

Proposal for Forming an IAA Study Group / SG 5.19

Title of Study: Opportunities for National Governments to Foster Space Traffic Management using the Space Sustainability Rating

Proposer(s):

(Must be member(s) of the Academy M or CM)

Prof. Danielle Wood, Corresponding Member

Primary IAA Commission Preference:

(From Commission 1 to Commission 6)

Commissions: 1 Space Physical Sciences, 2 Space Life Sciences, 3 Space Technology & Systems Development, 4 Space Systems Operations & Utilization, 5 Space Policy, Law & Economics, 6 Space and Society: Culture and Education

Commission 5 Space Systems Operation and Utilization

Secondary IAA Commission Interests:

(From Commission 1 to Commission 6)

Commission 5 Space Policy, Law and Economics

Members of Study Team

Chair(s): Prof Danielle Wood (CM) and additional co-chairs, to be confirmed

(Must be member(s) of the Academy, M or CM)

Secretary: To be Confirmed

Other Members:

(Open to members and non- members of the Academy)

Elena Cirkovic

Moriba Jah

Miles Lifson

Maya Slavin

Richard Linares

Stijn Lemmens (to be confirmed)

Representatives from EPFL in Switzerland, METI in Japan, Roscosmos, ISRO and the Chinese Academy of Astronautics will be invited

Short Description of Scope of Study

Overall Goal:

(Expected scientific or practical benefit of the study group's efforts)

Space Traffic Management and Coordination is needed to ensure the long term capability for humans to safely operate spacecraft in Earth's orbit. New technical systems, coordination mechanism and norms of behavior are needed to improve space situational awareness, data sharing among space operators and space debris mitigation. Governments play a key role to work toward future global Space Traffic Management and current work to mitigate debris creation and on-orbit collisions. When governments authorize the launch of spacecraft, they have the opportunity to require or incentivize behavior by spacecraft operators that is more sustainable, increases transparency, reduces debris creation and avoids collisions. The Space Sustainability Rating is one tool, behind developed within the private sector, that governments around the world can use to help define what behavior should be incentivized by spacecraft operators. The Space Sustainability Rating (SSR) was first conceptualised within the World Economic Forum Global Future

Council on Space Technologies, and is being designed by an international and interdisciplinary 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 incentivising 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 SSR is a composite indicator that is a function of the Space Traffic Footprint, measured through a mission index and compared to the so-called Environment Capacity 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. The Space Sustainability Rating design process is nearing completion and the World Economic Forum and technical design team are selecting a private sector entity to host and issue the SSR in the long term.

The proposed study asks how national governments can use the Space Sustainability Rating as part of their domestic regulation and authorization of space launches and operations. What would be the implications if national governments required a certain level of performance based on the Space Sustainability Rating for operators applying for approval to launch? Is it more effective for governments to require minimally sustainable actions or to incentivize spacecraft operators to identify innovative ways to be as sustainable as possible? This study will draw insights from engineering, policy and economics to address these and related questions. The results will recommend to national governments how they can make use of the Space Sustainability Rating as a tool to increase the sustainable behavior of space actors.

Intermediate Goals:

The study will review the views of government and private sector actors toward the Space Sustainability Rating, catalog methods used by governments to incentivize or require sustainable behavior by operators and draw from economic and engineering theory to consider the implications of different scenarios through which governments can adopt the Space Sustainability Rating.

Methodology:

(Email works, workshops, stand alone conferences, interim publications, etc.)

The study team will be conducted over a one year period. The study team will meet virtually via video calls once every two months during the study period. In between, study volunteers will be assigned to perform work in the form of literature reviews, interviews with stakeholders and drafting report elements.

Time Line:

(Cannot exceed three years)

The study is planned for one year in order to coincide with the transition into operations of the Space Sustainability Rating initiated by the World Economic Forum.

April 2021 to June 2021: Study initiation, scoping and initial background research on the views of public and private sector actors regarding the Space Sustainability Rating

July to October 2021: Detailed research phase, culminating in a meeting on the margins of the International Astronautical Congress to share initial findings

November 2021 to March 2022: Final writing and editing phase

Final Product (Report, Publication, etc.):

The study will produce an IAA report and one to two peer reviewed journal articles. Some of the work may also be reflected in student thesis projects at several universities. The study team will also host one to two workshops to share the findings on the margins of the International Astronautical Congress or IAA meetings.

Target Community:

The study is designed to be read by national government agencies concerned with authorizing the spacecraft operations under their national policies. It is also targeted to spacecraft operators to highlight opportunities to voluntarily adopt behaviors that reduce space debris.

Support Needed:

The study team requests advice from the IAA Secretariat to meet contacts in Russia, China and India who are members of the IAA and may provide introductions to colleagues interested in the report.

International Academy of Astronautics (IAA)

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Instructions and application form: see: "Scientific Activity" section at <http://iaaweb.org/content/view/256/393/>

Potential Sponsors:

The study team anticipates that this work can be done without funding, however, sponsorship options will be explored to cover the cost of any in-person events that may be feasible during and after the study.

To be returned to the IAA Secretary General Paris

by fax: 33 1 47 23 82 16 or

by email: sgeneral@iaamail.org

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