tailored to the individual circumstances. In this way, safety of the immediate activity might be better addressed, much like the safety assessments done for the US at present. Intermodality is also supported; regardless of regime (air or space), States entering into a bilateral can hammer out the parameters of their agreement as to rights of recovery and safe operations.

Methods of harmonization

Harmonization takes many shapes. All State systems can be subordinated to one existing system, a new system harmonizing all actors (or ratifiers) could be drafted, or existing regimes can be modified and integrated, resulting in a hybrid.

Universal harmonization

Universal harmonization is an available alternative response; Article 38 provides several methods through which harmonization of spaceport regulations could be achieved internationally – through treaties and conventions, custom, or general principles of international law.[616] Treaty law is the most obvious.[617] Chapter Two described the space

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[615] Andy Quinn, et. al. "Suborbital Safety Technical Committee Proposed Standards & Guidelines" Proceedings (and presented at) 6th IAASS Conference Montreal Canada 23-25 May 2013; *Guidelines for the safe regulation, design and operation of Suborbital Vehicles* IAASS Suborbital Safety Technical Committee Manual (May 2014), update presented at the 7th !AASS Conference (Space Safety is no Accident) in October 2014 in Germany.

[616] Article 38 of the Statute of the International Court of Justice reads:

1. The Court, whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply:
   a. International conventions, whether general or particular, establishing rules expressly recognized by the contesting states;
   b. International custom, as evidence of a general practice accepted as law;

treaties; they contain very little pertaining to spaceports and nothing directly on point for the issue of whether suborbital flight is a space activity. The treaties as they stand are framed in general principles and broad strokes and nothing comes close to providing a clarifying principle that would or could force the harmonization of spaceport regulation.

After the adoption of the first five treaties, over the course of twelve years, the norms concerning space activities have derived from softer sources, such as resolutions and declarations,[618] or from States' domestic implementation of the principles found within the treaties and those softer sources. This is true for much of international law.[619] It is taking years to hammer out diluted legal instruments that can pass transnational consensual muster. Furthermore, even where an international treaty exists, as with the Kyoto Protocol, dependence upon national implementation and the absence of one central oversight authority creates a multi-layered governance architecture leading to coordination difficulties.[620]

As in the context of human rights, while space law first developed with equal sovereignty for all State parties to treaties, there are vast differences in the levels of

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c. The general principles of law recognized by civilized nations;
d. Subject to the provisions of Article 59, judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law.
2. This provision shall not prejudice the power of the Court to decide a case *ex aequo et bono*, if the parties agree thereto.
The Statute is annexed to the UN Charter.

[617] The US is a State and can enter into treaties. Although the proposed European model is in force through European Communities Directives and administered by EASA, the European Union is able to enter into treaties in some situations. The EU has international personality as a supranational organization. Member States have conferred certain powers and competences to the organization and the EU is a subject of international law, as far as those competences allow. Desmond Dinan, et al., "The European Community – International Personality Pre- and Post- 1992" *Proceedings of the Annual Meeting (American Society of International Law),* Vol. 84 (28-31 March 1990), 213-228, at 216. The European Union replaced the European Communities. See note 522.

[618] Brisibe, *supra* note 602 at 1.

[619] Serge Sur, "Norms of Limited Authority", *supra* note 598 at 149.

[620] Driesen, *supra* note 597 at 395. This is one of the criticisms lobbed at the Moon Treaty, which contains within it a directive to State Parties to establish an international regime to govern exploitation of the Moon's natural resources.

power and/or resources available to those parties and the interests the parties wish to protect or promote.[621] As a result, consensus building for a unified spaceport regulation at this level could be long and tedious.[622] Requiring consensus could lead to a race to the bottom, either dismantling the norms in place or diluting them to the point of ineffectiveness, in order to serve a state's political agenda.[623] This appeared to be the case in 2010 at ICAO, when Europe encountered a surprising consequence to its proposal, at that time, to exempt from its proposed emission reduction scheme countries with insubstantial international aviation emissions.[624] *De minimis* clauses were added to the controversial EU proposal, quantifying the threshold.[625] As a result, nearly 170 states would be exempted, despite the fact that they were home to carriers to be included in the EU ETS. The scramble for consensus was characterized as a "race to the bottom," diluting the original intention of the European proposal.[626]

Likewise, the Chicago Convention, while providing a harmonized approach to airports or aerodromes, does not address the issue of applying it *ultra vires* to spaceports. However, even ICAO does not rule out the possibility that suborbital flights could be subject to international air law at such time that they traverse foreign airspace, concluding

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[621] Merry I, *supra* note 597 at 216.
[622] *Ibid.* at 216. The author has attended numerous space law workshops and Expert Groups provided by the UN Office of Outer Space Affairs and participated in the working groups and drafting sessions to sum up the Observations and Conclusions at their close. Merry's recap of the process was uncannily similar to that witnessed first hand. One could insert the issues pertinent to space wherever Merry referenced human rights issues in her article, and not lose anything in the article's meaning or veracity. As with human rights, disagreements are not about substantive issues but wording and comma placement, although those have a direct effect on the ultimate meaning as it relates to those tougher issues.
[623] Dryzek and Niemeyer posit meta-consensus as a middle ground between consensus and pluralism, grafting acknowledgment of alternatives onto the recognition of the values driving a decision-making process. John S. Dryzek & Simon Niemeyer, "Reconciling Pluralism and Consensus as Political Ideals" 50 Amer. J. of Pol. Science 3 (July 2006), 634-49.
[624] "ICAO Assembly resolution on climate change runs into trouble over de minimis exemptions for states" (12 October 2010) online: http://www.greenaironline.com/news.php?viewStory=950
[625] *Ibid.*; Commission of the European Communities "Frequently asked Questions about the implementation of the EU's Emission Trading Scheme regarding aviation activities" (6 May 2010) at 6.
[626] *Ibid*.

that the relevant Annexes to the Chicago Convention "would in principle be amenable to their regulation."[627] The constraints that make new treaty law unwieldy in the context of a space treaty remain valid for an air treaty, or for amendment of that currently in force; it would be time consuming and the current trend, at the international level, seems to run counter. This does not mean to say that an initiative in either direction is less than worthy, or perhaps, at some point necessary, but only that these are the constraints within which this mode of harmonization exists.

The spaceport/suborbital conundrum includes more than just the basic elements of two systems in conflict. It also includes issues regarding sovereignty. Going back to the air/space dichotomy, air law primarily developed during a state-centrist period, the early twentieth century. One of its most basic precepts is that of sovereignty, that a State owns and controls its air space.[628] Space law is a product of a much different sensibility. Although space law's evolution began during the Cold War, space has always been seen as a resource not subject to State appropriation.[629] Even more troublesome is the fact that there remains no resolution to the question of where exactly the delimiter between air and space lies. This lack of precision has allowed the current conflict in legal regimes applicable to a suborbital event. The spatialist and the functionalist theories are clearly evident in the silos found in the US system and EASA's proposal.[630] Tampering with the

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[627] *Concept of Suborbital Flights: Information from the International Civil Aviation Organization (ICAO)* (19 March 2010) UN COPUOS Legal Subcommittee A/AC.105/C.2/2010/CRP.9.

[628] Chicago Convention, *supra* note 249 at Art. I

[629] Outer Space Treaty, *supra* note 28 at Art. I, II. Interestingly, Kleinhans and Macdonald call comparative analysis of "artefacts of State law", such as spaceport regulations, evidence of the "persistence of the State" which, at its core, is contrary to the objectives of pluralist studies. Martha-Marie Kleinhans & Roderick A. Macdonald, "What is a *Critical* Legal Pluralism?" 12 Can. J.L. & Soc. 25 (1997) at 34.

[630] The spatialist relies upon a fixed location – all below it is in airspace, all above it is outer space. Alexandra Harris & Ray Harris, "The need for air space and outer space demarcation" Space Policy 22 (2006) 3 – 7, 6.; *See also* Yun, *supra* note 411 at 962. The US has taken the view that suborbital flight is to space, a location, without getting too specific about precisely where that is. The functionalist view turns on the function of a space object – how it stays up in the air – is it because of a reaction between

limits of air and space is delicate and complex because it could affect activities in LEO. Most probably, this is why delimitation of air and space is the longest-standing item on the agenda of the Legal Subcommittee of UN COPUOS, far from resolved as shown by the diverse answers to the Legal Subcommittee's questionnaire discussed in Chapter Two.[631] The suborbital transportation question may be forcing States to confront the issue and the conflict between the US and the European regulatory approaches may be the catalyst for action.[632] Commentators have suggested that a unified regime, incorporating all aspects of space travel, is becoming more and more appropriate as imminent commercial spaceflight brings to light more and more lacunae requiring attention (legal status of participants, inequitable recovery for second parties and conflicts with air law for activities bearing great similarity in the same location, to name but a few).[633] However, a new treaty would be long in the offing.

Customary international law (CIL) could be a source of harmonization but for the fact that there is simply not enough activity from which to glean custom.[634] What consistency of custom can be derived from the fact that, even on such basic issues, there is not agreement between the only two regimes with enough skin in the spaceport game to have any regulation at all? The chances of a "Grotian Moment", or, even more

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the object and the air (an aircraft, hence under the air law regime) or is it by thrust from a power source (so a rocket and subject to space law)? The definition of "aircraft" derives from the Chicago Convention, *supra* note 25 at Annex 8. One author has compiled a comprehensive description of the various theories and related rationales regarding the physical boundaries of outer space and airspace and the definitions of aircraft and space object. See Chatzipanagiotis, *supra* note 61 at 7 – 26.

[631] "A New Look on the Delimitation of Airspace and Outer Space" 50th Session of the UN COPUOS Legal Subcommittee, IISL/ECSL Space Law Symposium, Vienna (28 March 2011) online at: www.iislweb.org/docs/2011_IISL-ECSL-report.docx (date accessed: 23 November 2012).

[632] *See* Michael Listner, "Could commercial space help define and delimitate the boundaries of outer space?" The Space Review (29 October 2012) online: http://www.thespacereview.com/article/2180/1 (date accessed: 1 November 2012).

[633] Freeland & Masson-Zwaan, *supra* note 210.

[634] Customary international law is defined as a "customary practice of states followed from a sense of legal obligation." Restatement (Third) of the Foreign Relations Law of the United States § 102(2)(1986).

extreme, instant customary international law alá Bin Cheng, are infinitesimal.[635] Public outrage could trigger reactive legislation, at least at the domestic level, as the US shuttle accidents helped redefine the safety culture there.[636] However, it is difficult to extrapolate an international response that would meet the requirements of CIL.

General principles of law are an interesting option here, particularly because of their relationship to comparative law. Simply put, general principles of international law are derived from the body of municipal or domestic law pertinent to the issue.[637] Ellis breaks down the methodology for extracting these into 1) identifying a principle that is common to municipal legal orders of the main systems of the world; 2) distilling the essence of the principle; and 3) modifying the principle to the specific or particular needs of international law.[638] While the second part of this thesis is a comparative study, the problem with applying it to the case at hand is that it represents too scant a sampling.[639]

Even the larger classification, suborbital transportation, is lacking in domestic regulation other than in the US and Europe. As noted in Chapter Two, the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space of the Legal Subcommittee of UN COPUOS recently submitted its working paper

[635] A "Grotian Moment" refers to a transformative development of such scale that new rules and doctrines of CIL develop at an accelerated pace. The creation of the Nuremberg Tribunal and September 11 are events of such magnitude. Scharf, *supra* note 32 at 443-44. Professor Richard Falk coined the term "Grotian Moment" in reference to the Peace of Westphalia. Professor Bin Cheng has often been cited for his argument for instantaneous CIL, made in a 1965 article, "United Nations Resolutions on Outer Space: "Instant" International Customary Law:" 5 Indian J. Int'l L. 23 (1965). In it, he says that merely voting on a General Assembly resolution established sufficient *opinio juris* such that no state practice was necessary. The resolution was the 1963 UN Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space. Criticism has been leveled at this argument for many reasons, exceeding the parameters of this footnote, but one salient critique for the idea that any CIL emerged from this resolution is the fact that its precepts were codified in a formal treaty just a few short years later, in 1967.

