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Assuring a Safe, Secure and Sustainable Space Environment for Space Activities (4)

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EXTENDING THE SPACE SUSTAINABILITY CONCEPT BEYOND EARTH ORBIT

Abstract

The concept of 'space sustainability' has become increasingly recognised within the space community in the past decade, but the term is applied to a limited part of the space environment: chiefly low Earth orbit (LEO). Today, the concept relates predominantly to the future sustainability of government, military and commercial spacecraft operations in LEO and is closely linked to issues such as 'space situational awareness', 'space traffic management' and 'space safety'.

This enhanced recognition of the value of some of the space environment's 'natural assets' is welcome, as is the fact that issues such as debris mitigation and removal are being taken seriously for LEO (and at least considered for geostationary orbit). It is also encouraging that the subject is being reviewed by UNOOSA under its "Working Group on the Long-term Sustainability of Outer Space Activities" – but again its remit is limited more or less to LEO.

From a pragmatic point of view, and because the majority of space activity occurs in Earth orbit, this concentration of effort on the planet's immediate vicinity is understandable. However, it risks neglecting the long-term sustainability of activities and operations in the wider space environment, particularly with reference to the Moon and Mars. Within the next decade or two, if current plans come to fruition, there could be commercial teleoperated rovers, scientific bases and perhaps even space tourists on the Moon; meanwhile, space entrepreneur Elon Musk has plans for a colony on Mars.

Some would argue that it is too soon to consider purely prospective developments, but they risk ignoring the long-term nature of space developments. Warnings of a possible collisional cascade effect in LEO, known as the Kessler Syndrome, were published in 1978, but it was not until the formation of the IADC in 1993 that guidelines for debris mitigation (published eventually in 2002) began to take shape. Significant collisions observed in the past decade have made the Kessler Syndrome seem increasingly plausible.

In the context of increasing interest in missions to the Moon and Mars, delaying consideration of potential degradation of their orbital environments may result in similar problems. To ensure the sustainability of the space environment and protect its unique resources for future generations, guidelines and policies should be agreed well in advance of full operational utilisation of those resources. This paper argues for a more extensive view of space sustainability that extends current consideration of the issues beyond Earth orbit.