OSI

www.outerspaceinstitute.ca

Agenda Item 11 – Long-term Sustainability of Outer Space Activities

Mr. Chair, distinguished Delegates,

The Outer Space Institute greatly appreciates this opportunity to comment on the Long-term Sustainability of Outer Space Activities.

In fostering coordination and cooperation, the establishment of The Guidelines for the Long-term Sustainability of Outer Space serves as an important step in addressing humanity's rapidly expanding use and exploration of outer space. We support the stated purpose of the Guidelines to assist in mitigating the "risks associated with the conduct of outer space activities..." (Guideline 1.4).

Mr. Chair, we would like to emphasize that a holistic approach to space sustainability, as promoted in the Guidelines, is necessary due to the complexities and interdependencies of its various challenges. Indeed, proceeding with a view that challenges can be overcome independently of each other could lead to undesirable effects.

For example, since 2020, the number of satellites in low Earth orbit has been doubling every two-to-three years. In order to reduce space debris, the best practice is to deorbit satellites expeditiously into Earth's atmosphere at the end of their operational lifespan, which is 5-7 years for many satellites in low Earth orbit constellations.

However, fragments of satellites sometimes survive atmospheric reentry, and when they do, they create casualty risks to people on the ground and in airplanes in flight. Reentry debris is being found on Earth's surface with growing frequency, and concerns about casualty risks have caused disruptions to aviation.

To address this, design-for-demise is an engineering strategy that aims to reduce casualty risk by ensuring that reentering space objects ablate completely. However, by design, it deposits fine particulates into the upper atmosphere. The mass deposition rate of spacecraft materials is already in excess of the mass deposition by meteoroids for certain elements. This, in turn, is producing measurable changes to Earth's aerosol population, which could have several destabilizing effects, including changing the optical and infrared properties of atmospheric aerosols, nucleating upper atmosphere polar clouds, and potentially affecting ozone equilibrium abundances. In short, one solution to the casualty risk problem exacerbates the upper atmosphere pollution problem.

Another example of the interdependencies between space sustainability challenges can be seen in light pollution and space debris mitigation measures. The International Astronomical Union recommends the use of lower altitude orbits to increase the fraction of an orbit that a satellite spends in Earth's shadow, as well as to reduce negative detector impacts due to the satellite's corresponding faster sky motion when visible. Synergistic with this choice in operations is that lower-altitude satellites have shorter natural clearing times due to the stronger gas drag environment. Thus, in the event of a satellite failure or even a debris-generating event, the orbital environment will be cleared out faster than if the same event occurred at a higher altitude. In this case, at face value, two problems have a complementary solution.

However, compressing the use of orbital space to any confined region, in this case low Earth orbit, can put greater pressure on space traffic management and space domain awareness. The use of lower altitudes can further drive a need for yet more satellites as satellites at lower altitudes have smaller beam coverage and again move across the sky more quickly. More satellites on orbit also means more launch exhaust injected into the upper atmosphere, and more satellites ablating at the end of their operational lives.

Mr. Chair, as the foregoing shows, there are many connections between the different challenges to space sustainability, and further connections to Earth's atmosphere and terrestrial environment. Indeed, it is appropriate to speak of an "Earth-Space system" here.

We suggest that, as member States continue their ongoing discussions of the Long-term Sustainability Guidelines, including the development of additional Guidelines, as appropriate, and develop national mechanisms for addressing them, that they also consider Earth-Space system interdependencies.

Before closing, we make two additional points.

First, as recently expressed in the UN Office of Outer Space Affairs and UN Environment Programme issue note, titled "Safeguarding Space: Environmental issues, risks and responsibilities", there is a clear need for monitoring and studying the impacts of reentries on Earth's upper atmosphere. We recommend that member States invest in their national scientific programs to meet this urgent need.

Second, we suggest that member States establish national mechanisms that provide clear reporting pathways for people who find reentry debris. This would provide essential statistical information on the success of efforts such as design-for-demise. It would also provide a way to warn people about any safety considerations associated with handling certain kinds of space debris.

The OSI wishes to affirm its support for the Chair, the work of the Long-term Sustainability Working Group, and the work of the Subcommittee. We look forward to the discussions on the Long-term Sustainability of Outer Space Activities and other important matters. Thank you for your attention.