[636] The US shuttle accidents transformed NASA's safety culture. Arjen Boin and Paul Schulman, "Assessing NASA's Safety Culture: The Limits and Possibilities of High-Reliability Theory" Public Administration Review (Nov/Dec 2008) at 1050.

[637] Jaye Ellis, "General Principles and Comparative Law" EJIL (2011), Vol. 22 No. 4, 949-971 at 954.

[638] *Ibid*. Using the "main systems of the world" appears to be a nod to Article 38's reference to civilized nations. Art. 38(c), Statute of the ICJ.

[639] See Howard I, *supra* note 33.

and schematic overview compiling the national regulatory frameworks in place for space activities as a whole.[640] This comprehensive table, by illustrating the differences and similarities in how States have chosen to comply with different treaty obligations, is a good start for distilling out the essence of general principles of international law in space.[641] However, as useful as this will be for other space activities, it offers no meaningful assistance to harmonizing these two systems or determining what entity should. Suborbital transportation and spaceports do not factor in it. While the table in Chapter Two reveals the beginning of trends for spaceport regulation, only half of those sampled have direct regulation or licensing.

Harmonization of standards or practices could be a start. This entails the process of alignment between national or regional standards in the absence of an international standard. Rather than requiring that the standards be equivalent in all jurisdictions, harmonization permits them to be consistent or compatible so that trade is not impeded.[642] Harmonization can be upward, where governments raise standards toward the most stringent among them, or downward, or down to the least stringent to a lower average.[643] The SARPs are a good example of the latter, in that they set a minimum standard. Jurisdictions can exceed the mandates of the SARPS at their discretion but the floor, ensuring safety, is set. While harmonization of all spaceport regulation from the top down is perhaps too ambitious at this point in time, utilization of modified SARPs is

[640] The multi-year workplan encompassed 2008-2012. A/62/20, para. 219.
[641] The schematic can be found in A/AC.105/C.2/2012/CRP.8 (16 March 2012) and Add.1 and the Recommendations are contained within "Draft Report of the Chair of the Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space" A/AC.105/C.2/2012/LEG/L.1 (28 March 2012).
[642] ECOlabel Index s.v. "harmonization", online: http://www.ecolabelindex.com/glossary/#H (date accessed: 26 January 2013).
[643] William F. Dietrich "Harmonization of Automobile Emission Standards Under International Trade Agreements: Lessons from the European Union Applied to the WTO and the NAFTA" William & Mary Env. L & Pol. R. Vol. 20 Issue 2, 175 at 193-94.

an accessible and manageable goal.

Harmonization may not be the most efficient model and it certainly brings with it its own set of problems. Berman notes three chief evils of "universalist harmonization schemes."[644] First, universalism wipes out the benefits of diversity and silences voices with less power or less access.[645] Next, innovation does not flourish in a homogenous setting. Maintaining the status quo becomes more important than finding a new way to skin the cat or paying attention to a method already in use somewhere, but not everywhere.[646] And last, "a legal system that provides mechanisms for mediating diversity without dissolving difference necessarily also provides an important model for mediating diversity in day-to-day social life."[647] Finding such a system is a worthwhile goal.

Most important, however, is the unfortunate truth that harmonization of all competing norms is most probably unsustainable as a practical matter. Technology is driving the law at an accelerated pace. This is particularly true with regard to space activities.[648] Harmonization is a backward-looking process, reconciling and codifying already established norms.[649] And, in the face of the rapidly changing context of technology-driven law, it could, at best, be an ongoing event. It is not likely that a one-

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[644] Paul Schiff Berman, "Global Legal Pluralism" 80 S. Cal. L. Rev. 1155 (September 2007) [hereinafter "Berman I"] at 1155.
[645] *Ibid.* at 1190.
[646] *Ibid.*
[647] *Ibid.* at 1191. Siegfried Wiessner writes that the "major flaw of traditional legal theory is the implied assumption that there is one correct decision that nay authorized decision maker would make on a point of law irrespective of the personality of the decision maker, irrespective of a particular factual scenario – one right answer to a particular set of facts that the law, properly interpreted, would always give you." Siegfried Wiessner, "The New Haven School of Jurisprudence: A Universal Toolkit for Understanding and Shaping the Law" 18 Asia Pac. L. Rev. No. 1 (2010) 45 at 47. Macdonald also views with near disdain the idea of a hierarchical, harmonizing "new world order" seeing it as "squeezing out" diversity, experimentation, plurality and innovation and undermining some of the best parts of discourse necessary to "decent" human existence. Macdonald, *supra* note 529 at 90.
[648] Rachel A. Yates, "Informal Regulation of Space Activities" 87 Neb. L. Rev. 530 (2008) at 537.
[649] Berman II, *supra* note 644 at 1191.

time pronouncement would have validity for long.

Harmonization, by any of the listed methods, eases the burden of international cooperation and trade. Ostensibly, if it is the result of the more formalistic methods (treaty, CIL) it would align with the goal of compliance with international obligations as the harmonized result would join the *res* of space law. Harmonization as accomplished by the SARPs encourages intermodality and this is one of the best arguments for extraction of this aspect of the EASA proposal going forward. Harmonization has drawbacks regarding the social value of innovation; however, safety could benefit from a baseline standard.

Dynamics of Integration

There are a number of jurisdictions that license and regulate spaceports and launch sites, and even more that authorize launches in some fashion. At present, space activities do not yet overlap between jurisdictions. Even the two jurisdictions discussed in great detail in Chapters Four, Five, and Six do not currently interact as far as the spaceports are concerned.[650] However, if these two governance systems are to integrate in the future on any level, it is useful to understand the dynamics involved when any two (or more) systems run up against one another. Pluralism is an available theoretical framework that has been helpful in sorting out the normative weave in situations where overlapping jurisdictions are found.

The concept of pluralism is not new.[651] Merry defines legal pluralism as a situation in which two or more legal systems coexist in the same social field; legal systems can be found in every functioning subgroup and a subgroup's legal system is, by necessity,

[650] Certainly, there is a great deal of cooperation and interaction between jurisdictions on space projects of scale, i.e. the International Space Station.
[651] Indeed, Kleinhans and Macdonald trace it back to, at the very least, Montesquieu if not as far back as Roman times and the distinction between *ius civile* and *ius gentium*. Kleinhans & Macdonald, *supra* note 629 at 29.

unique in some way.[652] Legal pluralism is less a theory, explaining a static condition of what the ordering system is or ought to be, and more a concept to be used in identifying the various elements of what is in order to understand the relationships between those variations.[653]

Early research on the dynamics of colonial and post-colonial societies generated theories of pluralism that Merry describes as classic.[654] Early pluralism acknowledged the existence of multiple systems. The focus was upon analysis of the relationship between the colonizing and the colonized, and the resulting intersection of European law, corresponding to the former, and indigenous people, the latter.[655] The emphasis was on

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[652] Sally Engle Merry, "Legal Pluralism" Law & Society Rev. Vol. 22, No. 5 (1988), 869-96 [hereinafter "Merry II"] at 870 (citing to Leopold Pospisil, "Modern and Traditional Administration of Justice in New Guinea" 19 Journal of Legal Pluralism 93 (1981); John Griffiths, "What is Legal Pluralism?" 24 Journal of Legal Pluralism 1 (1986); Sally Falk Moore, "Social Facts and Fabrications: Customary Law on Kilimanjaro, 1880 – 1980" (1986) (Cambridge: Cambridge University Press).

[653] Franz and Keebet von Benda-Beckmann, "The Dynamics of Change and Continuity in Plural Legal Orders" J. of Legal Pluralism Nos. 53-54 (2006) 1-44 at 14.

[654] Merry II, *supra* note 652 at 872.

[655] Interestingly, the spaceport at Vandenburg AFB in California represents a more traditional example of pluralism. The Chumash people, native to California for somewhere between 13,000 and 15,000 years, mark Point Conception, located by the entrance to Vandenburg, as their Western Gate or Humquaq. Terri Dunivant, "Who Is Chumash?" New Times cover story (2 March 2000) online: http://archive.newtimesslo.com/archive/2003-10-01/archives/cov_stories_2000/cov_03022000.html (date accessed: 7 September 2010). This was the place where departing souls of the dead discarded their earthly eyes for their celestial counterparts, necessary for traveling on the Path of the Dead into the celestial world. John Anderson, "Point Conception: The Chumash Western Gate" online: http://www.angelfire.com/id/newpubs/conception.html (date accessed: 7 September 2010); John Anderson, "Kuta Teachings: Reincarnation theology of the Chumash Indians of California" (1998) online: http://www.angelfire.com/id/newpubs/kuta2.html (date accessed: 7 September 2010). Controversy surrounding the use of the AFB as a commercial spaceport has raged since 1997, when archeologists Brian Haley and Larry Wilcoxon published an article essentially attempting to eviscerate Chumash mythology concerning the site. John Anderson, "The Chumash Indians and the California Spaceport: Controversy grows between commercial aerospace promoters and the California Indians" online: http://www.angelfire.com/id/newpubs/spaceport.html (date accessed: 5 September 2010); Brian D. Haley & Larry R. Wilcoxon, "Anthropology and the Making of Chumash Tradition" 38 Current Anthropology 5 (December 1997) 761; "The Making of Chumash Tradition: Replies to Haley and Wilcoxon" ed. Jon McVey Erlandson, 39 Current Anthropology 4 (August/October 1998) 477. Haley and Wilcoxon funded their research with compensation provided by the aerospace industry, which was building the California Spaceport at Vandenburg. With what appears to be too little, too late, the City of Lompoc in Santa Barbara County, California (home to Vandenburg/California Spaceport) passed Resolution No. 5295(05) in 2005. The Resolution merely acknowledges the Chumash history in the region and states that the "envisioned California Space Center will celebrate the role" of the Native Americans from the area, but does not pledge to preserve or maintain any sacred sites. Resolution No. 5295(05) "A Resolution Of The Council Of The City Of Lompoc, County Of Santa Barbara, State Of California, In

hierarchical interactions between systems occurring within an area, most often geographic, primarily dealing with the effect of a dominant system upon that which was dominated.[656] This paradigm aligned well with a modern state-centrist model.[657] This is not the situation this thesis confronts. Here, the dynamic is not dominant/dominated or hierarchal. If anything, there are multiple regulatory frameworks, with varying degrees of specificity. The two that are most developed are separately functioning silos that do not yet intersect but most probably will in the future. "Scholastic disputes aside, it is possible to see in legal pluralism a concern with how manifold legal norms emerge, change, and negate or reinforce on another in social situations not derived from, tributary to or purportedly structured by State action."[658]

The first shift in pluralism scholarship occurred in the 1970s and 80s, with acknowledgement of bi-directional interaction between legal systems and the realization that when multiple systems intersected, all were essentially affected.[659] No longer applied only to colonized and colonizer, pluralism was expanded to refer to relations between dominant and subordinate groups.[660] The current state of spaceport regulations does not fit this paradigm. There is no dominant or subordinate group. Of the two with the most to offer, there is a State, the US, and a supranational organization, the European Union,

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support of the California Space Authority's Proposed California Space Center to be located Outside Main Gate of Vandenburg Air Force Base" online: http://www.californiaspaceauthority.org/images/pdfs/Lompoc-CSC-resolution.pdf (date accessed: 7 September 2010).

[656] Paul Schiff Berman, "New Legal Pluralism" 5 Annu. Rev. Law Soc. Sci. (2009), 225-42 [hereinafter "Berman II"] at 226.

[657] Somewhat contrary to popular misconception, the modern State system has not always been thus. The strong-State-at-the-center-of-the-universe model came into vogue in the seventeenth and eighteenth centuries, after many more years of multi-systemic co-existence in the Roman Empire and medieval Europe. *Ibid.* at 227.

[658] Kleinhans & Macdonald, *supra* note 629 at 29.

[659] Berman II, *supra* note 656 at 228.

[660] Merry II, *supra* note 652 at 872.

comprised of Member States.[661] These are State-to-State relations, despite the fact that the dynamic is slightly different because of the air/space question, which involves one regime recognizing sovereignty and another regime that imposes State responsibility but allows no claims of sovereignty. However, because of this potential for a bi-directional dynamic between these two silos, interaction can affect both, which would be optimum.

