A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of **Master of Laws**

Oleksiy Burchevskyy
Student # 260282254
Faculty of Law
McGill University
Montreal

Are We Ready to Drive to the Sky? : Personal Air-Land Vehicles within the Modern Air Law Framework and Theory of Legal Innovation.

LL.M. Thesis

Advisor: Prof. Nicholas Kasirer

Faculty of Law, McGill University

December 2008

Abstract:

This work is a futuristic excursion to the would-be world of flying cars. It examines the impact on modern aviation law of possible future roadable aircraft, referred to as Personal Air-Land Vehicles. It first addresses theoretical impact which new technological advance would have on the legal system. The main focus is made on the way the law adapts technical inventions through such main approaches as legal analogy and legal innovation. Later it is discussed how the invention of Personal Air-Land Vehicle would influence current law. Cross-jurisdictional comparison of ultralight aviation regulations is a core of such study. The paper also examines history and future of roadable aircraft.

Ce travail consiste en une incursion dans le futur monde des automobiles volantes. Il traite de l'impact qu'auront ces futures voitures volantes, plus communément appelés Voitures Personnelles Terre-Air, sur le droit moderne de l'aviation. Ce travail abordera dans un premier temps la théorie générale sur l'impact qu'ont les développements technologiques sur les systèmes juridiques. Une attention particulière sera accordée aux principes d'analogie et d'innovation juridiques en tant qu'approches aux inventions nouvelles. Ensuite nous procéderons à une étude des influences probables qu'auront les Voitures Personnelles Terre-Air sur le droit moderne. Une approche comparative pluri-juridique des régimes d'aviation ultralégère sera au cœur de cette étude. Ce travail examinera ensuite l'histoire et le futur de ces voitures volantes.

Acknowledgements:

My sincere gratitude is addressed to Professor Nicholas Kasirer, Dean of the McGill Facuty of Law, for supervising this research and to Christopher W. Glower for assessing my English.

Index:

1. Introduction

Will we ever be able to fly an aircraft just as easily as we drive the car on the road? Will we be able to fly over the annoying traffic jams in our personal automobile? For most of our contemporaries such questions are still associated with science fiction. Nevertheless, there are increasing numbers of individual inventors and manufacturing companies that seriously work on the construction of a vehicle that would fly as easily as to drive on the road and will be as affordable and user-friendly as a conventional car.

There are various terms used to describe an aircraft which is capable of driving on the road and of a car which is capable of flying. Airborne car, roadable aircraft, flying car, and many other terms can be found in the literature and on the web. The term ***Personal Air-Land Vehicle*** (PAL-V) seems to be the most suitable for the purpose of this study. This expression is chosen primarily because of its neutrality, since it does not favor the term "car" or "aircraft".[1] As it will be discussed later, such a vehicle will resemble closely both personal car and personal light or ultralight aircraft.

Rapid technological developments of recent years, especially in the field of electronics and composite materials, make it possible for the roadable aircraft to be distributed widely within the coming decade. Therefore, legal systems across various jurisdictions should be prepared to effectively govern the new social relations associated with this radical technological innovation. It is impossible to say, however, what impact such a

[1] It must be noted that in this work Personal Air Land Vehicle means a machine which is equally capable of flying as well as driving on publicly used road and satisfies most of the criteria outlined on the page 11. It does not specifically resemble a PAL-V gyrocopter-type design proposed by the PAL-V Europe and Carver Engineering companies, although the PAL-V acronym will be used in this text. Any machine which satisfies the above-mentioned standards will be referred to as PAL-V for the purpose of this study

new means of transportation would have on the existing law, without detailed study of how law generally accommodates major technological advances.

1.1. Questions of the Research:

Thus, the proposed research will give a useful overview of the existing laws on ultralight aviation and will examine how an old aviation law may or may not be adapted to the new realities of mass personal air-land travel. Consistent with these objectives, the research questions will be as follows:

1. Is the current framework of national and international aviation law a sufficient tool to support mass production and use of air-land vehicles?

2. If the law is insufficient, will it be suffice to make minor changes to existing aviation law or will the whole concept of Civil aviation law have to be revisited in a revolutionary manner?

These rather complicated questions will be answered through the following analysis in four chapters.

Chapter 4 should answer the question: whether the radical scientific discoveries and innovations, which are often referred to as paradigm shifts, also lead to the similar radical changes in the law that governs social relations in various spheres? The chapter will study several historical examples of scientific revolutions that resulted in significant developments in the law.

Chapter 5. Are We Talking About Cars or Planes? When should the PAL-V be treated as an aircraft, when as a vehicle and when as a unique machine? Examples of several amphibious vehicles (surface effect vehicles, hovercrafts, etc.) and suborbital spacecrafts will

be used in order to show how law responds to the non-conventional vehicles which overlap established definitions of aircraft, spacecraft, ship or automobile. Discussion between functionalist and spacialist approaches to this problem will be studied in particular.

The chapter will further provide comparative analysis of regulatory framework for the PAL-V for production and operation. Requirements of several countries for cars and aircraft will be compared in order to determine whether there is a necessary degree of uniformity that would allow for the broad distribution of the same production models of PAL-V across various jurisdictions.

Chapter 6 will study wether the traditional notion of air travel and of air shipping is applicable to the transportation by PAL-Vs. The Chapter will further provide comparative analysis of the personal licensing required for the operators of PAL-V under various jurisdictions and make a conclusion as to their consistency. Finally, the chapter will emphasize on the "rule of the road" for PAL-Vs and will answer whether current navigation and safety rules established by ICAO standards are fully applicable to these vehicles. Discussion on GPS-based instrumental flight rules will be addressed more specifically.

The Chapter will also address modern definition of an airfield and how it may evolve in future. It will examine how existing airfield regulations in various jurisdictions are appropriate for the needs of PAL-Vs. The Chapter will further study how sovereignty in the air and on the ground may effect trans-border operation of the vehicles and their sale.

This paper may serve as a starting point for future studies in the areas of technical innovation and personal air travel. Should the new legislation on the PAL-Vs be drafted nationally or internationally, drafters may also find the paper useful, since there are no or very few sources of legal scholarship on the issues.

1.2. History of the Subject and Current Developments.

The idea of a machine that is equally capable of flying in the sky as well as driving on the road is almost as old as the idea of the aircraft itself. As early as 1911, Waldo Waterman, a notable early aircraft designer, speculated on the possibility of building an aircraft which would be easily convertible into an automobile. He was probably inspired by the first amphibious airplanes designed by Glenn Curtis with whom he worked in North Island, San Diego, California that same year. The dream of an aircraft that would not be confined by the underdeveloped airport infrastructure and would provide door-to-door transportation was fulfilled by Waterman in 1937 when he built an Aerobile, the first fully operational hybrid of a car and an aircraft.[2] Famous car designer Henry Ford constructed Sky Flivver in 1927 in an attempt to combine a motor-car and an aircraft[3].

Periodically, the idea of a flying car revitalized itself, especially as roads became increasingly congested with growing numbers of conventional motor vehicles. The most noteworthy later examples of flying cars are Fulton FA-2 Airphibian (1947); Aerocar (1946-66)[4]; Aerauto PL.5C (1950-53); AVE-Mizar (1971-73)[5].

Ford company again studied possibility of mass production of flying cars during the 1950's. and found such production economically feasible, but never actually began production.

All these early examples followed the same model, where a car had a wing section that was attachable. These machines required extensive preparation in order to convert the car from

---

[2] Ralph Cooper, *Waldo Waterman*, online: The Early Birds of Aviation Inc. <http://www.earlyaviators.com/ewaterma.htm>

[3] Bob Sillery, *Looking back at Henry Ford's Flivver* (2001), online: <http://www.popsci.com/military-aviation-space/article/2001-12/looking-back-henry-fords-flivver>

[4] Bob Blake, *Cars that fly…Cars that float,* (2005), online: The Rumage Box <http://www.aaca.org/publications/rummagebox/2005/spring/spring05c.htm>

[5] Kal Lahue, "Mitzar Flying Pinto" in *Peterson's Complete Ford Book*, (3rd ed. 1973), online: <http://www.fordpinto.com/mitzar1.htm>

flying mode into the driving mode. This conversion required of the owner certain technical skills, time and premises which restricted the wide distribution of the machines.

Another restriction was that the flight navigation systems and air traffic control at that time was insufficient for the traffic that would have resulted from the wide use of flying cars. When the Ford Company approached the Federal Aviation Administration in the 1950's for approval of the flying car concept, the idea of affordable air traffic was not supported due to the safety concerns.[6]

Since World War II, air traffic enjoyed enormous growth and technological progress. However, most growth was attributable to the long-haul wide-body traffic which was easier to control. The percentage of people engaging in personal air traffic remained insignificant. While currently, general aviation accounts for 80 % of aircraft departures, the numbers of people carried by non-scheduled personal aircraft is remarcably lower than those who use scheduled air traffic. The idea of the flying car inspired many science fiction movie makers[7] but was not taken seriously by the wide public.

Nevertheless, in recent years there has been revitalized interest by manufacturers and enthusiasts in the idea of the roadable aircraft. In by opinion, at this time the PAL-V project may finally become commercially viable and our contemporaries will see wide distribution of flying cars at least in well-developed countries. There are several factors supporting such opinion.

1. Developing composite materials allow for the construction of lighter less expensive aircraft bodies and engines;[8]

---

[6] Id.

[7] for example *The Fifth Element*, L.Besson, 1997; *Star Wars Episode II: Attack of the Clones,* G.Lukas, 2002;

[8] Boeing-787 Dreamliner is an example of an aircraft with all-composite fuselage, see

2. Development of global navigation systems and on-board electronics makes it easier to fly using instrumental flight rules and to control air traffic;[9]

3. Congested highways and increasingly congested high-attitude airspace push air traffic in the economically developed countries to the remaining relatively free airspace at the lower altitudes.[10]

4. A global trend for liberalization of air traffic rules has meant less stringent regulation of personal air traffic, including personal and type certification, flying rules, etc.[11] As a result, type certificates and personal pilot licenses become much more accessible to manufacturers and users of future roadable aircraft.

There are several criteria, which such an aircraft must satisfy, to be a viable market product with a wide distribution.

1. A vehicle should be equally capable of flying and driving on a conventional highway.

2. A vehicle must be easily transformable from flying into the driving mode without special technical knowledge and specialized assembly area.

3. When in driving mode, a vehicle must not differ significantly from conventional car in terms of size and external design.

4. A vehicle must be safe and technically reliable, and provide certain level of survivability in case of technical failure.

Boeing, *Boeing 787 Dreamliner Will Provide New Solutions for Airlines, Passengers*, online: Boeing <http://www.boeing.com/commercial/787family/background.html>

[9] Small Air Transportation System (SATS) is an example of future reliance of general aviation on Global Positioning System (GPS), see NASA, *NASA's Aerospace Technology Enterprise Goals for General Aviation*, online: Gaserving America <http://www.gaservingamerica.org/library_pdfs/AEROSP_1.PDF>
see also *Highway in the Sky program by NASA* at: NASA, *3-D Highway in the Sky* (2005), online: NASA <http://www.sti.nasa.gov/tto/Spinoff2005/t_2.html>

[10] Paul S. Moller, *Airborne Personalized Travel Using "Powered Lift Aircraft*"(May 16, 2000), online: <http://www.skyaid.org/Skycar/Media/airborne_personalized_travel.htm>

[11] PAL-V Europe, *Why this is Possible Now*, online: http://www.pal-v.com

5. A vehicle must be easy to drive, fly and maintain.

6. A vehicle must be relatively cheap, not much more expensive than a new conventional car.

7. Flying license for such a vehicle must not require extensive or expensive training.

8. Finance and insurance for the vehicle and the operator must not constitute a significant burden for the owner.

Several dozens projects all over the world are currently in progress aimed to create a machine which will at least partially satisfy the criteria mentioned. Technical characteristics of all these products can be found in various internet resources.[12] According to these resources such vehicles are traditionally grouped into three major categories.

Machines of ***Modular Design*** have two separate sets of components: one for air travel and another for road travel. They require special operations to be performed in order to change from the driving to flying mode and vice versa. All the early models of roadable aircraft, which were described earlier, followed this model. Despite the mentioned draw backs of this design such models as Trans Air Systems TAS 102[13], Volante,[14] Wolf Aerocycle[15] currently follow it.

Integrated Design implies that all necessary components for flight and road travel are incorporated into single aircraft, which does not require complex mechanical interference for the transition between flying and driving modes. This concept is the most complicated but the most promising for the flying car. A Dutch prototype Personal Air-Land Vehicle (PAL-

[12] please see *Flying Cars*, online: <http://www.roadabletimes.com/> as a primary source for such information;
[13] *Replace Your Car and Plane with a TAS-102 Flying Motorcycle*, online: Trans Air Systems, <www.flyingmotorcyclecompany.com>
[14] KP Rice, *Volante. The Flying Car is Here!*,online: <www.volanteaircraft.com>
[15] *Craft*, online: Aerocycle, <www.wolffaerocycle.com>

V) is probably the most feasible project of this model and among roadable aircraft in general.[16]

Vertical Take-Off and Landing (VTOL) aircraft may not be roadable *per se*. However, their design allows them to land on the public roads significantly easier than the conventional helicopter does, and sometimes even to drive short distances like a conventional car. Moller Skycar project, which has been in development for almost 30 years, is probably the most widely known "flying car" project.[17] Nevertheless, in my opinion, the Israeli X-Hawk by Urban Aeronautics Company seems to be a more acceptable prototype of this design type.[18]

This study will be focused primarily on vehicles of the Integrated Design type as the most complicated from the legal point of view. They seem to satisfy most of the criteria of the "flying car" mentioned earlier and therefore have a real chance of market success and so will require legal regulation. The Modular Design type vehicles had historically seen to be impractical and have clear distinctions between air and land modes. The VTOL aircraft are not dual purpose machines but rather aircraft with additional capabilities.

As was mentioned earlier, term PAL-V will be used to describe this family of vehicles in this paper.

Wide distribution of PAL vehicles may result in major shift in the paradigm of modern air transportation and a revolution in the field of aviation law.

---

[16] PAL-V Europe, Supra note 11.
[17] Moller International, *The Skycar*, online: <www.moller.com>
[18] Urban Aeronautics, *X-Hawk: The Revolutionary, Modular, VTOL Aircraft*, online: <www.urbanaero.com/Urban_Main.htm>

2. Methods of Research:

The following methods will be used to answer the research questions presented in the first Chapter of this paper.

The research will be of fundamental-contextualist nature. This means that the paper will consist of two easily-distinguished parts, linked by the topic and questions stated earlier. In the first part, in order to understand the nature of the advance itself, definitions of technology, theories of technological innovation and its impact on social relations will be addressed briefly. We will further take theoretical approach and examine the fundamental theories of legal analogy and innovation. Different opinions of various authors about how law adapts to the new social relations associated with technological advance will be explored.

Further, the historical comparative approach will be taken. We will study several examples of rapid technological change often referred to as paradigm shifts. Legal consequences of invention of printing press, aircraft and Internet will be presented. We will determine whether these dramatic advances in various social spheres also resulted in similar radical changes in the law that governed social relations in those spheres.

At the end of this first part, it will have been seen whether fundamental changes in technology automatically lead to the fundamental changes in the relevant field of law. It will than be possible to determine if there is a need to revisit the whole concept of modern aviation law as in response to PAL-V introduction, and to partly answer Research Question No.2.

The second part of the study will apply the fundamental theoretical conclusions made in the first part to the context of current transportation law. We will then undertake

comparative analysis of the existing legislation that may be applicable to the PAL vehicles across several jurisdictions. We will focus on the United States, Canada and the European Union, as possible big markets for PAL-Vs. Naturally, there is no existing legislation that specifically addresses PAL-Vs, therefore the research will review legal regimes for analogous machines such as ultralight aircraft, amphibious vehicles, etc. Once we have an overall understanding of the global existing legal framework that may be applicable to PAL-Vs, we then analyze it from the critical/reformist perspective and will be able to answer Research Question No. 1. Finally, it will be possible to predict overall developments in the air law regarding road-able aircraft in the immediate future.

Examining aviation legislation from various jurisdictions will be essential for the research. Most of the resources are available on-line and in English translation. Various scholar materials on government regulation of air transport and on policy issues in transport in general will also be useful. There has not been a significant research on the questions of technical innovation and the law, however, there is some scholarship and it should be retrieved in order to answer the second research question. A more precise list of sources may be found in the Literature section of this paper.

3. Literature:

As was mentioned earlier the topic of flying cars itself did not attract scholarly attention and largely remained in the realm of a science fiction. Modern law does not have any legislation on the PAL-V either. Therefore, because there has been no prior discussion of this novel topic no sources specifically addressing these vehicles will be cited hereof. Nevertheless a number of related topics are based on a well-developed background of sources.

We will start the discussion with the paradigm shift theory of T. Kuhn.[19] It is one of the topics that receive varied discussion in the scientific literature and it will be addressed more precisely later hereof. Although Kuhn himself intended his theory of paradigm shift for the natural sciences, numerous scholars have applied similar principles to the area of humanities. Therefore we are especially interested in the authors who further developed Kuhn's original scholarship. Tang,[20] for example, discusses differences between paradigm shifts and scientific revolutions. Pinch[21] distinguishes between conservative and radical interpretations of Kuhn's legacy. Robertson[22] and Barnett[23] give examples of how the paradigm shift concept may be used empirically in the field of criminal law. These examples

---

[19] Kuhn, T.S. "Second Thoughts on Paradigms", in Suppe ed., *The Structure of Scientific Theories* 459-82 (1974) as cited by T. J. Pinch, "Kuhn - The Conservative and Radical Interpretations: Are Some Mertonians 'Kuhnians' and Some Kuhnians 'Mertonians'?" (1997) 27 No. 3 Soc. Stud. Sci, 465-82;
Kuhn, Thomas S., *The Structure of Scientific Revolutions*, (Chicago: University of Chicago Press, 1962)

[20] Paul C. L. Tang, *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association*, Vol. 1 (1984) at 125-136 (JStore).

[21] T. J. Pinch, "Kuhn - The Conservative and Radical Interpretations: Are Some Mertonians 'Kuhnians' and Some Kuhnians 'Mertonians'?" (1997) 27 No. 3 Soc. Stud. Sci, 465-82

[22] James E. Robertson, "Houses of the Dead: Warehouse Prisons, Paradigm Change, and the Supreme Court," (1997) 34 Hous. L. Rev. 1003.

[23] Randy E. Barnett, "Restitution: A New Paradigm of Criminal Justice" (1977) 87 No.4. Ethics 279-301.

will help us to create our own empirical application of the paradigm shift concept for the fields of law we study.

There is some scholarship on the nature of technology which comes primarily from the field of sociology of science. We will briefly look into this field for the purpose of defining terms. Misa[24] compares different definitions of technology and refers to historical types of technology, on which we will later base our examples. Hilpert[25] explains the difference between science and technology. Grey[26] explains how innovation changes technology through the process called diffusion. Authors like Diewert[27] and Gershuny[28] focus on social impacts of innovation from economic perspective, which is of less interest to this paper. Impacts of administrative legal regulations on technological innovation are in debth studied by Stewart.[29]

The second major field of study is innovation and the law. The question of how the law is created and applied always attracted the minds of scholars. Hunter[30] gives a comprehensive overview of the main theories of legal reasoning. As our main focus in this work is on roadable aircraft and not on the legal hermeneutics we will only examine principal works in the field of development of law. Levi[31] represents the deductionist school of

[24] Thomas J. Misa, "Theories of Technological Change: Parameters and Purposes" (1992) 17 No.1. Sci. Tech. & Hum. Values 3-12 .
[25] Ulrich Hilpert, "Techno-Industrial Innovation, Social Development, and State Policies*"* (1990) 11 No.1 Int. Pol. Sci. Rev. 75-86.
[26]Virginia Gray. "Innovation in the States: A Diffusion Study*"* 67 No.4 Am. Pol. Sci. Rev. 1174-1185.
[27] W.E. Diewert, "The Effects of an Innovation: A Trade Theory Approach" (1987) 20 No.4 Can. J. Econ. 694-714
[28] Jonathan Gershuny, "Technology, Social Innovation, and the Informal Economy*"* (1987) 493Annals Am. Acad. Pol. & Soc. Sci. 47-63.
[29] Richard B. Stewart. "Regulation, Innovation, and Administrative Law: A Conceptual Framework" (1981) 69 No.5 Cal. L. Rev. 1256-1377.
[30] Dan Hunter, "Reason is Too Large: Analogy and Precedent in Law" (2001) 50 Emory L. J. 1197-1264
[31] Edward H. Levi, *An Introduction to Legal Reasoning* (Chicago: University of Chicago Press, 1961), at 9-27.

thought. Alexander[32] also writes on deductive reasoning, denying legal analogy as such. Dworkin[33] is a founder of "law as integrity" concept, which denies any uniform principles of law. Kamm on the contrary refers to the general theory of law as a basis for legal decision.[34] Holyoak and Thagard [35] were the first ones to outline the multiple-constraint theory of legal reasoning and Hunter further supports this theory. All of the authors discussed help to understand the correlation between the use of legal analogy and legal precedent and to see how the extension of legal principle through analogy works in Common Law system. Such European authors as Langenbucher[36] address similar questions in the Civil Law system.

After we have described the theoretical framework of how the law adapts to new social relations through analogy and innovation, we will review three examples from different times and fields of law. Factual information on the history of copyright law, aviation law and cyber law will be needed. We will use works of the following authors. For the general history of copyright Lowenstein's[37] summary will be useful, while works of Sherman & Bentley[38] analyze development of intellectual property in Great Britain. In the field of aviation law, the unpublished book by Cooper[39] is a fundamental monograph on the history of air and aviation laws from the Roman times up until the middle of 20-th century. Especially valuable is his presentation of the discussion among European lawyers at the turn

---

[32] Larry Alexander, "Bad Beginnings" (1996) 145 U. Pa. L. Rev. 57, 87; Larry Alexander, "Constrained by Precedent" (1989) 63 S. Cal. L. Rev. 1 cited by Hunter, *supra* note 30

[33] Ronald Dworkin, "In Praise of Theory" (1996) 29 Ariz. St. L. J. 353. cited by Hunter, *supra* note 30

[34] F.M.Kamm, "Theory and Analogy in Law" (1996) 29 Ariz. St. L. J. 405, 413-414

[35] Keith J. Holyoak & Paul Thagard, *Mental Leaps: Analogy in Creative Thought* (Boston: MIT Press, 1995), at 19-20, cited by Hunter, *supra* note 30

[36] Katja Langenbucher, "Argument by Analogy in European Law" (1998) C. L. J. 57(3), at 481-521

[37] Joseph Lowenstein, *The Author's Due: Printing and the Prehistory of Copyright*, (Chicago:University of Chicago Press, 2002)

[38] Brad Sherman & Lionel Bently, *The Making of Modern Intellectual Property Law: The British Experience, 1760-1911* (Cambridge: Cambridge University Press, 1999).

[39] John Cobb Cooper, *Flight and Sovereignty, A Historical Survey* (1965) [unpublished, archived at the library of Institute of Air and Space Law of McGill University].

of the 20-th. century, which led to the first internationalization of air law. He mentions works by Wheaton[40], Ortolon[41] and Guelle[42] who drew analogies between high seas and atmosphere as equally belonging to all men and claiming universal freedom of the air, and Bluntschli,[43] Binding,[44] Von Bar,[45] Chretien,[46] Pietri,[47] who supported the idea of the state sovereignty in the air space up to a certain altitude.

As may seem natural for the part on cyber-law, we will take most information from the web-resources. Lectures of Prof. Chon with the detailed description of origins of cyber-law and types together with some factual information from Weiser's[48] work will be used. Contradicting ideas of Easterbrook[49] supporting cyber-law concept and of Sommers[50] against cyber law will constitute a small discussion within this paper. Many court cases will be used in this section of the paper, as an evidence of different interpretations by courts of the old law while applying it to the new social relations.

The last big part of the work is purely empirical. It will study the examples of the current regulations that may be applicable to the roadable aircraft. There no scholarly works

---

[40] Henry Wheaton, *Elements of International Law*. The literal reproduction of the edition of 1866 by Richard Henry Dana, Jr. Edited with noted by George Grafton Wilson, Oxford/London (1936) (Classics of International Law No. 19 – Carnegie Endowment for International Peace), pt. II, chap. 4, sec. 187, p. 226., cited by Cooper, *supra* note 39

[41] Joseph Louis Elzéar Ortolan, "Le Paysan combatant l'invasion'' *Revue des cours litteraires de la France et del'etranger*, 1870-71 753-61, cited by Cooper, *supra* note 38

[42] Jules Charles Guelle, *Précis des lois de la guerre sur terre* … (Paris:1884), cited by Cooper, *supra* note 38

[43] Johann Kaspar Bluntschli, *Das moderne Völkerrecht der civilisirten staten*, (Nördlungen: 1878) at 28, cited by Cooper, *supra* note 39

[44] Karl Binding, *Handbuch des Strafrechts*, (Liepzig: 1885), cited by Cooper, *supra* note 39

[45] Karl Ludwig von Bar, *Lehrbuch des internationalen privat-und strafrechts*, (Stuttgart, 1892) at 338, cited by Cooper, *supra* note 39 .

[46] Alfred M.V. Chrétien, *Principes de droit international public*, (Paris:1893), 117-18, cited by Cooper, *supra* note 39.

[47] Francois Piétri, *Étude critique sur la fiction d'exterritorialite*, (Paris :1895), 14-16, cited by Cooper, *supra* note 39.

[48] Philip J. Weiser, "Internet Governance, Standard Setting, and Self-Regulation"(2001) 28 N. Ky. L. Rev. 822

[49] Frank H. Easterbrook, "Cyberspace and the Law of the Horse" (1996) U. Chi. Legal F. 207

[50] Joseph H. Sommers, "Against Cyberlaw" (2000) 15:3 Berkley Tech. L. J., online: <http://www.law.berkeley.edu/journals/btlj/articles/vol15/sommer/sommer.html>

are studied in this part. Instead we will focus on the web-resources devoted to amphibious vehicles, cars and ultralight aviation. We will find and compare relevant regulations of the various jurisdictions. International aviation law conventions, such as Chicago (1947) and Montreal (1999) together with Annexes and Recommended Practices will be the main focus. In order to find regulations on civil aviation, we will search web-sites of the numerous ultralight aircraft associations. One document was encountered, which already expressly addresses roadable aircraft. Only original conclusions will be drown in this part, based on the results of the abovementioned facts comparison. A list of sources used will be presented at the end of this paper in accordance with the relevant standards of citation.

4. Law vs. Technical Innovation: Who Leads?

The mass-produced Personal Air Land vehicle will clearly be an innovation in the field of transport. It was only recently that development of new technology, such as global positioning systems and new generation of composite materials, allowed for PAL-Vs to be constructed. In the first chapter this work explained how the theory of paradigm shift and scientific revolution by Tomas Kuhn explains new developments in science and law. This chapter will show how the law under an old paradigm will adapt itself to the development of new technology. Types of technological innovation, analogical legal reasoning as well as creation of new norms of law will be discussed in theory and by examples from Intellectual Property, Aviation and Cyberspace laws. The chapter will demonstrate how the law may be impacted by technological innovation and how it is adapted to regulate the new technology.

