Internet from the Sky
Legal Challenges

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Abstract

The traditional government role in establishing safety regulations and certifying compliance is no longer suitable for highly advanced and fast evolving technologies that are being used to provide internet to remote areas of the world. This is due to the difficulty for these governments to find the appropriate regulatory regime to govern these technologies. Technology is developing in such a way, that the capability to provide Internet to remote areas of the world may be governed by either the air law regime or space law regime. An indicative example of this is Google's Project Loon. Google plans to provide Internet access to every part of the world through the use of helium balloons that will fly through the stratosphere. Facebook is also considering the use of flying drones on a high altitude for the same reason. This raises the question of which law regime is applicable, and whether there is a need for a new one to cover these non-conventional aircrafts. What may put a break to these ambitious plans, however, is the issue of sovereignty. Both balloons and drones will be flying on an altitude that is arguably still within the sovereign rights of the States and subject to air law. Both of these companies must first get permission from all the States that they will fly over. There is also the question of third party liability in case of damage caused by those crafts to a third party. Compliance with the ITU's Radio regulations and ensuring the absence of any harmful interference will also be a huge challenge. On that respect, coordination with all the potentially affecting parties will be a hurdle towards the realization of the projects.

I. Introduction

The technological advancements and achievements do not stop to surprise us. The conception of the aircraft was thought by many to be the greatest achievement mankind can reach. Then the first satellite launched into space and after a bit more than a decade man landed on the moon. Now, internationally well-established private companies have set a new goal: exploiting new technologies to provide Internet to the world from the sky.

Google plans to put into airspace unmanned balloons that will fly above the territory of different States providing wireless internet to remote areas of the

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world where they do not currently have access. Facebook is developing drones that will also fly high on the sky providing Internet to remote areas as well. Elon Musk's SpaceX is preparing a constellation of 4000 small satellites that will orbit the planet and send Internet to all over the world. OneWeb also has similar plans with 700 small satellites.

All of the aforementioned companies are well-known for their services. Their new ventures put them on completely new regulatory grounds. The law of outer space is not as straightforward or as developed as other areas of international law and is definitely not commercially-oriented. The lack of certainty and the inability to calculate the risks involved may put a constraint to their plans. Also, when it comes to airspace, the sovereignty principle will prove a huge legal hurdle to surpass; getting permission from foreign States to fly over their territories will be very difficult. There are also questions of safety and airworthiness of these aircrafts and who should regulate them.

The paper looks at the industry perspective, trying to present not all, but rather the biggest legal challenges that the private entities will face or are already facing. It starts by briefly presenting the plans of each company and explaining the technology and method that will be used to achieve them. Next, the sovereignty principle is examined and how these companies will need authorization from different States. In addition, the paper introduces the ITU filing and frequency coordination procedure and the international obligations the companies have in this respect. There is also a discussion about the airworthiness of the aircrafts and the sustainability of outer space activities. Finally, before concluding, the paper looks at issues relating to third-party liability and insurance.

II. Overview of the Projects

This section lays out the framework of the paper by presenting the various methods that companies are now developing to provide the world with Internet from the sky. Google, Facebook, SpaceX, and OneWeb are the companies that this paper will address, and below there is a description of each project.

II.1. Google's Project Loon

Google's Project Loon aims to use high-altitude balloons placed in the stratosphere at an altitude of about 32 km (20 miles) to create an aerial wireless network with up to 3G-like speeds.[1] Project Loon works by providing connectivity to a grounded area about 40km in diameter using a wireless technology known as LTE.[2] Loon shares the cellular spectrum with telecommunication companies in order to provide people with access to the Internet everywhere

1 Project Loon, Google, <www.google.com/loon/how> accessed 23 September 2015.
2 id.

directly from their phones and other LTE-enabled devices.[3] As a result, the balloons relay wireless traffic from cell phones and other devices back to the global Internet using high-speed links. The balloons are created to last around 100 days in the stratosphere and when they are ready to be taken out of service a gas is released from the balloons to bring them down through a controlled descent.[4] They will be using the currents of the wind in order to navigate on air.