The next logical extension in the evolution of pluralism theory came with a broadening of the definition of legal systems such that nonofficial ordering was included in a variety of settings, including commercial.[662] This new, post-modern, legal pluralism addresses the realities born out of the understanding that there has occurred a shift in focus from State-to-State relations and universal overarching norms to something else.[663] Macdonald finds "matters of definition", like those inherent in the proposition of choosing to classify suborbital as either air or space, to be a characteristic of the post-modern era.[664]

Notably, this new facet of pluralistic research emerged after the collapse of the Cold War, coinciding with the signing of the Maastricht Treaty as well as the time frame in which space activities increased exponentially without any further hard law guidance.[665] Nothing happens in a vacuum.[666] International personality was undergoing a

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[661] Barbara Crutchfield George, et al., "The Dilemma of the European Union: Balancing the Power of the Supranational EU Entity Against the Sovereignty of its Independent Member Nations" 9 Pace Intl L Rev 111 (1997) at 112.
[662] Berman II, *supra* note 656 at 228.
[663] *Ibid.* at 226.
[664] Roderick A. Macdonald, "Metaphors of Multiplicity: Civil Society, Regimes and Legal Pluralism" 15 Ariz. J. Int'l & Comp. Law 69 (1998) at 71-72.
[665] Since, the Maastricht Treaty has been replaced with the Treaty of Lisbon (entered into force 1 December 2009). "EU Treaties" europa.eu online: http://europa.eu/about-eu/basic-information/decision-making/treaties/index_en.htm (date accessed: 20 January 2013); "Treaty of Lisbon: Taking Europe into the 21st Century" online: http://europa.eu/lisbon_treaty/index_en.htm (date accessed: 20 January 2013). However, our reference is to the historical events transpiring concurrent to the end of the Cold War in 1991. *See* "Cold War International History Project" online: http://www.wilsoncenter.org/program/cold-war-international-history-project (date accessed: 23 November 2012). At that time, the Maastricht Treaty signified the single market program and establishment of the three pillars of the European Union. It was

transformation, particularly with regard to supranationals, such as the EU and the UN, and even NGOs.[667] From this, several versions of hybridity, or shared legal authority, are emerging: between tribunals situated at the intersection between national and international systems, as well as between state and non-state actors.[668] Santos calls this hybrid/overlap "interlegality" and views it as an intrinsic feature of relations both between and within legal orders.[669]

This hybridity will be key to sorting out the spaceport regulatory issue. According to Macdonald "this type of inquiry into the resistance and accommodations of legal-political culture to deeper integration and international trading regimes is the stock-in-trade of a legal pluralistic analysis."[670] Later in this section, interlegality will be taken into account when analyzing existing entities for possible decision-making, administration, and/or implementation regarding the synthesis of spaceport regulation, For the immediate purpose, hybridity exists in some of the IGOs and NGOs and advisory groups that interface with lawmakers and regulators of spaceports and suborbital transportation.

There are benefits that accrue from these multiple assertions of jurisdiction and authority. For instance, Cover lists greater possibility for error correction, a more robust

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signed on 7 February 1992. "The history of the European Union: The European citizenship" online: http://www.historiasiglo20.org/europe/maastricht.htm (date accessed: 23 November 2012).

[666] For a general discussion of interdependent causation, see Alfred Bloom, "Globalization and Buddhism" available at: http://www.shindharmanet.com/writings/globalization.htm (date accessed: 18 September 2010).

[667] Sur, *supra* note 598 at 190.

[668] William W. Burke-White, "International Legal Pluralism" 25 Mich. J. Int'l L. 963 (Summer 2004) at 976; Berman I, *supra* note 644 at 1161.

[669] B.d S Santos, "Toward a New Legal Common Sense: Law, Globalization and Emancipation" (Cambridge, UK/New York: Cambridge Univ. Press 2nd ed.) 2002; Ralph Michaels, "Global Legal Pluralism" Annual Rev. of L. & Soc. Science Vol. 5 online: http://ssrn.com/abstracts=1430395 (date accessed: 10 June 2010).

[670] Macdonald, *supra* note 664 at 89.

field for norm articulation, and a larger space for creative innovation.[671] It is even possible for non-governmental actors to influence state actors, by internalizing international norms as in the context of a multinational corporation, for its own self-interest, supporting the Kyoto protocol on global climate change despite a lack of formal state support for same, and, in turn, influencing the state to reevaluate its position.[672] This is a powerful dynamic. Non-governmental actors, in the form of industry stakeholders currently participate in the ITU, internationally, and COMSTAC, in the US.[673]

The focus has shifted to the discourse between "the official legal system and other forms of ordering that connect with it but are in some ways separate from and dependent on it."[674] Instead of distraction by the competition for legitimacy between hard law and soft law, official acts and rogue, Berman says the most important test is the "impact of legal pronouncements …on the ground over time."[675] This is a far more practical perspective.

Berman offers us fundamental principles to guide a pluralistic approach. They are: 1) managing hybridity should not attempt to erase the reality of that hybridity; 2) a pluralist framework recognizes that normative conflict is unavoidable and attempts to manage it through procedural mechanisms, institutions, and practices that draw the participants into a shared social space; 3) to create that shared social space, those mechanisms, institutions, and practices should encourage decision-makers to deal with

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[671] R.M. Cover, "The uses of jurisdictional redundancy: interest, ideology, and innovation" 22 William Mary L. Rev. 4 (1981) 639-82.
[672] Schiff Berman, "Seeing Beyond the Limits of International Law" 84 Tex. Rev. 1265 (April 2006) [hereinafter "Berman III"] at 1292.
[673] "The International Telecommunications Union (ITU) 1. Core Areas" online: http://www.un-ngls.org/spip.php?page=article_s&id_article=848 (date accessed: 26 January 2013); COMSTAC, *supra* note 202.
[674] Merry II, *supra* note 652 at 873.
[675] Paul Schiff Berman, "Federalism and International Law Through the Lens of Legal Pluralism" 73 Mo. L. Rev. 1151 (Fall, 2008) [hereinafter "Berman IV"] at 1159.

issues of multiple community affiliation and transborder effects instead of suppressing or ignoring normative differences; 4) it should compel consideration of the independent benefit that accrues when domestic judicial and regulatory decisions acknowledge the big picture advantage of a smoothly functioning overlapping international legal order; 5) public policy exceptions, when faced with one faction's law that is abhorrent to the others, should be accompanied by equally strong normative commitments that help shape the contours of the public policy favored; and 6) this pluralist framework should always be understood to be a middle ground between the poles of strict State-centric territorialism, on the one side, and universalism, on the other.[676]

On the other hand, Macdonald condenses the inquiry down to three questions concerning the legitimacy of the institutions asserting power, the principles (or policies) underpinning ordering (regulation) and criteria for evaluation of these policies. [677] These are suitable for the spaceport context and are essentially the questions this thesis addresses with regard to appropriate policies, how to unpack and integrate the most effective aspects of spaceport regulation, and who has the competency to administrate that integration.

An aspect of pluralism developing in recent years involves values, the idea that values can conflict between and within systems.[678] Value pluralism acknowledges that values differ and do not trump one another for moral worth.[679] This theory is less vested in one outcome as opposed to another, but inquires as to the normative consequences when values differ. Incompatible values cannot be put into practice simultaneously.[680] Incommensurable values cannot be expressed either in terms of each other or by

[676] Berman I, *supra* note 644 at 1192 – 95.
[677] Macdonald, *supra* note 664 at 78.
[678] Matthew J. Moore, "Pluralism, Relativism, and Liberalism" 62 Political Research Quarterly 2 (June 2009), 244.
[679] Ruth Chang, ed. 1997. *Incommensurability, incomparability, and practical reason.* (Cambridge, MA: Harvard University Press).
[680] *Ibid.* at 245.

reference to a third term as a standard unit of measure.[681] At least with regards to spaceport regulations, virtually all jurisdictions share the value of safety. Furthermore, the underlying policy goals provide additional shared values. For the most part, there is agreement, not conflict, on at least safety and robust economic growth and international cooperation.

Safety is an essential element in both a US spaceport license and an EASA/CAA aerodrome certificate. The risk assessments are not the same, but they are not completely incompatible and can be used simultaneously. One is simply dealing with first and second parties, while the other deals with third parties, and there is a difference in the metric considered acceptable. However, while figured using different parties and a different standard, the risk assessments are stated in the same terms (numerical), apples to apples. More importantly, the value on safety is of vital importance in all systems.

Applying both Macdonald's and Berman's principles to the case study at hand reveals the reality of a crowded legal domain. This domain is shared by two State systems (or State and supranational) that have developed concurrently and do not currently intersect, but contemplate interaction in the future. Conflict is inherent in the legal approaches and the regimes to which they assign both the regulation of spaceports, in specific, and suborbital transportation, in general. The systems share a basic value, safety, which is quantifiable. While the two regulatory systems themselves are not hybrid, they interface with hybrid entities that may be positioned to extract norms from both silos and administrate their implementation. As Macdonald posits "[t]he issue is not so much one of constructing new 'quasi-official' regimes as it is recognizing those regimes

[681] *Ibid.*

that exist already."[682]

Integration rates high when held to the policy goals appropriate for spaceport regulation. International cooperation would be enhanced through integration of the most effective aspects of the regulations in place (or proposed by EASA). Dialog between stakeholders is necessary, allowing for encouraged intermodality. Innovation flourishes. Safety is already a shared value. Increased international cooperation and the ability to compete in the global marketplace are foundational to economic growth.

Emerging norms and integration

This next sub-section examines methods to unpack and integrate some of the existing spaceport regulations (norms) into an international approach that uses features of both. While relative to one another in a multitude of aspects, norms themselves represent a measurable standard of behavior, considered appropriate for identifiable actors.[683] There are norms at all levels of human activity; here, we are concerned with the relationship and interaction between domestic norms, identified within the silos, and international norms, somewhere along the continuum of relativity described earlier. While the discussion is on norm emergence, the starting point is the preexisting norms in the two systems and the emergence would lie in their integration.[684]

Norms emerge over time. It is a process. Finnemore and Sikkink parse it down to three stages: norm emergence; broad acceptance, sometimes called a norm cascade; and internalization. The tipping point is a threshold located between the first and second stages.

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[682] Macdonald, *supra* note 664 at 79.
[683] Robert Post, ed. *Law and the Order of Culture* (University of California Press: Berkeley 1991) Francois Ewald (translated by Marjorie Beale) "Norms, Discipline, and the Law" at 140.
[684] Giulia Andrighetto, et al., "The Complex Loop of Norm Emergence: A Simulation Model" K. Takadama et.al. eds. *Simulating Interacting Agents and Social Phenomena* (Springer: 2010) at 21.

It is the point at which "a critical mass of relevant state actors adopt the norm."[685]

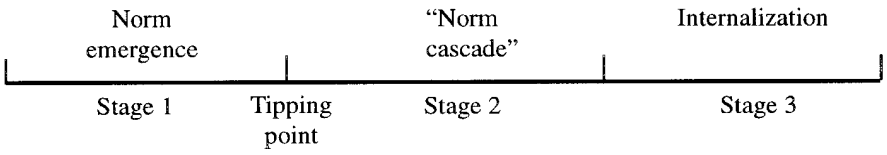

Figure 7.1: Norm Life Cycle [686]

A good example can be found in the formal protocol involved in standards development at the ISO. Most often, the private sector (industry) communicates its need for a standard to a national member body (of the ISO) that, in turn, then proposes the agenda item to the entire ISO.[687] The proposer would be the norm entrepreneur, or the agent bringing the issue to the attention of the group.[688] If the need is recognized and formally agreed upon, the item proceeds through phases. This is the tipping point in the norm's life cycle. The first phase defines the technical scope of the future standard in working groups consisting of technical experts from countries with an interest in the subject matter. The next phase negotiates the detailed specifications within the standard. Consensus is built during this phase. The third and final phase involves the formal approval of the draft International Standard.[689] At the point the standard is finalized, the norm then moves to the second stage of the cycle into its cascade.