The further chapters will refer to this model while specifically considering the PAL-V. It will be demonstrated that technological paradigm shift does not automatically result in paradigm shift in the field of law, but, subject to several important criteria, may trigger fundamental changes in the legal system.

4.1. What do Technology and its Innovation mean?

Before we discuss technological innovation, it is necessary to understand what technology is, and how it is different from science, discussed in the Kuhn's work. The difference between these two notions can be seen even from their linguistic meanings. Science is a Latin word for "knowledge", while techno- and –logos can be translated from Greek as knowledge about arts or crafts. Technology is more commonly understood as a type of knowledge[51]. Tomas Misa outlines at least four definitions of the technology. These are technology as knowledge, technology as a series of empirical examples, technology as defined formally or explicitly, and technology as relationships between the material and human worlds. In stead of discussing each of them we will simplify the definition as an *empirical application of scientific discoveries*.[52] Although in early human history technology seemed to be based on the cumulative empirical experience of generations rather than on the efforts of the scientific community, it is hard to imagine modern technology without a strong support of academic research. Some sociologists point to the so-called proto-technological scientific knowledge as a midpoint between pure scientific and pure technological research,

[51] Misa, *supra* note 24.
[52] Ibid.

which is often developed in modern scientific parks.[53] Technology is inseparable from innovation.

Innovation is normally understood as a time between an "eureka moment," when the idea is first conceived by an individual, but prior to the decision to adopt or reject this idea.[54] Once being adopted, the innovation becomes part of ordinary knowledge through diffusion (adoption by society other than inventor). Technology is sometimes divided into several historical periods: the wood-and-wind-based eotechnic, the coal-and-iron-based paleotechnic and the electricity-and-alloy-based neotechnic.[55] Each of these periods was characterized by revolutionary inventions and paradigm shifts in science and technology. Sometimes, these changes resulted from state policy, for instance development of large ocean vessels was a result of sovereigns' pursuit of in colonization. However, more often, the process was the reverse. The innovation of technology is believed to frequently appear spontaneously within society and cause changes in these societies and to their political systems and, what is more important for us, to their legal systems.

The first manned space flight by Gagarin on 12/04/1961 influenced states to adopt the Outer Space Treaty six years later. There will be no aviation law if no plane had been invented. The development of cheap print-presses and paper made people recognize that ideas may be a property. Examples are countless. At the same time, invention of the automobile did not result in revolutionary changes in the then existing legal systems and the automotive industry remained governed by the long-established contracts of carriage by animal-drawn transport. It is clear, that in some cases, the law has to be revisited significantly in order to meet the technological change, while in other cases, no such change is necessary.

[53] Hilpert, *supra* note 25.
[54] Gray, *supra* note 26.
[55] Misa, supra note 24.

Therefore it is very important to understand these rules in general, in order to predict how the existing aviation law may respond to the wide distribution of the PAL-vehicles. In the following sections we will compare radical innovations, often referred to as paradigm shifts, in the fields of technological and legal innovation. Therefore it is necessary to clarify the general concept of paradigm shift.

4.2. Theory of Paradigm Shift and Revolution

The concept of paradigm shifts and revolutions in the field of science were developed by American physicist and philosopher Tomas Kuhn in his fundamental work The Structure of Scientific Revolutions (1962).[56] In his work, which was originally attributable only to science, Kuhn proposed that the development of science is not a constant unfolding of events, but rather a number of shifts in paradigms of thinking that result in scientific revolutions. The concept of paradigm is central to Kuhn's study. It caused a lot of controversy amongst various authors. Kuhn himself uses the term paradigm in at least 21 different meanings.[57] Generally, there are two interpretations of this term.[58] According to the Conservative approach, paradigm – is "what the members of the scientific community and they alone share."[59] So-called Radical approach talks about paradigm generally, as a set of believes and values shared by wider social groups than just scientists.[60] The latter interpretation was often used by empirical researchers who tried to use Kuhnian ideas and methodology to explain

[56] Kuhn, Thomas S., *The Structure of Scientific Revolutions*, (Chicago: University of Chicago Press, 1962)
[57] Masterman, M., "The Nature of a Paradigm", in Lakatos & Musgrave, eds., *Criticism and the Growth of Knowledge* (Cambridge: Cambridge University Press) 59-90. as cited by Pinch, *supra* note 21
[58] Pinch, *supra* note 21.
[59] Kuhn, *supra* note 19.
[60] Pinch, *supra* note 21.

developmental processes in the areas of knowledge other then natural sciences, such as law and sociology.

The next important term of this methodology is ***paradigm shift*** which is a "shift in problems and problem solutions, shift of models, shift in type of knowledge sought and attained, and a shift of symbolic systems."[61] Development of modern molecular genetics from the classical Mendelian genetics is an example of paradigm shift in science. In order to become a revolution, such paradigm shift should commence with an anomaly in the originally existing paradigm, the new paradigm should be incompatible with the old one and the shift should be non-cumulative.[62] Transition from a Ptolemaic astronomy to the Copernican astronomy is commonly sited example of scientific revolution. Although, all revolutions in the types of knowledge are paradigm shifts, not all paradigm shifts take place in the form of revolutions.[63] If a society experiences a shift as described earlier, but that new paradigm follows from the methods and laws of the old paradigm, and the old one is perceived as a foundation for the new paradigm – such a shift is not a scientific revolution. Such relations are sometimes called asymmetry between the two concepts described.

The framework of paradigm shifts and scientific revolutions is a very convenient tool of describing developmental processes in various areas of human knowledge. It should be noted that since the first edition of Kuhn's book appeared in 1962, many scholars tired to apply his ideas to areas other than science, such as humanities or arts. Tang, for example, applies the paradigm shift/scientific revolution analysis to the development of cultural anthropology, and functionalism and behavioralism in psychology. There are examples when

[61] Tang, *supra* note 20.
[62] Ibid. p. 126
[63] Ibid.

the notion of paradigm shifts was applied to the legal field as well.[64] Therefore, it is possible to apply the theory of paradigm shift and paradigm revolution to the field of aviation law when talking about wide distribution of the personal air vehicles.

Let us first examine how these aircraft may effect transportation in general. According to Ogburn, social effects of innovation may be grouped into several categories, such as social effects of producing the new invention, social effects of using such invention and derivative social effects on society which can be either successive or fanning out.[65]

Production of PAL-vehicles will contribute to the expansion of air-construction technology. If a reliable and cheap PAL-vehicle is developed, the growing demand would encourage more companies to start production of such vehicles, employing an expanded force of highly skilled workers and engineers. Such expansion of the aircraft industry and competition among producers will probably lead to more rapid technological advances in aircraft construction in general since many inventions used for the PAL-V manufacturing could be used in long-hull aircraft construction.

Direct social effects of PAL-V use will be even more dramatic. Numerous small airfields will be constructed in densely populated areas enabling people to avoid big airports while flying the vehicles as close as possible to the centers of commercial activity. Affordability of the daily use of PAL-Vs will further push population to the suburbs of the metropolitan areas allowing them to overcome morning and evening traffic jams on conventional highways. Since most commercial flights, at least in the US, are within the 900-mile range, many people may choose to refuel and use PAL-vehicles instead of spending hours on the way to big airports and during security checks inside the terminals. The number

[64] Barnett, *supra* note 23.
[65] William Fielding Ogburn, "How Technology Changes Society" (1947) 349 Annals Am.Acad.Pol.& Soc.Sci. 81-88.

of connecting flights in hub-and-spoke systems will probably decrease. Personal travel by air, which is currently a prerogative of wealthy or the dedicated, will become routine procedure for many ordinary people. The meaning of the word "to fly to a certain city" will change. It will not necessarilly mean taking a conventional airplane with at least two transfers between modes of transport, but will mean convenient door-to-door transportation in a single vehicle. PAL-Vs will reflect an opportunity to countries with vast territories but underdeveloped road infrastructure and large land mass, such as Russia, to improve their transportation system. Logistics will work differently overcoming congested airport hubs.

The derivative (indirect) social effects of PAL-V use are numerous and therefore hard to predict.

All these changes, listing all of which is difficult, may be generally referred to as a shift in the mode of air transportation. Therefore, they qualify as paradigm shifts in this field. Nevertheless, these changes, potentially triggered by introduction of PAL-Vs, would not discredit traditional air transportation. There is no doubt that people will continue to travel by conventional means when flying long distances, and personal air-land transportation will only be an organic supplement to long-haul wide-body air travel. Therefore, the paradigm shift in personal air transportation will not cause a revolution in the field of air transportation in general.

Now, we have defined what is a paradigm shift and concluded that the development of a PAL-V would be an example of such a shift, it is possible to return to historical examples again and to describe three other technological innovations which are often referred to as paradigm shifts. We would further refer to the impact each of these inventions had on their respective field of law.

4.3. Printing Press, Aircraft, Internet – Technologies which Shifted Paradigms and Law.

The invention of the printing press, movable print and paper are sometimes considered the greatest inventions of the last thousand years and definitely amongst the most significant **in the era of wind and wood**. Together they had such a great impact on education, science, politics and all other aspects of social life that they may be considered a paradigm shift within the terms discussed earlier in this chapter. Written knowledge, which was scattered across several thousands of monasteries, universities and private libraries, and was accessible by few members of the elite, became wide-spread across the European middle classes in less then 200 years. The number of literate people grew significantly and communication between them improved dramatically as more books and newspapers appeared. A book, which used to cost as much as a farm in the XV century, became affordable for even working class people three centuries later.

Our second example is from the **era of paleotechnic**, when iron was the main material used, and steam, and later internal combustion, provided energy source. Clearly, the invention and mass production of aircraft shifted the paradigm of travel. Before 1787, when Montgolfier Brothers launched their first flight in Paris, any travel in the world was confined by the state and natural boundaries such as rivers or mountains and was virtually impossible outside of the expensive and limited roads, railways and waterways. Much of the Earth's surface was barely accessible from the major centers of civilization. Sea travel enjoyed relative freedom, but this freedom ended at the harbor gates. Invention of steerable aircraft allowed for the relatively easy crossing of natural and political boundaries by people, a

situation which had never happened before. This was a significant shift in the paradigm of travel in general, and caused people to perceive distance in a very different way.

It is hard to determine when exactly the **era of neotechnic** began. The main feature of this period in the history of technology was the wide use of electricity as an energy source and alloys as the main materials. We currently live in this period. One of the most recent and the most notable inventions of this era is the Internet as a series of interconnected computer networks that are publicly accessible and transfer information by switching of information packets between computers using internet protocols (IP). It offers a number of services to its users such as electronic mail, file sharing, world wide web, etc. It is widely believed that the Internet appeared when two computers, one at UCLA campus another at SRI International company were connected by what was then known as APRANET network on October 29, 1969. The Internet changed the lives of millions of people and most of us are witnessing this process. The Internet accelerated communication between different parts of the world as no invention had before. It allowed enormous amounts of information to be circulated between continents within seconds. Development of new high-speed internet technologies and wide use of credit cards made it even easier for many people to access a variety of services without ever leaving their home. All these features allowed scientists to outline a new type of reality – a cyberspace[66], where human minds are interconnected by the World Wide Web and are governed by a slightly different set of rules than in the real world. This also can be referred to as a classical paradigm shift which we discussed earlier. Remote access, file sharing systems, IP telephony, online collaboration – these are just some the most important applications offered by the Internet.

---

[66] Margaret Chon, *Introduction to Cyberspace and Law The Relation of Law to Cyberspace and of Cyberspace to Law*, online: Learning Cyberlaw in Cyberspace <http://www.cyberspacelaw.org/chon/index.html>

Consequently, all three technological innovations conceived new social relations that were not governed by the existing law. Therefore, three distinct areas of law emerged as a result of these inventions. The invention of book-printing not only contributed to a paradigm shift in science, but also triggered comparable changes in the field of law, by creating of copyright as a distinct legal concept. Copying books used to be a complicated process before XV century as it was done by hand. As competition between publishers increased when they employed printing presses, they became interested in preventing their competitors from reprinting their commercially successful books and turned to the law for help.

The French Ordinance of 1784 prohibiting the use of Montgolfier-type balloons is usually considered to be the first aviation law in the world. It illustrated the absence of an effective regulation of man's activity above the Earth's surface. The unpublished historical survey "Flight and Sovereignty" by the founder of the Institute of Air and Space Law John Cobb Cooper is our main guide through the history of aviation law[67].

It is currently disputed whether the Cyberlaw, which evolved as a result of Internet development, can be considered as a distinct field of law. We will briefly address this issue. What remains undisputed is the fact that the law faced extensive challenges when it was applied to such technological advance as the World Wide Web.

4.4. Analogy to an Old Law or the Creation of a New One:

The impact of technical innovation on society is diverse. As was mentioned in the first part, it includes a set of direct and derivative social effects. Each of these effects has some impact on the law. An impact of the technical innovation on the law can be either direct

[67] Cooper, *supra* note 39.

or indirect. Development of cheap automobiles combined with highway improvements caused “white flight” to the suburbs of the US cities. This in turn encouraged government to legislate racial integration policies in public schools. Indirect impacts like this one are too complicated and too broad to be discussed in this paper. It is not the innovation itself, but social impacts of innovation which need legal governance missing from the existing law.

The direct impact is easier to understand. When the first balloons and aircraft soared into the sky, their pilots realized that there were no rules of the air or any other legislation to protect them should two objects collide or cause damage. In this example, the lack of legal governance is obvious at the time of the immediate use of the technical innovation, irrespective of what derivative social effects might have later lacked governance. This paper is focused primarily on the direct impact that PAL-V may have on aviation law.

There are only two types of response, any legal system may have to the absence of law governing certain social relations. These are **analogy** and **innovation**. Analogy means that the existing law is extended to new social relations because they have certain similarities with the social relations already governed by such law. Innovation means, that in stead of applying old laws to the new social relations the new law is adopted which is tailored to these new social relations.

4.4.1. Legal Analogy:

Ideally a new legal norm (rule) should be adopted by the society when any innovation results in a certain new type of social relations. However, this would complicate legal system by an enormous number of legal rules. Therefore, people grouped certain social relations in

order to adopt common rules for similar social relations.[68] Legal reasoning on a given case, therefore, would include analogizing this case to certain type of social relations and applying the proper law. Drawing analogies between cases therefore is a basis of legal reasoning. Should PAL-Vs enter the market there will be no specific laws governing the use of such vehicles. However, courts will probably recognize similarities between PAL-Vs and other modes of transportation and therefore apply existing aviation or transportation laws by analogy. Consequently, it is important to understand how does the analogy work in law and when it is not sufficient and an innovation in law is needed.

Let us turn to the three examples we already discussed. Approximately 50 years passed between the time when Gutenberg published his first book and the first book privilege was granted by the government of the Republic of Venice. We can call it a **trial period**, when society tried to understand if there are specific social relations, associated with a new invention, which need to be regulated by the law. European law of the early Renaissance, as its Roman predecessor did not recognize the concept of intellectual property or copyright. After publishers realized their need for legal protection, they applied for the royal privileges – a legal concept which was in existence long time before. Royal privilege, called monopoly in certain jurisdictions, was an exclusive right to perform certain kind of activities, granted by the government (usually a monarch, but not necessarily) to a certain individual or group of individuals. A privilege to print a specific book was usually given to a specific printer for a

[68] The history of law for any type of social relations is a move from the absence of law to the creation of the specific law, then to the multiple categories of the specific law and as a result to the generalized categories of law. The example of this is development of Roman contractual law. First, the formal law established a category of binding agreements – *contracta* for specific relations only (purchases, exchange, etc.) while all other relations were governed by non-binding *pacta*. Gradually, the types of contract increased in number until all the *pacta sunt servanda* maxim was adopted, generalizing that any agreement that satisfies certain conditions must be binding on parties. See: Andrew Stephenson, *A History of Roman Law: With a Commentary on the Institutes of Gaius and Justinian* (Buffalo: Wm. S. Hein Publishing, 1992) at 452-453

limited period of time.[69] England was the first jurisdiction which developed a new institute of patent out of the traditional conception of monopolies in a *Statute of Monopolies* of 1623. Notably the Statute was often used to grant letter patents to publishers but it did not offer any protection to the writers. Let us refer to this period as to the **analogy of an existing law**.

In the field of aviation law, the French Ordinance of 1784 did not explicitly establish the legal status of the air space or of the aircraft. It was too early for legislators to realize that such categories required their attention – a situation comparable to the **trial period** just mentioned, in the previous paragraph. Following turmoil of Napoleonic Wars, while the balloon flights continued, legal systems of the time realized that air space requiring regulation as much as the ground beneath it. There were several other documents in several jurisdictions, adopted later which were more explicit as to the status of the air above the Earth.[70] These documents, however, relied on the concepts of laws already in existence in Europe. Therefore we can classify this period as an **employment of an existing law**. First of all it was the existing concept of absolute state sovereignty which allowed the State to exercise total control over the movement of goods and people from, two and within its territory, no matter what mode of transportation was used for that. [71] Roman law was the first source in Civil Law jurisdictions often referred to in order to prove that the column of the air

---

[69] The first known privilege of this type was given by the Republic of Venice to Marcus Antonius Coccius Sabellicus for the book "Rerum venetarum ab urbe condita opus" in 1486; see Joseph Lowenstein, *The Author's Due: Printing and the Prehistory of Copyright* (Chicago: University of Chicago Press, 2002) at 52-82.

[70] These are the Netherlands Statute,1808; French Civil Code, 1808; Austrian Civil Code, 1811; Italian Civil Code, 1865;

[71] Absolute state sovereignty is a very ancient concept, explicitly outlined *inter alias* in *The Schooner Exchange v. McFadden and others*, (1812) 7 Cranch (11 U.S.) 116, *see*: Davis Graham & Stubbs LLP, *A Primer on Foreign Sovereign Immunity* (March 8, 2006), online: Worldwide Legal Directories <http://www.hg.org/articles/article_1223.html>

above the land parcel is a natural part of such a land property.[72] A similar principle existed in Common Law jurisdictions, notably in the cases *Fay v. Prentice*[73]*; Electric Telegraph Co. v. Overseers of Salford*[74]*, Ellis v. Loftus Iron Co*[75]*, Wandsworth Board of Works v. United Telephone Co*[76] (in Great Britain)*, Lyman v. Hall*[77]*, Smith v. Smith*[78]*, Hannabalson v. Sessions*[79]*, Butler v. Frontier Telephone Co.*[80] (in the United States). It was generally accepted that the states could not exercise sovereignty in the regions of high seas and therefore had no right to control an airspace outside its territorial waters. This means that a concept of territorial waters was employed to claim sovereignty above the waters within the length of cannon shot (3 miles zone).[81]

A similar two stages of development were present in the history of Cyberspace Law. First years of the Internet and its predecessors, probably until 1992, when first convenient internet browsers appeared and US government sanctioned use of Internet for the commercial purposes, law treated the Internet with a degree of skepticism, primarily due to the limited

---

[72] *"Cujus est solum, ejus debet esse usque ad coelum (* Whose is the soil, his it ought to be up to the heavens) maxim is found in the Digest XLIII. 24.22.2 and later discussed by Accursius, a prominent medieval glossator, as well as in other editions of the Digest, as cited by Cooper, *supra* note 39

[73] *Fay v. Prentice* 1 C.B. 828, 36 Digest 162., as cited by Cooper, *supra* note 39, a court held that "the mere fact of defendant's cornice overhanging the plaintiff's land may be considered as a nuisance, importing a damage which the law can estimate,"

[74] *Electric Telegraph Co. v. Overseers of Salford* 11 Exch. 181, 156 Eng. Rep. 795., as cited by Cooper, *supra* note 38, a court held that a telegraph company occupied land by owning wires hanging over such land.

[75] *Ellis v. Loftus Iron Co* (1874), 10 C.P. 10, as cited by Cooper, *supra* note 39, a court held that a trespass existed when one horse kicked another one on a neighbor's territory, although it never touched the ground of the neighbor's property

[76] *Wandsworth Board of Works v. United Telephone Co* 13 I.B.D. 104., as cited by Cooper, *supra* note 39, a court held that "no doubt that an ordinary proprietor of land can cut and remove a wire placed at any height above his freehold."

[77] *Lyman v. Hall* (1836), 11 Conn. 177, as cited by Cooper, *supra* note 39, a court held that overhanging branches constituted a legal nuisance for "land comprehends everything in a direct line above it;"

[78] *Smith v. Smith* (1872), 110 Mass. 302, as cited by Cooper, *supra* note 39, a court held that overhanging barn constituted trespass of the neighboring property.

[79] *Hannabalson v. Sessions* (1902), 116 Iowa, 457; 90 N.W. 93, as cited by Cooper, *supra* note 39, a court held that "it is one of the oldest rules of property that the title of the owner of the soil extends, not only downward to the center of the earth, but upward '*usque ad coelum*."

[80] *Butler v. Frontier Telephone Co* (1906), 186 N.Y. 486; 79 N.E. 716, as cited by Cooper, *supra* note 39, a court held that "within reasonable limitations land includes also the space above and the part beneath …"

[81] for example *The Ann*, (1812) 1 Federal Cases, 926, 2 Cranch 187, as cited by Cooper, *supra* note 39

use of the system. This can be referred to as a **trial period**, which we have seen in the previous examples with copyright and aviation law.

However, this trial period ended when certain social relations were significantly affected by the new inventions. Social relations affected primarily were the areas of copyright and use of certain restricted information such as internet pornography, defamatory news, etc. Such intangible property became widely accessible through the new intangible world of Cyberspace. And there were social groups concerned about such activities who initiated wide application of the existing laws to the new areas of Internet. Judge Easterbrook, for example, stated that there may not be a distinct law of Internet, but an application of existing laws to the new invention.[82] The early cyber law cases were based primarily on the existing legal doctrines.[83] This search for precedent illustrates a concept of **application of the existing law by analogy** to the new social relations and mirror similar processes in the other two examples discussed. They show how the Common Law system adapts to the new social relations. In CompuServe Germany case[84] Civil Law jurisdiction

---

[82] see Frank H. Easterbrook, "Cyberspace and the Law of the Horse", (1996) U. Chi. Legal F. 207

[83] In *Washington Post Co. v. Total News, Inc.,* (1997) 97 Civ. 1190 (S.D.N.Y.), online: AOL Legal Department, <http://legal.web.aol.com/decisions/dlip/wash.html> a newspaper accused a website of "misappropriation, trademark dilution and infringement, willful copyright violations, and other related tortious acts."
In *Bourke v. Nissan Motor Corp.,* (July 26, 1993) No. B068705 (Cal. Ct. of Appeals, 2nd Dist.), (not published), online: <http://www.tomwbell.com/NetLaw/Ch05/Bourke.html> plaintiffs sued their employers, who read and disclosed to public their e-mail communication, for "common law invasion of privacy, violation of their constitutional right to privacy, and violation of the criminal wiretapping and eavesdropping statutes."
In *Spevack v. National Community Bank of N.J.*(1996) 677 A.(2d) 1168, online: The UCLA Online Institute for Cyberspace Law and Policy, <http://www.gseis.ucla.edu/iclp/csth.html> a court found that a signature may take an electronic or any other form and that Statute of Fraud is applicable to such cases.
In *U.S. v. Thomas* (1996) 74 F. (3d) 701 (6th Cir.) the defendants were criminally charged for on-line distribution of obscene and pornographic materials and therefore violating US Federal obscenity laws.
In *Cubby v. CompuSer*v (1991)776 F. Supp. 135, plaintiffs sued an on-line mass media for defamatory statements under traditional US First Amendment jurisprudence.

[84] *Criminal case v. SOMM, Felix Bruno for the dissemination of pornographic writings*. Local Court [Amtsgericht] Munich, File No.: 8340 Ds 465 Js 173158/95, online: Cyber Rights and Cyber Liberties, <http://www.cyber-rights.org/isps/somm-dec.htm>

tried to apply general concept of pornography to the on-line world, but with much less success.

"Analogy" presented in the examples above is not a homogenous term and there are several different theories that explain how analogy works in law. First it is important to distinguish between analogy in Civil and Common Laws. Common law cannot function without drawing constant analogies between cases. Precedent – a prior decision of the court in a similar case – is binding on the Common law judges. In order to decide a case, a common law judge has to base his decision on analogous cases which were decided before by other judges. "Noting similarities between cases and adapting them to fit new situations are defining characteristics of legal reasoning within the Common law systems."[85] Nevertheless, there are several theories that explain how reasoning by analogy works in reasoning by the judge. These theories may be united in two groups.

Deductionists, such as Edward Levi claim that when a judge decides a case, he/she looks at the previously decided cases of the similar nature and distinguishes a principle or a rule (sometimes called holding) which was common for the previous decisions.[86] Rules are either rationales of previous cases or „immanent legal principles stemming from them".[87] This process of inductive reasoning then continues with a deduction, when the discovered rule or principle from the old cases is applied to the new one. For example, when the first oil-drilling developed in the United States there was no case-law or statutes governing such resource exploration. Some land owners claimed that the oil producers had to pay them a royalty when they worked on an oilfield which extended under the land owners' properties.

[85] Hunter, *supra* note 30.
[86] Levi, *supra* note 31.
[87] Alexander, *supra* note 32.

However, in a cases like *Westmoreland & Cambria Natural Gas Company v. DeWitt*[88] courts concluded that as well as possession of the land does not mean possession of the wild animals on this land because they may escape at any time, possession of the land does not mean possession of oil in it, which becomes possession of the producer similar to the animal becoming possession of the trapper. Here the principle of *ferae nature* was derived from previous cases, notably from ***Pierson v. Post***,[89] and applied to the new one. The role of analogy in deductive theory is limited to the discovery process of similarities between the case and the precedents, so that the further induction-deduction process may take place. In the example presented, this was similarity between wild animals and oilfields. Analogy here is simply a tool to choose a correct precedent(s) that will contain an underlying legal rule suitable for the new case. Larry Alexander states that there is no analogy "as such" in the common law court reasoning at all, because judges do not match a new case with another one, but only with a legal principle.[90]

Dworkin does not deny analogy "as such" but argues that it is a way of stating a legal conclusion, not a way of reaching one.[91] The case-as-holding approach to deductive reasoning does not require a set of precedents and does not derive a principle from them. It states that there is a legal rule (holding) in each precedent, and this rule can be applied to the new cases without comparing several similar precedents. Kamm notices, that sometimes, the necessary legal principle may be found in the general theory of law and only supported by precedents.[92] Under this theory, analogy between case and precedents will be used

---

[88] *Westmoreland & Cambria Natural Gas Company v. DeWit* (1889) 18 A. 724, 725, cited by Hunter, *supra* note 30
[89] *Pierson v. Post*, (1805) 3 Cai. R. 175, 2 Am. Dec. 264[1] (N.Y.)
[90] Alexander, *supra* note 32
[91] Dworkin, supra note 33.
[92] Kamm, *supra* note 34

postfactum, in order to support theory with an example. All of the reasoning theories which are based on a deductive approach described are known as a principle-based analogy because they aim to discover similar principles, upon which different cases are decided.