II.2. Facebook's Aquila Program

Facebook's attempt at providing access to remote parts of the globe comes in the form of an 880lb. unmanned aerial vehicle (UAV) known as Aquila.[5] The drone will operate between 18km and 27km and run on solar power.[6] In addition, it is capable of flying for 90 days straight and circling a two-mile radius in order to stay afloat.[7] Aquila provides Internet by sending signals to small cellular towers, and converts those signals into a Wi-Fi or LTE network that people can use to connect to their laptops and smartphones.[8] After successful testing, Facebook plans on deploying many more drones around the world, which will also be able to send signals to and from each other, which would result in less Internet structure to be needed on the ground.[9]

II.3. SpaceX and OneWeb

Both of these companies plan to provide Internet to the whole world by deploying satellites in Low Earth Orbit (LEO). SpaceX plans on launching a constellation of 4,000 small satellites within the next 5 years that would send high-speed Internet signals to all parts of the globe.[10] Similarly, OneWeb aims to have its entire constellation launched and operational by 5 years.[11] However, instead of launching 4,000 satellites, OneWeb plans to deploy just 700

3 id.
4 id.
5 Alex Hern, 'Facebook launches Aquila solar-powered drone for internet access', (*The Guardian*, 31 July 2015) <www.theguardian.com/technology/2015/jul/31/facebook-finishes-aquila-solar-powered-internet-drone-with-span-of-a-boeing-737> accessed 23 September 2015.
6 id.
7 id.
8 Jonathan Vanian, 'Behind the scenes with Facebook's new solar-powered Internet drone and laser technology' (*FORTUNE*, 30 July 2015) <http://fortune.com/2015/07/30/facebooks-solar-power-drone-internet-earth/> accessed 23 September 2015.
9 id.
10 David Goldman, 'Elon Musk's plan to put the Internet in space moves to launch pad' (*CNN Money*, 10 June 2015) <http://money.cnn.com/2015/06/10/technology/musk-spacex-internet/> accessed 23 September 2015.
11 Stephen Clark, 'OneWeb launch deal called largest commercial rocket buy in history' (*SPACEFLIGHT NOW*, 1 July 2015) <http://spaceflightnow.com/2015/07/01/oneweb-launch-deal-called-largest-commercial-rocket-buy-in-history/> accessed 23 September 2015.

satellites to LEO.[12] Both companies want to take advantage of the new revolution of small satellites. These satellites will not be able to stay in orbit more than a few months to a year; however, they both see it as an opportunity to update their technology. They cheap cost of these satellites possible allows such a venture.

III. Sovereignty & Authorization

In contrast to the outer space where States have surrendered any sovereign right or claim following the Outer Space Treaty of 1967,[13] airspace is an area where States exercise complete and exclusive sovereignty. The airspace above the territory of a State (including its territorial waters) falls under the jurisdiction of that State. Already in 1919, the Paris Convention[14] has recognised the complete and exclusive sovereignty of States over the airspace above their territory.[15] The Paris Convention was replaced in 1944 by the Chicago Convention,[16] which also starts with the unequivocal proclamation of the principle of sovereignty.[17]

The rules of the Chicago Convention apply exclusively to civil aircraft.[18] Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface is defined as an 'aircraft'.[19] Facebook's drones clearly fall under the above definition as they use wings to fly. But, so do Google's balloons as they use the currents of the wind to navigate on air.

State aircraft are explicitly excluded from the scope of the Chicago Convention. Although the Convention does not provide a definition of 'state aircraft', it is generally accepted that a state aircraft has to be registered in the non-civil aircraft registry of a State; or belongs to, or is owned by the State; or is operated by the State.[20] Examples of aircraft that are considered to fall

12 id.
13 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, *entered into force* 10 October 1967, 610 U.N.T.S. 205 [hereafter also referred to as the Outer Space Treaty].
14 Paris Convention relating to the Regulations of Aerial Navigation of 1919, 11 League of Nations Treaty Series 173.
15 id., Article 1.
16 Chicago Convention on International Civil Aviation of 1944, 15 United Nations Treaty Series 296-361 (1948) [hereafter also referred to as the Chicago Convention or the Convention]. The Chicago Convention has been ratified by 191 States as of 23 September 2015.
17 id., Article 1.
18 id., Article 3.
19 Revised and amended text of Annex 7 to the Chicago Convention.
20 See ICAO Secretariat Study on Civil/State Aircraft – Comments from States and International Organisations; ICAO Doc. LC/29-WP/2-2 (1992/3); ICAO Resolution 22/1: Consolidated statement of continuing ICAO policies and associated practices

under the definition of state aircraft are those operating services such as search and rescue, coast guard, emergency assistance, humanitarian flights, carriage of heads of States and official personalities, etc.[21] Put simply, the classification of an aircraft as 'state' or 'civil' will depend upon its use.[22] Both Facebook's drones and Google's balloons are 'civil aircraft' and not 'state' since they are owned by private companies, registered or will be registered by those companies and their use is purely commercial. Thus, they both fall under the scope of the Chicago Convention and have to abide by the rules established by it.

