**The United Nations Office for Outer Space Affairs (UNOOSA)**

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## TOPIC A. Measures to control low-Earth orbit satellite systems

### I. Introduction

Nowadays, it is impossible to imagine the modern world without Internet or telecommunications. Almost the whole population depends on Wi-Fi connections, whether it is for easy access to updated information, fast and secure communications, or data about meteorological and geographical forecasts, geo-biological phenomena, and other types of natural predictions. People take into account this information in order to plan their day-to-day life, as well as their future. Just in 2018, about 51% of the world population had access to the Internet, hence the ambition of various entrepreneurs and organizations to bring bandwidth coverage to developing countries. For the correct comprehension of these tools, its background and development must be understood (Gómez, 2019).

Stemming from the Second World War, the USSR and the USA emerged together as competing world powers, igniting a dispute for the title of predominant leadership. Since they were so far apart, both in geographic and political aspects, there was no way of knowing the plans or actions that their opponent was taking; therefore, spying actions took place on both sides. Consequently, most countries, including their allies, were faced with various interceptions of telegrams from the opposite faction. Having the need to access secure lines of communication and ameliorate the accuracy of the received information, both countries embarked on a technological race.

Since 1957, when the Soviet Union launched the first ever satellite (Sputnik I), the world has seen revolutionary changes regarding the use of technology in outer space. From then on, there has been an exponential increase in the presence of artificial satellites in Earth's orbit, which has led to various satellite systems being devised (Hann, 2019). In present days, there are nearly 6,000 satellites surrounding planet Earth; however, only 40% of those are operational. In April 2020, the Union of Concerned Scientists (UCS) determined that 1,918 of the 2,666 operational satellites were located in the low Earth orbit (Datta, 2020).

Low Earth's orbit (LEO) is useful due to its proximity to the planet, and it is mostly employed for high-resolution satellite imaging. As the ISS (International Space Station) is also located in this orbit level, the relatively short distance facilitates astronauts to travel to and from the Station. Besides, in this orbit, satellites travel with a speed of 7.8 kilometers per second, which means it takes approximately 90 minutes to cover the Earth's circumference, travelling around the planet around 16 times per day (ESA, 2020).

Individual LEO satellites are not as efficient for tasks as telecommunication due to their fast speed. Because they move quickly across the sky, lots of efforts are needed for them to be tracked from ground stations. Therefore, if communication satellites are grouped together, they work in a large combination known as a satellite constellation, giving constant coverage. Constellations are launched together to create a "net" around Earth, letting them cover larger areas of the planet simultaneously (ESA, 2020).

## II. Definition of concepts

- Artificial satellite: Man-made object placed in the Earth's orbit for communication purposes or information gathering.
- Low Earth orbit: Also known as LEO, it is an orbit that is relatively close to Earth's surface. LEO's satellites work from 160 kilometres to 1,000 kilometres above the Earth's surface (ESA, 2020). In comparison, traditional communication satellites are located far higher from the

LEO at 36,000 kilometres and are moving at the speed of the Earth's rotation (Ritchie and Seal, 2020).

- Satellite constellations: "Number of similar satellites, of a comparable type and function, designed to be in alike, complementary, orbits for a shared purpose, under shared control. Satellite constellations have been proposed and implemented for use in communications, including networking" (Wood, 2003, p. 13).
- 3rd Generation Partnership (3GPP): The 3rd Generation Partnership Project (3GPP) unites telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as "Organizational Partners". They provide their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies (3GPP A Global initiative, 2020).
- 5G Network: Mobile communication system. It is expected to provide basic technology support for future industries and society, as well as artificial intelligence and the upgrading of multimedia communication services with new and improved features, such as, high speed, high capacity, low latency, and connectivity with worldwide coverage (NTT DOCOMO, 2020, p. 2).
- 6G Network: New network system generation that will support industry and society in the 2030's (NTT DOCOMO, 2020, p. 2).

## III. Current situation

More than 15 LEO projects have surfaced in the last three years regarding launching new constellation satellites. The LEO constellations take part in an innovative project carried out by many space agencies around the world, which encompass the ability to provide high-throughput and broadband Internet with low latency. These constellations are being developed rapidly due to the technological advances and the demand for a better global internet network. It should be said that these satellite systems will be suitable for the 6G Network (Frontiers Media, 2020).

Satellite communication network and its integration in today's technology has gained worldwide attention. For the future development, the 3GPP´s 5G (3rd Generation Partnership) standardization of the Non-Terrestrial Networks (NTN) to space ground integrated network 6G, must evolve in order to provide coverage and global internet service. The International Telecommunication Union (ITU) Network 2030 states that the 6G is considered as one the most essential systems to achieve the Internet coverage project (Frontiers Media, 2020).

As technology keeps advancing, more companies are developing new business models to make profits from connectivity. For example, several enterprises including *SpaceX* and *Amazon*, are planning to launch a net of vast new satellite constellations that will provide band internet to the whole world. If successful, there could be an additional 50,000 satellites in orbit, which means that collision avoidance maneuvers will need to be done more frequently (the first satellite maneuver to avoid colliding with a mega constellation was performed by the European Agency in 2019) (O'Callaghan, n.d.).