There is slightly different approach described by Dan Hunter, namely multiple constraint theory, which suggests that analogy itself can become a basis for the court's decision. He suggests that a judge's decision-making process is divided into two stages. At the first stage, he/she notes the similarities between cases and formulates a decision in his/her mind being influenced by these similarities. On a second stage, a judge justifies this decision by applying principles he/she might have derived from precedents, other cases or theory. The main difference between approaches is that under a multiple constraint approach the analogy between the cases is the basis for a case, while under deduction theory, analogy is a tool to find matching precedents in order to extract a legal principle from them upon which the decision can be based.[93]

Let us imagine an example with PAL-Vs. A passenger takes a taxi ride in PAL-V from a Sotheby's auction where he bought an ancient Chinese vase for 100,000 USD, which he recklessly took as baggage on the ride. The ride included both driving and flying, and due to the driver's negligence the vase was broken. Let us imagine that once the case is brought to the court, a judge has two precedents brought by the parties. Under the first precedent, liability of the air transport company for the passenger's damaged luggage is limited to the weight of this luggage. Under another, the cab company is liable for the damage to passenger's luggage according to the value of this luggage.

If deductive approach is correct, the judge can, for example, decide that there is a principle of common law and justice that a person should be reimbursed for his damaged

[93] Hunter, *supra* note 30

property to the greatest extend possible. Therefore he/she will grant a ruling in the passenger's favor and justify it by analogizing between a PAL-V and a cab, referring to the second precedent.

If the multiple constraint theory is correct, then the judge will first decide whether the PAL-V is more like a car or more like a plane, and if its owner is more like an air transport carrier or a taxi company. After he/she decides, that the vehicle is more like a cab, a decision in the passenger's favor will immediately appeal to the judge, and he/she will refer to the legal principle simply to justify this decision. The judge may very well decide that the PAL-V is more like a plane and grant a ruling in the respondent's favor, in which case another legal principle would be used to justify such a decision. The theory is called multiple-constraints theory, because, according to Hunter, it suggests that there are at least tree constraints that influence a judge's *ratio legis* on similarity between source case (precedent) and the target case (case under consideration).

The first constraint is about surface-level similarities between the cases or their subjects. The judge may notice that both precedents and the case involve moving vehicles. Or that the PAL-V and the cars both have wheels. Or that PAL-V and planes are both expensive. Such constraint, also called propositional-level constraint helps the judge to pick up several precedents for future considerations and to abandon other ones. Surface-level similarities are usually contextually based, so that PAL-V-cases will look more like "cab-cases" if other cases available involve planes, and it will look more like "plane cases" if all the other cases available are car-cases. [94]

[94] Ibid.

The second constraint is a relation-level one. It explains why a judge picks up certain cases as precedents when surface-level constraints are not sufficient.[95] Under this constraint PAL-V is primarily like a plane because it is capable of carrying passengers in the air. It also carries passengers on the ground, which makes it like a cab.

Finally, there are purposive level similarities, which match cases based on the purpose of their decision.[96] The judge may discover from the precedent's rationale that the air carrier's liability was limited specifically to support the airline industry in its infancy. Since the automobile industry was well established, no such limitation was needed for road carriers. If the judge believes that the PAL-V industry is in it's infancy as well and needs support, he/she will make a conclusion that the PAL-V case is more similar to the airplane precedent, and therefore rule in favor of the respondent.

It is hard to say which approach – deductive or multiple constraints explains better the role of analogy in the Common law system. Probably, there are elements of both approaches in every court decision, and some judges are more predisposed to certain approaches than the others. A number of subjective constraints, a judge may have, such as cultural background, education, or experience in certain area, may influence the decision as well. The deductive approach is clearly more suitable for a radical technical innovation, such as the PAL-V because it bases its decisions on the more general principles of law and does not require substantial new legislation. However, it is also true that many judges, especially in the lower-level courts, follow a multiple constraint approach and therefore may grant totally different judgments in similar cases.

[95] Ibid.
[96] Ibid.

In the Civil Law, role of analogy is a bit different from the Common Law. As mentioned by Langerbucher, if Common law uses analogy of legal principle, Civil law employs analogy of statute. A Civil law judge is not allowed to adjudicate the case on the basis of legal principle or his/her interpretation of justice, but has to use norms of law fixed in a written statute. If certain social relations are not covered by the written statute in the form of laws or by-laws, a judge may apply the existing norms which govern social relations that are somewhat similar to the new ones. If the example of the air taxi would had happened in a Civil law country, instead of two precedents there would be two statutes, presented to the Court on the issues of carrier's liability. A judge then would have to decide which statute would govern the PAL-Vs based on the similarities between the social relations in the case and in the statutes. However, rule based Civil Law analogy has more restrictions than Common law analogical reasoning. As noted by Langenbucher, there are three main limits for the statutory reasoning of a judge in the Civil law. First, the judge has to establish if there is a *lacuna* (missing rule) in the existing statutory law and if such *lacuna* was not purposefully created by legislators. Second, the judge must be free of constitutional restraints on the interpretation of the statutes (this relates to the principle of separation between judicial and legislative powers). Third, the judge may not find a similarity between the new case and the social relations governed by the existing statutes.[97] The process of analogous statutory reasoning, however, is simpler than under the multiple constraints theory of Common law. A judge does not have to compare cases. He/she needs to establish a purpose which is behind the words of a statute and decide whether the new case falls within such a purpose. Such reasoning resembles the purposive reasoning under multiple constraint theory discussed above.

[97] Langenbucher, supra note 36

Here is another example. A historical district of a city may issue a statute prohibiting private automobiles from entering and parking within its boundaries. A PAL-V owner may suggest that his vehicle, which possesses an air-worthiness certificate, does not fall under the definition of an automobile under the statute and therefore may enter the city. However, should the case be brought to court, the judge will conclude that cars are prohibited from entry because they are noisy and polluting. Therefore, since the PAL-Vs are equally polluting and noisy, their entry should be prohibited as well.

It should be mentioned that the statutory reasoning is not a characteristic of only Civil law systems. Over the last several hundred years, the Common law system enriched itself with a number of statutes governing big number of areas of social relations. This process is especially obvious in the United States. Therefore, Common law judges also undertake statutory reasoning by analogy. However, the Common law system puts rather rigid limits on the expansion of statutory authority. There is a belief among Common Law jurists that any case not covered by the statute should be decided by the general Common Law and its set of precedents. However, fair treatment principle requires that if one case was decided under the statute, the similar case also has to be decided under the statute as well.

Relations between different types of analogy may be represented in the algorithm at the end of this chapter. Whenever the analogy is prohibited or it does not cover the diversity of social relations, the society through the legislation creates a new law. This is often referred to as legal innovation. Sometimes the statute is adopted by an example from a neighboring jurisdictions – a process known as diffusion. If a technical innovation creates new set of social relations that are governed by a set of new rules in the new statute, Civil Law says that the concept of law has been created. In pure Common Law innovation would mean

establishment of a new legal principle, rather than a new rule. However, both rules and principles are considered legal norms.

4.4.2. Legal Innovation

Analogy is a powerful tool to apply existing legal norms to new social relations which appear as a result of a significant technological advance. Hovewer, at some point the existing law becomes incapable of governing these new social relations and a legal innovation, that is a set of legal norms specifically dedicated to the new social relations, are devised. It is notable the new legal norms do not appear at once, but follow a sequence of more or less distinct stages: the crisis of the existing law; initial specific law; correlation between initial specific law and public policy; subsequent specific law and, sometimes, internationalization. Let us examine how this happened in the past and what are the usual stages of legal innovation.

In the field of copyright, as the *Statute of Anne* was enacted (1709), the copyright law entered its the phase of an **initial specific law -** the first attempt to create specific legal norms to regulate specific social relations appearing as a result of a revolutionary invention. Enacting of this law was preceded by the **crisis of the existing law** of royal privileges which did not recognize the interests of authors. The law was specifically designed for copyright of books. The *Statute of Anne* gave exclusive rights to authors to permit copying of the book for a limited period of time (21 or 14 years) after which the published work became a public

domain. Authors could assign their rights to the publishers who then enjoyed the same statutory protection. Similar developments occurred in other European countries.[98]

Although early aviation was governed by the analogy of the existing non-aviation law, there were enough concepts that were exactly opposite to concept of the complete state sovereignty in air space which we mentioned in the previous chapter. For example, the above-mentioned concept of the high seas was also used to support the idea of completely open airspace without any state sovereignty. Such authors as Wheaton[99], Ortolon[100] and Guelle[101] drew analogies between the high seas and the atmosphere as equally belonging to all men hence claiming universal freedom of the air. There was a school of primarily German thinkers who propagated a somewhat mixed view on air sovereignty. Bluntschli,[102] Binding,[103] Von Bar,[104] Chretien,[105] Pietri,[106] supported the idea of state sovereignty in the air space up to a certain limit (usually to a limit of a cannon shot) beyond which atmosphere was supposed to be free or subject to innocent passage right. One can notice that the law, existing at the time of first flight, was rather contradictory as to the key legal categories of flight in airspace. Various conflicting legal concepts could not effectively protect rights of states and balloon operators in air space. Such conflict became a **crisis of the existing law** at the turn of the XX-th. century when dirigibles and the first aircraft started flying.[107]

---

[98] Sherman & Bently, *supra* note 38
[99] Wheaton, *supra* note 40
[100] Ortolan, *supra* note 41
[101] Guelle, *supra* note 42
[102] Bluntschli, *supra* note 43
[103] Binding, *supra* note 44
[104] Bar, *supra* note 45
[105] Chrétien, *supra* note 46
[106] Piétri, *supra* note 47
[107] Cooper, *supra* note 39

All developed countries felt an urgent need to enact a specific law governing air-space activities. The period of 1910-1919 can be referred to as a creation of an **initial specific law** as it was discussed in the earlier section. The Paris Convention (1919)[108] which was initiated as early as 1910 reaffirmed the exclusive sovereign rights of the state in the air space above its territory while denying the right of innocent passage and freedom of commerce in the air space, making it a privilege. The convention also established the basic rules for aircraft and their crews, which had never been done before. If the Paris Convention established specific public aviation law, the Warsaw Convention became an initial specific private aviation law.[109] In Warsaw, governments agreed on the terms of relations between users and providers of air transport services. Air transport was regarded as being in its infancy and needing government support and protection. National legislation followed these international developments adopting their national laws on aviation. Consequently, in the '20's – '30's the paradigm of Aviation law came into existence in most of the jurisdictions.[110]

In the field of Cyber-law, which was also initially governed by the existing legal norms, modern jurisdictions soon observed that the invention of the Internet posed several significant challenges to the existing laws' application. First, there was the absence of borders in the Internet. It is hard to establish which jurisdiction has power over which segment of the World Wide Web and therefore which legal norms should apply. Jurisdiction of web-server host, jurisdiction of website owner and jurisdiction of the user – all three

---

[108] *Convention Relating to the Regulation of Aerial Navigation Signed at Paris*, 13 October, 1919, online: <http://www.aviation.go.th/airtrans/airlaw/1914.html>

[109] *Convention for the Unification of Certain Rules Relating to International Carriage by Air,* October 12, 1929 [Warsaw Convention], online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/private/>

[110] Cooper, *supra* note 39

jurisdictions may apply to the same case.[111] This was especially challenging in the Internet pornography cases in the US when the law required applying the community standards for testing images as pornographic, while the same images were available throughout varying communities with varying community values and standards across the country.

Anonymity of Internet users was the second problem. All Internet users access Cyberspace through similar computer devices, therefore it is virtually impossible to establish if the person making an on-line transaction is who he declares himself to be. Concept of digital signature arose out of this fact.[112] Unless the person uses an internet IP address which was specifically assigned to him, it is very hard to identify a law violator, as was the case with numerous file-sharing copyright infringement cases. This also resulted in low enforceability of the laws against Internet users. If a web-server host or an internet user is located outside the certain court's jurisdiction, it may be very difficult to enforce the court's decision and to disconnect such a server or detain said user.

Finally, the Internet grew so significantly that there are certain social relations which did not exist in the real world and therefore were not governed at all by the existing laws. Internet hacking, or the unauthorized use, or attempts to circumvent or bypass the security mechanisms of an information system or network,[113] is an example of such relations. Criminal codes of many countries had to be amended in order to outlaw such actions. These main problems faced by law in the Cyberspace are examples of **crisis of the existing law**, which we have already witnessed in the previous examples. By the end of the 90's most of

---

[111] Masaki Hamano, *Comparative Studies in the Approach to Jurisdiction in Cyberspace,* online: Cyber Jurisdiction <http://www.geocities.com/SiliconValley/Bay/6201/>

[112] for more information on digital signatures refer to: Carlos Alberto Rohrmann, *Electronic Promisory Notes* (LL.M. Thesis, UCLA School of Law, 1999) [unpublished].

[113] *Glossary,* online: Texas State Library and State Commission <http://www.tsl.state.tx.us/ld/pubs/compsecurity/glossary.html>

the jurisdictions in the developed world had introduced some elements of the **initial specific law** in their jurisdictions in order to regulate the cyberspace.

The first Article 4A of the *American Uniform Commercial Code* (1989), codifying the practice of bank wire transfers, may be considered the first "cyber-code."[114] *Children's Online Privacy Protection Act of 1998* (COPPA)[115] and *Child Online Protection Act* (COPA)[116] were the first laws to regulate distribution of children-sensitive information via Internet. Utah Digital Signatures Act[117] and similar acts in other US States regulated e-signature use. The *No Electronic Theft Act*[118] and *Digital Millennium Copyright Act* were the most notable laws protecting copyright on-line in the United States. European Union Copyright Directive (EUCD) of 2001[119] and the resulting national statutes (DADVSI 2006[120] in France, The Copyright and Related Rights Regulations 2003 in Great Britain, 2005 amendment to the Finnish Copyright Act and Penal Code etc.) are examples of the similar processes of initial specific cyber law creation in European jurisdictions. Interestingly enough that **internationalization** of the initial specific copyright Cyber-law happened before national jurisdictions adopted relevant domestic legislations. The WIPO Copyright Treaty[121] was one of the earliest laws specifically designed to regulate on-line aspects of the existing copyright principles.

---

[114] Sommers, *supra* note 50.
[115] *Children's Online Privacy Protection Act*, 15 U.S.C. § 6501–6506, 1998, [*COPPA*]
[116] *Child Online Protection Act,* 47 U.S.C. 231, 1998, [*COPA*]
[117] *Utah Digital Signatures Act*, Utah Code §§ 46-3-101 to 46-3-504, 1995, ch. 61
[118] *"No Electronic Theft"* Act, 17-18 U.S.C. 105 P.L. 147; 111 Stat. 2678; 1997 Enacted H.R. 2265; 105 Enacted H.R. 2265
[119] EC, *European Parliament and of the Council Directive 2001/29/EC of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society*, [2001]OJ L167, , corrected by OJ L006 of 10 January 2002, p. 70.
[120] *Loi n°2006-961 du 1 août 2006 relative au droit d'auteur et aux droits voisins dans la société de l'information (1),* NOR: MCCX0300082L, 2006, online: Legifrance <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000266350&dateTexte=>
[121] *World Intellectual Property Organization Copyright Treaty*, December 20, 1996, online: World Intellectual Property Organization <http://www.wipo.int/documents/en/diplconf/distrib/94dc.htm>

Initial specific law, however, usually represents only the first stage of legal innovation, with several more to follow. It is rare possibility that the first initial specific law is perfect enough to regulate the new social relations in the most efficient way. Usually, the new legal rules have to pass through „adaptation" to the existing law, and social norms which people are used to. Therefore, public debates and often outcry cause the state to correct the new initial specific law according to public policy needs. This creates the **subsequent specific law** which is much more stable within the given jurisdiction. Let us examine how it happened in our examples.

As we learned, British copyright was incorporated in the *Statute of Anne*, as the initial specific law. However, while in Civil law the length of the copyright was more or less clear, depending on the statute, in the British Common law system a lengthy debate occurred, known as the "literature debate." As described by Sherman and Bentley[122] as well as by Pettitte[123] the publishers claimed that except for the statutory right, which had a time limit, they were entitled to a natural right over the book with no limitations in time. In a *Millar* case[124], an English court recognized such a natural right of the publishers. At the same time, courts in Scotland rejected similar claims of the common-law copyright.[125] The final decision in the debate was made by the House of Lords, who rejected the common law copyright on the grounds that granting perpetual copyright to publishers was against public policy interests.[126] The debate over the natural copyright in Great Britain represents a **correlation between the initial specific law and public policy.** During this debate, British society and

[122] Sherman & Bently, *supra* note 38
[123] Clare Pettitt *Patent Inventions – Intellectual Property and the Victorian Novel* (Oxford: Oxford University Press, 2004).
[124] *Millar v. Taylor* (1769), 4 Burr. 2303, 98 Eng. Rep. 201
[125] *Hinton v. Donaldson,* Edinburgh (1773), online: Primary Sources of Copyright <http://copyright-project.law.cam.ac.uk/cgi-bin/kleioc/0010/exec/ausgabe/%22uk_1773%22>
[126] *Donaldson v. Beckett* (1774), 2 Brown's Parl. Cases 129, 1 Eng. Rep. 837; [1774] 4 Burr. 2408, 98 Eng. Rep. 257; [1813] 17 Cobbett's Parl. Hist. 953

courts realized that protection can be granted to an intangible property (idea) as much as to the already known material property right. Consequently, ideas of copyright and intellectual property developed in the areas other than book printing.[127] Gradually, over the 19-th century the distinct categories of intellectual property evolved (Copyright, Design and Trademarks, Patents). Finally, the **subsequent specific law** emerged in the form of the *Copyright Act* (1911)[128] creating the system of copyright which remains mostly unchanged until now. British model of intellectual property became a model for intellectual property laws in other jurisdictions, and contributed to the **internationalization of copyright**. In 1887 under *Berne Convention*[129] several states agreed to mutually recognize copyright privileges of their citizens.[130] .

The subsequent stages of aviation law development also resemble those of the copyright. As described by Cooper,[131] after Paris-Warsaw system was established, several broad discussions took place among legal scholars and policy makers, which represent the same phase as the literature debate in 18-th. century Britain. In Public aviation law the main question was whether the right of innocent passage is natural and should be universal or whether it shall remain a privilege pursuant to the Paris convention. In Private aviation law the main question was whether the carriers should be fully liable to air transport users or whether their liability has to be severely limited as it was the case in Warsaw Convention.

---

[127] Calico Printers' Act (1787) and Copyright of Designs Act (1839) regulated copyright of fabric design; Designs Registration Act (1839) extended protection to all ornamental designs and established the procedure for design registration; Ornamental Designs Act (1842) and Utility (Non-Ornamental) Designs Act (1843) further developed the system of copyright protection for various intangibles. *See* Sherman & Bently, *supra* note 38;
[128] *Copyright Act 1911*, online: Office of Public Sector Information <http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1911/cukpga_19110046_en_1>
[129] *The Berne Convention for the Protection of Literary and Artistic Works,* September 9, 1886, , online: World Intellectual Property Organization <http://www.wipo.int/treaties/en/ip/berne/trtdocs_wo001.html>
[130] Later, as the new technologies emerged, such as cinema, audio recording, television, the scope of copyright protection broadened to include these new technologies. However, we do not consider such copyright expansion as the new stages of copyright, but rather as the new type of copyright law with its own stages of development.
[131] Cooper, *supra* note 39

Development of the initial specific law occurred. Several international documents resembled these discussions in both Public[132] and Private laws[133] but no consensus was reached among the world legal community for a long time. World War II was the turning point for the world policy-makers to finalize the discussion in the **subsequent specific public aviation law**. This was Chicago Convention - an almost universally accepted "constitution" of air law.[134] The convention further developed legal status of the aircraft and its crew and reaffirmed the principles of State sovereignty over the airspace above its territory. More importantly, it affirmed the right of innocent passage and non-technical stop for civil aircraft (first and second freedoms) but denied all other traffic freedoms as natural rights. The role of the Chicago Conference, where public policy issues dominated the outcome, is somewhat close to the role of House of Lords decision of 1774 in *Donaldson vs. Beckett,* which was also heavily influenced by public policy. Therefore this stage can also be referred to as the **correlation between the initial specific law and public policy**. Chicago convention also internationalized air law by creating ICAO and even added some form of law enforcement on the international level through ICAO Council. There were no major changes in Public international air law from 1944 until recently. Chicago Convention system was reinforced by hundreds of restrictive bilateral air traffic agreements which cemented it for at least 40 years.

---

[132] *The Ibero-American Convention relating to Air Navigation,* November 1, 1926 [Madrid Convention]; *The Pan American Convention on Commercial Aviation,* February 20, 1928 [Havana Convention];
[133] *Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air,* September 28, 1955, [Hague Protocol]; *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*, March 8, 1971,[The Guatemala City Protocol]; *Montréal Protocol No. 4 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,* September 25, 1975, [Montreal Protocol # 4], online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/private/>
[134] *Convention on International Civil Aviation,* December 7, 1944, [Chicago Convention], online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/public/ >

In Private aviation law similar processes occurred but much later. It was not until 1999 that the Warsaw system started to yield to modern ideas embedded in the *Montreal Convention* (1999).[135] State parties to the Montreal Convention agreed that since the airline industry is not in its infancy anymore, the presumptive liability of the carrier to passengers should be unlimited while strict liability should be limited to a significant amount of 100,000 SDR (163,270 USD).[136] More and more countries recognize this convention instead of the old Warsaw system. New issues such as terrorism and environmental concerns were embedded in various air law documents, but they did not change the paradigm of aviation law significantly.

In Cyberlaw, in several years after the first specific statutes were adopted, the legal practice followed. One of the most articulated examples of such practice was the number of cases initiated by RIAA (Record Industry Association of America) against users and providers of Peer-to-Peer (P2P) file sharing networks, Napster case to be the most discussed. P2P network allows its users to install a certain software on their computer and to download any files which were made available for download in computers of the other users with the same software on their PC.[137] No surprise, that most of the files downloaded were the copyrighted audio and video materials. RIAA therefore filed for copyright protection under the new DMCA against P2P network provider company Napster and managed to shut it down.[138]

---

[135] *Convention for the Unification of Certain Rules for International Carriage by Air,* May 28, 1999, [Montreal Convention]

[136] Before, the strict liability was limited to 125,000 golden francs (8,300 USD) under Warsaw Convention art. 22 and 250,000 golden francs (16,600 USD) under Hague Protocol (1956) Art. XI

[137] see: I. Khan & Adam Wierzbicki, eds. "Foundation of Peer-to-Peer Computing" (2008) 31 Issue 2 Science Direct 187-418.

[138] *A&M Records, Inc. v. Napster, Inc.* (2001), 239 F.3d 1004 (9th Cir.)

These actions by the recording companies caused a significant public outcry since they threatened to criminalize otherwise law abiding people. Similar complaints were expressed in France as a result of DADVSI implementation. The debate about "public license" as an alternative to criminalization of the P2P file-sharing[139] is an example of public policy issues influencing the new specific laws. In the previous examples this stage was described as **correlation between the initial specific law and public policy.** It is possible to say that the law of Cyber space is currently at this stage of its development. It is quite possible that in future the subsequent cyber-law would appear as a result of the public policy debates, but right now it is only the initial specific law which is present.

The last question I would like to address in this part is the nature of paradigm shift in the field of law as a result of legal innovation, caused in its turn by the technological advance. Let us examine, how the six stages of legal innovation in all three examples we mention resulted in paradigm shifts in the subsequent fields of law.This theme will be continued in the Conclusions section of this chapter.

As it was mentioned earlier in this chapter, the invention of book printing represents a paradigm shift, because it changed the perception of written knowledge in the society. Interestingly, development of copyright law described above can also be classified as a paradigm shift considering the fundamental change in the perception of property that occurred as a result of copyright development. It is not easy to determine at which of the nine stages of legal innovation, outlined above, the perception shift occurr. The *Statute of Anne* seems to represent a change in perceptions of property which occurred at some time between the 16-th. and 18-th. century. The Statute recognized not only publisher's right on certain

[139] see Guillaume Champeau, *Universal and blanket licensing,* online: P2PNet <http://www.p2pnet.net/story/10393>

book (tangible property) but also a writer's right to the content of this book (intangible property). However, Sherman and Bently argue that intellectual property did not emerge as a distinct legal concept until the middle of 19-th. century.[140] They make a distinction between the pre-modern and modern copyright. "While modern law tends to be framed using more generalized concepts, pre-modern law provided subject-specific protection for sculptures of human and animal figures, designs for cottons, linens, muslins and calicos, and also granted exclusive privileges to individuals to perform certain activities."[141] In addition, pre-modern copyright viewed the intangible property as an existing *res nullius*, which was occupied by the author through the process of mental labor. The modern copyright, however, sees intangible property as a result of the author's creation not as a mere occupancy.

Air (aviation) law is often perceived by lawyers as heavily regulated by the State, manufacturers and carriers-oriented set of legal norms, which regulate most of the social activity associated with aircraft operations. This paradigm was different from the legal paradigms of maritime or ground transport and was due to the fact that aeronautics was associated with a great risks for operators, users and the general public and involved highly expensive and complicated machines. It would not be a mistake to say that before the 20-th. century air navigation was largely perceived as of entertainment, not warranting meticulous government attention. Many doubted whether the State has right to regulate air space at all. In the 1910's the situation changed radically with society accepting almost total control of the State over aviation through various kinds of licensing. I consider these changes a paradigm shift, comparable to the creation of copyright. And the initial specific law period seems the most likely time at which this shift occurs.

[140] Sherman & Bently, *supra* note 38.
[141] Ibid. p. 18

Summarizing the third historical example, we can say that it generally mirrored the previous two examples from the eras of eotechnic and paleotechnic. The revolutionary invention did not trigger revolution in the subsequent law. It was rather a paradigm shift based on the previously existing laws. Such stages as application of the existing law, its crisis, development of the initial specific law and its testing by public policy issues are alike in all three examples. The change in the pace of development (all stages become closer to each other or even happen simultaneously). Internationalization stage in all three examples happened in different sequence from other nine steps outlined above comparing the aviation and copyright laws, but this fact is not of crucial significance.

Therefore it is possible to conclude that the shift in paradigm of intellectual property, and specifically in copyright occurred even later than when the initial specific law was enacted. Such a conclusion means that it may take rather long time for the legal system, at least within the Common law, to fully adapt to the new social relations derived from the new invention. This process may involve conflicts of laws and lengthy debates within legal community. Public policy issues may interfere as well. As a result of these manipulations, a new legal paradigm emerges. The specific law, however, may be enacted far before the new paradigm shapes itself within legal society, as happened with the *Statute of Anne*. It is possible to create the initial specific laws at the beginning of the active use of the invention. This initial specific law may not itself signify the paradigm shift, but will considerably contribute to such a shift in future and to the creation of more general concepts of a new law.