International air law also makes a distinction between 'scheduled' and 'non-scheduled' flights or services. Google and Facebook aircrafts' services do not fall under the definition of 'scheduled' services since they will not perform transportation of passengers, mail or cargo for remuneration open to use by members of the public.[23] Article 6 of the Chicago Convention provides that "no scheduled air service may be operated over or into the territory of a contracting State, except with special permission or other authorization of that State, and in accordance with the terms of such permission or authorization." Therefore, each State is free to impose such limitations as it deems fit on the aircraft of a foreign State. Google and Facebook will face considerable difficulties getting authorization from foreign States to fly their balloons and drones over their territory. This is justifiable considering that foreign States will fear that those machines will be used for spying on them.

IV. ITU Frequency Coordination

As discussed under heading II, SpaceX and OneWeb plan to put a constellation of small satellites in LEO for providing Internet to the whole world. For their proper functioning, all satellites, big or small and irrespective of their application, need to use radio frequency in order to communicate between them and with the earth stations.

In order to avoid possible harmful interference, radio frequencies are heavily regulated both at international and national level. Radio frequencies are a limited international natural resource to be used by all countries on an equitable

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related specifically to air navigation, Appendix P: Coordination of civil and military air traffic, laid down in ICAO Doc. 9845 A35-TE (2004), and Resolution A32-14 adopted in 1998 by the ICAO Assembly.

21 See Isabella Henrietta Philepina Diederiks – Verschoor, *An Introduction to Air Law* (Pablo Mendes de Leon rev., 9th rev. edn, Kluwer International Law 2012) 20-22.

22 See Stephan Hobe and Michael Lysander Fremuth, 'No Fly Zones': Connectivity between International Law and Air Law in Case of Libya (in German; English summary); and Stefan Kaiser, No Fly Zones Established by the United Nations Security Council, both published in 60(2) Zeitschrift für Luft- und Weltraumrecht 2011.

23 See ICAO Doc. 7278-C/841, at 3.

basis, and they do not respect national borders.[24] Therefore, the international community has devised an extensive international regulatory system through the International Telecommunication Union (ITU).

ITU is a specialized agency of the United Nations, located in Geneva, Switzerland. Its role is to maintain and extend international cooperation between its 191 Member States for the improvement and rational use of telecommunications of all kinds.[25] The Union formulates regional and global standards to be applied through the members' national administrations. Member States are to require their private entities to operate in accordance with the ITU regulations and to use radio frequencies in accordance with the Radio Regulations.[26]

SpaceX and OneWeb must make sure that the frequencies that they will designate to their satellites will be in accordance with the standards provided by the Radio Regulations. In addition, they must make sure that their services will not cause any harmful interference to services operating under the same frequencies, which are internationally protected after successful coordination with the ITU.

To successfully coordinate with ITU and make sure that there will be no interference with other services is a lengthy process even when it comes to a single satellite; it may take up to two years. It may also be that sometimes the desired frequency might cause interference to another State's service and coordination with that State will also be necessary, which might delay the process even further. It is not difficult to imagine the huge challenges SpaceX and OneWeb will face in this respect. Putting in use 4,000 and 700 satellites respectively will likely require coordination with many States around the globe. Finding a way to secure interference-free services will prove to be a big hurdle.

OneWeb has already advised with ITU for potential solutions and managed to secure a license for a non-GEO Ku-band network. Following OneWeb's website,[27] this allocation of a priority spectrum to them came with a significant constraint: their use of the spectrum must not cause interference to the GEO satellites, which will be a major engineering challenge. The company claims that they developed a new technology called 'Progressive Pitch' which will enable them to avoid interference with the Ku-band satellites in GEO. According to them, this technology will allow them to modify the orientation and power level of their satellites as the satellites pass over the equator so that they never interfere with those services.