Best practices are norms that proceed through the same cycle as standards and other norms. The method of initial emergence may vary in degree of formality and role of actor. Next to occur is the cascade, or the dissemination via network effects.

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[685] Finnemore and Kathryn Sikkink "International Norm Dynamics and Political Change" Int'l Organization 52, 4 (Autumn 1998), 887-917 at 895.
[686] *Ibid.*
[687] *Ibid.*
[688] Finnemore & Sikkink, *supra* note 685 at 897.
[689] "The acceptance criteria stipulate approval by two-thirds of the ISO members that have participated actively in the standards development process, and approval by 75% of all members that vote)." *Ibid.*

	Stage 1 *Norm emergence*	*Stage 2* *Norm cascade*	*Stage 3* *Internalization*
Actors	Norm entrepreneurs with organizational platforms	States, international organizations, networks	Law, professions, bureaucracy
Motives	Altruism, empathy, ideational, commitment	Legitimacy, reputation, esteem	Conformity
Dominant mechanisms	Persuasion	Socialization, institutionalization, demonstration	Habit, institutionalization

Table 7.1: Stages of Norms[690]

Understanding these network effects requires examination of how behaviors are duplicated. People tend to converge on behavior or imitate one another, an occurrence sometimes referred to as "herding".[691] One fundamental cause of this is that individuals face similar decision problems, with similar information, similar action alternatives, and similar payoffs and this leads to similar choices.[692] For instance, how do we launch this safely? How do we avoid overfly? How do we safely transport fuel?

Herding may occur when payoffs are similar even if the information leading to the decision is not. This can happen because of one of three alternatives: 1) communication between people, 2) observation of actions, or 3) observation of the consequences of these actions.[693] How individuals or entities inform decision-making is key to the outcome. While each entity could, theoretically, perform an independent analysis of all the factors inherent to a decision, this carries a high resource cost, both in funds and

[690] Finnemore & Sikkink, *supra* note 685 at 898.
[691] Sushil Bikhchandani et al., "Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades" The Journal of Economic Perspectives Vol. 12 No. 3 (Summer 1998) [hereinafter "Sushil I"] at 152.
[692] *Ibid*. at 152.
[693] *Ibid*.

time. Instead, that entity could rely upon information from others in a similar situation, either through direct communication or observation. This kind of influence, obtained by rational processing of information gained by observation of others, is called observational learning or social learning.[694]

Actions reflect information.[695] In a simplistic summarization of an example, Bikhchandani et. al., asked the reader to imagine two actors, each starting with some private information known only to them.[696] Each is given information from individuals preceding them, and required to decide upon a definable action. Two scenarios ensue. In one, the actor faced with the decision can observe only the actions of her predecessor, but not the signals as to the value of the decision (whether it was a good one or a bad one).[697] In the other, both actions and signals can be observed. Without going into a rather complicated probability analysis here,[698] the truncated version is that when only actions can be observed, the resulting scenario differs greatly from that occurring when signals can also be observed. In the observable actions scenario, entities often converge upon the same wrong action – the choice producing a lesser payoff.[699] Worse, the behavior is not necessarily logical or rational but idiosyncratic – a few bad choices early in the chain can have long lasting effects, determining the choices of the network down the line.[700]

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[694] *Ibid*. at 153.
[695] *Ibid*.
[696] I*bid*.
[697] Sushil Bikhchandani et al, "A Theory of Fads, Fashion, Custom, And Cultural Change as Informational Cascades" vol. 100 no 5 Journal of Political Economy 1992 (Sushil II) at 995. For instance, a good decision would carry a high value and a decision that had less optimal results would carry a low value.
[698] The reader is invited to read both articles by Bikhchandani, et al., *in toto*, probability analysis and all. The equations are illuminating and it is somewhat chilling to see how a simple proposition can perpetuate bad information *ad infinitum*.
[699] Sushil I, *supra* note 691 at 154.
[700] *Ibid*. at 154. This is consistent with the results of another study. When normative behavior is the result of actions formed while observing and interacting with others, that behavior is more stable than when imitators converge upon behaviors *en masse*, rapidly and without more. Andrighetto, *supra* note 571 at 33.

The term "informational cascade" refers to the phenomenon occurring when, for whatever reason, someone follows the observed behavior of a preceding individual without regard to her own information.[701] "A cascade once started can last forever, even if it is wrong."[702]

The cascade stage of the norm's development is where it is most fragile. Best practices often develop in much the same way the decisions were made by those actors described in the preceding paragraph; some company or country that is credible is doing it this way; hence, we will as well. The pitfalls in this kind of informal imitative protocol is that it loses depth of reasoning and diversity as successive adopters fail to assimilate their own information and this is precisely why it is fragile.

Much of what is referred to as "best practices" in the space sector can be found on a continuum. With codified hard standards at one polarity, and informal ad hoc industry practices the other, there can be found various stages of developing norms. It is along that relativistic continuum where it is most feasible to integrate parts of the US and European systems.

As described, lack of depth of reasoning can lead to bad, or less than stellar, choices, and these could then be replicated down the line. Another snare is the fact that decision makers stop collecting public information.[703] After a while, even when signals can be observed, the order of high and low signals that are observed has less impact simply because the higher the level of reasoning required (in other words, when there are more steps to complete an abstract task), the more we tend to shortcut and rely upon the

[701] Sushil II, *supra* note 697 at 994.
[702] *Ibid*. at 1000.
[703] Sushil I, *supra* note 691 at 155. See also Dorothea Kubler & Georg Weizsacker, "Limited depth of reasoning and failure of cascade formation in the laboratory" (2004) London: LSE Research Online. online: http://eprints.lse.ac.uk/archive.00000508 (date accessed 11 September 2011).

actions of others, regardless of why they chose a specific behavior.[704] This results in either less, or no, diversity in either information or reasoning. The cascade becomes precarious.

But it can be avoided. In his book "The Wisdom of Crowds," James Surowiecki discusses the incredible intelligence evidenced by large factions of people when making group decisions.[705] In his view, in order to achieve the best collective decisions, disagreement is necessary and flows from the diversity and independence of the members of the group.[706] Collective decision-making lends itself well to certain kinds of problems. Two of these are problems of 1) coordination, requiring members of a group to figure out how to coordinate their behavior with each other, and 2) cooperation, involving the conundrum of getting self-interested, suspicious parties to work together.[707]

Certainly, integration of elements of the two prevailing systems, with safe spaceport operations as the goal, falls into these two categories.[708] Coordination and cooperation represent the second most valued policy goal for all jurisdictions examined in Chapter Two, bested only by the value for safety. The very thing that makes the cascade fragile can save us from it. It is brittle because it is susceptible to a number of shocks that can dislodge its apparent endorsement of actions that are not optimal. For instance, the appearance of better informed newcomers (new norm entrepreneurs) or the release of public information or a change in the underlying values making one decision more effective than another, can end the cascade or spin off a new one with a better

[704] Anthony Ziegelmeyer et. al., "Fragility of Information Cascades: An Experimental Study using Elicited Beliefs" (2008) published with open access at Springerlink.com, online: http://www.abdn.ac.uk/~pec202/fragility.pdf (date accessed: 11 September 2011).
[705] James Surowiecki *The Wisdom of Crowds* (Anchor Books: Random House New York 2004) at 2.
[706] *Ibid.*at 183.
[707] *Ibid.* at 2 -3, 85
[708] *Ibid.* at 78.

outcome.[709]

Following this logic, a change in policies deemed appropriate for spaceports could also change which responses to the status quo might be held to be most ideal. If such were to occur, the fragility of the cascade could resurrect it. Social change, to redirect a cascade, can be brought about by the entrance of any of these change agents. Regardless of whether a high-precision individual[710] comes into the sequence early or late, the possibility of cascade reversal allows for improved decisions because more (diverse) information can be aggregated than if only the single sequence had been left undisturbed.[711] It is this perceived quality of a best practice to be able to respond to new information that appears to make it favored by industry above positivist standards and codified norms. In Surowiecki's opinion, aggregation of information of everyone in the system is imperative, a clear leader can be helpful, but diversity and independence of members is crucial. He says centralization is not the answer but aggregation of good information is.

Best practices, by themselves without more, do not provide an adequate enforceable floor for safe and secure spaceport operations unless they are subject to some sort of formal vetting process, with notice to those subject to the practices' mandates, and some procedure to continually assimilate new information. Simply adopting industry practices does not necessarily provide enough diversity within the drafting of the practice, nor does it provide sufficient clarity to establish when there is and is not a duty such that a business can manage its risks responsibly. The point is that it is the process by which a practice emerges that is important because this is how it achieves its legitimacy, as is

[709] Sushil I, *supra* note 691 at 157.
[710] One who is more inclined to use his own information than that of those who precede him. Sushil II, *supra* note 696 at 1004.
[711] *Ibid.*

the availability of a mechanism to incorporate new information as it becomes available because this is how the norm keeps that legitimacy. There are useful points to both the US and proposed European systems. Integration is the next stage in the emerged norm's life.

Lessons can be learned from another context – a situation where divergent regulatory models adversely affected international trade capabilities, and where regulations were modified to allow for integration.[712] Automobile emissions have been regulated in both the US and Europe for years. The first law in the US was a state law; California enacted the Motor Vehicle Pollution Control Act in 1960. Congress adopted the elements of this law in the federal Motor Vehicle Air Pollution Control Act in 1965.[713] The EU initiated emissions regulations in 1970; however, these were more lenient that those in the US.[714] The difference in standards and how vehicles were tested created a problem for high-end luxury car exporters in Europe in the early 1980s, preventing cars from being sold directly in the US and creating a gray market of exported vehicles that would then install catalytic converter "kits" to become street legal.

The German automobile manufacturers serving this luxury market were adversely affected as the disparity created an obstacle to free movement of trade both within the EU and between the EU and the US.[715] As a result, Germany took the decision to impose its own standard that would meet the US standard, allowing free flow of trade there, but denying entry into the German market to small manufacturers in France and Italy that could

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[712] Martin Feldstein, ed. *American Economic Policy in the 1980s* (University of Chicago Press) at 368.
[713] Actually, US efforts began with the enactment of the Federal Air Pollution Control Act in 1955, in response to findings that automobiles were one of the most significant contributors to declining air quality. Bill Canis & Richard Lattanzio "US and EU Motor Vehicle Standards: Issues for Transatlantic Trade Negotiations" Congressional Research Service 7-5700 R43399 available at: www.crs.gov (date accessed: 24 June 2014); David Vogel, et. al., "Environmental Federalism in the European Union and the United States" *A Handbook of Globalization in Environmental Policy: National Governments Interventions in a Global Arena* Frank Wiken, et. al, eds. (Edward Elger, 2005) at 4.
[714] *Ibid*. at 15. Within the EU there was profound disagreement between the States that manufactured automobiles which probably had some bearing on reining in the standards.
[715] *Ibid*. at 6.

not install converters. German tourists traveling outside of their home country by car would no doubt be stranded without available unleaded gasoline necessary for the newer technology. Ultimately, this impasse forced the EU to adopt uniform automobile emission standards, although with different standards applicable to different sizes of vehicle (the Luxembourg Compromise of 1987).