As for the PAL-V this conclusion means that the law makers should not be too reluctant to draft new legal norms for the new types of aircraft in anticipation of the extensive use of such aircraft. Even if the existing laws do govern the new social relations associated

with the roadable aircraft, it would be likely that some sort of crisis of law would appear sooner or later. The law makers should "cave the ground" by creating a new legislative framework, and such legal new legal norms do not need to be perfect, because they will be altered by public policy anyway and replaced by the subsequent legal norms when the initial law reveals its inadequacy.

And one more thought about the future of paradigm shift associated with PAL-V. Although 90 years have passed between the *Paris* (1919) and *Montreal* (1999) Conventions it is possible to say that the paradigm of air law remained the same as it was in the beginning of the 20-th. Century. It is still heavily regulated and dominated by the State. It is possible to say that current liberalization of air law is first evidence of a new stage in the development of air law. These changes may become a new paradigm shift if the Personal Air Vehicles were to become commonplace in the market. Large numbers of aircraft operators, both private persons and companies, will require even less restrictive air regulations than those currently in existence. It can be the first paradigm shift in the air law since the beginning of the XX century.

4.5. Conclusions:

We have studied the general principles of interconnection between the law and technological innovation. The two main questions raised at the beginning of this chapter were i) how does the law adapt itself to innovation in the field of technology; and ii) whether the paradigm shifts in the field of science automatically result in a paradigm shift in the laws that govern social relations associated with such change. The short answer to the second part of this question would be "no." Creation of a new law is a rather complicated process

influenced by many factors. I tried to model this process in the algorithm in Annex 1 to this paper, without claiming to give the complete explanation of the relationship between innovation of technology and changes in the law.

Any innovation may or may not create new social relations between people. In our case we only examine the direct impact of the invention. Let's imagine that PAL-Vs appeared in our skies. We would need to have people, operating PAL-V. Such activity as PAL-V operation did not exist before the invention of this machine, and it is directly connected to the invention itself. Therefore we consider the invention as a direct catalyst of new social relations. If there was no direct social impact and no new social relation appeared, the old law would apply and there would be no need for a new one. Numerous new composite materials are invented every year, but their direct social impact is not revolutionary and the old law governs their production and use.

Now let us examine how a new single legal norm will appear in order to govern, for example, at what age a person can operate a PAL-V. Once we established that the new social relations take place, an additional question is whether the pilots are under Common Law or Civil Law jurisdiction. In Common Law jurisdiction there may be judges applying deductive or multiple constraints methods of legal reasoning. If the judge applies the ideal deductive approach, he/she would probably outline the existing principles of Common Law and decide that operators of all dangerous vehicles shall be at least 18 years old. Analogy of the existing legal principle will substitute the new statute. If the judge is influenced by multiple constraints as it was described earlier in this chapter, the outcome is less predictable. Instead of outlining a principle a judge will look to existing similar cases, while the notion of similarity may be different for different people. A judge may think that a PAL-V operation is

more like driving a car and therefore adhere to the age of 15, or he/she may decide it is more like flying a plane, and therefore establish the age of 17.[142] The problem is, we never know what approaches a judge will take in a given case. Therefore, if there are only few cases arising from the new social relations, the Common aw can perfectly handle them with the existing legal mechanisms. If, however, the number of cases is significant, a contradiction may arise between different judges giving different opinions in the similar cases.

In this paper we referred to this process as a crisis of the existing common law which may contribute to the creation of new legal norms. In a Civil Law jurisdiction, dealing with new social relations is even more complicated. The judge first decides whether the lacuna in the existing law exists and then whether he/she has the constitutional right to interpret an existing legal statutory rule, and whether the statutory rules are comprehensive enough for the regulation of a given case. If there is no *lacuna*, the existing law applies. If there are constitutional constraints or if the judge doesn't think the case fits into the existing statute, the crisis of Civil law appears and the new law is then created. Otherwise, the analogy of the existing statute is applied.

Then, there are at least 3 stages of the new law creation, which is done by the legislative powers of a given jurisdiction: creation of the initial specific law in the form of statute (even for the Common Law jurisdictions); correlation between initial specific law and public policy (done either by case law or public discussion) and creation of the subsequent specific law in the form of statute which is more stable than the initial one.

In the case of PAL-V, that would mean that if courts fail to resolve the issue, the government would step in, and specifically regulate the PAL-V saying that the license should be granted for people no younger than 17 years old. Political dissatisfaction with the new

[142] These figures are imaginable and do not represent actual rules of any jurisdictions.

legal regime is another possible result. There could be a public outcry and the age would have to be raised to 18. We have seen this model of creating new legal norms in all three examples presented here: copyright, aviation and cyber law. Each was triggered by an invention which had direct social impacts on the societies at a certain time. The nature of invention and its complexity did not matter because all three inventions from different technological eras resulted in a similar process of development in their respective fields of law. It is direct social impact through creation of new social relations which is a significant factor. Probably such a sequence of new legal norms creation is nearly universal for any technological improvement with at least some sort of direct social impact.

The next question follows naturally, why in some cases (like the three presented in this paper) does the new field of law emerge with a new paradigm of law, while in other cases this does not happen. Actually, some authors believe that the modern law is rather consistent and there may not be a new field (paradigm) created by the new industry.

Joseph H. Sommers, for example, in "Against Cyberlaw"[143] argues that the technology can not define the new field of law, because the legal impact of most inventions are socially mediated. He points out that the social impact of any invention is rather diverse. Therefore, such an invention impacts many spheres of social life already governed by the established fields of law and the new industry is simply a new field for the application of the old concepts. He also argues that such fields as Cyber Law are not distinct new legal concepts, but nothing more than an area of legal practice outlined by lawyers for the ease of use. Following Sommers, PAL-Vs will fall under the finance, civil, criminal and other laws already in existence, and under any circumstance can't we say that its use will somehow change an existing legal paradigm. By this paper, I mean to disagree with such a statement.

[143] Sommers, *supra* note 50.

The author fails to explain why such areas of law as Maritime and Aviation are considered distinct legal doctrines and not simply areas of practice. The first one is renowned by its global character and largely non-government regulation. The other one in contrast is distinct by its broad government involvement across jurisdictions. These are not simply areas of practice; these are areas of law with slightly different methods. And therefore it is natural to ask a question: why automotive or railway transport law did not evolve into distinct legal concept? An answer seems to be as follows. It is the number of new norms and the nature of their use which at the end define whether the new field of law will appear or not. There are three outcomes new specific norm creation may have.

It is true that legal impact of any invention is socially mediated. However, we know that there are certain social relations directly resulting from new technological advances. They are shaped by the existing legal system through the process just described and, as a result of such test, a number of legal norms appear. If the number of such new legal norms is insignificant, they will simply merge to the existing statutes. If these norms are not used extensively, there will be few cases in existence. Therefore norms will become a small part of the existing fields of law. A rule about PAL-V operators may be just a small paragraph of a big transportation code.

Nevertheless, if an invention is significant, it may have many direct impacts and many new social relations may emerge as a result. In case of PAL-V it would be not only operator licensing, but also commercial user licensing, rules of the air, technical certification, etc. Each of these social relations will be tested by the existing legal systems as previously described and each will probably have some new norms created. If the number of such new norms is not significant, but they are significantly used, the field of legal practice emerges.

This happened with the railway or automotive laws. If the number of norms is significant and they are extensively used, a new field of law or a new paradigm within the existing field emerges. The key point here is the correlation between the new legal norms and the legal norms from the existing fields of law. If within certain industries people use primarily legal norms specific for such industry while occasionally using norms from the other fields of law – a new legal paradigm emerges. If the opposite is true – only a new legal practice takes place. I may say that as an in-house counsel of an airline I have to deal with tax, contract and real-estate law, but 80% of my workload is spent on Aviation Administration regulations and similar documents, because every aspect of the airline business is governed by the specific law, developed through the algorithm already described. If I held a similar position within taxi company, I would probably spend 80% of my time listening to passenger complaints and reviewing contracts under general laws. And only some time would be spent on an industry-specific issues such as parking tickets for example. This is simply because the social impact of the plane shifted paradigm of transportation with much more direct impacts than the invention of the car did.

Now we can address the last point of this discussion and explain the connection between the paradigmatic nature of an innovation and the paradigmatic nature of changes it brings to the law. The connection exists but it is indirect. The paradigm shift means change in common perception of something. The telegraph and phone changed our perception of communication. They are almost universally used. Nevertheless, the telecommunication law never pretended to be a new legal paradigm, rather a field of practice. This is because there are few social relations associated with such invention apart from phone production, customer relations, wire allocation. Therefore, back in XIX century, there were few new

social relations tested by then existing laws and few new norms emerged. They were enough to create the International Telecommunication Union and the law of bank transfers but definitely not enough to constitute a paradigm shift in the law.

Another example is oil drilling. The industry itself hardly changed any paradigm of everyday life, but the legal field of oil and gas industry is rather influential with some distinct legal concepts such as use of the continental shelf. The reason – oil and gas extraction had a direct impact on many social relations such as land ownership and state sovereignty, which were later tested by legal system with a creation of vast majority of new legal norms specifically associated with the oil and gas industry.

Summarizing, the main conclusions of this chapter will be as follows:

1. Paradigm shift in technology and science does not directly cause paradigm shift in the relevant field of law.
2. Any technological innovation, no matter whether it is a paradigm shift or not, may contribute to the creation of new legal norms as soon as it triggers new social relations.
3. The new legal norms resulting from innovation follow similar stages of development, irrespective of the nature of innovation itself.
4. Initial specific legal norms that appear as a result of technological innovation usually appear before any type of paradigm shift occurs.
5. New legal norms resulting from innovation may or may not result in new paradigm of law, depending on how extensively they are used compared to the existing legal norms, and not depending on the nature of invention.

It is hard to predict for certain if the introduction of PAL-Vs will generate a substantive number of new specific legal norms and therefore create a real paradigm shift in the field of aviation law. Aviation law now is a rather established legal discipline covering all types of aircraft including ones, which are comparable to the PAL-V. At the same time, social relations associated with the PAL-V do not look much different than those associated separately with the modern car or small aircraft. Therefore, it is possible that the current paradigm of aviation law will remain the same with only minor changes made. This question, however, needs further exploration which will happen in the second part of this work.

5. Is PAL-V a Car or a Plane?

In the previous chapters we established that the legal system responds to technical innovation by the direct implementation of the existing law, by the analogy of the existing law or by legal innovation. All three stages may follow each other or they can be separate. The main factor is whether the new social relations, which we understand as a set of social interactions regulated by the set of social norms,[144] appear as a result of the technical innovation, and whether such new social relations change the lives of people in a number of different ways. We will now analyze the social relations that would appear as a result of the extensive use of the PAL-V. We will see that although PAL-V use seems to generate new social relations for many people, in fact they will become just a new form of social relations,

[144] See: TenHouten, W. D. , *Primary Emotions and Social Relations* (2006) [Paper presented at the annual meeting of the American Sociological Association, Montreal Convention Center, Montreal, Quebec, Canada Online, 2008], online: All Academic Research <http://www.allacademic.com//meta/p_mla_apa_research_citation/1/0/2/5/6/pages102568/p102568-4.php>; *Social Relation*, online: Wikipedia <http://en.wikipedia.org/wiki/Social_relation>

already in place. Therefore, there would be no crisis of the existing law as for the PAL-Vs and the current legal framework will be suitable for the regulation of new machines. After that we will see how different legal statuses currently in place, such as car and aircraft can be reconciled within a single machine.

This chapter will start from the general aspects of PAL-V status. We will aim to answer a question whether a modern legal system of Aviation law has to create a special legal status for the Personal Air-Land Vehicles or if the current status, such as surface vehicle or aircraft is sufficient for the new invention. We will study several examples of the law dealing with similar problems.

5.1. Multi-Environment Vehicles in General.

The most significant characteristic of the PAL-Vs is their ability to use multiple environments for transportation. Usually such characteristic is referred to as amphibiocity. However, "amphibious" *per se* means an object capable of using water as well as any other natural environment for transportation.[145] Historically, people used ground surface for moving things, first using pack animals, later sledges and finally all kinds of wheeled transport, such as train or car. Later, but in ancient times as well, humanity discovered how to use rivers and seas as a substitute, and sometimes a primary transportation surface. Most cargo in the modern world is carried by water transport. In relatively modern times, the aircraft allowed people to use the third major environment – air, while spacecraft utilizes

[145] See; *Encyclopædia Britannica* (2008), s.v. "amphibious vehicle", online: Encyclopædia Britannica Online: <http://www.search.eb.com/eb/article-9007239>
Wikipedia.

gradually the space orbit. Although the first documented attempts to put a ship on wheels date to as early as the 9-th. century,[146] most of the transportation vehicles were unable to use several environments equally easily. The first steam-propelled vehicle capable of driving as well as sailing was the one constructed in 1805 by an American inventor, Oliver Evans.[147] Within a century amphibious vehicles became widely used for certain types of transportation such as military assault operations or transporting tourists on famous "Duck-Tours" in American cities.[148] The first aircraft capable to use water for landing were built as early as the 1910's.[149] "Flying boats" are used extensively in places with few of conventional airfields and great demand for aviation services such as Alaska. The first boat capable of surface transportation is the hovercraft, first designed in 1915.[150] The ecranoplan resembles a machine which flies in the air, but uses solely the ground effect which is virtually unusable over any other surface except for water. Up until PAL-V there were no machines capable of using air and ground surface instead of water.

Each of the machines mentioned have a primary function and a secondary one. The primary is the one used most of the time and which it is best suited for. The secondary function can also be used, but usually it is used less extensively. Therefore, we usually call "Duck Tour" DUK-W vehicle a floating car, not a driving boat, because it spends far more time on the road and performs much better there than on the water surface. Social relations,

---

[146] *Повесть времяньныхъ летъ* ("*The Russian Primary Chronicle*")(Kiev: *circa* 1113), online: University of Oregon <http://www.uoregon.edu/~kimball/chronicle.htm>
[147] Lubar S. "Was This America's First Steamboat, Locomotive, and Car?" *Invention and Technology Magazine* V.21, Issue 4 (Spring 2006), online American Heritage.com <http://www.americanheritage.com/articles/magazine/it/2006/4/2006_4_16_print.shtml>
[148] *About the Original & World Famous Boston Duck Tours*, online, Boston Duck Tours <http://www.bostonducktours.com/>
[149] Ralph Cooper, *supra* note 2.
[150] Malnig Helmut W. „Das erste Luftkissenfahrzeug der Welt von k.u.k. Lschlt. Dagobert Müller von Thomamühl" (2001)146, n°3, ÖIAZ 96-101 (abstract), online: INIST <http://cat.inist.fr/?aModele=afficheN&cpsidt=1088767>

associated with transportation in different environments differ significantly. As a result such environments are regulated by a different set of legal rules with their unique institutions and methods of legal reasoning. The fact that Maritime and Aviation law exist as two distinct legal fields is another evidence of such differences. Pursuant to such dichotomy a logical question arises: if a vehicle can operate in several environments simultaneously, which legal regime should apply to such a vehicle? Should it be a legal regime of the primary function, of the secondary function, of both, or a specific legal regime for dual-purpose vehicles? Let us take a look at several examples.

5.2. Amphibious Vehicles:

As for the amphibious automotive vehicles, a **dualistic model** is used. In many jurisdictions, amphibious vehicles are regulated separately by the maritime and automotive legal rules. Mentioned "Duck Tour" vehicles, which used to be DUK-W military machines during WWII and are extensively used now for the tourist entertainment in the USA, Canada and the UK is the most suitable example of civil use of amphibious vehicles.

In all three jurisdictions mentioned, the amphibious vehicles are governed within the dualistic legal framework, meaning that they are regulated as cars and boats at the same time. When a vehicle is on the water, it is treated as a vessel for all purposes. If it is on the land surface it should be treated as an automotive vehicle. In Great Britain, the vehicle must satisfy requirements of the Maritime and Coastguard Agency and, at the same time, of the Department of Transportation[151]. In Canada, such vehicles are certified as Special

[151] London Ducktours, *About us*, online: <http://www.londonducktours.co.uk/aboutus.htm>

Purpose/Non-conventional Vessels and have to comply with several vessel standards.[152] Automotive standards apply as well. British Columbia Insurance (Vehicle) Act, for example, exempts amphibious vehicles from the automotive insurance, but only when "an amphibious vehicle when being used in or upon water, when docked or floating in water, or when being launched into or landed from water."[153] On the water, separate boat insurance is required. In the United States, amphibious vehicles have to obtain a Coast Guard passenger-use boat license and a public service vehicle license from the Registry of motor vehicles.

Summarizing: for the amphibious vehicles a **functionalist** approach is taken by the jurisdictions. Vehicles are treated according to the function they are performing at that time. In case, the vehicle has lost its boat certification it may still qualify as a car and *vice versa*. Amphibious vehicles are referred in the existing regulations as a separate case, but this is solely for the purpose of avoiding misunderstandings. There are no specific new legal norms created, but the existing law is used to accommodate the new social relations associated with the use of amphibious vehicle. Nevertheless, at some point, when the conflict of laws is possible, the law created a separate legal regime for the amphibious vehicles. In Australian Customs Regulations there are special norms establishing the specific legal status of amphibious vehicles. This helps to avoid misunderstanding in case cars and boats are subject to different customs duties.[154]

---

[152] such as: *TP 11717 - Standards for the Construction and Inspection of Small Passenger Vessels; Hull Construction Regulations; TP 7301 - Stability, Subdivision and Load Line Standards; TP 1332 - Construction Standards for Small Vessels; Small Vessel Regulations*. (retrieved from *Special Purpose/Non-conventional Vessels* (2007), online: Transport Canada <http://www.tc.gc.ca/marinesafety/CES/small-commercial-vessels/Amphibious.htm>

[153] *Insurance (Vehicle) Act, Insurance (Vehicle) Regulation* (1983), B.C. Reg. 447/83 O.C. 1897/83 [includes amendments up to B.C. Reg. 341/2007, November 8, 2007], online: <http://www.qp.gov.bc.ca/statreg/reg/I/InsurV/InsurV447_83/447_83_01.htm>

[154] see: Australia, *Customs Regulations* (Amendment) (1991), No. 30, retrieved from http://www.austlii.edu.au/au/legis/cth/num_reg_es/cr1991n30340.html

5.3. Hovercrafts:

Hovercrafts are regulated largely in the same manner as the amphibious vehicles are. However, due to its unique design, there are several differences in how the legal system responded to the invention and use of hovercrafts. Regulation authorities are inclined to classify hovercrafts as a distinct type of boat. Although such boat in fact hovers in the air over the surface, the ICAO explicitly refused to classify it as an aircraft.[155] The vehicle is capable of moving over the land surface as well, in this case it is considered a surface vehicle. According to the US regulations, a hovercraft must first satisfy the standards of the Coast Guard as for the buoyancy, life preservers, hull number, etc.[156] It is however possible not to register the hovercraft as a vessel if it is only to be operated on the land surface. In this case it will be classified as an off-road vehicle, similar to the snowmobile for example.

In the US, the regulations may differ according to the state, so such things as plate number or headlights may be required. In Canada, the regulator also classified hovercraft as Special Purpose/Non-conventional Vessels, but established several regulations specifically designed for the operations of hovercraft defined as an Air Cushion Vehicle.[157] As for insurance purposes, the complete dualism exists. There is no special insurance policies for the hovercrafts and the owners have to buy a boat insurance, off-road vehicle insurance, or both, depending on the environment where the vehicle usually operates. Therefore, it is possible to say that in the case of hovercraft, the legal system experienced very little innovation and largely relied on the existing law.

---

[155] *Annex 6 to the Convention on International Civil Aviation* (8-th. ed. 2001) [Chapt. 1 "Definitions"]
[156] *Hovercraft Regulations*, online: Hovercraft Central <http://www.hovercraftcentral.com/article/hov_regs.html
[157] *General Standards relating to the Design, Construction and Operational Safety Certification of Air Cushion Vehicles (A.C.V's) in Canada*, TP 5579 E, online: Transport Canada <http://www.tc.gc.ca/marinesafety/TP/Tp5579/general-stand.htm> ;
Air Cushion Vehicles, Standards for the Construction of "Light" Air Cushion Vehicles – Under development, online: Transport Canada <http://www.tc.gc.ca/MarineSafety/CES/Small-Commercial-Vessels/ACV.htm>

5.4. Ekranoplans:

Ekranoplan is still a rather rare vehicle to operate. Therefore there is no extensive legal practice on this issue. Nevertheless ekranoplan represents example of the deeper legal innovation resulting from the new multi-environment vehicle. The main difference of the ekranoplan from a conventional amphibious vehicle and a hovercraft is that, depending of its construction, it can or can not perform its secondary function as easily as it does the primary one. The machine can easily sail and fly over the water using the surface effect, but is unusable at a height above the surface effect and over most ground surfaces. However, the aeronautical profile of the machine allows it to fly as a conventional plane after minor changes to the wingspan.[158]

Naturally, dualism system would have been the most suitable for such case. However, the international legal system appeared to be more creative. The reason for that was that while the border between land and water and therefore between application of relevant laws is obvious, it is not so easy to separate air and maritime jurisdictions for the ekranoplan. Technically speaking, moving on a surface aerodynamical ground effect is flying, but the altitude of such flight is so low that the vehicle operates in the social environment typical for vessels rather than for aircraft. Nevertheless at certain altitudes the ekranoplan loses its connection to the marine environment and operates more similar to an aircraft. In order to avoid misunderstanding, the International Maritime Organization (IMO), in cooperation with the International Civil Aviation Organization (ICAO), amended *International Regulations for Preventing Collisions at Sea*, (1972 COLREGS) and adopted the *Interim Guidelines for*

[158] Jeff Scott, *Ground Effect and WIG Vehicles*, online: Aerospaceweb <http://www.aerospaceweb.org/question/aerodynamics/q0130.shtml>

wing-in-ground (WIG) craft.[159] According to these regulations ekranoplans are divided into three categories with different legal status for each of them.

The Type A ekranoplans are certified for operations within the surface effect only and therefore are completely governed by the IMO standards and regulations and regarded vessels.

Type B ekranoplans are certified for the temporary flight over the surface effect for the purpose of over-flying obstacle or other vessel. It has the same legal status as the previous one but only within the altitude less than the minimum allowed altitude for the plane, which is 150 meters above sea level.

Type C ecranoplans are certified for operation above the altitude of 150 meters but also may travel within the surface effect. They are governed by the IMO regulations in below the 150 meters and by ICAO regulations above that altitude. ICAO may modify some of its standards to accommodate constructional particularities of the ecranoplans. Therefore, the dualistic system described above was interpreted by the existing legal system and created the new mechanism of the existing laws' application.

5.5. Suborbital Flights:

All three examples discussed above represent slightly different variations of the same legal method of accommodation of new inventions which is analogy of the existing law. It shall be remembered that in each of the examples the second approach is possible - legal innovation through creation of the new statute specifically for the multiple-environment vehicles. Although the algorithm from the previous chapter of this work explains that the

[159] *Interim Guidelines for wing-in-ground (WIG) craft* (2002), MSC/Circ.1054 [approved by the Maritime Safety Committee at its 76th session], online: International Maritime Organization <http://www.imo.org/Safety/mainframe.asp?topic_id=757>

need for the new law appears only in case of crisis of the existing laws there is always a possibility to artificially create the new body of law, which would contain specific regulations for amphibious vehicles, hovercrafts or ekranoplans, and in this way avoid misinterpretations of the existing laws once and forever.

These two alternatives – application of the existing law and creation of the new one were especially explicit concerning another multiple environment vehicle that is only being constructed – a suborbital plane. The concept of the suborbital flight presumes that the spacecraft can use the atmosphere as a conventional plane during take-off and landing but can cross the border into the outer space and perform a space flight in between. There is a question, therefore, whether such a vehicle should be considered an aircraft or a spacecraft. As an aircraft it should comply with the ICAO regulations and ask for permission to over fly the foreign territory. As a spacecraft it does not require such permission and is exempt from ICAO requirement.

One group of legal scholars (**spacialists**) claimed that function of the flying object shall be determined according to the primary environment for which the object is originally designed. Since for the suborbital flight vehicle this is space, it should therefore be considered a spacecraft. However, this idea does not explain what happens if the spacecraft decides not to enter the space orbit but remains within the atmosphere for the complete duration of flight. Following the spacialist approach it shall still to be considered a spacecraft and therefore be exempt from ICAO regulations. However, socially, such a vehicle will behave more like a plane and exempting it from the aircraft legal regime does not make a lot of sense. The proponents of the second regime (**functionalists**) claim that the flying objects shall be classified according to the type of engines they operate. If they use the conventional

turbine engine with an air thrust, the vehicle should be regarded as a plane. If only propulsion is used, the vehicle should enjoy the status of a space craft. Following functionalist approach, such aircraft-looking machines as Russian "Buran" and USA "Challenger" are, nevertheless, deemed to be spacecraft. This approach, although favored by the majority of legal practitioners, does not however address the case if the vehicle uses both engines at different altitudes.[160]

Notably enough, the dualist approach we have seen earlier was not discussed by the space lawyers. The main reason for this was that the modern law can not agree on the boundaries between air space and outer space. Claims to prescribe it at the altitude of 100 000 meters do not find unanimous support among jurisdictions. Therefore it is impossible to say where regime of national airspace ends and the international space regime begins, so we may not claim that space multiple environment vehicles are governed by one of the regimes up to a certain point as it is the case with a "Duck Tour" boat for example. Therefore the functionalist approach came as an alternative, letting physics, not the law, make the important boundary between legal regimes of air and space.

5.6. New Social Relations across Multiple Environments:

We can see that there were no revolutionary changes in the legal categories of the transportation vehicles following such unprecedented technical advances as multiple environment vehicles. None of the vehicles described above enjoyed a completely new legal status with multiple new legal norms. Only minor amendments were made to the existing laws in order to accommodate the fact that certain machines were able to use several

[160] See: Michael C. Mineiro, "The United States and the Legality of Outer Space Weaponization: A Proposal for Greater Transparency and a Dispute Resolution Mechanism" (2008) Ann Air & Space L 441-466

environments at the same time. With the help of the algorithm explained in the previous chapter, it is relatively easy to explain why it happened.

As the reader may remember, the main point of this framework was that the number of new legal norms developed by the legal system is connected to the novelty and variety of changes to social relations rather than with the number of people engaged in social relations as a result of the technological advance. Despite the number of new opportunities offered by the invention of multiple-environment vehicles, people do not engage in many new social activities when using them. The function of a multiple environment vehicle remains the same as it used to be for the single-environment conventional vehicles – to carry people and goods. Purchase and sale of tickets, labor relations, shipping and charter contracts, safety rules, etc.- all remain the same irrespective of the fact that the vehicle is able to move over several surfaces. Most of the social relations associated with the vehicle are not new, but already well established in the existing industries. Therefore, the existing law appears to be sufficient to regulate most of the social relations associated with the vehicle.

There are certain cases, of course, when it is hard to reconcile the existing laws from different environments, for example between marine and surface insurance policies. Then the crisis of the existing law appears and new legal norms are developed. The problem with the amphibious and other similar vehicles is that they are not so widely used as to result in the extensive legal practice. There are only a few cases (if any) addressing such conflicting issues. As a result, at least in the Common Law jurisdictions the existing law is not under pressure to adopt new legal concepts in order to define the status of the multiple-environment vehicles. As we could see the new term, such as hovercraft, or air suspension vehicle, or

ground effect vehicle is adopted, but it is generally defined within well established categories such as vessel or an aircraft.