Both companies, along with their investors, have the capital needed to make possible the funding of large satellite constellations. However, these companies must reduce a range of costs to ensure long-term connectivity (Daehnick, *et al.*, 2020). Furthermore, the three most relevant projects at the moment are the *OneWeb*, *LeoSat* and *SpaceX* initiatives (European Commission, 2017).

The most controversial company is Elon Musk's agency *SpaceX* and their mission *Starlink*. Being a satellite constellation development project, it has the objective of launching 12,000 satellites into Low Earth Orbit to connect the entire planet to the Internet, providing fast broadband access in any area (Mosher, 2020). Nonetheless, *SpaceX* is not the only company pursuing the internet-from-space business. Other private businesses are aiming towards global internet coverage as well (Grush, 2020).

The mission *Starlink* has generated controversy amongst other countries, since many of them have their own internet network, in which each one can control and manage what their population sees or searches for. Some of these

are China, Iran, the United Arab Emirates, Syria, and Vietnam; countries whose governments and private enterprises regulate significant portions of the Internet access. Similarly, Russia has the technology to isolate its internal networks, servers, and users from the Internet in general. Even India has come to block the Internet network completely, as a result of its anti-Muslim laws (Koetsier, 2020).

Elon Musk's project threatens the supervision authorities have over what their population sees, reads, and hears from external sources, therefore generating various worldwide concerns. In addition, this program has led to disagreements with the treaties regarding "waste" control in space, which in turn puts astronomical research at risk. Finally, space agencies around the world disagree with the massive and unorderly launch of satellites, since it implies an increase in evasive maneuvers to avoid accidents and collisions, which may negatively affect other enterprises (Koetsier, 2020).

There are other examples of the increase in satellite constellations. *One Web* plans to launch a mega constellation of about 650 satellites, each one costing approximately one million dollars to manufacture. Also, Jeff Bezos's project, known as *Amazon's Project Kuiper,* is developing its mega constellation of 3,236 satellites. Lastly, the Canadian company *Telesat* is negotiating with other space companies, such as *Blue Origin* (Jeff Bezos' space company), as well as 3D printing rocket builder *Relativity Space,* to launch its mega constellation of 300 satellites. Between the four companies, approximately 46,100 satellites will be launched in the next few years (Sheetz and Petrova, 2019).

There are several other space agencies around the world that seek to put satellites into orbit; however, the companies mentioned above are the main ones. Fast Internet from satellites is the next global space race; countries of every continent, such as the United States, Canada, China, Russia, United Arab Emirates, United Kingdom, Australia, Nigeria, among others; are getting ready for this major project.

## IV. Previous treaties, agreements and resolutions

In 1976, the Convention on Registration of Objects launched into Outer Space entered into force, which was established by UN member states and International Intergovernmental organizations. Representatives from the signed states that agreed to abide by the Convention, are required to establish their own national registries and provide information on their space objects to the Secretary-General for inclusion in the United Nations Register. To this date, over 86% of all outer space mechanisms launched into Earth orbit have been registered with the Secretary-General (UNOOSA, 2020).

*Figure 1. Registration submissions by states and organizations* (UNOOSA, 2020).

Also, the following is a list of some recent orbit mechanisms submissions to the Secretary-General:

- ST/SG/SER.E/954 – United States of America (being processed).
- ST/SG/SER.E/948 – China (being processed).
- ST/SG/SER.E/577/Add.1 – United Arab Emirates (being processed).
- ST/SG/SER.E/829 – Spain (published).
- ST/SG/SER.E/869 – Japan (published).
- A/AC.105/INF/432 – Luxembourg (published).

Likewise, an essential treaty is "The Outer Space Treaty", which was adopted by the General Assembly in its resolution XXI, opened for signature on January 27th, 1967. This document states fundamental subtopics regarding satellites and orbit objects, including that states must avoid harmful contamination of space, such as celestial bodies. Furthermore, its points also declare that outer space is free to explore by all countries (by sending satellites); nevertheless, there must be a regulation to put them into orbit (UNOOSA, 2020).

"The Liability Convention" was an important treaty that mentioned the damage caused by space objects. It was signed and passed in the resolution XXVI, in March 1972. This convention points out that the effectiveness of each country's space programs is in correspondence to the respective state only. It also designated the process that must be followed when a space object is damaged in space (UNOOSA, 2020).

To conclude, "The Registration Convention" pointed out the enrolment of outer space objects, already mentioned in this document. It was adopted in resolution XXIX in January 1975. This convention addressed the process of launching an outer space object for countries and organizations, and the need for every state's space agency or organization to send a request to the Secretary-General for it to be voted and approved or denied (UNOOSA, 2020).

## V. Key questions

1. What is your delegation's position regarding this topic?
2. Are there any proposals given by your country addressing this topic?
3. What is the current situation of your delegation in terms of satellites?
4. Does your delegation have any type of space program or agency? If so, when was it founded? Is it part of any international organization?
5. What are possible improvements to the current treaties about low orbit satellites?
6. How can the UN and UNOOSA regulate the monopoly of certain countries and enterprises with reference to low Earth's appropriation?

7. How could your delegation seek financial growth by implementing a space program?
8. Does your delegation have monetary resources for it to help other space organizations and agencies?
9. What are the pros, cons, risks and consequences of launching Internet satellites to Earth's low orbit?

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