Even today, there is disparity between markets and standards in the two. President Obama and EU leaders formed a Working Group to recommend responses and strengthen transatlantic economic cooperation. During the same timeframe, President Obama began negotiations on a free trade agreement, the Transatlantic Trade and Investment Partnership (TTIP),[716] which included discussion of motor vehicle safety and emission standards. Some of the responses (labeled Pathways of Convergence in the Congressional Report prepared to address these issues) are: 1) harmonization of rules; 2) comprehensive mutual recognition; 3) selective mutual recognition; and 4) forward looking rules. These responses are similar to those under discussion in this section.[717]

Before we begin to integrate, more must be understand more about the first and second stages of the cycle and the tipping point, particularly as they relate to the spaceport situation at hand. It is likely that spaceport governance has not yet reached the tipping point because of complacency – commercial suborbital flights are still in test phase and the first ones will be domestic activities, taking off and landing from a single spaceport. Motive comes into play here. It will be the motivation of the early norm entrepreneurs, found in the organizations next discussed, that will facilitate the tipping point.[718]

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[716] Canis & Lattanzio *supra* note 713 at 21-22.
[717] Perhaps commercial spaceflight/transportation should be included in the issues addressed by this Working Group.
[718] A fascinating study investigating the formation of consensus using the processes involved in the emergence of group norms is explained in a paper by Christopher D. Hollander and Annie S. Wu, "Using

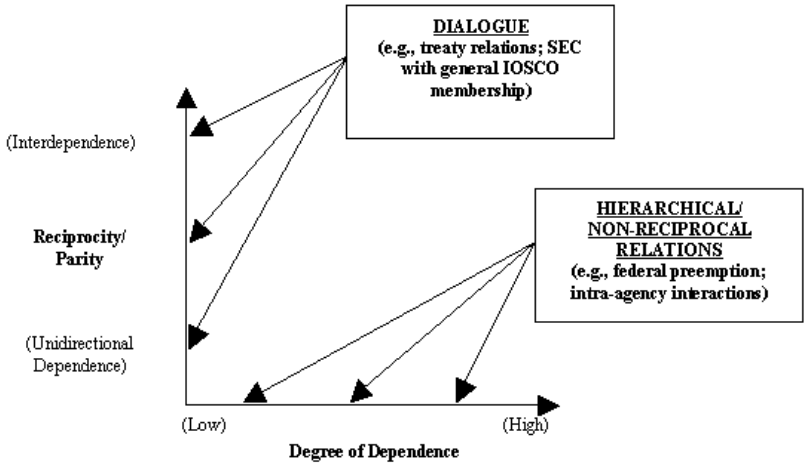

Figure 7.2. The Bounds of Regulatory Dependence in Cross-Jurisdictional Regulatory Interaction [719]

Networks of Affiliation

One of this chapter's goals was to identify procedural mechanisms, institutions, and practices that could create, or utilize, shared social space for the regulators of spaceports and could facilitate legitimizing multiple-community affiliation. In other words, if integration of the two approaches was the intended goal, how could this be achieved?

Intersystemic regulation is one available mechanism. This next sub-section will attempt to ascertain whether already existing networks or space-related institutions either create or support integration. This is the last of the questions posed at the beginning of this chapter. Who has the will and the legitimacy to manage? To reach the tipping point and move from emergence to a cascade, the norm needs to be institutionalized, to some degree, in international rules or organizations.[720]

Standards bodies are precisely the type of institution that invites potential

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the Process of Norm Emergence to Model Consensus Formation", presented at Ann Arbor MI Self-Adaptive and Self-Organizing Systems (SASO) Conference 3-7 October 2011, Proceedings pp. 148-157.

[719] Robert B. Ahdieh, "Dialectical Regulation" 38 Conn. L. Rev. 863 (July 2006) at 908.

[720] Finnemore & Sikkink, *supra* note 686 at 900.

participants into a shared social space; they are comprised of multiple parties from both governmental and non-governmental entities, all with a shared mission. Networks, described *supra*, have been characterized as carriers of institutional effects.[721] Networks of institutions provide community affiliation. The cascades in stage two of the norm's life cycle occur via networks, often institutions. In cyberspace, networks such as service providers create their own boundaries through contract, determining availability and conditions of access.[722] In this way, these networks are imposing their own rules of citizenship and participation, supplying different terms for continued membership and privately agreed methods of enforcing compliance. As a result, the global information infrastructure (GII) requires a new model of governance. The old State sovereign model just does not fit.[723] However, as the participants in the GII have continued to interact, it has become apparent that in order to regulate these networks, all aspects -- State, industry, technical, and private individual – must have some input.[724] This is congruent with Finnemore and Sikkink's model; during stage two (the cascade), States, international organizations, and networks interact.[725]

The interaction between the developing rule and the normal condition really amounts to institutionalism as described by Schmitt.[726] "[L]aw is the whole set of social relationships and communal practices which durably characterize, and in so doing institutionalize a certain form of life, and without which the political community would

[721] Jason Owen-Smith & Walter W. Powell, "Networks and Institutions" R. Greenwood et al. (eds.) *The Handbook of Organizational Institutionalism* (Sage: New York 2008) at 595.
[722] Reidenberg, *supra* note 597 at 917.
[723] *Ibid*. at 926.
[724] *Ibid.*
[725] Finnemore & Sikkink, *supra* note 686 at 898-900.
[726] Carl Schmitt, *Political Theology. Four Chapters on the Concept of Sovereignty* trans. George Schwab) (Cambridge Mass. And London: MIT Press. 1985).

implode."[727] Two interpretations of institutionalism have surfaced. The strong version places in the institution all power to embed social relationships. The weak version places primary value upon the plurality of institutions and their use in coordinating and governing.[728] Whereas strong institutionalism is flawed because it is arbitrary, atemporal, and abstract, the weak perspective allows for an intersection of practices and other institutions and is compatible with regulation by multiple institutions in differentiated situational contexts.[729] "Different legal regimes are in constant interaction, mutually influencing the emergence of each other's rules, processes and institutions."[730]

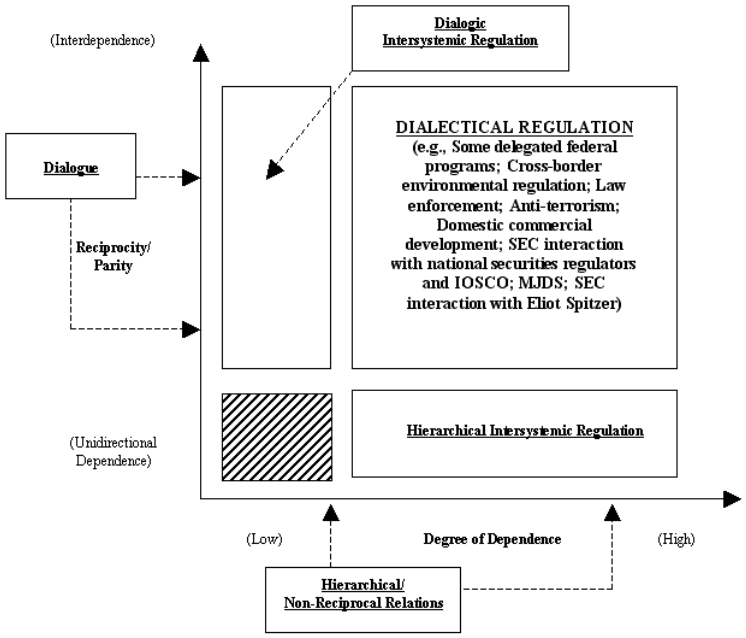

Figure 7.3: Dialectical Regulation[731]

This weak institutionalism is consistent with the evolution of transnational law on the ground, particularly in the technological contexts discussed in this thesis. Effective

[727] Mariano Croce & Andrea Salvatore, "Ethical Substance and the Coexistence of Normative Orders: Carl Schmitt, Santi Romano, and Critical Institutionalism" 56 J. of Leg. Pluralism (2007) at 3.
[728] Hans Berger et. al., "Determinants of supplier dependence: an empirical study" Geoffrey Martin Hodgson (ed.) *A modern reader in institutional and evolutionary economics: key concepts* (Edward Elgar Pub.: 2002) at 100.
[729] Croce, *supra* note 727 at 10-12.
[730] Macdonald, *supra* note 666 at 77.
[731] Ahdieh, supra note 719 at 908.

law flows from interactions that resolve dysfunctions arising within a social network.[732] Perhaps "weak" is not the best description of this manifestation of institutionalism in that it brings with it a value judgment not entirely objective in connotation and certainly not in keeping with value pluralism from a relativistic perspective. Permeable may better express the nature of this beast. Allowing this interaction between institutions or systems, changing all parties to the interaction, is one of the benefits of a pluralistic environment and also allows for system-internal pluralism.[733] One very important element to successful engagement is an emphasis on functional thinking regarding the regulatory obligations involved instead of formalistic preconceptions of the desired result.[734]

The current status of the silos fit the paradigm of intersystemic regulation; the existence of each silo is influencing the other. Europe has evidenced clear recalcitrance to set in stone its plans for suborbital winged vehicles and aerodromes. The EASA system, as described herein, is still proposed, not certain. The EU is aware of the fact that its approach fits into a bigger context. The FAA AST is aware of the European approach and the fact that, as it stands without more, there will be interoperability problems in the future. This interactive effect is consistent with weak institutionalism. Even within these internal systems, unnamed and informal law develops. For instance, the FAA AST sponsors Centers of Excellence. One of these COEs focuses upon Commercial Space Transportation, including all aspects of suborbital transportation and spaceport operations. Information from the COE is available to the AST in developing procedures, policies, and, ultimately, regulations. Project law refers to the rules that flow from

[732] Croce, *supra* note 727 at 13.
[733] von Benda-Beckmann, *supra* note 653 at 18-19. The FAA Centers of Excellence policies and roadmaps are an example as are the Terms of Reference of various Working Groups functioning in COPUOS.
[734] Ahdieh, *supra* note 731 at 917.

interaction between agencies and target projects.[735]

While not one of the entities listed is specifically tasked with regulation of spaceports, each is in some way connected. Merry notes that new legal institutions and regulations can be grafted onto already established economic and political activity.[736] This aligns with Aviram's analysis of norms enforcement in a private legal system (PLS), building upon extant networks that already regulate members in some way.[737] He defines a private legal system as "a multi-party institution that enforces norms through the use of network effects" and theorizes that the way private ordering evolves from an institution, and the nature of that institution to begin with, has a direct effect upon the effectiveness of the PLS.[738] Networks that employ low-enforcement-cost norms, or norms that do not require coercion to achieve compliance, generally develop into more effective private legal systems.[739] In other words, when parties of their own volition buy into a network's norms, the networks develop more effectively and, in turn, have more success ordering via successive norms.

Enforcement costs are affected by the benefits conferred by the network to the members or how important the norms enforced are to the members of the network, the degree of divergence of those benefits among the members, and how members would rank the possible outcomes of their participation in the network.[740] Networks employ four mechanisms to enforce norms: 1) the information mechanism, collecting and

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[735] von Benda-Beckmann, *supra* note 653 at 19, 21.
[736] Sallie Merry "From Law and Colonialism to Law and Globalization" (Spring 2003) 28 Law & Social Inquiry 2, 569-90 [hereinafter "Merry III"] at 579.
[737] Amitai Aviram, "A Paradox of Spontaneous Formation: The Evolution of Private Legal Systems" (Winer 2004) 22 Yale L. & Pol. Rev. 1, 1-68 at 1.
[738] *Ibid.* at 2, 6.
[739] *Ibid.* at 6.
[740] *Ibid*. at 8. This last is predicated upon game theory and game types assigned to member reactions, a more complicated analysis than the limitations of this paper will allow here. However, this concept is developed in some depth in the cited article and can be found in its Section III.

disseminating information regarding the credibility of the members which develops reputation capital (name and shame); 2) the switching mechanism, replacing a defaulted transaction with an alternate (rain checks or buyer covering for a breached contract); 3) the control mechanism, or centralized processing of transactions (like the registry maintained by OOSA); and 4) the exclusion mechanism which denies a member the network benefits by either temporary or permanent exclusion (sanctions).[741]

There are two steps to the process of private legal system (PLS) development. The network begins by creating a centralized bonding mechanism which is usually not its primary goal but a by-product of regulating a norm members obey without coercion – a low-enforcement-cost norm. After this, the network used its ability to deny members the benefit of that low- enforcement-cost norm to leverage compliance with a higher-enforcement-cost norm.[742] The network then evolves to incorporate the new higher cost norm. The enforcement issue will be avoided because the instant inquiry deals with the threshold matter of ability.[743]

Assessment is of a cross-section of organizations and agencies, with hopes to build upon those networks that are already regulating or interacting with either spaceport regulators or operators. Adapting Aviram's rather abstract model of PLS development to suit our needs, three matrices of effectiveness are analyzed: 1) ability to extract spaceport best practices from the US and European silos (and any others as they become available) and act as agents to integrate; 2) ability to administrate that integration by promoting adoption.[744] The analysis will also evaluate for the balanced representation of