This raises a question: when do we apply one of the existing statuses to the multiple environment vehicle and when the other. Practice gives us three approaches. Spacialist (or more generally **single-environment**) approach looks into the environment the vehicle is primarily designed for. Dualist approach favor the environment in which a vehicle is operating at the moment. Functionalist approach looks into a technology as a main distinguisher between the legal statuses of multy-environment vehicles. Let's look how the above-said applies to the Personal Air-Land Vehicle.

5.7. Main Approaches to the Legal Status of PAL-V:

If we look at the social relations that would be associated with the PAL-V, we can find them relatively similar to the ones associated with the existing multi-environment vehicles. Therefore it is possible to say that there will not be significant numbers of new social relations associated with flying cars, once they appear on the market. The PAL-V seems to be a typical multi-environment vehicle, compatible to the existing conventional amphibious or to the would-be suborbital planes. Unlike hovercraft or ecranoplan, the PAL-V will not have a new power technology, which could have differentiated them from the existing cars or aircraft. Therefore, there are going to be two legal statuses associated with the vehicle, such as a conventional car and a light (or ultralight) personal aircraft. Each status will have a number of existing social relations associated with it and therefore there will be no need for the new specific legal status and for the large number of new legal norms.

Nevertheless, the crisis of certain aspects of the existing law is likely to occur in relation to the PAL-V quicker than it did in relation to the other multi-environments vehicles. The reason for that will be the extensive use of the PAL-V in future. In my opinion the public need to utilize ground and air using the same vehicle is far more urgent than the need to utilize land and water, or air and space. Furthermore, it is expected that the PAL-V will be able to fly much better than the modern amphibious craft are able to go on water. Taking this into consideration, the above-said, manufacturers expected that the PAL-V will enjoy far greater distribution and far more extensive use than the current multi-environment vehicles do. As a result of such extensive use, small discrepancies between the existing legal regimes of light aircraft and automobiles will be experienced by greater numbers of people. More court cases may appear, especially in the Common Law system trying to resolve such issues using the existing laws.

Referring to the earlier chapter of this work, more judges with the multiple-constraint approach to cases will come up with the conflicting issues and therefore there may be more need for new legal norms. While virtually nobody cares about the insurance discrepancies for the hovercraft apart from the International Hovercraft Association members, thousands may care about similar discrepancies as for the PAL-V. Low numbers of new social relations would be compensated for by their extensive use. Following the algorithm from the pervious chapter that would mean that we can expect a creation of new legal norms specific for PAL-Vs even in the Common Law jurisdictions. It is still a question, however, whether the use of such norms will be extensive enough to create a sustainable new legal practice. In most of the cases, however, the existing law or a direct analogy of the existing law will be used. Let us

examine more thoroughly the would-be legal status of the PAL-Vs and answer a question when the car laws will apply for these vehicles, and when aviation laws would apply.

The most obvious approach we may apply for the flying cars is the dualism, discussed above. PAL-V in the skies should be treated as a plane, while on the ground it shall be regarded a simple car. As such, all the requirements of Aviation Authority will be applicable to the vehicle in order to be able to fly and all the transportation authority requirements (such as DoT) are to be followed when the machine drives on the highway. Two certifications are to be obtained therefore – as for the aircraft and as for the motor vehicle. If the vehicle loses one of the licenses, the other one may be kept and the vehicle may continue operations as a single environment one. The key question here is, what is the moment when the vehicle shall be regarded as an aircraft?

An obvious answer would be that when the vehicle leaves the ground it shall be considered an aircraft. However this may not be the right decision to make. The process of take-off includes a lengthy run on the runway, which is a natural part of the take off and landing. If we look at the PAL-V by "PAL-V Europe BV" company,[161] this roadable gyrocopter unfolds its rotors and ceases to be a car far before the actual take-off takes place. I would suggest the following criteria for establishing the moment of legal status change. **When a PAL-V enters territory which is specifically designated as an aerodrome or an airfield for the purpose of take off, or when it leaves such a territory after landing**. In case no specifically designated airfield is used, the **moment when a PAL-V becomes ready for take off or becomes ready for road transportation after landing** (folding-unfolding rotor, for example). The statement may be incorporated as one of the few legal norms regarding the PAL-Vs.

[161] PAL-V Europe, *supra* note 11

Such dualist approach seems to be the most legitimate but it is not the only one that could be taken. If we take the spacialist (single environment-oriented) approach we need to look at the environment which the PAL-V is primarily designed for. This would be air, since most of the current producers try to make it an affordable airplane, not just a redesigned car. Then, the PAL-V shall be deemed as a light aircraft, and does not have to comply with car standards. This is unlikely to happen, since the vehicle is more likely to be damaged or cause damage in a congested highway than in the relatively empty skies. Transportation authorities of the US and European Union probably have similar reasoning, since most of the current PAL-V producers try to meet the standards of cars almost as vigorously as they try to comply with the aircraft standards.

The functionalist approach may also be suitable for the case. PAL-Vehicles use different technology for transportation on the road and in air space. In the first case, wheels are the main transmitter of the engine's energy, while in the case of aircraft – rotor (turbine) is the main form of propulsor. Based on these functions, it is relatively easy to distinguish between the legal status of automobiles and aircraft in a single PAL-Vehicle. In this case, a PAL-V on the landing strip still will be considered an aircraft (as in the case with dualist approach) but not because it will be on the territory designated as an aerodrome, but because it will be moving along such landing strip with the help of a rotor, not the wheels' transmission. Therefore, when a PAL-V operator will press the button, and shift the power from the wheels to the aircraft propulsor or *vice versa*, it will be regarded as a transition point between land and aerial modes and applicable legal regulations associated with such modes. Functionalist approach is useful when there is a need to separate the legal statuses of car and

aircraft in case someone decides to land at or take off from an ordinary road and not a designated landing strip.

5.8. Ostrich Story of the Fourth Approach:

All three approaches we have recently discussed –dualist, single environment and functionalist either accept one legal regime at the expense of another (like single-environmentalists do), or setup an exact point when one legal status replaces another (like dualists or functionalists do). None of them demonstrate a possibility to resolve inconsistencies between the legal statuses without contrasting them to one another. Actually, a method of doing this exists in legal practice, and I will relate to some anecdotic case from Ukrainian law, which reflects such fourth approach.

At one point in the early 90's it was popular among Ukrainian farmers to raise ostriches. One farmer, whom I knew, decided to import several species of young ostriches from Europe. The export-import and customs regulations dated back to the Soviet times when it was not very common to import ostriches to the country. The customs officer checked with the import registry in order to calculate the appropriate duties and found out that there was no such class of goods as ostrich in the customs catalogue. Instead, there was a lower import duty for the class of poultry and higher duty for the class of circus animals. Ostriches were not a typical poultry in Ukraine at that time, nor was it very common to see them on a circus arena. Acting by analogy, the customs officer could have legitimately classified an ostrich as either poultry or a circus animal. The farmer expected him to classify

it as poultry because he was clearly going to raise the bird for meat and eggs and not to resell it to the circus (this way of reasoning is somewhat similar to the single-environment approach which values purpose of the object). However, the officer made him pay the higher duty with the following reasoning. He claimed that there is a **principle of absorbtion** under which if two or more conflicting standards are applicable to the same object, the strictest standard should apply. Since the duty for the circus animal was higher, it sort of "included" a lower duty for poultry. Incidentally, in a few years legislators developed a specific legal norm for ostriches, but only after repeating complaints from other farmers (just another example of legal innovation following the crisis of existing law). The same principle of absorption applies in the criminal law of the former Soviet Union republics. In Ukraine, for example, if a person is charged with several crimes, each applying different penalties, the strictest penalty absorbs all less strict ones (unlike the USA where penalties can be consecutive).

As for the PAL-V, the principle of absorption mean that if regulations for one environment are stricter (these would definitely be the aircraft regulations) they imply the less strict regulations for another environment (cars). PAL-V will then be certified as an aircraft. If it would pass a maintenance inspection for the aircraft, for example, it will be implied that it will satisfy similar inspection as for the car with no need to get a second inspection ticket. The same approach shall apply during the export-import duty calculations as for the PAL-V. It may be used in many cases to avoid double application of largely similar norms to the same object without creating a new law for it in each problematic case.

We have already extensively addressed two legal regimes regulating PAL-Vs. By now, we understand that there are at least three approaches which may be used to apply the

existing laws to PAL-Vs. This means that there is no need to create a special legal status for the roadable aircraft since it is well covered by the existing legal statuses of car and ultralight aviation. We should always keep in mind the conclusion of the previous chapter: whether technical innovation requires substantial legal change or not depends not on how many people are affected by such invention, but in how many different ways they are affected. Invention of the usable PAL-V would be a great one with the possibility to change the lives of millions. However, their lives will be changed in just few ways. They will continue driving their cars, but the skies will be their road now. This means that there will be very few new social relations associated with the PAL-Vs, but the scope of existing ones will expand. It means, for example, that if thousands of people are applying for the private pilot's licenses now, there may be millions in the near future. Nevertheless, the same rules as they exist now may be able to handle this scope of use, and the crisis of the existing aviation law within each single jurisdiction may never arise. The only reason why we may need such innovation, at least on the international level, will be the serious contradictions between existing national and international, which would not allow the PAL-Vs to be distributed globally. Let us now take a brief look at the main points of air and automobile legal regimes across several jurisdictions and to understand if there is enough consistency among them allowing for wider distribution of PAL-Vs.

5.9. Automobiles and Light Aircraft across the Globe:

Let us start with the legal status of the motor car. Automobiles have been around for more than 100 years. Since then they have enjoyed almost worldwide distribution and vast commercial success. Cars and their spare parts are manufactured and distributed around the

world. We could have offered numerous examples comparing legal regimes regulating cars across jurisdictions, but we would probably reach the same conclusion: standards of car manufacturing and distribution are compatible in most of the developed world. Of course, not all car modifications are allowed to be sold in the USA, but the recent globalization of car market for the mainstream manufacturers in my view is the best evidence of the generally favorable standards around the world.

The situation is not so simple for the aircraft. PAL-V in its aerial mode will more probably qualify as a light or ultra-light aircraft. **United States** is the most unconventional legal definition of ultra-light aircraft. According to the Federal Aviation Administration regulations[162] an ultralight aircraft is one which:

(a) Is used or intended to be used for manned operation in the air by a single occupant;

(b) Is used or intended to be used for recreation or sport purposes only;

(c) Does not have any U.S. or foreign airworthiness certificate; and

(d) If unpowered, weighs less than 155 pounds; or

(e) If powered:

(1) Weighs less than 254 pounds empty weight, excluding floats and safety devices which are intended for deployment in a potentially catastrophic situation;

(2) Has a fuel capacity not exceeding 5 U.S. gallons;

(3) Is not capable of more than 55 knots calibrated airspeed at full power in level flight; and

(4) Has a power-off stall speed which does not exceed 24 knots calibrated airspeed.[163]

---

[162] *Title 14: Aeronautics and Space, Part 103—Ultralight Vehicles,* 49 U.S.C. 103 ; online: GPO Access <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=550836984d4438af2f5c15d80dff5c99&rgn=div5&view=text&node=14:2.0.1.3.16&idno=14 >

[163] Ibid.

Such an aircraft is not required to be registered and to have airworthiness certificate. It is prohibited to fly over highly-populated areas and it is allowed to fly using *visual flight rules* (VFR) only. It is clear that a commercially attractive PAL-V will have to exceed these parameters. However, the US has developed another certification type, the PAL-V may fit into. This is a Light Sport Aircraft (LSA) – an aircraft class unique for the US. A LSA is an aircraft which:

(a) Has a maximum gross takeoff weight of less than 600 kilograms (1320 pounds) for aircraft designed to operate from land, 649 kilograms (1,430 pounds) for seaplanes;

(b) Has a maximum airspeed in level flight of 120 knots (222 km/h) and a maximum stall speed of 45 knots (83 km/h);

(c) Has either one or two seats; fixed undercarriage and fixed-pitch or ground adjustable propeller; and a single electric motor or reciprocating engine, which includes diesel engines and Wankel engines.[164]

The design team of the PAL-V Europe BV tries to fit their craft into these Light Sport Aircraft requirements in order to distribute it in the US market.

In **Canada**, there is no single definition of the ultra-light aircraft. It is divided between Basic Ultra-light Airplane (BULA) and an Advanced Ultra-light Airplane (AULA). Basic Ultra-Light should:

(a) Have no more than two seats;

(b) A maximum take-off weight not exceeding 544 kg (1,200 pounds), and

[164] *Title 14: Aeronautics and Space, Part 1—Definitions and Abbreviations,* 49 U.S.C. 1 [Doc. No. 1150, 27 FR 4588, May 15, 1962], online: GPO Access <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?type=simple;c=ecfr;cc=ecfr;sid=21f49c4d694094f9387b08cea878eb59;region=DIV1;q1=Light-sport%20aircraft;rgn=div8;view=text;idno=14;node=14%3A1.0.1.1.1.0.1.1>

(c) A stall speed in the landing configuration of 39 knots (45 mph) indicated airspeed, or less, at the maximum take-off weight.

Advanced Ultra-Light should:

(a) Be propeller driven;

(b) Be designed to carry a maximum of two persons, including the pilot;

(c) Have a maximum take-off mass of 350 kg (770 lb) for a single place airplane, or 560.0 kg (1232 lb) for a two place airplane;

(d) A maximum stalling speed in the landing configuration, at manufacturer's recommended maximum take-off mass (weight) not exceeding 72 km/h (20 m/s, 45 mph) and

(e) Is limited to non-aerobatic operations.[165]

In theory, a PAL-V could fit into any of those two categories rather easily.

In the **European Union** various aircraft statuses within national jurisdictions were unified within Joint Aviation Requirements (JAR). PAL-V can fit into 2 main statuses – *Very Light Rotorcraft* and *Very Light Aircraft*. According to the SC-VRL[166] a *Very Light Rotorcraft* shall:

(a) Have a certified take-off weight of not exceeding 600 kg;

(b) Be of a simple design;

(c) Carry no more than two passengers;

(d) Not be powered by turbine or rocket engines;

(e) Be restricted to Visual Flight Rules (VFR) operations only.

JAR-1 describes a *microlight plane* which:

---

[165] *Ultra-light Aeroplane Transition Strategy*, online: Transport Canada <http://www.tc.gc.ca/civilaviation/general/recavi/Ultralight/ULTransitionStrategy/menu.htm>

[166] European Aviation Safety Agency. *Decision NO. 2003/17/RM of the Executive Director of the Agency of 14 November 2003 on certification specifications for very light rotorcraft (« CS-VLR »)*, online: EASA <http://www.easa.eu.int/doc/Agency_Mesures/Certification_Spec/decision_ED_2003_17_RM.pdf>

(a) Has no more than two seats;

(b) Has Stalling speed not exceeding 35 knots (65 KM/h) CAS, and

(c) Has a maximum take-off mass of no more than:

- 300 kg for a landplane, single-seater ; or

- 450 kg for a landplane, two-seater; or

- 330 kg for an amphibian or floatplane, single seater; or

- 495 kg for an amphibian or floatplane, two-seater, provided that a microlight capable of operating

as both a floatplane and a landplane falls below both MTOM limits, as appropriate.[167]

In **India**, micro-light aircraft has:

(a) An all up weight of not more than 450 kg. without parachute and 472.5 kg. with parachute;

(b) A stall speed of less than 80 km/h;

(c) Maximum level speed of less than 220 km/h;

(d) No more than 2 seats;

(e) Single reciprocating engine, including rotary or diesel engines;

(f) A fixed or ground adjustable propeller;

(g) Non-pressurized cabin;

(h) Wing area more than 10 square meters;

(i) Fixed landing gear, except for operation on water or as a glider.[168]

In **Australia**, there is a notion of "Sport/Recreational aircraft" which must have:

(a) Maximum all-up weight (MAUW) of 544 kg or 1,200 lb or less;

---

[167] Joint Aviation Authorities. *Joint Aviation Requirement (JAR)-1: Definitions and Abbreviations,* 1 November, 2004, online: JAA< http://www.jaa.nl/publications/jars/500969.pdf>

[168] *FAQ-Ultralight,* online: West Wind Aviation Services Ltd <http://microlight.in/index_files/faqs.htm>

(b) Stalling speed under 45 knots (83 km/h) in landing configuration and

(c) Maximum of two seats.

The smallest of these aircraft, whose weight does not exceed 450 kg are known as micro-lights.[169]

In **New Zealand** there are again two types of ultra-light aircraft.

NZ Class 1 aircraft has:

(a) One seat;

(b) Design gross weight of 544 kg (1,200 lb) (landplanes) or 579 kg (1,275 lb) (seaplanes or amphibians), or less, and

(c) A stall speed in the landing configuration of 45 knots (83 km/h) or less.

It requires aircraft registration, and annual condition inspections.

NZ Class 2 aircraft has:

(a) Two seats;

(b) Design gross weight of 544 kg (landplanes) or 614 kg (seaplanes or amphibians), or less, and

(c) A stall speed of 45 knots (83 km/h) or less in the landing configuration. Requires aircraft registration, annual condition inspections.[170]

Ukrainian law requires an ultra-light aircraft to have a take-off weight of no more than 450 kg., minimal stalling speed of 65 km/h. They are divided into aircraft with balancer

---

[169] Australian Government, Civil Aviation Safety Authority, *Civil Aviation Safety Regulations 1998,* 1st Ed. 2003 [CASR 1998], online: <http://www.casa.gov.au/rules/1998casr/index.htm>

[170] Civil Aviation Authority of New Zealand, *Civil Aviation Rules.* Parts 91; 103. online: <http://www.caa.govt.nz/GA/GA.htm>;
Civil Aviation Authority of New Zealand, *Guidance Notes for Microlight Importers, Assemblers and Builders* (21.01.2005), online: <http://www.caa.govt.nz/ga/sport_&_rec/guide_for_micro_importers.pdf>

and aerodynamical steering.[171] No other requirements to type certification exist. Aircraft are not registered in the state Registry, instead non-governmental organizations are responsible for their registration.

Russian laws restrict maximum take-off weight of an ultra-light aircraft to 495 kg. Minimum speed of less than 65 km/h., and distinguishes between motorized and non-motorized aircraft.[172]

We can see that although the requirements look alike, they differ in details, such as take-off weight and additional requirements. This, however, may cause problems for the wide distribution of the PAL-Vs as the basic model will have to be adjusted to meet requirements of each specific jurisdiction. Unification of standards at the international level like ICAO standards could have solved the problem. This approach will be further discussed in the conclusions of this paper.

5.10. Conclusions:

---

[171] *МІНІСТЕРСТВО ТРАНСПОРТУ УКРАЇНИ Н А К А З Про затвердження Положення про організацію та виконання демонстраційних польотів (Положення, гл.2)* (Ministry of Transportation of Ukraine, Order on Statute of Organization and Performance of Demonstrational Frights), 08.04.2003 N 269 [translated by author]*;*
ДЕРЖАВНА СЛУЖБА УКРАЇНИ З НАГЛЯДУ ЗА ЗАБЕЗПЕЧЕННЯМ БЕЗПЕКИ АВІАЦІЇ Н А К А З Про затвердження Правил сертифікації авіаційних навчальних закладів цивільної авіації з підготовки льотного складу в Україні (Ukrainian Aviation Security Service, Order On Rules of Certification of Civil Aviation Schools a for the Pilot's Training in Ukraine) від 17.08.2005 N 60б [translated by author], online: Zakony Ukrajiny <http://uazakon.com/big/text1502/pg1.htm>

[172]. *ФЕДЕРАЛЬНЫЕ АВИАЦИОННЫЕ ПРАВИЛА, Эксплуатанты авиации общего назначения. Требования к эксплуатанту авиации общего назначения, процедуры регистрации и контроля деятельности эксплуатантов авиации общего назначения,* УТВЕРЖДЕНЫ приказом Минтранса России от 18 июня 2003 г. № 147 (с изменениями и дополнениями, внесенными Приказом МИНИСТЕРСТВА ТРАНСПОРТА РОССИЙСКОЙ ФЕДЕРАЦИИ от 28 мая 2005 г. N 55) (General Aviation Operators. Requirements to General Aviation Operators. FEDERAL AVIATION RULES, approved by the Order of Russian Ministry of Transportation of 18.07.2003 No. 147 as amended by Order of Ministry of Transportation of Russian Federation of 28.05.2005 No. 55) [translation by author], online: Fly Center http://www.flycenter.ru/pages/fap_01072005.doc

Let us summarize this short chapter. Legal status of the object is a fundamental framework for determining what legal norms shall apply to the PAL-V at certain moment. There may be a new legal status specifically created for the PAL-V or the current legal statuses may be applied. Examples of the existing multiple-environment vehicles were studied here in order to determine a suitable approach. Conventional amphibious vehicles, hovercraft, ecranoplan, suborbital aircraft – all of them use primarily the existing legal norms and operate within two existing legal regimes. This is primarily due to the fact that multiple-environment vehicles do not create a significant number of new social relations. Most of the social relations associated with transportation in each separate environment simply become combined within one vehicle with very few new specific regulations needed. This, together with the rare use of modern multi-environment vehicles contributes to the fact that there is very little legal innovation in the field of multi-environment transportation. This statement applies to the PAL-Vs as well, as they will combine two already-established statuses of an aircraft and a car. However, the extensive use of PAL-Vs may cause a greater number of inconsistencies within the existing laws.

Since legal innovation is not likely to appear for PAL-Vehicles, we further reviewed approaches which may be used to apply two potentially conflicting legal regimes to the same object of PAL-V. We reviewed dualist, single-environment, functionalist and absorption approaches. It was established that all three of them, except for the single-environment, may be taken by lawyers in order to decide what legal norms from two statuses in place shall be picked up for a certain case to ensure the most effective regulation of PAL-Vs.

Finally, we studied several regulations across jurisdictions in order to establish if there is enough consistency between them to allow for global distribution of PAL-Vs. It was

established that although automobile legal status regulations in different jurisdictions are generally consistent, the aircraft regulations as for certification vary significantly. This is primarily due to the fact that ICAO regime does not cover Ultra-Light Aircraft. It was proposed to include appropriate amendments as for the ultralight aviation into Annexes or Standards and Recommended Practices (SARPs) of ICAO, but this approach will be revisited at the end of this paper.

In the next chapter we will perform similar analysis a for the personnel certification and ground infrastructure for the PAL-Vs.

6. PAL-Vs – Other Aspects of Operation.

In the previous chapter we discussed how the status of the Personal Air-Land vehicle may be assessed based on the existing models of multi-environment vehicles. It was established that in general, the modern legal system is rather flexible for the implementation of existing laws to the new types of multi-environment machines. This led to the conclusion that it may not be necessary for any given jurisdiction to implement new specific laws in order to regulate the PAL-Vs should they appear on the market.

In the first chapters we established that there is no need to rewrite the whole aviation law simply because a revolutionary technological advance appears on stage. We understood that the new law will appear only together with the new social relations resulting from technological innovation and only if there is a *lacuna* or inconsistency in the existing national

or international law. After we examined the existing legal rules and methods of their interpretation regarding the modern multi-environment vehicles we understood that most of the social relations associated with the use of PAL-V fit into the current law regulations. In each separate jurisdiction, PAL-V does not require specific legal status and complies with existing definitions of ultralight aircraft and cars and there are very few *lacunas* or inconsistencies in the existing law.

Nevertheless as we discussed in the introduction to this paper, the PAL-V is expected to have a global impact on the world economy. On the other hand, only global distribution of the PAL-V will attract more capital into manufacturing these machines and as a result make personal air travel affordable for many. Therefore, it is not enough to have sufficient legal background in each given jurisdiction. It is equally important to a reach certain level of consistency between the regulations of various jurisdictions and international aviation law. Unfortunately, there are still many aspects of PAL-V operations which have overly divergent regulations across various jurisdictions. International aviation law also seems to be rather outdated to regulate many of the PAL-V operations effectively. Some of them, such as an absence of a single definition of an ultralight aircraft, were outlined in the previous chapter.

In this chapter, we will take a look at several different aspects of use of the PAL-Vehicles. First, we will revise operator's licenses required for the future PAL-V drivers and compare them across various jurisdictions. After that the nature of carriage and legal status of passengers will be briefly assessed. Further, the rules of the operation will be studies as well as the modern approaches to navigation, such as GPS. Land-based infrastructure regulations will be examined further. Finally, the nature of cross-border travel by PAL-V will be

addressed. All the *lacunae* and inconsistencies found will indicate a need for change in the aviation law in the nearest future.

Therefore, as a result of this chapter, we will be able to make a conclusion as to what areas of international and national aviation law need innovation in order to regulate PAL-Vs effectively and what areas appear to be consistent.

6.1. Pilots and Drivers:

Only one approach will probably be used by most of the jurisdictions in order to establish what kind of licensing the operator shall obtain in order to operate such multi-environment vehicles as a PAL-V. This approach is dualist approach within the terms discussed in the previous chapter. According to this approach an operator shall obtain the type of license needed for operating in a given environment. If he/she will use a multi-environment vehicle in a single environment only, he/she can obtain only one license. If a machine is operating in several environments, two operators with different licenses or a single operator possessing both licenses shall be employed.

In case of PAL-V this would mean that if a single person is willing to drive the vehicle on the road as well as to fly it, he/she will have to obtain a driver's license as well as the pilot's license for an ultralight (microlight, sport) aircraft.

Let us first take a look at the driver's license. Most of the jurisdictions have some form of licensing for drivers, the absence of which restricts a person' right to ride the automotive vehicle. International regulations such as the *Geneva Convention on Road Traffic*

(1949)[173] and the *Vienna Convention on Road Traffic* (1968)[174] encourage member states to introduce such regulations. Nevertheless, there is little uniformity in the licensing process. Minimum age required varies between 16 (in most of the United States) 17 (Great Britain) and 18 (European Union). Technical requirements vary as well, with only minimal operational skills required for the drivers in the USA and Canada, compared to the significant skills required in such countries as Germany. Such variety, however, does not pose a significant burden for international traffic. A number of bilateral treaties were concluded between states on the mutual recognition of driver's licenses. In addition, the *Vienna Convention*, already mentioned earlier, required signatories to recognize driver's permits issued by the other signatory states in case such a license is accompanied by the appropriate translation. An *International Driver's Permit* is as example of such translation. Therefore it is possible to say that the significant level of uniformity is achieved by automotive law in respect of personal certification of operators. The car is an established and widely-used invention and automobile national and international law had already passed all the developmental stages described earlier. This means that PAL-Vs in their land mode will be easily operational by a wide majority of individuals who have valid driver's licenses.