Despite the assurances from OneWeb, satellite fleet operators fear that OneWeb's satellites will disrupt their established services by interfering with millions

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24 Constitution of the International Telecommunication Union, *signed in* Geneva on 22 December 1992, 1825 U.N.T.S. 31251 (as amended in 1994, 1998, 2002 and 2006) [hereafter also referred to as the Constitution], Article 44 (2).

25 id., Article 1(1).

26 id., at Article 45 (1) and 45 (2).

27 *OneWeb*, <http://oneweb.world/#solution> accessed 23 September 2015.

of user antennas installed around the equator.[28] Some of the operators are hoping that OneWeb will stay true to its commitment to abide by the international regulatory guidelines and to ensure the absence of interference with their services.[29] Other operators express their fear that ITU, lacking in any real enforcement power, will not be up to the task if interference develops after the deployment of OneWeb's hundreds of satellites.[30]

Being the only one to have secured an ITU license for a non-GEO global Ku-band network, OneWeb has a clear advantage over competitors like SpaceX. With OneWeb possessing the Ku-band license, and Ka-band spectrum now reserved by multiple satellite operators across the GEO, any prospective competitors will have a more difficult time securing a license that does not interfere with satellites already in the ITU reservation system, which have higher priority. However, OneWeb's licenses with ITU expire in 2018 and 2020 by which time satellites must be in place and start operations. Otherwise OneWeb's licenses will be cancelled following the ITU 'Bringing into Use' provisions.[31]

SpaceX's challenge could be even bigger planning to use not just hundreds, but a few thousands of satellites. The company has recently filed to the Federal Communications Commission (FCC)[32] seeking permission to begin a test deployment of a few satellites, which can be used for performance and technology assessment. If everything goes according to the plan, the test could be underway by 2016, and the thousands of satellites that will provide Internet could be in operation within five years.

V. Safety Concerns

V.1. Safety and Airworthiness in Airspace

Thousands of small satellites orbiting the Earth; unmanned drones flying over the airspace and huge balloons moving with the currents of the wind [...] surely it sounds impressive and they are indeed impressive technologies. Nevertheless, these endeavors pose threats to the safety of persons and to property. There have already been several incidents where such activities have triggered

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28 Peter B. de Selding, 'OneWeb Fails (At Least for Now) To Soothe Satellite Interference Fears' (*SPACENEWS*, 18 September 2015) <http://spacenews.com/oneweb-fails-at-least-for-now-to-soothe-satellite-interference-fears/?utm_content=buffer41fe1&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer> accessed 23 September 2015.

29 See id.

30 See id.

31 ITU Radio Regulations, *signed in* Geneva on 6 December 1979, as revised by the World Radiocommunica¬tion Conference of 2012 at Geneva [hereinafter Radio Regulations], No. 11.44.

32 The FCC is an independent agency of the US government that regulates interstate radiocommunication.

safety concerns. For instance, on September 4, 2015, it was reported that a drone crashed into the stands of the U.S. open.[33] Fortunately, the drone crashed into an empty section of seats. Prior to that, there was an incident in 2014 where a balloon from Google's Project Loon crashed into a power line in a relatively remote area of Washington State rendering several homes powerless for 5 hours.[34] Although the above incidents did not inflict serious damage, they nevertheless raise important safety concerns.

While the Chicago Convention addresses 'pilotless aircraft', currently there is no uniform international legislation for the regulation of UAVs. Thus, laws governing these aircraft vary from State to State. Assuming that States do provide authorization to Google and Facebook to operate over their territories, then one of the biggest issues will be safety and airworthiness. Although the number of drones Facebook plans to deploy in their Aquila program is currently unknown, one can imagine that there will be issues of, *inter alia*, air traffic congestion, software malfunction and loss of situational awareness of the pilot. For instance, on August 2, 2010, due to a software anomaly a US Navy MQ-8B Fire Scout UAV loss control and violated the Air Defence Identification Zone surrounding Washington, DC.[35] Moreover, on October 3, 2006, an IAI Hunter UAV of the Belgian forces crashed during a EUFOR mission killing two civilians in the streets of Congo due to the loss of situational awareness of the pilot.[36] Although both of these examples concerned military aircraft, this type of scenarios can easily occur in a commercial context.