[741] *Ibid.* at 13.
[742] Aviram, *supra* note 719 at 20.
[743] However, once the issue of which regime controls or whether a new hybrid regime, then enforcement can and does become far more relevant. We are just not there yet.
[744] Aviram's model would have us determine the effectiveness of the various institutions/networks listed by identifying the benefits conferred, the divergence of those benefits among the membership, how

parties within the entity as well as the ability of the entity to access and assimilate information, which will be called its facility for change

Intergovernmental organizations or international governmental organizations (IGOs) provide linkages between governments.[745] The United Nations (UN) is an IGO.[746] The UN Committee on the Peaceful Uses of Outer Space (UN COPUOS) consists of two sub-committees, the Legal Subcommittee (LSC) and the Scientific and Technical Subcommittee (STSC).[747] Neither subcommittee has entertained spaceport regulation as an agenda item, to date. The LSC did not include spaceport regulations in its recent table of national space laws.[748] The STSC currently has an active Working Group on the Long Term Sustainability of Space Activities, which is broken out into four clusters, or Expert Groups.[749] One of these, Expert Group D, is titled Regulatory Regimes and Guidance for Actors in the Space Arena.[750] Expert Group D has completed drafting high-

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invested the members are in one outcome (compliance) or another, and which of the mechanisms the network is using to achieve its aims. To take it a step further and attempt to predict which entity might have the best probabilities for evolution into a network that would accommodate spaceport regulation, a second tier norm, we could also analyze enforcement costs. In order to determine which of the extant networks are best situated to manage what issues pertinent to spaceport regulation of safety and security, a numerical scale could be assigned to qualitative factors indicating network effectiveness, including *inter alia* those listed in the paragraph above. These numerical ranking of the factors could be tabulated per organization, resulting in a ranking. The ranking could then be broken out in multiple ways – for safety as opposed to security, or for dissemination of information, or for dispute resolution. However, a proposal as described exceeds the scope of the thesis at hand and must be left for future study. Macdonald would ask what are the variables that predict or suggest when one normative order is more likely to direct the others. Macdonald, *supra* note 664 at 81.

[745] They are an "association of States established by and based upon a treaty, which pursues common aims and which has its own special organs to fulfill particular functions within the organization." Encyclopedia of Public International Law *s.v.* "Intergovernmental organization" online: http://www.asil.org/erg/?page=io (date accessed: 25 November 2012).

[746] "The United Nations as a Glance" UN online: http://www.un.org/en/aboutun/index.shtml (date accessed: 26 January 2013).

[747] UN COPUOS was set up by the UN General Assembly in 1959 to develop programs to be undertaken with UN support, to encourage continued research and dissemination of information on issues pertaining to outer space, and to study legal problems arising from the exploration and use of space. UN GA resolution 1348 (XIII); online: http://www.oosa.unvienna.org/oosa/COPUOS/copuos.html (date accessed: 25 November 2012).

[748] See note 51 and accompanying text.

[749] "Terms of Reference and methods of work of the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee" UN Doc A/AC.105/C.1/L.307.

[750] *Ibid.*

level guidelines to give guidance to current and future space actors.[751] The guidelines are targeted to both government and non-government actors. Some of these guidelines are in the form of best practices. However, spaceport operations are not considered activities with enough direct impact upon the long-term sustainability of space such that they should have been included.

While UN COPUOS subcommittees both have the ability to integrate the two systems, until it is actually determined that suborbital issues are of concern to COPUOS and, more specifically, that spaceport regulation is pertinent to the peaceful use of outer space, this entity has not yet demonstrated the will to be involved. Furthermore, there is an issue regarding balanced representation of parties. States enjoy full participation. Non-governmental organizations with permanent observer status can only participate to a limited degree.[752] Industry is able to participate via a member delegation.[753] Individuals cannot participate at all unless they have organizational accountability; the organization's status will then determine the degree of permitted participation.[754] This is similar to methods employed in Working Groups at the ITU. The STSC has proven itself with regard to facility for change. It assimilated technical information from the IADC and successfully drafted the space debris guidelines, with input from the LSC, resulting in the General Assembly's endorsement of the UN COPUOS Space Debris Mitigation Guidelines in 2007.[755]

The International Civil Aviation Organization (ICAO) represents another network

[751] The author participated in this initiative.
[752] Terms of Reference, *supra* note 722 para. 22.
[753] *Ibid*
[754] For instance, as the representative of an NGO with permanent observer status, limited participation is allowed. The same individual can participate fully as an expert member of a State delegation, but with organizational accountability to an entity organized within that State. That individual cannot participate representing him or herself.
[755] UN GA resolution 62.217.

within the United Nations. The Chicago Convention first established ICAO and it is the central authority setting standards for both safety and security in international aviation.[756] Annex 14 deals with airports and sets minimum standards for both safety and security in the form of the SARPs.

ICAO has both the legal and technical competence to extract and integrate the two systems of spaceport regulation as far as suborbital facilities may be concerned. Furthermore, EASA is proposing to use the ICAO SARPs and has already created a cross-reference of SARPs to regulations. ICAO suffers the same limits to representation as COPUOS but exhibits an even more developed ability to assimilate new information by its ongoing maintenance of the SARPs system for almost 70 years, through many technological permutations.

ICAO's will to include suborbital flight and suborbital vehicles in its mandate remains undetermined but a fledgling level of interest has surfaced. While the ICAO study on the Concept of Sub-orbital Flights, presented to UN COPUOS in 2010, was not enthusiastic or definite in its conclusions,[757] it recognized that current commercial activities in the suborbital realm were domestic but allowed that if foreign airspace was traversed, "and should it be determined that sub-orbital flights would be subject to international air law, pertinent Annexes to the Chicago Convention would in principle be amenable to their regulation."[758]

However, that determination may or may not be within ICAO's competence to

[756] "Introduction" ICAO website online: http://www.icao.int/cgi/goto_m.pl?/icao/en/chicago_conf/intro.html (date accessed: 23 September 2010).
[757] *Concept of Suborbital Flights: Information from the International Civil Aviation Organization (ICAO)* UN Doc A/AC.105/C.2/2010/CRP.9, referencing ICAO Working Paper C-WP/12436 presented to the Council – 175th Session.
[758] *Ibid.* at 5.

decide alone, nor does it bear upon the bigger issue – all spaceports.[759] One reason it may exceed ICAO's competence is because of the possible effect including suborbital transportation in the aviation regime might have upon LEO and the satellites functioning there. Further, consequences to sovereignty could flow from the inclusion of suborbital transportation in the aviation legal regime. This is an issue that could impact States' rights. ICAO recently populated a Learning Group initiated to examine issues surrounding suborbital activities and whether or not it has competence, and the States have political will, for the organization to go forward.

The UN fosters inter-agency coordination and cooperation in space related activities through the Inter-Agency Meeting on Outer Space Activities. The stated goal is to promote synergies and prevent duplication of efforts as they relate to the use of space technology and applications within the UN system.[760] This would be an appropriate forum with the competence to determine or negotiate the question of how best to regulate spaceports and whether suborbital transportation, at least with winged vehicles, is more properly a function of air or space such that it should fall to one regime or the other. The Inter-Agency Meeting would be the best setting for such a decision because it is informal; it could include both UN COPUOS and ICAO, and because of the possible effect upon LEO, should include the ITU. There is a certain level of voluntarism necessary in this determination, because of the steep State responsibilities entailed by space activities and, as a result, it is proper that determination of which regime should

[759] The UN has legal personality under international law but it is a secondary subject. *Reparation for Injuries Suffered in the Service of the United Nations* (1949 ICJ). It only makes sense that a UN agency such as ICAO would be subject to at least these limitations, if not more. While it is true that some non-UN IGOs can have legal rights and duties sufficient to enter into treaties, ICAO is part of the UN system and it carries out tasks of the Charter. States are primary.

[760] UN GA A/AC.105/1014 "Coordination of space-related activities within the United Nations system: directions and anticipated results for the period 2012-2013 – the use of space-derived geospatial data for sustainable development".

control suborbital transportation or whether it should be a hybrid, collaborative effort, be a member State situation.[761]

This is not simply a matter of interpretation of the existing treaties. It is a situation where States and UN agencies comprised of those States are confronting activities that were not contemplated at the time of drafting of those treaties. Placed in historical context, the Chicago Convention was drafted to deal with airspace over which States had sovereignty. Space travel was the stuff of science fiction. Likewise, in context, the Outer Space Treaty was drafted at a time when space travel involved vertical launches into orbit. However, States are not limited to these systems. This chapter is about alternatives. The Inter-Agency Group would allow States to negotiate the terms and conditions surrounding those alternatives among the various, affected UN agencies, drawing upon the diversity of expertise that provides. At the very least, the results could be used in bilateral agreements, as discussed earlier in this chapter, and at the most, drafting of a *sui generis* treaty could be addressed. It is this last option, a new treaty, which truly could make possible an intermodal system.

Non-state actors are now acknowledged participants in the creation of international norms.[746] Non-governmental organizations (NGOs) play a crucial role.[762] They are a form of private legal system, providing ordering systems to networks, or collections of users of a particular good or service,[763] and a number of them exist in relation to spaceport regulation. The International Association for the Advancement of Space Safety (IAASS) is one such network/organization, established in 2004 in the Netherlands and

[761] "The rules of law binding upon States…emanate from their own free will." *France v. Turkey*, 1927 PCIL, ser. A, No. 10 at 18 (Lotus).
[762] Paul Schiff Berman, "From International Law to Law and Globalization" 43 Colu. J. Transnat'l L. 485 (2005) at 546.
[763] Aviram, *supra* note 719 at 5.

"dedicated to furthering international cooperation and scientific advancement in the field of space systems safety."[764] The privatization of launch service and spaceports is an identified trend that the organization is watching.[765]

In 2011, the IAASS formed a Technical Committee to tackle the safety issues becoming relevant to the suborbital industry.[766] The TC's membership included individuals representing regulatory authorities, space agencies, private industry, academia, and IAASS members with expertise. Its goal was to identify best practices and standards for technical issues pertaining to safety and operations, including spaceport operations.[767] The TC drafted guidelines to be presented with a report at the next meeting, to be held in Germany in October 2014. The TC is addressing the suborbital grey area arising from the current lack of settled law and contemplates a formal agreement between the relative parties after receipt of approval for three prongs.[768]

The IAASS appears able to extract the most relevant and best of the current spaceport regulations. Further, the organization deals with all space activity, not simply suborbital or orbital. The impetus behind the drafted guidelines has been functionality, rather than formalism or doctrine. Also evident is the balance of representation in membership of the IAASS as a whole, and the TC in particular. The technical expertise of the organization's membership increases its facility for change; new information is consistently available.[769] However, there is an issue with respect to gathering new, relevant

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[764] "About IAASS" IAASS website, online: http://www.iaass.org/About.aspx (date accessed: 23 September 2010).
[765] Simonetta Di Pippo, et.al., "Pursuing the Advancement of Space Safety: the Case of ISSF & IAASS" IAC-12-D5.1.5 at 2, Presented at IAC Naples Italy October 2012.
[766] Andy Quinn, et.al. "New Suborbital Safety Technical Committee for the IAASS" Proceedings 5th IAASS Conference 'A Safer Space for a Safer World', Versailles, France 17-19 October 2011 (ESA SP-699, January 2012). The author serves as the legal lead for the TC.
[767] *Ibid.*
[768] IAASS Guidelines, *supra* note 615.
[769] Additionally, the organization is contemplating entering into an MOU with the FAA COE for

information, particularly related to the TC's mandate to draft operational guidelines utilized by industry. COMSTAC in the US has repeatedly resisted the TC's efforts to include member inputs in the guidelines, citing the disparity of safety metrics as a chief area of concern, and thus limiting US involvement in drafting the guidelines.

The IAASS falls short; it has limited ability and no competence to administer or legally order the integration of the systems. However, administration of the integration may be incidental. Extraction of the norms and dissemination to the appropriate parties could be sufficient in the interim, particularly if there is buy-in by enough stakeholders during the process of norm extraction/unpacking and integration. This is internalization from the ground up. And, until there is an answer to the bigger question of which regime should control suborbital transportation, air or space, anything else may be premature.