The situation is not that easy in case of pilot's licensing. It is true that in the world of aviation there is a significant degree of uniformity as for the personal licensing requirements achieved through the means of the *Chicago Convention* (1944). Annex 1 to this convention establishes the following types of licenses for aircraft operators: Student pilot license, Private pilot license (Airplane), Commercial pilot license (Airplane), Airline transport pilot license

---

[173] *Geneva Convention on Road Traffic,* 19 September, 1949, (entered into force on 26 March 1952) online: <http://www.geocities.com/bkkriders/law/unc/road1949.html>

[174] *Convention on Road Traffic done in Vienna,* 8 November, 1968, online: UNESE <http://www.unece.org/trans/conventn/crt1968e.pdf>

(Airplane), Instrument rating (Airplane), Private pilot license (Helicopter), Commercial pilot license (Helicopter), Airline transport pilot license (Helicopter), Instrument rating (Helicopter), Flight instructor rating appropriate to airplanes and helicopters, Glider pilot License, Free balloon pilot license.

Private Pilot License or Commercial pilot license would be required to operate the PAL-V's in their aerial mode. According to Article 33 of the Chicago convention all types of licenses listed above that are issued by one contracting state shall be recognized by another contracting states as valid if they satisfy the requirements outlined in the Annex 1. Therefore the system of pilot licensing seems to be as internationally-consistent as the system of driver's licensing. However, there is a problem with this rule that is not obvious at once.

The standards mentioned by the Annex 1 are rather strict and do not allow the wide majority of people to obtain the licenses mentioned. Even the least strict Private Pilot License under ICAO standards require a holder to have at least 40 hours of flight training, know such disciplines as Air law, Operational procedures, Meteorology, Navigation, Aircraft general knowledge, Principles of flight (Aerodynamics), Flight performance and planning, Human factors (performance and limitations), Radio-communications. In addition strict medical conditions must be met by future pilots. Annex 1 does not differentiate between size and technical characteristics of the aircraft. We should also remember that there is no definition of the ultralight aircraft within Chicago convention legal regime. This means that in order to obtain an ICAO-recognized pilots license, an operator of the ultralight aircraft has to satisfy requirements for the piloting of almost any non-jet engine aircraft. If the same system was applied to road traffic it would mean that in order to operate a motorcycle, one would have to obtain a license for a bus. Naturally, many countries felt that the strict ICAO standards may

not be necessary for the small private aircraft pilots. Therefore they established an alternative system of ICAO non-compliant pilot's licenses which do not have to be recognized by other states.

Great Britain is a notable example of such a system. There are two types of licenses for the aircraft with type characteristics similar to the future PAL-V. One is a normal Private Pilot License which is compliant with ICAO standards and is recognized by other states. Another one is the National Private License with less stringent flying hours and medical requirements. The latter one is limited to use on British-registered aircraft and is not automatically recognized in other states.[175] The same system of pilot certification is used in Canada. There, aircraft operators may fly either under a Permit, which requires 10 hours of practice (for ultralight aircraft) and is not internationally recognized, or under a Private Pilot License, which requires 45 hours of flight experience and is fully recognized internationally.[176] The United States is another good example. Among six pilot license types stipulated by the Federal Aviation Administration two (Sport and Recreational) have less stringent requirements than the Private license under Annex 1.[177] This is not to mention the American ultralight operators who do not require any certification whatsoever.

Some countries, such as Ukraine,[178] on the contrary try to strictly adhere to the ICAO standards and do not issue any pilots licenses below the requirements of the internationally-

---

[175] please see *The National Private Pilot License*, online: <http://www.nppl.uk.com/index.html>
[176] *Canadian Aviation Regulations 2008-1; Part IV - Personnel Licensing and Training,* online: Transport Canada < http://www.tc.gc.ca/CivilAviation/Regserv/Affairs/cars/Part4/menu.htm>
[177] *Title 14: Aeronautics and Space, Part 61: Certification: Pilots, Flight Instructors, and Ground Instructors; Subpart J: Sport Pilots; Subpart D: Recreational Pilots; Subpart E: Private Pilots*. 49 U.S.C. 61(j;d;e), online: GPO Access <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=40760189a03dfea0b501608f33820a45&rgn=div5&view=text&node=14:2.0.1.1.2&idno=14#14:2.0.1.1.2.10>
[178] *Програма підготовки пілота та пілота - інструктора надлегкого повітряного судна*, online: Всеукраинская Ассоциация Аэроклуб Украины <http://www.aeroclub.kiev.ua/association/study/index.html> (Ultralight aircraft training program for pilot and instructor-pilot) [translated by author].

recognized Personal Private License. The European Microlight Federation conducted a study of the personal licensing requirements across European jurisdictions which may be found in a slightly amended format as Annex 2 to this paper. According to this study, out of 13 countries surveyed, only one (Belgium) requires flight experience for ultralight aircraft pilots within 40-hours of ICAO regulations; 3 countries (Belgium, France, Spain and Sweden do not require mandatory training with instructor); 7 countries do not require such pilots to know radio-communication; 4 waive the requirements for knowledge flight performances and training. Requirements as for the length and duration of test flight also vary significantly.[179]

In summary, we can say that in the field of personal certification of ultralight operators there is a great lack of uniformity. It results from the fact that many countries have developed their own national standards for such certification outside of ICAO requirements. This was partially caused by the inability of the Chicago Convention and Annexes to address the special needs of the ultralight aviation. Unfortunately, the variety of standards and lack of ICAO approval makes it hard for the pilots to have their ultralight licenses recognized across jurisdictions, much harder than for the drivers to have their licenses recognized. For the Personal Air Land Vehicles that would mean that if an owner of such a vehicle obtains a drivers license and ultralight pilot license or permit, internationally both his license will have very different legal significance. In the case of the driver's license, he/she will be able to easily operate the PAL-V on foreign road across the border. If, however such operator decides to take off from foreign airports, he/she will probably be unable to do so unless his/her pilot's license or certificate is validated by the relevant foreign civil aviation

[179] *Pilot Licencing, General Requirements*, online: European Microlight Federation <http://www.emf.nanco.no/Flying%20over%20Europe/EMF%20Licencing.htm>

authority. This may not constitute a big problem for large countries like US, Canada or Russia but will most probably be an issue in European countries, should PAL-Vs become popular there.

We can see that the current ICAO-based law had never addressed the technological innovations in the field of ultralight aviation. As a result a number of *lacunae* and inconsistencies have occurred in this field. Social relations associated with ultralight aviation are slightly different from those associated with heavy general aviation and commercial aviation. While in the latter case, flying is usually a profession, for ultralight operators, flying is a hobby or could be necessary for carrying an of income, much as driving is for the average Canadian. Aviation law does not acknowledge this difference, and in fact a crisis of the existing law had already occurred in each separate jurisdiction. As a result of this crisis, each jurisdiction has adopted its specific law on ultralight national licensing. On the international level, however, the crisis of current Annex 1 never occurred. There are pilots, of course, who feel badly because they cannot participate in international ultralight aircraft competitions without obtaining an ICAO-class license, for example, but their number is insignificant on a global scale. And we shall remember, that according to the algorithm, described in Chapter 4, frequency of use and a large number of users are rather necessary prerequisites for changing the existing law. This is especially true for such conservative types of law as international law. When the PAL-V will appear, however, it is expected that the number of personal ultralight operators will increase significantly, therefore, crisis of the existing law will become more obvious and legal innovation is likely to occur.

Introducing of the new type of license – ultralight aircraft pilot license with less strict requirements than the modern Private Pilot License – may be a solution for the problem

discussed. If ICAO will amend Annex 1 with this new type of license, it will encourage ICAO member states to adhere to such standards and will require them to recognize the ultralight licenses and certificates of each other. Such solution will benefit many of the current ultralight airplane operators even now and will certainly have a great effect on distribution of the PAL and similar vehicles in the near future.

Such measures would be a natural response for the inconsistencies in the existing personal license regulations, and will happen eventually. We propose to anticipate such changes, and to preemptively introduce initial specific law in this area at the international level, because, as was discussed in Chapter 4, the initial specific law will later be amended by public policy anyway. Therefore, the sooner ICAO makes an initial law, the sooner more consistent subsequent law will appear. And of course, thousands of flying fans across the globe will welcome such a decision.

6.2. Passengers and their Baggage;

Most of the current multi-environment vehicles are capable of carrying at least several passengers other than the driver. All of the existing PAL-V projects allow an operator to take at least one passenger with him on the ride or flight. Ability of a PAL-V operator to take a passenger and at least minimal cargo is a prerequisite of the commercial attractiveness of this vehicle. Besides, it is suspected that the PAL-V will be broadly used as an air taxi, carrying passengers for profit. There are two major issues regarding passengers traveling by PAL-V, contract of carriage and personal pilot licensing rimitations.

6.2.1. Contract of Carriage by PAL-V:

The first issue is of a contractual nature. Travel within different environments may be regulated by slightly different regimes. There are different regimes for travel of passengers and for transportation of cargo that apply to road and to air transportation. An explicit example of how these regimes may contradict each other was demonstrated in an example from Chapter 4 about a broken Chinese vase in the trunk of a PAL-V cab. Liability of an air carrier for damage to passengers, their baggage and cargo is limited significantly by relevant international conventions reflected in the national legislations of many jurisdictions, while road carriers are subjects to usual Common or Civil law liability. The *Warsaw convention* (1929), which is still in force in majority of countries, limits air carrier liability for death or personal injury at approximately 8,300 USD,[180] for damage to baggage and cargo at 250 golden francs per 1 kilo. As amended by the *Hague Protocol* (1956) it increased liability for death and injury up to 16,600 USD. The new *Montreal Convention* (1999) increased liability limits up to 100,000 SDR (Special Drawing Rights = 159,581 USD) for the injury or death of each passenger and 17 SDR (17 USD) per 1 kilogram of lost or damaged cargo or up to a declared value of shipment.[181] These mentioned liability limits in both Conventions apply if "the event 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 the operations of embarking or disembarking."[182]

Since a PAL-V will possess certificate of airworthiness from a relevant Civil Aviation authority, technically, a passenger and a cargo will be considered to be on board of an aircraft and therefore air carrier's liability limits could have applied regardless of whether the vehicle was driving or flying. Modern aviation law acknowledges that a flight commences when the

[180] Warsaw Convention, *supra* note 110, Art. 22
[181] Montreal Convention, *supra* note 136, Art. 21-22
[182] *supra* note 110, Art. 17; *supra* note 136 Art. 17

door of an aircraft is closed and terminates when it is open again.[183] Therefore, all the time, an aircraft spends while taxiing on the tarmac and on the landing strip is deemed to be in-flight time. This is not a problem for modern aircraft which do not taxi on conventional roads, however, it may be a problem for a machine which may switch from flying to driving without even opening a door. It would be unfair for the passengers and cargo owners if they would be subjects to different limits of liability while traveling on the road simply because the vehicle, which they use, was capable of flight.

A concept of **successive** and **combined carriage** already in place together with the dualist approach described in the previous chapter may be useful to resolve this complication described. The *Montreal Convention* stipulates that "the period of the carriage by air does not extend to any carriage by land, by sea or by inland waterway performed outside an airport. If, however, such carriage takes place in the performance of a contract for carriage by air, for the purpose of loading, delivery or trans-shipment, any damage is presumed, subject to proof to the contrary, to have been the result of an event which took place during the carriage by air."[184] Following this rule, courts may interpret all road traffic of a PAL-V as a trans-shipment or delivery, since the rule does not require the reloading of cargo. The only necessary prerequisite for the limitations of liability to apply will be a presence of flight as part of such carriage, which shall be indicated in a special airway bill. If during transportation from point A to point B there was no flying, the Montreal convention will not apply and the carrier will be subject to an ordinary Civil or Common law liability. Unless the specific law will be introduced for the case of PAL-V, there is very little, a hypothetical customers would be able to do in order to increase the carrier's liability.

---

[183] *Convention for the Suppression of Unlawful Seizure of Aircraft,* December 16, 1970 [Hague Convention], Art.3

[184] supra note 9, Art. 18(4)

This rule, however, does not apply to transportation of passengers and their baggage. If an aircraft performs to make an emergency landing in a spare airport and an airline decides to transport its passengers by bus to the final point, and an accident occurs during such travel, an airline will not be able to defend itself under limitations established by the *Warsaw* or *Montreal Conventions*. The only problem is that in case of passengers, the existing law requires a change of vehicle (disembarkation) before the different legal regimes start to apply. It is unclear what would happen if there would be no change of vehicle as in the case of PAL-V.

The dualist approach, which we already discussed, may be useful in this case. It may be held that travel by air may commence when the PAL-V operator switches power from the wheels to the air propulsor (rotor, propeller or turbine). Alternatively, it may be held that the travel changes its character from flight to road travel when the vehicle enters or exits a territory specifically designated as an aerodrome or an airfield. Most probably, a specific law in the form of a statutory norm or continuous court decisions will be required in order to settle this issue. It will not create a new institute of aviation law but will add certain clarification to the use of PAL-Vs under the current legal framework. Generally, there is not as much inconsistency in the current rules regarding contract of carriage by PAL-V as in other aspects we discuss in this chapter. Therefore, it is possible to say that legal innovation is not likely to occur in this field, while analogy of the existing norms and new methods of their interpretation are likely to be sufficient.

6.2.2. Passengers and Personal Pilot Licensing:

The second issue for the transportation of passengers by PAL-Vs is again connected with personal licensing. Even if the person decides to give a ride to a passenger for free, he/she may face problems in so doing. The problem is that not all personal licenses for the ultra-light aircraft allow operators to transport passengers, while all driver's licenses do. This is especially true for the United States, where an aircraft qualifies as an ultralight only if it does not carry any passengers. For the broader status of sport aircraft, carriage of only one passenger is allowed.

In Canada, a basic ultralight pilot permit does not allow one to carry passengers without further endorsement. An aircraft itself is allowed to fly only one passenger only if it holds a certificate of an Advanced Ultra-Light Aircraft (AULA).[185] In New Zealand, there is a similar situation with NZ-1 type ultralights being allowed to carry the operator only and NZ-2 type aircraft being able to fly with only one passenger.[186] European law allows an ultralight aircraft to carry one passenger,[187] but many simplified Private Pilot Licenses, which are not compliant with JAR-FCL/Annex 1 (such as British National Private License) do not allow pilots to carry any passengers.[188] In certain jurisdictions (for example in Italy), an ultralight pilot can receive the right to carry a passenger without the need to obtain a different type of license after he/she flies on his/her aircraft solo for a certain period of time.

Therefore, pilot licensing regulations in different jurisdictions are inconsistent with each other regarding carriage of passengers and many types of ultralight pilot licenses do not allow carrying any passengers at all. This may create further complications for the global distribution of PAL-Vs and for the cross-border use of these machines.

---

[185] *Supra*, note 166
[186] *Supra*, note 171
[187] *Supra*, note 168
[188] *Supra*, note 176

By way of review, currently the law has not reached a status of crisis on the national and international level, because the number of ultralight aircraft pilots who would like to carry passenger but are unable to do so is rather low. PAL-V introduction, however would mean that the number of such pilots will increase. This will be especially true if the fuel price will push people to use PAL-Vs in a way similar to modern car-pooling. Then the inconsistency will quickly become obvious and critical when the scope of use of ultralight aircraft, such as PAL-V, increases.

Amending Annex 1 of the Chicago convention and introducing a specific pilot-license rating for ultraligt aircraft, already discussed, seems to be the most suitable approach to the problem discussed. Such a new rating would explicitly allow the pilot of an ultralight aircraft to carry at least one passenger if the aircraft's construction allows for it. Certainly, the main concern of the air-regulating authorities would be safety. The new type of license will require less training and less strict medical checks than the current Private Pilot License. The Italian approach would probably be the optimal one. An ultralight pilot should be allowed to carry passengers after he flies for a certain time on his own and gets used to the aircraft.

It is however critical that the changes proposed are introduced together and in accordance with the simultaneous introduction of ultralight aircraft type, GPS Instrumental Flight Rules' updates, and other necessary changes, which are discussed elsewhere in this chapter.

6.3. Rules of the Road/Air:

Rules of operation of Personal Air Land vehicles is another field where the commercial interest of manufacturers and regulatory interests of civil aviation authorities may conflict. As was the case with type and private licensing and with passenger carriage, there will be no problems with the rules of the road for the PAL-Vs operating in ground mode. If a PAL-V is certified as an automobile it will have to be operated in compliance with the traffic regulations established by a certain jurisdiction. These rules are often alike in many juricdictions, which allows drivers to travel across them without major inconveniences.

Rules of air traffic are unified as well on the basis of Annex 2 ("Rules of the Air") to the *Chicago Convention*. The problem is that the international regime does not allow Private Pilots to operate aircraft using instrumental flight rules and at night without further endorsements. Many national regulations specifically forbid ultralight aircraft from operating under instrumental flight rules conditions, such as bad weather and night. Almost all types of easily accessible ultralight pilot licenses do not allow night or instrumental operations either.

At the same time, PAL-V manufacturers hope that their vehicles will be operated under instrumental flight rules, especially the Global Positioning Satellite Systems such as GPS or GLONASS. NASA administers a new air traffic system often called Highway-in-the Sky, which would eventually replace traditional air traffic control systems. General Aviation Association of America believes that such system will especially benefit small private airplane pilots because it will simplify operation of such aircraft significantly. GPS-based flight instruments may become an autopilot, a navigation system and an aircraft collision avoidance system for the ultralight aircraft. Should a significant numbers of ultralight PAL-Vs enter the sky, such instruments will be the most efficient way to increase the safety of their flight. In addition, it is a matter of commercial success for the PAL-Vs to be able to fly

at night and through limited visibility, so that their owners will not be dependent on natural conditions.

There will be further discussion of instrumental flight rules in the section about aerodromes, which also suffer from the old-fashioned ICAO standards in this area. A few additional statements however need to be made here. The fact is that most of the standards described, which do not allow instrumental flight operations were adopted at the time when flying instruments were expensive and complicated, and when computers and satellite systems were not used in aviation, especially in general aviation. At that time it was reasonable to prohibit pilots from flying using instrumental flight rules unless they had significant experience. Now, when computer may guide and even land a plane using a GPS-based signal, such restrictions on instrumental flying seem obsolete. Private Pilots and ultralight pilots shall be allowed to operate an aircraft at night and in other instrumental flight conditions provided that their aircraft are equipped with modern GPS-based navigation systems and on-board computers which may advise operators on the basis of these systems.

Relevant changes to the Annexes 1; 2, and 11 have to be made in order to make instrumental flight more accessible and at the same time not to overwhelm ground control services with large number of ultralight aircraft flying using instrumental flight rules. (Right now it is required for every aircraft flying in instrumental conditions to be guided by ground traffic controllers). Such amendments will benefit general aviation users in general and specifically the would-be operators of Personal Air-Land Vehicles.

Another issue in this regard is separation of aircraft. Right now, according o ICAO standards, airspace is divided into 7 categories (A,B,C,D,E,F,G) depending on the type of flight rules and level of Air Traffic Control (ATC) service involvement. Actual classification

of airspace slightly varies in different jurisdictions. In the lower layers of airspace, where PAL-Vs will operate, both aircraft operating under VFR and IFR are allowed. VFR pilots are not provided with any separation services and are expected to actually see other aircraft. That is where prohibition of night flights and flights in the clouds come from. IFR pilots, however are often provided with separation services by ATC controllers.[189] Should there be an amendment to the IFR status and GPS-based instruments will be recognized, there will be no need for ATC service in the lower sections of airspace. Ultralight PAL-Vs and other light aircraft will be able to see each other through GPS-based Air Collision Avoidance Systems. This would mean that even after sunset and in a bad weather they will be able to track their location and location of the neighboring aircraft watching their own flat screens.

It would be unwise to leave a requirement for such aircraft to pass through ATC clearance in the lower airspace of G and F class as it is the case in most jurisdictions now. In some countries, for example in Russia, any aircraft operating in the low altitudes has not only to pass clearance but also to file a flight plan and to get permission to fly from the relevant ATC service. Countries like Ukraine also require permission to fly, but it grants seasonal permission for the members of registered aviation clubs. Clearly, most of these rules have to be lifted in order to simplify flying in the lower altitudes where PAL-Vs are intended to operate. This shall be taken into consideration by relevant national civil aviation authorities as soon as the ultralight aircraft are allowed to operate on a GPS-based IFR.

6.4. Things on the Ground:

[189] For example in Great Britain, ATC provides separation for the IFR pilots as low as F-class airspace. See: *CAP 493 Manual of Air Traffic Services Part 1*, Art.2 Chapt. 2, online: Civil Aviation Administration <http://www.caa.co.uk/docs/33/CAP493PART1.PDF>

The problem of obsolete ICAO standards, just discussed, applies also to the ground infrastructure which will be used by the PAL-Vs. Current aerodrome regulations are hardly adapted to the technological progress and may constitute an obstacle for the future distribution of the flying cars, although these problems are not so critical as issues with personal licensing, passenger carriage and instrumental flight rules which were discussed above. Let us review the aerodrome regulations and their application to PAL-Vs briefly.

We already briefly discussed the key role the aerodrome will play in the use of Personal Air-Land Vehicles. First of all the aerial mode of the PAL-V implies that there shall be some piece of Earth surface which the vehicle will be able to use for take-off and landing. Minimal technical requirements, such as a clear approach path and a more or less secured landing strip are necessary. It is possible, that in future it will be possible for the PAL-Vs to use conventional roads and other non-designated areas of land for this purpose. Currently, however, it is unlikely that states will allow for such free use of land for aviation purposes, primarily due to security reasons. Secondly, it was also discussed that aerodrome has a significant legal meaning as a place where a PAL-V is transformed from one operating mode to another and therefore changes legal regimes applicable to it. It was proposed earlier as part of the dualist approach that the moment when a PAL-V crosses the borders of the territory specifically designated as an aerodrome shall be deemed as a moment of transformation between driving and flying mode of the PAL-V. Such an important role of the aerodrome for the PAL-V requires significant attention from the regulatory bodies. On the other hand, the personal nature of transportation by PAL-V requires accessibility of aerodromes and their wide distribution over the territory. In my view, modern aviation law fails to find a balance between these two requirements.

Internationally, aerodrome certification is regulated according to ICAO Annex 14 to the Chicago Convention. According to this document, aerodrome is a "defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft."[190] However, the document requires member states to bring only aerodromes which are used for international traffic in compliance with the regulations. As for the domestically-used aerodromes, it is only advised to make them comply with the applicable ICAO standards.

Naturally, many countries find the ICAO standards to be too strict for the general, and particularly for the ultralight aviation. There are three main approaches countries take in regulating such less important aerodromes, which usually consist of a single landing strip. The first approach is universal licensing. Ukraine is an example of such an approach along with most post-Soviet countries. Ukrainian law requires any airstrip used for any type of aircraft, including ultralights, to be issued an operational permit. Take-off and landing from the airfirelds without permit is prohibited. Requirements for the ultralight and helicopter landing sites are significantly less strict compared to ICAO standards of Annex 14. Nevertheless, aerodrome owners have to undergo a lengthy application process, which includes a Civil Aviation Authority inspection, in order to designate their landing strips as aerodrome.[191] CAA maintains a registry of the aerodromes designated in this way. This approach is probably a result of the former monopoly of the Socialist State on air traffic.

The second approach is notificational operation. It is used, for example, in the USA. Anyone is permitted to build a landing strip for operations under the VFR. However, all

---

[190] *Supra*, note 135, Annex 14, art, 1.1

[191] *Про затвердження Правил допуску до експлуатації злітно-посадкових майданчиків для польотів легких повітряних суден,* Наказ Державіаслужби від 01.12.2004 N 205, ст. 2.1; 2.2 (Civil Aviation Administration of Ukraine, Order "On Rules of Permission for Airstrips for Light Aircraft) [translation by the author]

owners are required to notify the Federal Aviation Administration about the new airstrip that was built by submitting a special registration form (FAA 7480-1). There are minimal requirements to be complied with in order for the airstrip to be officially recognized. FAA may prohibit operations on any airstrip if it finds them not complying with such minimal standards. No obligatory inspection is performed though, and no permit is issued for the airstrip.[192] Such system developed because traditionally in the US, aviation was permitted to use privately-owned agricultural fields for landing, while FAA (formerly CAB) had no ability to check all the landing sites.

The third approach is partial licensing. In Great Britain as well as in some other countries, airfield certification according to ICAO standards is required for performance of certain operations, such as flight training or scheduled traffic out of such airfields. All other airfields, operating under VFR are not licensed by CAA[193] and are not even placed on the flight charts. In most European countries it is not required for the operation of ultralight aircraft, such as future PAL-Vs.[194]

In all three cases, ICAO non-compliant aerodromes are not allowed to accept flights performed under Instrumental Flight Rules.

Therefore the first problem is an obvious lack of uniformity in aerodrome regulations across jurisdictions. This means that it will be much easier for the owners to operate an airstrip for a PAL-Vehicle in the United States than in Ukraine and Russia. The situation is similar to the personal licensing regulations. At the time when aerodrome ICAO standard

---

[192] *Federal Aviation Regulation, Notice of Construction, Alteration, Activation, and Deactivation of Airports*, 14 U.S.C. 157, online: FAA <http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfr157_02.html>

[193] The Bartlett School, University College London, *General Aviation Small Aerodrome Research Study* (September 2004), online: The General Aviation Awareness Council <http://www.gaac.co.uk/gasar/GASAR_AerodromeCategorisation.pdf>

[194] *Final report to the CAA Executive Committee* (2006-01-16) p. 1, para. 1.1. online: CAA <http://www.caa.co.uk/docs/17/srg_asd_laasgfinalreport_16-01-06.pdf>

was developed (1947-51), general aviation did not differ much from the commercial one using almost similar types of the aircraft and operating primarily on the basis of visual flight rule (VFR). Therefore, it was justified to establish rather high standards for aerodrome design and to apply them to all types of aircraft. There was no need for internationally-uniform specific norms of airfield certification for the needs of light and ultralight aviation, which could have been used by the states as a model for national regulations. Referring to the tendency described in the chapter 4 of this work, small airfields for general aviation are used less extensively than big airports. Even fewer people use small aerodromes across national boundaries. As a result, if there were private pilots suffering such aerodrome regulation inconsistencies, their number was so insignificant that national regulation authorities did not find it necessary to cooperate on these issues on the international basis. So lack of use superceded lack of uniformity and no new international norms were created regarding small airfields. There is another problem with the aerodromes, however, which may be more serious than simple certification differences across jurisdictions.

Most of the national regulations allow using ICAO non-compliant aerodromes for operations under the VFR only. This would mean that most of them are not allowed to be used after sunset and in bad weather. We already discussed that ability to operate under instrumental GPS-based flight rules is an essential prerequisite for wide distribution of PAL-Vs. Moreover, the technology, such as GPS-based Wide Area Augmentation System (WAAS)[195] allows for "blind" landing on airstrips not equipped with Instrumental Landing Systems.