Due to safety concerns, airworthiness and certification play an important role for integrating UAVs into non-segregated airspace.[37] The purpose of certification is to guarantee flight safety in order to protect other aircrafts and the public on the ground.[38] As a result, airworthiness standards and acceptable means of compliance need to be established to have any meaningful impact on unmanned aviation systems (UAS). These standards should focus on remote

33 Barb Darrow, 'Drone crash lands at U.S. open' (*FORTUNE,* 4 September 2015), <http://fortune.com/2015/09/04/drone-crash-lands-at-us-open/> accessed 23 September 2015.

34 Frederic Lardinois, 'One Of Google's Project Loon Balloons Crashed Into Power Lines In Washington State' (*TechCrunch*, 3 June 2014) <http://techcrunch.com/2014/06/03/one-of-googles-project-loon-balloons-crashed-into-power-lines-in-washington-state/> accessed 23 September 2015.

35 Christopher P. Cavas, 'Lost Navy UAV Enters Washington Airspace' (*NavyTimes*, 25 August 2010) <http://archive.navytimes.com/article/20100825/NEWS/8250313/Lost-Navy-UAV-enters-Washington-airspace> accessed 23 September 2015.

36 George C. Larson, 'UAVs, or Nothing Can Go Wrong, Go Wrong [...]' (2008) Vol. 102, iss.1, Business and Commercial Aviation, 26.

37 Stefan A. Kaiser, 'UAVs and Their Integration into Non-segregated Airspace', *Air and Space Law* 36, no. 2 (2011), 161.

38 id.

control, the quality and reliability of data links and sensors and their protection against misuse (such as hacking), the reliable technical means for a 'detect, see, and avoid' collision avoidance regime, and all aspects of autonomous flight.[39]

One way of implementing such standards on an international scale is by establishing what is known as a 'classification society' specifically for UAVs. Originating in London in the 18th century, classification societies are non-profit, non-governmental organizations with the purpose of providing classification and statutory services and assistance to the maritime industry and regulatory bodies with regards to maritime safety based on the accumulation of maritime knowledge and technology.[40] Classification Societies develop and apply their own standards and verify compliance with international and/or national statutory regulations on behalf of flag Administrations.[41] They could serve a useful tool towards ensuring safety on air in regards to these new technologies. Another, more pragmatic perhaps, solution would be to include UAVs under the scope of the International Civil Aviation Organization (ICAO). ICAO develops international Standards and Recommended Practices (SARPs), which States reference when developing their legally-enforceable national civil aviation regulations.[42] There is no doubt that UAVs and manned aircraft will be flying in the same airspace soon enough. ICAO could ensure that all regulatory steps will be undertaken to maintain the safety levels the aviation industry has achieved during a century.

V.2. Sustainability of Outer Space Activities

The number of space debris[43] in-orbit is rising quickly. Currently, about 23.000 pieces of human generated debris in Earth orbit larger than 10 cm in size is tracked by the U.S. Space Command Space Surveillance Network. These pieces are large enough to destroy a satellite.[44] Additionally, research shows that there are an estimate 5.000.000 pieces between 1 to 10 cm size

39 id.

40 International Association of Classification Societies, 'Classification Societies – What, Why and How?' available at <www.iacs.org.uk/document/public/explained/Class_WhatWhy&How.PDF> accessed 23 September 2015.

41 id.

42 ICAO, <www.icao.int/Pages/default.aspx> accessed 23 September 2015.

43 According to the Inter-Agency Space Debris Coordination Committee (IADC), 'space debris' are "[…] all man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional". UN Doc. A/AC.105/C.1/L.260, 29 November 2002, 3.1. Space Debris.

44 Fabio Tronchetti, 'The Problem of Space Debris: What can Lawyers do About it?', in: German Journal Of Air And Space Law, Special Issue: 90th Anniversary Of The Institute Of Air And Space Law, Cologne (2015) 334, 334.

that are largely untracked.[45] Despite their minimal dimension these pieces are capable of severely damaging a satellite in a collision.[46]

Both SpaceX and OneWeb are planning to put into orbit a considerable amount of new space objects. These will add to the already big number of existing space objects and the huge amount of space debris. Limiting the creation of new space debris is crucial for the future sustainability of space operations. Both companies need to make sure that their operations will respect and follow the international guidelines on space debris mitigation.

