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REGULATING THE EFFICIENT USE OF LOW-EARTH ORBIT: A COORDINATED APPROACH TO  
THE CHALLENGE OF SATELLITE MEGA-CONSTELLATIONS**Abstract**

Over the last few years, the number of satellites in low-Earth Orbit (LEO) has increased significantly. Much of this growth has been generated by the proliferation of satellite mega-constellations, with thousands of satellites being deployed in a short period of time. These new LEO constellations enable many important new services due to the high data rates and lower latency enabled by lower altitudes. Many have touted the ability of this technology to connect remote regions of the world, thus providing benefits to all countries in a manner envisaged by Article I of the Outer Space Treaty of 1967.

Despite the importance of these new technologies, many regulators have been criticised for lacking specific rules to govern these unique satellite systems and the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) guidelines fail to address the issue. The UN COPUOS Long-Term Sustainability Guidelines provide only overarching principles, whilst the UN COPUOS Debris Mitigation Guidelines fail to address the specific challenges of constellations. Furthermore, a 2022 discussion paper prepared by the Chair of the Working Group on Status and Application of the Five United Nations Treaties on Outer Space highlighted lack of agreement on how such systems should be registered in compliance with the Registration Convention of 1975.

Mega-constellations present unique challenges for the sustainability of Low-Earth Orbit which deserve specific attention. These challenges centre around the rapid deployment of these satellites, the frequently unsophisticated nature of the individual satellites within the system, and the high self-induced collision risk caused by individual failures within the system. This paper will make the case for UN COPUOS and governments to further enhance their cooperation with industry to ensure the sustainability of LEO, by proposing a multi-level governance approach to Space Traffic Management (STM).

Using a comparative analysis, this paper will study the various global regulatory approaches to the problem of satellite mega-constellations. In doing so it will provide an assessment of regulatory management of orbital capacity and commitment to managing the proliferation of debris in LEO. Using the same comparative approach, the paper will consider existing approaches to STM, and will consider how the combination of private and public participation in the Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) could serve as a model for future engagement between government and industry.