[195] *The Future of GA in America, Navigating the Future*, online: Gaserving America <http://www.gaservingamerica.org/future_navigation.htm>

Unfortunately, modern ICAO-based aviation law does not acknowledge recent developments in the navigation technology. The *Chicago Convention* and relevant annexes do not acknowledge in any way GPS-based navigation systems. Referring to the theory discussed above, GPS is a new technological innovation which is currently governed by the existing law. It does not create new social relations but improves the existing ones in a similar way as e-mail replaced paper mail 20 years ago. The term "flight instruments" is rather wide and GPS is usually included within this definition. However, it is not taken into account that operations under modern GPS-based computer-run instruments, such as color moving maps or WAAS is far less complicated and requires far less training and experience than similar operation under traditional flight instruments such as altimeter, altitude, turn, vertical speed and airspeed indicators and compass. This does not constitute a problem now, because of the relatively low numbers of personal flights in all jurisdictions. Those few pilots, who regularly fly now, are ready to limit themselves to VFR time and weather conditions or to undertake an additional training for IFR. However, as the PAL-V, equipped with the modern GPS-based instruments enters the market and the number of people flying increases, a crisis of the current regulations is likely to occur. It will become clear for users, manufacturers and regulators that the safety offered by GPS-based instruments is far beyond traditional flight instruments and that it shall be possible for the ultralight pilots to use them during flight, take-off and landing on the small uncertified local airstrips. We must confess that there is no legal inconsistency or *lacuna* in the current IFR requirements, they are consistent, but simply too strict compared to the levels of safety of the modern flight instruments. Therefore, the natural test by the legal system, as described in Chapter 4 is not likely to occur. It will probably be a matter of public policy to distinguish GPS-based flight

instruments into a distinct category and to allow their use under ultralight pilot licenses and on the ICAO non-compliant aerodromes that currently operate under VFR only. Such policies will accommodate technological innovations already in place, such as GPS with the future technological advance, such as PAL-V.

Should the uniform standard for the ultralight aerodromes be established and the GPS-based IFR flights be allowed on small airfield, a big number of PAL-V pilots will be able to use most of the small aerodromes even after sunset. This will also enable large number of privately-operated existing airfields to be certified or at least to be placed on the floght charts. Once they receive official designation as aerodromes they will be able to serve as official points of transformation between aerial mode and surface mode of PAL-Vehicles for the purposes of aviation law. The ability to receive PAL-Vs and ultralight aircraft after sunset will also encourage landowners to develop more airstrips and to charge PAL-V operators for their use since there will be no need to maintain hangars or any other buildings to store aircraft. Therefore, the social impact of the mentioned legal innovation is likely to be complex and wide.

6.5. Crossing borders in PAL-V:

One more aspect of PAL-V use has to be examined. This is crossing of borders in PAL-Vs. While in some places, like Russia, Canada, or the United States, the majority of PAL-V users will never need to cross the border into a neighboring State, in smaller countries this may be an issue. Importing these vehicles should also be taking into consideration.

First of all we shall distinguish between crossing the border in aerial and in ground mode. It was discussed in the previous chapter that there is no specific status for the flying car set up in the current legal regulations across jurisdictions and it is unlikely one will be developed. Therefore, for legal purposes, PAL-vehicle crossing the border is viewed as two distinct objects, depending on what environment is used during the border crossing. In case of aerial mode, the procedure is more or less clear. The PAL-V is regarded as an ultralight aircraft making an international flight. The flight shall originate from an ICAO-certified aerodrome and filing of the flight plan is required. The aircraft will be given a time and location corridor within which it shall be able to perform the flight. The fundamental principle of state sovereignty over its borders is a basis for such procedures, unless an open border regime has been established between the states as it is the case in Schengen area of the European union. The flight will have to be completed at the aerodrome designated for international traffic. Customs and immigration clearance may be required for the vehicle and its crew and passengers at the designated customs zone of the destination aerodrome. It is likely that for the purpose of customs, PAL-V will be regarded as an aircraft.

It is possible that after clearance, the PAL-V will be able to continue a flight within the territory of the foreign state, subject to the valid airworthiness certificate and personal license of the pilot. All issues associated with the ultralight aircraft type and personal licensing were already discussed within this and the previous chapter. It is clear, that unless a specific agreement is reached between the states, only ICAO-compliant certificates and licenses are recognized automatically pursuant to the Chicago Convention.

If the vehicle crosses the border in ground mode, it is still considered an aircraft for customs purposes. If we recall the absorption principle, customs is likely to charge the higher

of two applicable duties. Even if an aircraft is temporarily disabled and carried on a truck, it is still considered to be able to fly and therefore is taxed accordingly. In Ukraine, for example, this would mean 20% VAT for each aircraft imported. There is still the question of how to deal with the car status of the PAL-V. In the same Ukraine, for example, cars are subjects to special excise duty which depends on the car type. The importer can refer, of course, to the principle of customs law which prohibits double taxation of the same object in two different customs categories. It is however, unclear, whether the PAL-V cleared as an aircraft will be able to drive on foreign roads. Especially if such vehicle is sold abroad and needs to be registered in the local car registry to get a license plate number. In many countries, registries will only register a motor vehicle if it has passed the customs clearance. In our case, a vehicle, cleared as an aircraft still remains uncleared as a motor vehicle. Another confusion may happen if there are passengers crossing the border in the PAL-V. If a plane crosses a border by air and carries passengers, it is considered an international flight with many legal norms applicable to it. If a car crosses a border and carries some passengers, another set of legal rules and procedures apply. If an aircraft crosses the border in a truck, it is considered goods and is subject to customs clearance under well-established procedures as well. Any passengers, who may accompany such aircraft travel in a truck cabin and therefore are considered to be crossing the border by ground transport. It is not clear what happens when some passengers cross the border in PAL-V by land. Physically, there is no difference between driving a car and a PAL-V to the border patrol station. Legally, however, PAL-Vs will be customs cleared as an aircraft, therefore passengers inside PAL-V may seem to have the same status as aircraft passengers. On the other hand, it is clear that in terms of safety and other characteristics, crossing borders in a PAL-V is much closer to crossing border in car

than to international flight. Therefore, we may see that current customs law, if applied to the PAL-V may suffer from the contradiction of overlapping laws. Therefore, legal innovation in the field of customs regulation will probably be necessary as soon as the PAL-V enters the market. Although for the purpose of certification there is no need to create a distinct type of transportation vehicle, such as PAL-V, for the purpose of customs, such a category may be necessary.

Interestingly enough, many countries actually have some references to the PAL-Vs already in their customs classifications. This is the result of adoption by many countries of the Harmonized Commodity Description and Coding System, which is developed and maintained by World Customs Organization. For example, there is a note in the US customs regulations that "Aircraft specially constructed so that they can also be used as road vehicles are classified under the appropriate heading of chapter 88 (aircraft)."[196] It is hard to imagine, what vehicles exactly were imagined by the law-makers in this rule, but it may be the basis for further legal norms in this field.

We can see that the international customs law makers took both environmentalist and absorption approaches, and decided that since an aircraft is more complicated machine and since PAL-V is first of all designed for the purpose of flight and then of driving. There is no new legal category created for the customs purpose, which it should be classified as, but the rule is introduced of how to interpret the existing ones. This is an approach, other jurisdictions may take, however the rule does not address inconsistencies with the passengers and further registration of the vehicle. Therefore, we may say that some initial specific law is necessary with regard to the customs regulations, so that the specific status of the PAL-V will

[196] *Harmonized Tariff Schedule of the United States* (2008) art. 4, Chapt. XVII - Supplement 1, online: <http://hotdocs.usitc.gov/docs/tata/hts/bychapter/0810c86.pdf>

be established. Otherwise, as the frequency of border crossing by PAL-V would increase, more people will face some inconsistencies of the existing regulations and the number of cases pursuant to this will increase. This will inevitably lead to the legal innovation in this field anyway. Therefore, as a matter of anticipation, some jurisdictions may choose to regulate these issues in advance, before the era of PAL-V has actualy arrived.

6.6. Conclusions:

In this chapter we reviewed international regulations concerning private pilot's licenses, carriage of passengers and cargo, rules of the air, aerodrome regulations and customs clearance of PAL-Vs. It was established that the pilot's requirements which may apply to the future PAL-V operators across jurisdictions vary significantly and are in general inconsistent. The main problem discovered is a factual presence of two legal regimes for ultralight operator licensing – a strict ICAO regime and more liberal national regimes.

International regulations applicable to future PAL-V carrying cargo are generally consistent and are based on *Montreal Convention*. It is relatively easy to establish when such carriage is regulated by an air law and when by a general Common or Civil law. There are more problems in the carriage of passengers. First, current law does not allow establishing when exactly the legal status of the carriage changes from air to road mode; second, many ultralight type certificates and personal licenses does not allow for carriage of passengers at all. This was considered a problem for the future distribution of PAL-Vs.

The rules of operation of the future PAL-Vs were briefly discussed. It was pointed out that the current ICAO and national regulations which prohibit Instrumental Flight Rules operation for ultralight aircraft are not aligned with the technical progress, such as development of GPS-based flight instruments such as Highway-in-the Sky.

A similar problem was discussed regarding aerodromes. ICAO does not distinguish special aerodromes for the light and ultralight aviation with less stringent requirements. Most of the small airstrips in most of the jurisdictions are not certified and are not allowed to accept IFR flights. The GPS-based approach and landing systems are not recognized by ICAO and therefore the airfields may only rely on expensive and complicated Instrument Landing System only if they want to accept IFR flights.

In the customs regulations with regard to border crossing by PAL-V, we have found first actual regulations on roadable aircraft, which are stipulated by the international Harmonized Commodity Description and Coding System. However, it does not make legal innovation and simply explains how the existing customs clearance regulations regarding aircraft and cars shall be applied. Several possible misinterpretations with further registration and passenger status were outlined as not addressed by the current regulations.

Legal innovation was proposed as a solution to most of these inconsistencies. It was proposed to establish a new pilot license category within ICAO framework which would be the ultralight aircraft pilot. Such pilots have to be given rights to operate under instrumental flight rules and to carry passengers while being subject to less stringent training and medical requirements than current Private Pilot License holders. If such international standards would be established, separate jurisdictions will have more incentive to liberalize and standardize

their national ultralight aviation requirements which will benefit the future manufacturing and distribution of PAL-Vs.

Existing regulations in this field of contract of carriage by PAL-V were regarded as efficient with only minor contradictions. Therefore, no major legal innovation was proposed but the new methods of interpretation of the existing law.

International and national requirements as for the carriage of passengers were deemed too strict and inconsistent with the pilot licensing requirements. Therefore it was proposed to link the new ultralight pilot license to the right of passenger carriage in ultralight aircraft and to take Italian approach as basis for such innovation. ICAO was targeted as the main possible legal innovator in this field.

It was further proposed to allow small airfields, which are not allowed to operate Instrumental Flights to accept flights operating under GPS-based instruments. Furthermore, introduction of a special international standard for an ultralight aircraft aerodrome was proposed.

The proposals outlined, however, were not the only outcome of this chapter. The most important thing is that we were able to answer the very first question of this research. Current aviation law regulations have a lot of inconsistencies regarding various aspects of PAL-V operations. Minor innovations, however, may change the situation in favor of the PAL-V users and producers. No fundamental change in aviation law is required to accommodate Personal Air-Land Vehicles. More specifically, these conclusions will be addressed in the final pages of this thesis.

7. Conclusions and Summary:

It is now time to draw conclusions from this brief paper. This research set two main goals: to understand how law generally responds to radical technical innovation and to predict what would happen to aviation law when the first machines equally capable of flying and driving would appear on the market. Would revolutionary technology of Personal Air-Land Vehicle trigger a revolution in existing aviation law? - that was the underlying question of the paper presented. Contrary to expectations, it was established that technical innovation does not automatically cause innovation in the field of relevant law. It was further established that current aviation law is generally comprehensive enough to regulate roadable aircraft should they be used widely, although some minor changes have to occur in order for such broad use to be possible at all. Let us briefly examine what brought us to these conclusions.

Description of the Personal Air-Land Vehicles (PAL-V), their history and modern development opened this research paper. Out of three main types of roadable aircraft one type with integrated design was chosen as a primary focus of this work. It was further claimed that current technological advances, crisis of the existing ground infrastructure and general tendency towards liberalization of air law made development of PAL-Vs not only possible but highly desirable. Several technical, economical and legal requirements, such as low price, reliability, attractive design, easy use and certification, and others were outlined as key prerequisites for the commercial success of the new vehicles. We could see that the current level of technological development, especially in the field of composite materials and electronics, allowed manufacturers to meet most of the technical specifications required while reducing the price significantly. Whether current system of air law was equally capable

to meet the legal requirements outlined, was not so clear. Therefore, two main research questions were outlined for this research.

Is the current framework of national and international aviation law a sufficient tool to support mass production and use of air-land vehicles? If it is insufficient, will it suffice to make minor changes to existing aviation law or does the whole concept of Civil Aviation law have to be revisited in a revolutionary manner? By answering these questions we intended to understand whether the current aviation law environment is friendly enough for PAL-Vs, should they appear on the market. However, an extensive theoretical investigation had to be carried out in order to answer these questions properly.

It was decided to start from the last question and to determine if a revolutionary technological innovation, which PAL-V will definitely be, will cause similar revolutionary changes in the aviation law concept. It was decided to look first into the examples of how law responds to the technological innovation in general and then to project this principle on the specific examples of PAL-V and aviation law.

We found that there are two main approaches legal system can take when a ground-breaking technological innovation occurs. New invention is either governed by existing legal norms which are interpreted in a way to address specific characteristics of the invention (so called analogy of law). Alternatively, the new legal norms may be specifically created to regulate new invention in the most efficient way. We further defined that in the system of Common law, analogy is more likely to occur, while Civil law is more predisposed towards legal innovation. Several theories of how legal analogy works in Common law legal systems were presented with the multiple-constraints theory and deduction theory being the most viable examples. It was observed that judges using the deductive approach are usually able to

apply the existing law to the new cases in a more instant way. At the same time, judges influenced by multiple constraints are disposed to give very different opinions to similar cases, which in case of extensive practice becomes a problem. In Civil law, the possibilities of interpretation by judge are rather limited, therefore, it is even harder to apply the existing law to the new technological advance.

We further explored how exactly the legal innovation takes place as a result of innovation in technology. After studying the examples from three eras of technological development, such as invention of the printing press, aircraft and Internet, we reached the same conclusions. It was established that in any legal system there are at least 3 stages of new law creation, by the legislative power of a given jurisdiction: creation of the initial specific law in the form of statute; correlation between initial specific law and public policy (done either by case law or public discussion) and creation of the subsequent specific law in the form of statute which is more stable than the initial one. Adaptation period, analogy of the existing law and a crisis of the existing law precede such legal innovation.

After we understood that the law responds to technological advance not in a simple way but through complicated multiple-stage processes, it was possible to define why in some cases relatively insignificant inventions trigger revolutions in the related fields of law, while in some cases, real paradigm-shifting technological innovations contributed to very little change in the legal field. The conclusion was reached that in order for the new legal paradigm to emerge it is not enough to have a ground-breaking invention which would change lives of millions of people, that invention must also produce many new social relations in various spheres of life, to create a new legal paradigm. In other words, lives of millions have to be changed in many different respects, and not just in one. It was held that

the PAL-V will make a paradigm shift in the field of transportation, but it is not likely to change social relations significantly in other aspects of human life. As a conclusion, new paradigm of aviation law will not arise as a result of PAL-V appearing on the market, just a new area of practice is likely to appear. In summary, this theory of legal innovation may be found in the algorithm which is Annex 1 to this paper.

After the theoretical background was established and one of the questions was partly answered, the paper addressed more empirical research in the field of aviation law. The main question remaining was whether the current law across various jurisdictions is acceptable for the nature of the PAL-V and if there are significant legal obstacles for the global distribution of PAL-V. We also had to answer how much legal innovation is needed in order to make it more PAL-V friendly.

In the second part of the paper we have studied the existing laws across various jurisdictions regarding such aspects of PAL-V use as type certification, personal licensing, passenger carriage, rules of operation, infrastructure and border crossing. First we looked at the existing multi-environment vehicles, such as amphibious cars, and outlined four main methods of distinguishing which law should regulate such a vehicle in each applicable environment and how do such applicable legal regimes replace one another when the vehicle changes environments. The assumption was made that the dualist approach was the most applicable for the PAL-V and therefore there will be two types of certificates and two types of personal operator's licenses applicable to the vehicle – one for a car and another –for the ultralight aircraft. At the same time it was made clear that there is no need in the current international law and national laws for the specific legal status of roadable aircraft.

Nevertheless, it was determined that there are many contradictory provisions in the existing laws which may become obstacles to the smooth introduction of PAL-V to the world markets. While regulations applicable to PAL-Vs in their ground mode are more or less established and consistent, this is not the case for ultralight aircraft regulations. Rules of ultralight aircraft certification and personal pilot licensing for such aircraft are not specifically addressed by international aviation law within the ICAO framework. The *Chicago Convention* and its Annexes simply ignore the differences between ultralights and the rest of general aviation. As a result, each jurisdiction regulates ultralight aviation in its own way, not necessarily in consistence with each other and ICAO requirements. This is also true for the legal regulation of small airstrips, which are used by the ultralight aircraft. We discovered that current ICAO regulations do not at all address such technological advance as GPS-based flight instruments and do not distinguish them from other flight instruments. This, in turn, significantly limits possibilities of modern ultralight aircraft, including future PAL-Vs, and their pilots which are normally not authorized to fly under Instrumental Flight Rules within their current definition. Carriage of passengers by ultralights is another issue, which lacks uniform and adequate regulation in modern aviation law. International customs law attempts to foresee the appearance of the roadable aircraft, but it still refers to the existing legal categories and does not address many issues of border crossing by PAL-Vs.

As a result of the aforementioned, it may be difficult for the manufacturers to make PAL-Vs, which satisfy diverse certification requirements across jurisdictions. It may be even harder for the PAL-V user to operate the machine across several jurisdictions.

In summary, in the second part of this work it was established that current aviation law does not have to change significantly to accommodate a PAL-V *per se*. Instead, it is time

for ICAO-sponsored aviation law to acknowledge the rapid development of ultralight aviation, which PAL-V will be a part of.

Legal innovation was proposed as a method for such improvements. It was proposed to establish a new ultralight pilot license category within the ICAO framework. Such pilots have to be given rights to operate under instrumental flight rules and to carry passengers while being subject to less stringent training and medical requirements than current Private Pilot License holders. It was further proposed to allow small airfields, which are not allowed to operate Instrumental Flights, to accept flights operating under GPS-based instruments. Furthermore, introduction of a special international standard for the ultralight aircraft aerodrome was suggested.

Therefore, the first question of the research appeared to be answered. Although the paradigm of the existing aviation law is generally able to accommodate PAL-Vs, many minor changes will have to be done on international level.

Speaking more broadly, the following most important conclusions may be derived from both the first and second parts of this paper:

1. New legal norms resulting from innovation may or may not result in a new paradigm of law, depending on how extensively they are used compared to existing legal norms, and not depending on the nature of invention;

2. The new legal norms resulting from innovation follow similar stages of development, irrespective of the nature of innovation itself;

3. Although development of the PAL-V is a clear paradigm shift in technology and science it will not directly cause paradigm shift in the field of aviation law;

4. Personal-Air Land vehicles will be simultaneously regulated by the norms of current aviation law and norms applicable to road transport. Current methods of law make it possible to apply these existing legal regulations without major contradictions, therefore there is no need for a specific law on roadable aircraft.

5. Although within each given jurisdiction aviation law and automotive regulations are consistent, this is not the case on the international level.

6. Lack of specific international law on PAL-V does not constitute a problem for the vehicle distribution on international level, while the absence of specific law on ultralight aircraft does.

7. The international community has to adopt a number of minor innovations to the existing aviation law, specifically addressing ultralight aviation, which would benefit thousands of current ultralight aircraft pilot today and millions of PAL-V users tomorrow.

The flying car is still a dream. No one can say for sure when the first operator will take the first passenger on the first ride by Personal Air Land Vehicle. Even though, it may not be a bad idea to review this paper even before such a paradigm-breaking event of world's transportation will take place. I hope that the brief exploration of the various legal theories may be useful for anyone who tries to fit the unusual new innovation into the existing, conventional legal framework. This thesis may also be interesting for a reader with a specific passion for the present and future of general ultralight aviation. There are many complications caused by the modern national and international law in this field. I would hope that this work will help us, at least to a certain extend, to cope with some of them and to say one day "Yes, We are able to drive in the sky."

Bibliography:

I. International Legal Instruments:

1. *Convention Relating to the Regulation of Aerial Navigation Signed at Paris*, 13 October, 1919, online: <http://www.aviation.go.th/airtrans/airlaw/1914.html>
2. *Convention for the Unification of Certain Rules Relating to International Carriage by Air,* October 12, 1929 [Warsaw Convention], online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/private/>
3. *World Intellectual Property Organization Copyright Treaty*, December 20, 1996, online: World Intellectual Property Organization <http://www.wipo.int/documents/en/diplconf/distrib/94dc.htm>
4. *The Berne Convention for the Protection of Literary and Artistic Works,* September 9, 1886, , online: World Intellectual Property Organization <http://www.wipo.int/treaties/en/ip/berne/trtdocs_wo001.html>
5. *The Ibero-American Convention relating to Air Navigation,* November 1, 1926 [Madrid Convention];
6. *The Pan American Convention on Commercial Aviation,* February 20, 1928 [Havana Convention];
7. *Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air,* September 28, 1955, [Hague Protocol]; online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/private/>

8. *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*, March 8, 1971,[The Guatemala City Protocol]; online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/private/>
9. *Montréal Protocol No. 4 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,* September 25, 1975, [Montreal Protocol # 4], online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/private/>
10. *Convention on International Civil Aviation,* December 7, 1944, [Chicago Convention], online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/public/>
11. *Convention for the Unification of Certain Rules for International Carriage by Air,* May 28, 1999, [Montreal Convention]; online: McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/private/>
12. *Convention on Road Traffic done in Vienna,* 8 November, 1968, online: UNESE <http://www.unece.org/trans/conventn/crt1968e.pdf>
13. *Geneva Convention on Road Traffic,* 19 September, 1949, (entered into force on 26 March 1952) online: <http://www.geocities.com/bkkriders/law/unc/road1949.html>
14. *Convention for the Suppression of Unlawful Seizure of Aircraft,* December 16, 1970 [Hague Convention], Art.3, McGill Institute of Air and Space Law <http://www.mcgill.ca/iasl/research/treaties/air_law/public/>

II. National and International Statutory Law:

1. Digest XLIII. 24.22.2
2. *Children's Online Privacy Protection Act*, 15 U.S.C. § 6501–6506, 1998, [*COPPA*]
3. *Child Online Protection Act,* 47 U.S.C. 231, 1998, [*COPA*]
4. *Utah Digital Signatures Act*, Utah Code §§ 46-3-101 to 46-3-504, 1995, ch. 61
5. *"No Electronic Theft"* Act, 17-18 U.S.C. 105 P.L. 147; 111 Stat. 2678; 1997 Enacted H.R. 2265; 105 Enacted H.R. 2265
6. *Loi n°2006-961 du 1 août 2006 relative au droit d'auteur et aux droits voisins dans la société de l'information (1),* NOR: MCCX0300082L, 2006, online: Legifrance <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000266350&dateTexte=>[France]
7. *Copyright Act 1911*, online: Office of Public Sector Information <http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1911/cukpga_19110046_en_1> [Great Britain]
8. *TP 11717 - Standards for the Construction and Inspection of Small Passenger Vessels; Hull Construction Regulations; TP 7301 - Stability, Subdivision and Load Line Standards; TP 1332 - Construction Standards for Small Vessels; Small Vessel*

Regulations. (retrieved from *Special Purpose/Non-conventional Vessels* (2007), online: Transport Canada <http://www.tc.gc.ca/marinesafety/CES/small-commercial-vessels/Amphibious.htm>

9. *Insurance (Vehicle) Act, Insurance (Vehicle) Regulation* (1983), B.C. Reg. 447/83 O.C. 1897/83 [includes amendments up to B.C. Reg. 341/2007, November 8, 2007], online: <http://www.qp.gov.bc.ca/statreg/reg/I/InsurV/InsurV447_83/447_83_01.htm>
10. Australia, *Customs Regulations* (Amendment) (1991), No. 30, retrieved from http://www.austlii.edu.au/au/legis/cth/num_reg_es/cr1991n30340.html
11. *Annex 6 to the Convention on International Civil Aviation* (8-th. ed. 2001) [Chapt. 1 "Definitions"]
12. *General Standards relating to the Design, Construction and Operational Safety Certification of Air Cushion Vehicles (A.C.V's) in Canada*, TP 5579 E, online: Transport Canada <http://www.tc.gc.ca/marinesafety/TP/Tp5579/general-stand.htm> ;
13. *Air Cushion Vehicles, Standards for the Construction of "Light" Air Cushion Vehicles – Under development*, online: Transport Canada <http://www.tc.gc.ca/MarineSafety/CES/Small-Commercial-Vessels/ACV.htm>
14. *Interim Guidelines for wing-in-ground (WIG) craft* (2002), MSC/Circ.1054 [approved by the Maritime Safety Committee at its 76th session], online: International Maritime Organization <http://www.imo.org/Safety/mainframe.asp?topic_id=757>
15. EC, *European Parliament and of the Council Directive 2001/29/EC of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society*, [2001]OJ L167, , corrected by OJ L006 of 10 January 2002, p. 70.
16. *Title 14: Aeronautics and Space, Part 103—Ultralight Vehicles,* 49 U.S.C. 103 ; online: GPO Access <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=550836984d4438af2f5c15d80dff5c99&rgn=div5&view=text&node=14:2.0.1.3.16&idno=14 >
17. *Title 14: Aeronautics and Space, Part 1—Definitions and Abbreviations,* 49 U.S.C. 1 [Doc. No. 1150, 27 FR 4588, May 15, 1962], online: GPO Access <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?type=simple;c=ecfr;cc=ecfr;sid=21f49c4d694094f9387b08cea878eb59;region=DIV1;q1=Light-sport%20aircraft;rgn=div8;view=text;idno=14;node=14%3A1.0.1.1.1.0.1.1>
18. *Ultra-light Aeroplane Transition Strategy*, online: Transport Canada <http://www.tc.gc.ca/civilaviation/general/recavi/Ultralight/ULTransitionStrategy/menu.htm
19. European Aviation Safety Agency. *Decision NO. 2003/17/RM of the Executive Director of the Agency of 14 November 2003 on certification specifications for very*

light rotorcraft (« CS-VLR »), online: EASA <http://www.easa.eu.int/doc/Agency_Mesures/Certification_Spec/decision_ED_2003_17_RM.pdf >

20. Joint Aviation Authorities. *Joint Aviation Requirement (JAR)-1: Definitions and Abbreviations,* 1 November, 2004, online: JAA< http://www.jaa.nl/publications/jars/500969.pdf>
21. *FAQ-Ultralight,* online: West Wind Aviation Services Ltd <http://microlight.in/index_files/faqs.htm>
22. Australian Government, Civil Aviation Safety Authority, *Civil Aviation Safety Regulations 1998,* 1st Ed. 2003 [CASR 1998], online: <http://www.casa.gov.au/rules/1998casr/index.htm>
23. Civil Aviation Authority of New Zealand, *Civil Aviation Rules.* Parts 91; 103. online: <http://www.caa.govt.nz/GA/GA.htm>;
24. Civil Aviation Authority of New Zealand, *Guidance Notes for Microlight Importers, Assemblers and Builders* (21.01.2005), online: <http://www.caa.govt.nz/ga/sport_&_rec/guide_for_micro_importers.pdf>
25. *МІНІСТЕРСТВО ТРАНСПОРТУ УКРАЇНИ Н А К А З Про затвердження Положення про організацію та виконання демонстраційних польотів (Положення, гл.2)* (Ministry of Transportation of Ukraine, Order on Statute of Organization and Performance of Demonstrational Frights), 08.04.2003 N 269 [translated by author];

26. *ДЕРЖАВНА СЛУЖБА УКРАЇНИ З НАГЛЯДУ ЗА ЗАБЕЗПЕЧЕННЯМ БЕЗПЕКИ АВІАЦІЇ Н А К А З Про затвердження Правил сертифікації авіаційних навчальних закладів цивільної авіації з підготовки льотного складу в Україні* (Ukrainian Aviation Security Service, Order On Rules of Certification of Civil Aviation Schools a for the Pilot's Training in Ukraine) від 17.08.2005 N 606 [translated by author], online: Zakony Ukrajiny <http://uazakon.com/big/text1502/pg1.htm>

27. *ФЕДЕРАЛЬНЫЕ АВИАЦИОННЫЕ ПРАВИЛА, Эксплуатанты авиации общего назначения. Требования к эксплуатанту авиации общего назначения, процедуры регистрации и контроля деятельности эксплуатантов авиации общего назначения,* УТВЕРЖДЕНЫ приказом Минтранса России от 18 июня 2003 г. № 147 (с изменениями и дополнениями, внесенными Приказом МИНИСТЕРСТВА ТРАНСПОРТА РОССИЙСКОЙ ФЕДЕРАЦИИ от 28 мая 2005 г. N 55) (General Aviation Operators. Requirements to General Aviation Operators. FEDERAL AVIATION RULES, approved by the Order of Russian Ministry of Transportation of 18.07.2003 No. 147 as amended by Order of Ministry of Transportation of Russian Federation of 28.05.2005 No. 55) [translation by author], online: Fly Center http://www.flycenter.ru/pages/fap_01072005.doc

28. *Canadian Aviation Regulations 2008-1; Part IV - Personnel Licensing and Training,* online: Transport Canada < http://www.tc.gc.ca/CivilAviation/Regserv/Affairs/cars/Part4/menu.htm>

29. *Title 14: Aeronautics and Space, Part 61: Certification: Pilots, Flight Instructors, and Ground Instructors; Subpart J: Sport Pilots; Subpart D: Recreational Pilots; Subpart E: Private Pilots*. 49 U.S.C. 61(j;d;e), online: GPO Access <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=40760189a03dfea0b501608f33820a45&rgn=div5&view=text&node=14:2.0.1.1.2&idno=14#14:2.0.1.1.2.10>

30. *Програма підготовки пілота та пілота - інструктора надлегкого повітряного судна*, online: Всеукраинская Ассоциация Аэроклуб Украины <http://www.aeroclub.kiev.ua/association/study/index.html> (Ultralight aircraft training program for pilot and instructor-pilot) [translated by author].