The International Organization for Standardization (ISO) is an NGO network of national standards institutes in 163 countries with a Central Secretariat in Geneva Switzerland. There are both state and non-state elements of the ISO. Member institutes, one per country, are often part of the government structure where located, or are mandated by that government; however, other member institutes were set up by networks of industry associations.[770] The requirement is that the ISO member be the organization

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Commercial Space Transportation as a Supporting Organization, which will give it access to more research and information and extend its reach. The terms of the Affiliate Membership can be found generally online: http://www.coe-cst.org/core/scripts/wysiwyg/kcfinder/upload/files/2013-01-21%20Affiliate%20Member%20Federal%20Register%20Notice.pdf (date accessed: 26 January 2013). The COE is sponsoring the "Body of Knowledge for Commercial Space Transportation", an organic, digitized collection of documents and information which is constantly acquiring and updating data. Center of Excellence for Commercial Space Transportation "Body of Knowledge for Commercial Space Transportation" online: http://contentdm.nmsu.edu:2011/cdm/landingpage/collection/NMSGCBOK (date accessed; 6 November 2012). It contains a Framework for Spaceport Operations. Direct access to this database and its administrators makes the IAASS and the COE CST even more relevant.

[770] "About ISO" ISO online: http://www.iso.org/iso/about.htm (date accessed: 23 September 2010).

most representative of standardization in the home country.[771] The ISO develops far more than space standards but is active in that area.

However, despite the fact that the ISO is integral to the international creation of state of the art standards, it is currently far removed from spaceport operations. The organization gathers and disseminates information. It develops standards, but it has a far broader specialization than space in general. The regulation of spaceports is far narrower yet. However, some of the terrestrial standards in place at sites are subject to ISO standards not specific to them as spaceports.

Organization	Xtrct norms?	Integrate norms?	Suborbital issue?	Balanced rep?	Facility Change?
UN COPUOS	No	W will	Partial	No	STSC
ICAO	Yes	W will	Partial	No	Yes
Inter-Agency Group on OS	No	No	Yes	No	No
IAASS	Yes	No	No	Yes	Yes
ISO	No	No	No	Yes	Yes

Table 7.2. Analysis of Available Institutions

This analysis reveals several useful pieces of information. First, while both ICAO and the IAASS are positioned to extract spaceport norms from the silo/stovepipes, the IAASS has some advantage because of the diversity and expertise of its membership. Second, at present, no entity is entirely appropriate to integrate the norms that emerge from that first process. Third, the suborbital issue would be best dealt with by the Inter-Agency Group on Outer Space Activities in the UN system with participation by all affected agencies, including COPUOS, ICAO, and the ITU. This last is true because of the timeline; the intent here is to identify an entity that can and perhaps will address this question proactively, before a dispute or disaster. These results are congruent with the placement of international spaceport regulation on the norm life cycle. The norms are still emerging. The challenge will be how and by whom an initiative can be raised with the

[771] "ISO Code of Ethics" online: http://www.iso.org/iso/codeethics_2004.pdf (date accessed: 23 September 2010).

Inter-Agency Meeting.

Conclusions

This chapter began by asking about alternative responses to the current governance of spaceports, available methods to harmonize or integrate the more effective elements of their regulation, and who or what has the competency to administrate that integration.

Currently, there are varying degrees of spaceport regulation. The two regimes that are more specific are ideologically incongruent on some major points, primarily the separation of orbital and suborbital activities and authorization and the assignation of suborbital to the aviation law regime by one. Activities at spaceports in these two jurisdictions are currently either contemplated (Europe) or in test phase (US) and domestic (both). There are some benefits to be found in each of these systems.

Universal harmonization, imposing one set of regulations upon the others, is not necessarily an ideal or practical option. However, potential exists for a bi-directional dynamic between the two silos whereby interaction could affect both, which would be optimum. While the two regulatory systems themselves are not hybrid, they interface with hybrid entities that may be positioned to extract norms from each and administrate their implementation.

Norms evolve along a continuum with codified law at one polarity, and informal ad hoc industry practices the other. Best practices have been identified as useful norms, particularly in space and spaceports; however, to be most effective certain elements are necessary to their formation. These include a formal vetting process, notice to those who will be subject to the practice, a procedure to assimilate new information, and diversity in the group developing the norm. The process by which a norm emerges is often the source of its legitimacy. In order for the emerging norm to then become integrated into more

formalized legal systems, it must cascade. Intersystemic regulation, where systems interact and influence each other, is a model that suits the current status of spaceport regulation. Further, the applicability of this model is an indicator of weak institutionalism, which allows both the US and the EU to benefit from their affiliations with other networks that are pertinent to both the spaceport regulation (and, ultimately, suborbital issues).

Analysis of existing networks and mechanisms reveals where the spaceport regulations are in the norm life cycle. This is important because it informs what is necessary and practical to do and to expect at this point in time. The IAASS has some advantages in unpacking the norms and best practices from the individual silos because of its expertise and the diversity of its membership. The fact that it is currently in process on a project with similar goals is a clear sign that these norms are between stage 1 and stage 2. This is precisely the point at which we will find the tipping point. The enthusiasm of norm entrepreneurs who believe in their motives is, more often than not, the ingredient that changes the recipe. In stage 1, ideational commitment and altruism are strong motivators. Both the US and the EU share safety as a common value. This shared commitment voiced by promoters with strong platforms can shift the balance. And should. The IAASS would be a good candidate for stage 1 extraction and promotion as regards operational norms for spaceports. However, the organization lacks legitimacy to codify.

The next bit of information arising from analysis of these networks is that no entity is entirely appropriate to integrate the norms that emerge from that first process. Integration/internalization, the one thing that comes up in the table as inconclusive, is the last stage in the norm's life cycle. However, administration of the integration may be incidental at this juncture. Extraction of the norms and dissemination to the appropriate

parties, stage 2, could be sufficient in the interim at this time, leaving the formal status quo unchanged.

Europe appears hesitant to solidify its suborbital/ aerodromes regulatory scheme. The EASA system, as described herein, is still under construction. The EU is aware of the fact that its approach fits into a bigger context. The FAA AST is aware of the European approach and the fact that, as it stands without more, there may be interoperability problems in the future. This is intersystemic regulation working in real time. Integration between parts of the US and European systems can begin someplace along that relativistic continuum. Stage 3, formal internalization, will come in time. And, while harmonization of all spaceport regulation from the top down is perhaps too ambitious at this point in time, utilization of modified SARPs is an accessible and manageable goal, even now.

Lastly, the analysis suggested that the suborbital issue would be best dealt with by the Inter-Agency Group on Outer Space Activities in the UN system with participation by all affected agencies, including COPUOS, ICAO, and the ITU. Whether this would ultimately result in an attempt at *sui generis* treaty law or something along the lines of a declaration or resolution, an initiative at this level should be pursued simultaneous to the bottom-up development of norms in suborbital transportation as a whole.

Spaceport operations do not require an answer to the suborbital question immediately but safety concerns should remain a part of infrastructure planning. The IAASS should continue to develop suborbital safety guidelines. International materials should be brought into the COE CST framework for spaceport operations.[772] Both the IAASS and the COE CST materials can competently disseminate the information.

[772] Center of Excellence for Commercial Space Transportation "Body of Knowledge for Commercial Space Transportation" online: http://contentdm.nmsu.edu:2011/cdm/landingpage/collection/NMSGCBOK (date accessed; 6 November 2012).

Stage 1 and stage 2 will be well underway and, if the political will exists, stage 3 will follow. Intermodality between spaceports in different jurisdictions and between the two aspects of commercial spaceflight (orbital and suborbital) suffers as a result of the existing system. However, one of Berman's principles in navigating a successful pluralistic approach included a public policy exception, allowing strong normative commitments to trump adversarial points of view and help shape the contours of the public policy favored.[773] Perhaps policy will pull the law along where spaceports are concerned.

[773] Berman I, *supra* note 644 at 1192 – 95.

Chapter Eight: Conclusions & Recommendations

Conclusions

States have designed a number of methods to regulate the activities at terrestrial launch site/spaceports under their jurisdiction (or contemplated for the future). Some of these frameworks are more effective than others. Some States regulate the facilities themselves, through direct regulation. Others authorize or regulate the activities at those facilities and/or the entities/operators performing those activities. This thesis examined quite a few jurisdictions. Of those, half chose to regulate the facilities directly and a small percentage of those elected to tie the launch license to the site license. Vehicles are universally licensed through the launch.

What becomes apparent is that when a State has promulgated domestic space law, the launch activity itself is always licensed. This emphasis on the launch becomes even more critical in light of the US carve out in its indemnification scheme, its treatment of the spaceport operator in so different a manner than the launch operator. There are different requirements from a financial responsibility perspective, but also different operational parameters for safety assessments and quite a distinct apportionment of responsibility. The spaceport operator is responsible for locational aspects while the launch operator is responsible for everything connected to the launch activity. Pre-flight activities are part of the launch license, instead of the spaceport license. This distinction is not notional. It is the result of a very detailed and considered rationale process, which is provided in the Final Rule.[774]

Analysis of the elements of the laws that pertain to spaceport activity across jurisdictions revealed safety as a collective value, although it is calculated differently for

[774] 14 CFR § 401.5 (2012).

different parties in different jurisdictions. Other elements included operator financial responsibility, extraterritorial reach, operator competence, and the availability of sanctions for infractions.

In order to measure the effectiveness of the diverse approaches examined, a benchmark was developed, which required identification of appropriate policy goals for the legislation. This was accomplished by scrutinizing policy values in multiple domestic space laws as well as research into policy goals for transportation and airports. Most jurisdictions rated high on compliance with international obligations and international cooperation, and almost all were effective for safety. Although international cooperation was highly valued, the regulations themselves fell short for the policy goal of intermodality with other forms of transportation (and for suborbital activity, even between aspects of space travel) and many did not have a sound legal basis because the regulations were not specific, clear, or practical.

The effectiveness analysis supported a finding that the US system and the EASA proposal for European suborbital activity were the most detailed. While there were elements of intermodality in both of these, each system contained problems of internal cohesion; the regulations did not fully support the goals they contained for themselves, including that of intermodality. Both attempted, neither achieved.

The issues arising from suborbital spaceflight remain unresolved among States and this impacts spaceport regulation to a degree. Some of these ramifications are pointed up by the EASA choice to treat suborbital activity as an aspect of aviation. The US spaceport licensing regime and the EASA proposal for suborbital spaceports were compared. Both were found wanting in some aspects and strong in others. Quantitative analysis gave the US a slightly higher effectiveness rating (partially to completely effective) than the EASA

proposal (limited to partially effective). Both had a sound legal basis. Both attempted intermodality, the US by handling suborbital and orbital within one legal regime, and EASA's proposal by suggesting integration of suborbital activity with the proven aviation legal framework. However, problems with recovery rights for victims of a damaging event ensued under either regime. There were potential obstacles to international trade. Legal uncertainty was the only certain result.

Various responses are available to the current state of launch site regulation. These ranged from doing nothing, with all States carrying on as they are, developing spaceport regulation as a strictly domestic endeavor, to creation of a *sui generis* regime that could unify all aspects of transportation and provide more equitable recoveries in the event of an accident. Between those polarities lay the alternatives of harmonization and integration.

Normative relativism helped sort out various methods to harmonize. Pluralism theory was used to illustrate the dynamics of the current spaceport regulatory paradigm. Norm emergence theory was used to determine how developed the laws are at present – between emergence and cascading. Intersystemic interaction was identified as a method to effect changes, piggybacking the task of integration onto an already existing network or networks. Because of expertise and competence issues, no entity is entirely appropriate to integrate the norms and best practices that are emerging as most effective. However, several organizations stand out as important norm entrepreneurs, to wit the IAASS, Working Groups of UN COPUOS such as the Long Term Sustainability of Space Activities, the Learning Group currently in the planning stages at ICAO, and the US FAA's COMSTAC and its Working Groups.