Space debris mitigation consists of all efforts to reduce the generation of space debris through measures associated with the design, manufacture, operation, and disposal phases of a space mission.[47] The United Nations did not draft any rules on the mitigation of space debris. Understanding the importance of the issue, several space agencies of different States met in 1993 and established the IADC.[48]

The IADC Space Debris Mitigation Guidelines[49] were formally adopted by consensus in October 2002. They "describe existing practices that have been identified and evaluated for limiting the generation of space debris in the environment." The Guidelines cover the overall environmental impact of the missions with a focus on the following:

1. Limitation of debris released during normal operations;
2. Minimization of the potential for on-orbit break-ups;
3. Post-mission disposal;
4. Prevention of on-orbit collisions.[50]

These Guidelines were served as a baseline for the development of the UN Space Debris Mitigation Guidelines.[51] In its Resolution 62/217 of 22 December

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45 Heiner Klinkrad, Space debris: models and risks analysis (Springer, New York 2014); Mariano Andrenucci, Pierpaolo Pergola, Andrea Ruggiero, Joris Olympio, Leopold Summerer, 'Active Removal of Space Debris, Expanding foam application for active debris removal', European Space Agency, Advanced Concepts Team, Ariadna Final Report (10-4611) 2011; Nasa Standard (NASA-STD) 8719.14, Handbook for limiting orbital debris, Nasa-Handbook 8719.14, 2008; Christopher Lehnert, 'Space debris removal for a sustainable space environment', ESPI PERSPECTIVES 52 (2011); Joseph S. Imburgia, 'Space Debris and its Threat to National Security', in: 44 VANDERBILT JOURNAL OF TRANSNATIONAL LAW (2011) 593-607.

46 Tronchetti, *supra* note 44, at 334.

47 IADC Terms of Reference, July 11, 2011. Available at <www.iadc-online.org/index.cgi?item=torp_pdf> accessed 23 September 2015.

48 Current members include ASI, CNES, CNSA, CSA, DLR, ESA, ISRO, JAXA, NASA, NSAU, ROSCOSMOS and the UK Space Agency.

49 Available at <www.iadc-online.org/index.cgi?item=docs_pub> accessed 23 September 2015.

50 Section 1 of the guidelines.

2007, the General Assembly endorsed the Space Debris Mitigation Guidelines and agreed that the voluntary guidelines for the mitigation of space debris reflected the existing practices as developed by a number of national and international organizations, and invited Member States to implement those guidelines through relevant national mechanisms.
Although these guidelines have no binding nature at the moment, they provide good guidance to the sustainability of outer space environment and the safe operation of space activities. They also serve as the foundation for the implementation of policies by States and the adoption of code of conducts by international organisations for the mitigation of space debris.[52]
The United States is one of the countries that have implemented an extensive legislation on space debris mitigation. SpaceX, for instance, will need to show coherence with the FCC regulations in order to secure a license for satellite communications. These regulations require applicants to provide information concerning use of orbits and plans for mitigation of orbital debris.[53] The information is analyzed to determine whether a grant serves the public interest. The FCC must find that the "public interest, convenience, and necessity" will be served in order to grant a license.[54]
OneWeb seems to have taken seriously the above guidelines and according to their website, they have incorporated on-board propulsion on the satellites so that they can maneuver them to avoid collision with another satellite or space debris, and took into consideration the end-of-life disposal guidelines in the designing of the space objects.

VI. Third-Party Liability & Insurance

SpaceX's and OneWeb's satellites will be deployed in an orbit where other space objects are also orbiting the Earth. Although outer space seems vast, the probabilities of impact between two or more objects are not slim. History has shown that space objects do hit each other and that the results can be devastated.[55]
In case of a collision between, for example, a SpaceX's satellite and another satellite registered in another State than the US, the US as the 'launching

51 Ulrike Bohlmann, 'Connecting the Principles of International Environmental Law to Space Activities' (2011) International Astronautical Congress, IAC-11,E7,4,2,x11884.
52 See *e.g.* European Code of Conduct for Space Debris Mitigation, available at <http://cdm16064.contentdm.oclc.org/cdm/ref/collection/p266901coll4/id/1348> accessed 23 September 2015.
53 47 C.F.R. 5.64, 25.114, 97.207.
54 47 U.S.C.308.
55 See *e.g.* the 2009 Iridium-Cosmos collision.

