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Policy, Legal, Institutional and Economic Aspects of Space Debris Detection, Mitigation and Removal (1-A6.8)

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SPACE SUSTAINABILITY RATING: DESIGNING A COMPOSITE INDICATOR TO INCENTIVIZE SATELLITE OPERATORS TO PURSUE LONG-TERM SUSTAINABILITY OF THE SPACE ENVIRONMENT

Abstract

The Space Sustainability Rating (SSR) was first conceptualized within the World Economic Forum Global Future Council on Space Technologies, and is being designed by an international and transdisciplinary consortia including the World Economic Forum, Space Enabled Research Group at Massachusetts Institute of Technology (MIT) Media Lab, European Space Agency, University of Texas at Austin, and Bryce Space and Technology. With the increasing awareness of the rapidly growing number of objects in space, the implementation of a rating system, such as the SSR, provides an innovative way to address the orbital challenge by incentivizing industry to design missions compatible with sustainable

and responsible operations, and operate missions considering potential harm to the orbital environment and impact on other operators in addition to mission objectives and service quality.

The paper builds upon the SSR concept introduced at the IAC in 2019, and provides in-depth description into the methodology used to design the SSR, based on successful rating systems in other industries such as LEED (green building energy and environmental design) and STARS (higher education institutions' performance in sustainability measures). This method seeks to provide a practice tool that governments, satellite operators and insurers can reference. The process also seeks to build capability among emerging space actors as they seek to understand how to design responsible space missions.

The SSR is a composite indicator that is a function of the ESA Environmental Capacity Index, the Mission Index (also known as the Space Traffic Footprint) and other measures of the responsibility shown by operator actions. The components of the SSR take into account mission aspects including on-orbit fragmentation risk, collision avoidance capabilities, detectability, identification, trackability, data sharing, on-orbit servicing, collision avoidance, debris mitigation, and adoption of international standards. Case studies on specific mission scenarios, including large LEO constellation, SSO LEO earth observation satellite; university cubesat; and GEO weather satellite are presented and the corresponding SSR evaluated.

The paper further explores key questions including; (i) what factors are most important to influence whether an operator seeks to reduce the potential for debris creation, (ii) how can the SSR can contribute to existing mechanisms (eg. UN Long-term Sustainability Guidelines, IADC) in supporting long-term space sustainability, and (iii) how can the SSR educate policy makers regarding manufacturers' and operators' motivations in choosing specific criteria and certifications in designing their mission to achieve a high rating or improve their existing rating.