31. *CAP 493 Manual of Air Traffic Services Part 1*, Art.2 Chapt. 2, online: Civil Aviation Administration <http://www.caa.co.uk/docs/33/CAP493PART1.PDF>

32. *Про затвердження Правил допуску до експлуатації злітно-посадкових майданчиків для польотів легких повітряних суден,* Наказ Державіаслужби від 01.12.2004 N 205, ст. 2.1; 2.2 (Civil Aviation Administration of Ukraine, Order "On Rules of Permission for Airstrips for Light Aircraft) [translation by the author]

33. *Federal Aviation Regulation, Notice of Construction, Alteration, Activation, and Deactivation of Airports*, 14 U.S.C. 157, online: FAA <http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfr157_02.html>

34. *Harmonized Tariff Schedule of the United States* (2008) art. 4, Chapt. XVII - Supplement 1, online: <http://hotdocs.usitc.gov/docs/tata/hts/bychapter/0810c86.pdf>

III. National Case Law:

1. *The Schooner Exchange v. McFadden and others*, (1812) 7 Cranch (11 U.S.) 116
2. *Fay v. Prentice* 1 C.B. 828, 36 Digest 162
3. *Electric Telegraph Co. v. Overseers of Salford* 11 Exch. 181, 156 Eng. Rep. 795
4. *Ellis v. Loftus Iron Co* (1874), 10 C.P. 10
5. *Wandsworth Board of Works v. United Telephone Co* 13 I.B.D. 104.
6. *Lyman v. Hall* (1836), 11 Conn. 177
7. *Smith v. Smith* (1872), 110 Mass. 302
8. *Hannabalson v. Sessions* (1902), 116 Iowa, 457; 90 N.W. 93
9. *Butler v. Frontier Telephone Co* (1906), 186 N.Y. 486; 79 N.E. 716

10. *The Ann*, (1812) 1 Federal Cases, 926, 2 Cranch 187
11. *Washington Post Co. v. Total News, Inc.,* (1997) 97 Civ. 1190 (S.D.N.Y.), online: AOL Legal Department, <http://legal.web.aol.com/decisions/dlip/wash.html>
12. *Bourke v. Nissan Motor Corp.,* (July 26, 1993) No. B068705 (Cal. Ct. of Appeals, 2nd Dist.), (not published), online: <http://www.tomwbell.com/NetLaw/Ch05/Bourke.html>
13. *Spevack v. National Community Bank of N.J.*(1996) 677 A.(2d) 1168, online: The UCLA Online Institute for Cyberspace Law and Policy, <http://www.gseis.ucla.edu/iclp/csth.html>
14. *U.S. v. Thomas* (1996) 74 F. (3d) 701 (6th Cir.)
15. *Cubby v. CompuServ* (1991)776 F. Supp. 135
16. *Criminal case v. SOMM, Felix Bruno for the dissemination of pornographic writings*. Local Court [Amtsgericht] Munich, File No.: 8340 Ds 465 Js 173158/95, online: Cyber Rights and Cyber Liberties, <http://www.cyber-rights.org/isps/somm-dec.htm>
17. *Westmoreland & Cambria Natural Gas Company v. DeWit* (1889) 18 A. 724, 725
18. *Pierson v. Post*, (1805) 3 Cai. R. 175, 2 Am. Dec. 264[1] (N.Y.)
19. *Millar v. Taylor* (1769), 4 Burr. 2303, 98 Eng. Rep. 201
20. *Hinton v. Donaldson,* Edinburgh (1773), online: Primary Sources of Copyright <http://copyright-project.law.cam.ac.uk/cgi-bin/kleioc/0010/exec/ausgabe/%22uk_1773%22>
21. *Donaldson v. Beckett* (1774), 2 Brown's Parl. Cases 129, 1 Eng. Rep. 837; [1774] 4 Burr. 2408, 98 Eng. Rep. 257; [1813] 17 Cobbett's Parl. Hist. 953
22. *&M Records, Inc. v. Napster, Inc.* (2001), 239 F.3d 1004 (9th Cir.)

IV. Journal Articles:

1. Paul C. L. Tang, PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association, Vol. 1 (1984) at 125-136 (JStore)
2. T. J. Pinch, "Kuhn - The Conservative and Radical Interpretations: Are Some Mertonians 'Kuhnians' and Some Kuhnians 'Mertonians'?" (1997) 27 No. 3 Soc. Stud. Sci, 465-82
3. James E. Robertson, "Houses of the Dead: Warehouse Prisons, Paradigm Change, and the Supreme Court," (1997) 34 Hous. L. Rev. 1003.
4. Randy E. Barnett, "Restitution: A New Paradigm of Criminal Justice" (1977) 87 No.4. Ethics 279-301
5. Thomas J. Misa, "Theories of Technological Change: Parameters and Purposes" (1992) 17 No.1. Sci. Tech. & Hum. Values 3-12.
6. Ulrich Hilpert, "Techno-Industrial Innovation, Social Development, and State Policies" (1990) 11 No.1 Int. Pol. Sci. Rev. 75-86.

7. Virginia Gray. “Innovation in the States: A Diffusion Study” 67 No.4 Am. Pol. Sci. Rev. 1174-1185.
8. W.E. Diewert, “The Effects of an Innovation: A Trade Theory Approach” (1987) 20 No.4 Can. J. Econ. 694-714
9. Jonathan Gershuny, “Technology, Social Innovation, and the Informal Economy” (1987) 493Annals Am. Acad. Pol. & Soc. Sci. 47-63.
10. Richard B. Stewart. “Regulation, Innovation, and Administrative Law: A Conceptual Framework” (1981) 69 No.5 Cal. L. Rev. 1256-1377.
11. Dan Hunter, “Reason is Too Large: Analogy and Precedent in Law” (2001) 50 Emory L. J. 1197-1264
12. Larry Alexander, “Bad Beginnings” (1996) 145 U. Pa. L. Rev. 57, 87;
13. Larry Alexander, “Constrained by Precedent” (1989) 63 S. Cal. L. Rev. 1
14. Ronald Dworkin, “In Praise of Theory” (1996) 29 Ariz. St. L. J. 353
15. F.M.Kamm, “Theory and Analogy in Law” (1996) 29 Ariz. St. L. J. 405, 413-414
16. Katja Langenbucher, “Argument by Analogy in European Law” (1998) C. L. J. 57(3), at 481-521
17. Joseph Louis Elzéar Ortolan, “Le Paysan combatant l’invasion’’ *Revue des cours litteraires de la France et del’etranger*, 1870-71 753-61
18. Philip J. Weiser, “Internet Governance, Standard Setting, and Self-Regulation”(2001) 28 N. Ky. L. Rev. 822
19. Frank H. Easterbrook, “Cyberspace and the Law of the Horse” (1996) U. Chi. Legal F. 207
20. Joseph H. Sommers, “Against Cyberlaw” (2000) 15:3 Berkley Tech. L. J., online: <http://www.law.berkeley.edu/journals/btlj/articles/vol15/sommer/sommer.html>
21. William Fielding Ogburn, “How Technology Changes Society” (1947) 349 Annals Am.Acad.Pol.& Soc.Sci. 81-88.
22. I. Khan & Adam Wierzbicki, eds. “Foundation of Peer-to-Peer Computing” (2008) 31 Issue 2 Science Direct 187-418.
23. TenHouten, W. D. , *Primary Emotions and Social Relations* (2006) [Paper presented at the annual meeting of the American Sociological Association, Montreal Convention Center, Montreal, Quebec, Canada Online, 2008], online: All Academic Research <http://www.allacademic.com//meta/p_mla_apa_research_citation/1/0/2/5/6/pages102568/p102568-4.php>;
24. Michael C. Mineiro, “The United States and the Legality of Outer Space Weaponization: A Proposal for Greater Transparency and a Dispute Resolution Mechanism” (2008) Ann Air & Space L 441-466

V. Books and Other Printed Materials:

1. Kuhn, T.S. “Second Thoughts on Paradigms”, in Suppe ed., *The Structure of Scientific Theories* 459-82 (1974)

2. Kuhn, Thomas S., *The Structure of Scientific Revolutions*, (Chicago: University of Chicago Press, 1962)
3. Edward H. Levi, *An Introduction to Legal Reasoning* (Chicago: University of Chicago Press, 1961), at 9-27.
4. Keith J. Holyoak & Paul Thagard, *Mental Leaps: Analogy in Creative Thought* (Boston: MIT Press, 1995), at 19-20
5. Joseph Lowenstein, *The Author's Due: Printing and the Prehistory of Copyright*, (Chicago:University of Chicago Press, 2002)
6. Brad Sherman & Lionel Bently, *The Making of Modern Intellectual Property Law: The British Experience, 1760-1911* (Cambridge: Cambridge University Press, 1999).
7. John Cobb Cooper, *Flight and Sovereignty, A Historical Survey* (1965) [unpublished, archived at the library of Institute of Air and Space Law of McGill University].
8. Henry Wheaton, *Elements of International Law*. The literal reproduction of the edition of 1866 by Richard Henry Dana, Jr. Edited with noted by George Grafton Wilson, Oxford/London (1936) (Classics of International Law No. 19 – Carnegie Endowment for International Peace), pt. II, chap. 4, sec. 187, p. 226.
9. Jules Charles Guelle, *Précis des lois de la guerre sur terre* … (Paris:1884)
10. Johann Kaspar Bluntschli, *Das moderne Völkerrecht der civilisirten staten*, (Nördlungen: 1878) at 28
11. Karl Binding, *Handbuch des Strafrechts*, (Liepzig: 1885)
12. Karl Ludwig von Bar, *Lehrbuch des internationalen privat-und strafrechts*, (Stuttgart, 1892) at 338
13. Alfred M.V. Chrétien, *Principes de droit international public*, (Paris:1893), 117-18
14. Francois Piétri, *Étude critique sur la fiction d'exterritorialite*, (Paris :1895), 14-16
15. Masterman, M., "The Nature of a Paradigm", in Lakatos & Musgrave, eds., *Criticism and the Growth of Knowledge* (Cambridge: Cambridge University Press) 59-90
16. Andrew Stephenson, *A History of Roman Law: With a Commentary on the Institutes of Gaius and Justinian* (Buffalo: Wm. S. Hein Publishing, 1992) at 452-453
17. Joseph Lowenstein, *The Author's Due: Printing and the Prehistory of Copyright* (Chicago: University of Chicago Press, 2002) at 52-82.
18. Carlos Alberto Rohrmann, Electronic Promisory Notes (LL.M. Thesis, UCLA School of Law, 1999) [unpublished].
19. Clare Pettitt *Patent Inventions – Intellectual Property and the Victorian Novel* (Oxford: Oxford University Press, 2004).
20. Повесть времяньныхъ летъ ("The Russian Primary Chronicle")(Kiev: circa 1113), online: University of Oregon <http://www.uoregon.edu/~kimball/chronicle.htm>

VI. Online Sources:

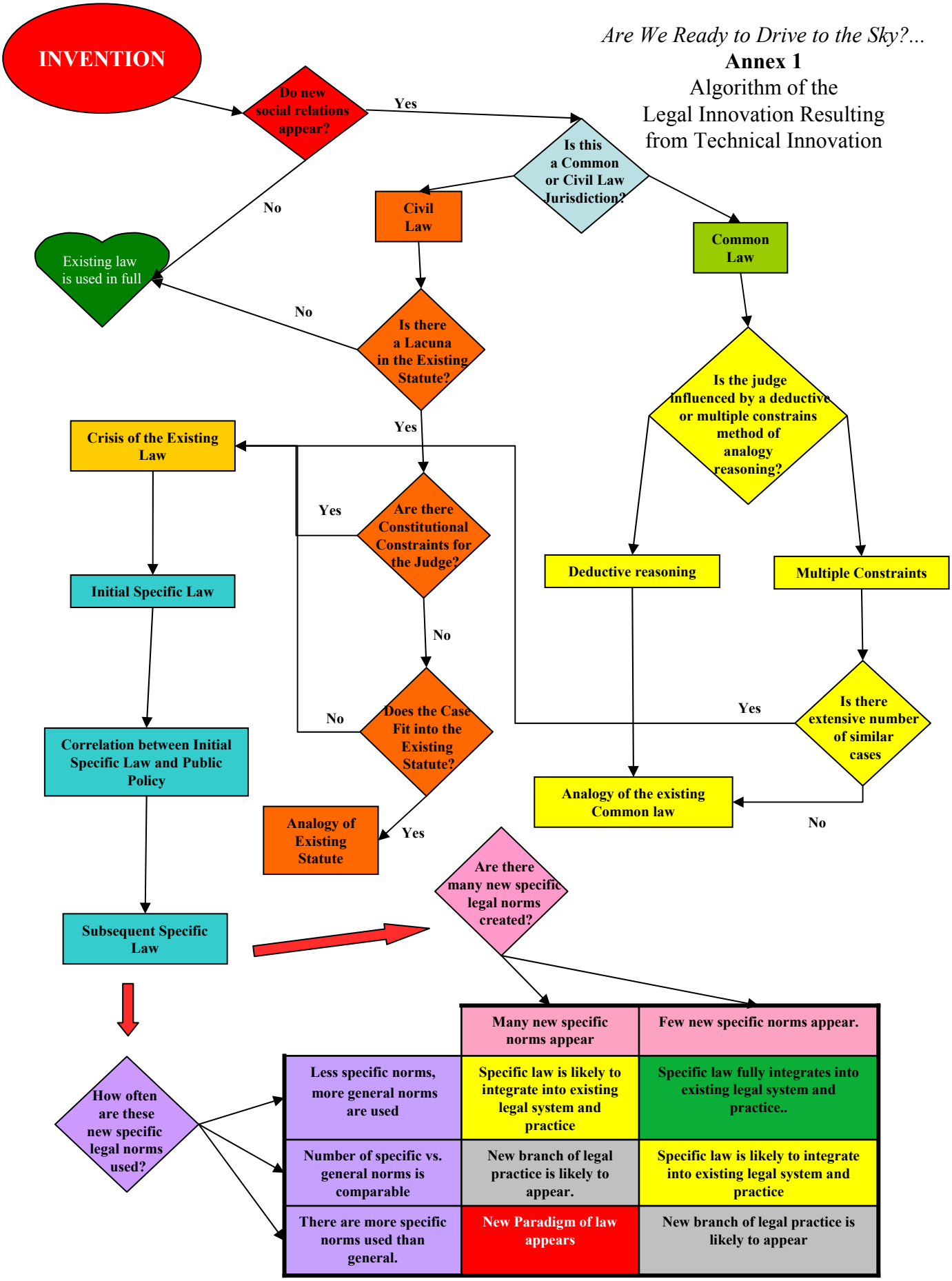
1. Ralph Cooper, *Waldo Waterman*, online: The Early Birds of Aviation Inc. <http://www.earlyaviators.com/ewaterma.htm>
2. Bob Sillery, *Looking back at Henry Ford's Flivver* (2001), online: <http://www.popsci.com/military-aviation-space/article/2001-12/looking-back-henry-fords-flivver>
3. Bob Blake, *Cars that fly…Cars that float,* (2005), online: The Rumage Box <http://www.aaca.org/publications/rummagebox/2005/spring/spring05c.htm>
4. Kal Lahue, "Mitzar Flying Pinto" in *Peterson's Complete Ford Book*, (3rd ed. 1973), online: <http://www.fordpinto.com/mitzar1.htm>
5. Boeing, *Boeing 787 Dreamliner Will Provide New Solutions for Airlines, Passengers*, online: Boeing <http://www.boeing.com/commercial/787family/background.html>
6. NASA, *NASA's Aerospace Technology Enterprise Goals for General Aviation*, online: Gaserving America <http://www.gaservingamerica.org/library_pdfs/AEROSP_1.PDF>
7. „Highway in the Sky program by NASA" at: NASA, *3-D Highway in the Sky* (2005), online: NASA <http://www.sti.nasa.gov/tto/Spinoff2005/t_2.html>
8. Paul S. Moller, *Airborne Personalized Travel Using "Powered Lift Aircraft*"(May 16, 2000), online: <http://www.skyaid.org/Skycar/Media/airborne_personalized_travel.htm>
9. PAL-V Europe, *Why this is Possible Now*, online: <http://www.pal-v.com>
10. *Flying Cars*, online: <http://www.roadabletimes.com/>
11. *Replace Your Car and Plane with a TAS-102 Flying Motorcycle*, online: Trans Air Systems, <www.flyingmotorcyclecompany.com>
12. KP Rice, *Volante. The Flying Car is Here!*,online: <www.volanteaircraft.com>
13. *Craft*, online: Aerocycle, <www.wolffaerocycle.com>
14. Moller International, *The Skycar*, online: <www.moller.com>
15. Urban Aeronautics, *X-Hawk: The Revolutionary, Modular, VTOL Aircraft*, online: <www.urbanaero.com/Urban_Main.htm>
16. Margaret Chon, *Introduction to Cyberspace and Law The Relation of Law to Cyberspace and of Cyberspace to Law*, online: Learning Cyberlaw in Cyberspace <http://www.cyberspacelaw.org/chon/index.html>
17. Davis Graham & Stubbs LLP, *A Primer on Foreign Sovereign Immunity* (March 8, 2006), online: Worldwide Legal Directories <http://www.hg.org/articles/article_1223.html>
18. Masaki Hamano, *Comparative Studies in the Approach to Jurisdiction in Cyberspace,* online: Cyber Jurisdiction <http://www.geocities.com/SiliconValley/Bay/6201/>
19. *Glossary,* online: Texas State Library and State Commission <http://www.tsl.state.tx.us/ld/pubs/compsecurity/glossary.html>
20. Guillaume Champeau, *Universal and blanket licensing,* online: P2PNet <*http://www.p2pnet.net/story/10393*>
21. *Encyclopædia Britannica* (2008), s.v. "amphibious vehicle", online: Encyclopædia Britannica Online: <http://www.search.eb.com/eb/article-9007239>

22. *Social Relation*, online: Wikipedia <http://en.wikipedia.org/wiki/Social_relation>
23. Lubar S. "Was This America's First Steamboat, Locomotive, and Car?" *Invention and Technology Magazine* V.21, Issue 4 (Spring 2006), online American Heritage.com <http://www.americanheritage.com/articles/magazine/it/2006/4/2006_4_16_print.shtml>
24. *About the Original & World Famous Boston Duck Tours*, online, Boston Duck Tours <http://www.bostonducktours.com/>
25. Malnig Helmut W. „Das erste Luftkissenfahrzeug der Welt von k.u.k. Lschlt. Dagobert Müller von Thomamühl" (2001)146, n°3, ÖIAZ 96-101 (abstract), online: INIST <http://cat.inist.fr/?aModele=afficheN&cpsidt=1088767>
26. London Ducktours, *About us*, online: <http://www.londonducktours.co.uk/aboutus.htm>
27. *Hovercraft Regulations*, online: Hovercraft Central <http://www.hovercraftcentral.com/article/hov_regs.html
28. Jeff Scott, *Ground Effect and WIG Vehicles*, online: Aerospaceweb <http://www.aerospaceweb.org/question/aerodynamics/q0130.shtml>
29. *The National Private Pilot License*, online: <http://www.nppl.uk.com/index.html>
30. *Pilot Licencing, General Requirements*, online: European Microlight Federation <http://www.emf.nanco.no/Flying%20over%20Europe/EMF%20Licencing.htm>
31. The Bartlett School, University College London, *General Aviation Small Aerodrome Research Study* (September 2004), online: The General Aviation Awareness Council <http://www.gaac.co.uk/gasar/GASAR_AerodromeCategorisation.pdf>
32. *Final report to the CAA Executive Committee* (2006-01-16) p. 1, para. 1.1. online: CAA <http://www.caa.co.uk/docs/17/srg_asd_laasgfinalreport_16-01-06.pdf>
33. *The Future of GA in America, Navigating the Future*, online: Gaserving America <http://www.gaservingamerica.org/future_navigation.htm>

Are We Ready to Drive to the Sky?...

Annex 1

Algorithm of the
Legal Innovation Resulting
from Technical Innovation



Annex 2

Requirements for Ultra-light Aircrafts and Their Pilots in Different Jurisdictions

(online: European Microlight Federation http://www.emf.nanco.no; edited and supplemented by the author based on relevant sources from Chapters 5 and 6)

Characteristic / Country	Max. Take-off weight (kg.)	Maximum number of Seats	Max. Stall Speed	Minimum age to fly (years)	Hours of flight before exam	Medical Certification for pilot	Theoretical knowledge required for pilot*	Minimal flight distance during exam (km.)
Belgium	300-495	1-2	65 km/h	16	50	JAR-FCL cl. III	3, 4, 5, 6	40
Czech Republic	300-495	1-2	65 km/h	15	5	JAR-FCL cl. II	1 to 9 (exept 8)	400
France	300-495	1-2	65 km/h	15	None	no	1,3,6	
Germany	300-495	1-2	65 km/h	17	12	JAR-FCL cl. II	1,2, 3,5 6,7,8	200
Ireland	300-495	1-2	65 km/h	17	12	JAR-FCL cl. II	1 to 9	
Italy	300-495	1-2	65 km/h	16	None	yes	1,3,4,5,6,8	
Lithuania	300-495	1-2	65 km/h	16	10	Driver's license		300
Netherlands	300-495	1-2	65 km/h	16	20	JAR-FCL cl. II	1 to 9	To another field
Norway	300-495	1-2	65 km/h	17	12	Yes	1,3,4,5,6,7,8	200
Portugal	300-495	1-2	65 km/h	17	6-12	JAA cl. II	1 to 9	None
Spain	300-495	1-2	65 km/h	16	3	JAR-FCL cl. II	1,2,3,4,5,6,7	To another field
Sweden	300-495	1-2	65 km/h	17	12+	JAR-FCL cl. II	2 to 9	50 nautical miles
United Kingdom	300-495	1-2	65 km/h	17	12	Self-declaration form signed by medical doctor	1, 3, 4, 5, 8	2 x 40 nautical miles
United States of America	115 kg empty weight	1	45km/h	n/a	n/a	n/a	n/a	n/a
Canada	165-195	1 or 2 depending on sub-type (AULA-BULA)	45-72km/h depending on sub-type.	16	10	CAR's standard 424	1-8; +emergency procedures	
Australia	544 kg.	2	83 km/h					
New Zealand	544-614	1 or 2 depending on sub-type (NZ1-NZ2)	83 km/h					
Ukraine	450	2	65km/h	17	40	Annex 1	1-9	

* Theoretical knowledge required:

1. Air law
2. Operational procedures
3. Meteorology
4. Navigation
5. Aircraft general knowledge
6. Principles of flight (Aerodynamics)
7. Flight performance and planning
8. Human factors (performance and limitations)
9. Communications

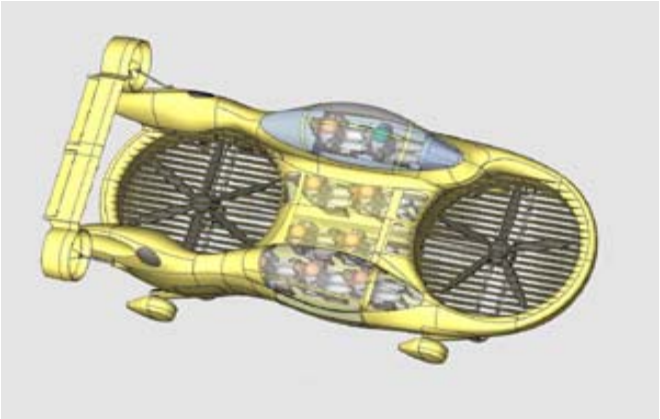
Are We Ready to Drive to the Sky?...

Annex 3:

The Most Famous Types of PAL-V

PAL-V by PAL-V Europe
Online: http://www.pal-v.com/

Aeromobile by Waldo Waterman (1937)
Online: http://en.wikipedia.org/wiki/Image:Waterman_Aerobile_6.jpg



X-Hawk by Urban Aeronautics,
Online: http://www.urbanaero.com/Frame-X-Hawk.htm

SkyCar by Moller International
Online: http://www.moller.com/purchase.htm