State'[56] of SpaceX's satellite could be found liable based on fault according to Article III of the Liability Convention. However, a legal definition does not currently exist for fault within the context of the Liability Convention. Proving fault in this respect will be almost impossible due to the ultra-hazardous activities on space. On top of that, The Liability Convention has also never been formally invoked – all incidents to date that could have resulted in potential claims under the Convention have been settled by the respective countries outside of the Convention.[57]

Article II of the Liability Convention holds a launching State absolutely liable to pay compensation for damage cause by its space object on the surface of the Earth or to aircraft in flight. Nevertheless, since both SpaceX and OneWeb will use small satellites, the chances of inflicting damage on Earth are very slim since the satellite will most likely burn up during re-entry into the planet's atmosphere. Thus, it seems almost impossible to be found liable and the two companies could have one less thing to worry about.

Nevertheless, both companies will be using launchers in order to get their satellites in orbit. During the launch and until the successful detachment of the satellites in orbit damages can be inflicted to third parties. This is the reason why third-party liability and government property insurances protecting launch service providers and their customers in the event of public injury or property damage caused by the launch or potential mission failure is crucial.[58]

SpaceX has its own launching capabilities and will be launching its satellites from within US territory. OneWeb has partnered, *inter alia*, with Richard Branson's Virgin Galactic, which will offer them launching capabilities. Virgin Galactic's launching facilities are also located in US territory. In the United States, Federal Aviation Administration (FAA)[59] regulations require that commercial launch licensees carry insurance to cover third-party and government property damage claims that might result from launch activity.[60]

However, public safety regulations for space launch are unique to each launching State. Thus, provisions of the Commercial Space Launch Act (CLSA), the governing US law for commercializing space, for third-party

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56 The term "launching State" means: (i) A State which launches or procures the launching of a space object; (ii) A State from whose territory or facility a space object is launched. Convention on International Liability for Damage Caused by Space Objects, *entered into force* October 9, 1973, 961 U.N.T.S. 187 [hereafter also referred to as the Liability Convention], Article I (c).

57 Ram Jakhu, 'Iridium-Cosmos Collision and its implications for space operations', ESPI Yearbook on Space Policy. 2008/2009: Setting New Trends. Wien: Springer Wien, NewYork (2010) 254.

58 FAA, Commercial Space and Launch Insurance: Current Market and Future Outlook, 2002, <https://www.faa.gov/about/office_org/headquarters_offices/ast/media/q42002.pdf> accessed 23 September 2015.

59 The FAA is the national aviation authority of the United States.

60 FAA, *supra* note 58.

liability indemnification do not limit U.S. government responsibility in the case of claims arising from damage to persons or property outside the US.[61] For example, if the launch of one of the SpaceX's satellites resulted in damage internationally and successful claims exceeded the maximum probable loss insurance requirement established in the CSLA, the US government would be obliged to settle the claim using mechanisms specified in the Liability Convention, which do not impose limits on such claims. The US government could then attempt to recover the amount of its settlement from SpaceX in the launch campaign responsible for the damage.[62]

VII. Conclusion

Google and the rest companies have big plans but they also face big challenges. It is doubtful whether Google and Facebook will get authorization from foreign States to fly over their territory with their balloons and drones. States fear of spying and most of them will not prove to be a cooperative party. SpaceX and OneWeb also face huge hurdle in respect to the ITU filings and ensuring interference-free services. Steps have already made from these companies to find a solution, but they still have a long road in front of them.

Google's and Facebook's UAVs do not fall under an international regulatory body which would certify their airworthiness. A solution must be found in this respect by the international community as soon as possible to ensure that the appropriate levels of safety will be observed. When it comes to space and the thousands of small satellites that will suddenly be deployed in orbit by SpaceX and OneWeb, there is the issue of the creation of more debris. The topic of the sustainability of future space activities is nowadays always being included in the discussion of the international community. Both companies must make sure that they abide by the existing space debris mitigation guidelines. Although not yet of binding nature, they are gradually transforming into customary law. Finally, like any other business, it is certain that there will be accidents and damage caused to third parties. The companies must make sure that they will be insured for such damages so that they protect their economic interests.

Technology always finds ways to challenge the suitability of established regulations. This is also the case with the progressive plans those companies made to provide Internet to the four corners of the world. The question is whether the law will prove flexible enough to encourage those initiatives or instead it will put a stop to them. It needs to be seen.

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61 James A. Vedda, 'Study of the Liability Risk-Sharing Regime of the United States for Commercial Space Transportation' (2006), 1. <https://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/media/Risk_Study(final).pdf> accessed 23 September 2015.

62 id.