During the course of researching the thesis, several areas ripe for future study presented. One is a study of the actual effectiveness of the different organizations based

on a quantitative metric. The issue of which norm entrepreneurs are most likely and most optimum to influence the continuing process of spaceport regulation (and that of space transportation in general) deserves further study. The interaction between agencies coordinating multiple modes of carriage (rail-motor-marine-air) in the 20th Century should be researched with a view to applying lessons learned to the emerging space sector as a subset of transportation.[775] Inclusion of space transportation in the Transatlantic Trade and Investment Partnership work now underway between the EU and the US should be explored; at the very least, the possible outcomes could be studied. Last, work should continue on the process of distilling general principles of international space law from the schematic developed by the LSC of UN COPUOS.[776]

Recommendations

The above conclusions lead to the following recommendations. It is not necessary to regulate spaceport facilities under one regime or the other (air vs. space). It is possible to take the view that the US treatment of spaceports is a key indicator. The spaceport is not included in the risk-sharing scheme, except through the launch license, precisely because the only operational activities at the spaceport that would put the USG on the hook for a space calamity are launch-related activity, as specifically defined in the Rule.[777] It follows that the spaceport would only receive the benefits of indemnification through the launch license. All other exposure at the spaceport can be easily handled by more traditional insurance coverage, a fact that could hold at any spaceport. The launch or

[775] The split jurisdiction between land and air carriers was a significant challenge to coordination. Columbia Law Review Assoc., Inc., "Coordination of Intermodal Transportation" Vol. 69 Columbia L. Rev. No. 2 (Feb. 1969) at 256.
[776] The author did some cursory work on this last with the article "Are we there yet" and presentation at the IAC in Beijing. See note 33. However, the analysis dealt with only one issue, on-orbit transfer of ownership, and further work is in order.
[777] 14 CFR § 401.5 (2012).

flight brings the activity within a specific regime, and the facility can be managed as an operations-driven coordinator of services.

However, simply licensing through the activity creates some disparity because of differences in the regime; hence, the larger issue arising from the suborbital conundrum will have to be addressed at some point in the future. Two pressing and related matters demanding resolution are the inequitable recoveries available to a victim under the air law and space law and the resulting legal uncertainties. These two problems detract from economic growth, global competitiveness, and even legal soundness of a regulatory framework. Because of the introduction of the paying passenger, different than a customer who simply pays for transport of his payload and usually delegates the tasks necessary for its launch, neither regime (air or space) is properly equipped to address the needs of the commercial suborbital transportation industry.[778]

Whether or not Europe continues with its original plan to treat this type of suborbital flight as a part of international aviation, EASA has provided a comprehensive model of how to handle the local component of safety (with an understanding of the geographic features that would render one evacuation better than another, or the climate challenges a location would pose) while plugging the spaceports into the SARPs for international standardization. This can be used to standardize common safety features in spaceports like lighting and marking of runways, wherever the spaceport is located, if that spaceport is to someday function as part of a transportation system. Setting baseline standards for handling hazardous materials, fuels, propellants, etc. for crew and maintenance, and servicing personnel, is far easier using lessons learned from aviation.

This should be done now precisely because both EASA and the FAA are in

[778] Actually, some of these problems will also surface with orbital commercial spaceflight as well.

transition.[779] It is an opportune time for the US FAA to begin to layer Annex 14 into the launch site license, at least where runways will be used for a portion of the mission (HTHL, Air launch/balloon drop HL). The certification of airports is currently undergoing changes in the US.[780] The AST could be included in this transition, training its own inspector to apply the airport certification checklist as it relates to ICAO Annex 14 and with minor modifications to accommodate the special needs of the eight spaceports currently licensed and the one now pending in Colorado.

Disparity exists between the safety metrics applied in the US and those that European safety experts currently advocate. The US considers harm to the uninvolved public, third parties, and calculates the acceptable risk using an expected casualty of $30x10^{-6}$. There is discussion in Europe to assess risk in terms of the vehicle and first and second parties using a threshold of $1x10^{-4}$ for acceptable risk. It may be prudent to use both. Wilde recommends handling safety for ELVs and RLVs differently than they are at present.[781] However, in the interim, it is possible to take the view that the UK CAA does in its recent review of potential commercial suborbital operations.[782] While the EU deliberates on how best to govern this aspect of transportation, each Member State can set its own parameters. The UK recommends using the FAA AST metric while the industry is nascent, for all the reasons the US is – to foster innovation, to avoid unnecessary burdens upon startups – and to be able to work with US operators. This decision by the UK aligns well with policy goals of international cooperation, global competitiveness, shows concern

[779] *Supra* notes 382-383 and accompanying text, regarding the FAA transition; the EU is still on the fence as to how to proceed with classification and certification of suborbital vehicles and aerodromes.
[780] *Ibid.*
[781] To take it a step further, it would be even wiser to incorporate some, if not all, of the goals suggested by Wilde, described at the conclusion of Chapter Three.
[782] *UK Government review of commercial spaceplane certification and operations: Summary and conclusions" UK CAA, UK Space Agency, Dept for Business Innovation & Skills, Dept of Transport (July 2014).*

for social values of economic health, innovation, and safety, and allows for intermodality between the US and the UK.

The licensing/certification dichotomy comes up regarding both sites and vehicles. Licensing, as currently handled by the AST, is flexible and cost-effective, a feature more relevant to vehicle developers and operators than spaceport operators. Government and industry are in close communication, in real time. For vehicles, a solution that would integrate the best of both would allow for licensing as per the US system up to a predetermined level of volume. At the point that level is reached, the certification model could be implemented. This would give the certification process the necessary data but would allow for innovation, as in the US.

Spaceport regulations are also more effective when they integrate the best of both worlds – the EASA model for suborbital HTHL/air launch/balloon drop HL and retrofitted airports, and the US model for hybrid (orbital and suborbital) spaceports. The US system would benefit by using the same baseline for its suborbital elements as are set forth in the SARPS, with appropriate modification (already done by EASA). Runway lighting should be the same, no matter whether the spaceport is licensed or certified, no matter if the runway is in a hybrid facility or not.

Jurisdictions contemplating siting and building out spaceports should ensure effective regulation, driven by clear internal policy goals that align with the broad overarching goals developed in this thesis. Again, the UK is an example. Recognizing that the country could benefit economically, and from the standpoint of technological leadership and global competitiveness, the UK Space Agency and the UK CAA commenced a Working Group in 2012 to investigate commercial suborbital operations. The agencies worked in tandem with experts from several countries to study existing regulatory

frameworks (the US FAA AST and the EASA proposal) in order to ensure that regulatory uncertainty in the UK would not be an impediment to progress.[783]

While ultimately the goal would be to construct a purpose-built spaceport capable of servicing both HTHL suborbital flight and vertical launches, the near-term goal is to accommodate suborbital transportation by 2018.[784] To that end, the study recommended use of an aerodrome certified by the UK CAA or EASA or retrofit of a UK military facility.[785] The various reviews presented for use in siting a UK spaceport mirror those used by the FAA AST. This is an excellent example of integration of the best elements of the two models studied in the immediate thesis. The UK chooses to adopt the EASA position that the suborbital craft in question fit the ICAO definition of aircraft. This does not ultimately impact the reality that the spaceport siting and modification/development are to be accomplished with intermodal operations with the US in mind. It also does not address the complications sure to arise when the UK does decide to build out a multi-modal spaceport, but it is a reasonable start.

Integration of regulatory elements is a form of internalization of norms, the last stage in the development of an emerging norm and the criterion that came up as inconclusive in the analysis of entities or organizations available to manage integration (end of Chapter Seven). However, administration of the integration may be premature. It may be enough to extract and integrate the best practices from all systems and disseminate these to the appropriate parties. It is recommended that all stakeholders with an interest in a current or proposed spaceport actively participate in the IAASS Technical Committee, the UN Working Groups, the ICAO Learning Group, the FAA Commercial

[783] *UK Government review of commercial spaceplane certification and operations: Summary and conclusions* UK CAA, UK Space Agency, Dept. for Business Innovation & Skills, Dept. of Transport (July 2014).
[784] *Ibid*. at 4.
[785] *Ibid*. at 53.

Space Transportation COE Framework, and COMSTAC. It is also recommended that COPUOS, ICAO, and the ITU address the issues flowing from both suborbital transportation and launch sites at the Inter-Agency Meeting on Outer Space Activities in the UN system.

For the time being, while the suborbital issue remains unsettled, perhaps bi-lateral agreements could manage the conflicts between US and Europe, and whomever else commences activity in the near future, as pertaining to the question of which will govern -- air or space. These could assign a segment of the flight to one regime of the other for the parties involved and could define rights of recovery for parties. Self-regulation in the US through private contracts and best practices and standards is likely to continue to be effective because of strong incentives.[776]

The broader issue is whether the regulations in place today and promulgated tomorrow serve the long-range policy goals that underpin them and the thesis' overarching goals for spaceport regulation in general. States can decide now whether they want to be part of a system that is integrated enough to accommodate global transportation in the future. The example used throughout the thesis, of a multi-modal transportation hub, is not a hypothetical. It is a reality in many locations around the globe.[786] Port Canaveral in Central Florida is currently developing a multi-modal transportation hub linking up rail, sea, air, motor, and space.[787] NASA's 20-year strategic plan for infrastructure at the Kennedy Space Center is for multi-user activity, integrating suborbital and orbital, other modes of transport, government and industry, and functioning more "like an

[786] Ronald Reagan National Airport in Washington DC, Vienna International Airport, Charles DeGaulle Airport in Paris France, JFK Airport in New York City, and Miami International Airport, to name but a few.
[787] *Spaceport Area Transportation Infrastructure Assessment" Space Coast Transportation Planning Organization* (October 2011). Available online: http://www.portcanaveral.com/TIGER%20VI/pdf/Space%20Port%20Transp%20Infrastructure%20Assessment%20.pdf (date accessed: 17 July 2014).

airport" than a launch site.[788]

This idea is not new. In the 1930s, multiple modes of transport were sorting out their relationships to one another. Rail, marine, motor, air – all were jockeying for position, often motivated by fear that another mode would elbow it out. A Federal Coordinator was installed, to help manage the complex interactions.[789] Ultimately, all methods have survived. Different activities and different needs for timeliness or cost effectiveness have provided enough markets to sustain all. This is not to say that modifications will not need to be made to bring the spaceports under the FAA AST's control into the larger intermodal transportation system. However, US airport law and US space transportation policy both contemplate and allow for overhaul of infrastructure if and when necessary to stay competitive.

Just as the US indemnification carve-out is a key indicator for spaceports, so also is the EU treatment of transport as an issue granting EASA competence. Treating suborbital transportation as transport is a beginning. Stepping back and acknowledging the transportation aspect of commercial spaceflight in general is the next step. Orbital spaceflight is also transportation. SpaceX and Orbital Sciences deliver cargo to the International Space Station. This is a function of transportation. The imminence of US commercial crew transport to the ISS is yet another. Perhaps, the EU will eventually accede all of commercial space transportation to EASA, not just the suborbital portion, because it is the transport element that is the crux, not the type of vehicle or the location of the activity. This type of interpretation supports European policy goals of intermodality.

Allowing a disconnect between air and space, or orbital and suborbital, or any

[788] *Kennedy Space Center Future Development Concept 2012-2031* NASA 2012 at 17.
[789] Public aids to transportation v. 1-2 United States (Washington US Govt. printing office 1938-40).

means of transport, could be debilitating for this industry that holds so much promise and excitement for everyone involved. Without some understanding of precisely where we are starting, we do not know where we need to go. Without insight into the best of what each system has to offer, we lose the special gifts that each can bring to the whole. There are parts of each system that can be integrated and there are methods to break through the recalcitrance to commit to hard and fast law found in both the international and business communities. From all the different systems, it is possible to hobble out some certainty, maintain interoperability, and reach agreement on the fact that the goal is to keep things safe while making a reasonable profit. We must if we are to act responsibly. Because, truly that is what it is all about at the end of the day – safety, certainty, and cooperation – for the benefit of all of us. Henry Ford said it well, "Coming together is a beginning. Keeping together is progress. Working together is success."[790]

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