

6 February 2020

**Statement to the 57th session of the sub-Committee of UN COPUOS
from
THE INTERNATIONAL ACADEMY OF ASTRONAUTICS (I.A.A).**

Dear Madam Chair, Dear Ambassadors, Distinguished Delegates,

The International Academy of Astronautics (IAA) would like to congratulate you, Madam Chair, on your election as Chair of the 57th Session of the Scientific and Technical Subcommittee of COPUOS. I am Danielle Wood. It is my honor, as a newly inducted member of the International Academy of Astronautics to present this report on behalf of myself and Secretary General Jean-Michel Contant. The Academy is an international community of leading experts, with nearly 1200 elected members committed to expanding the benefits of human activity in space. To foster the development of astronautics, the Academy undertakes a number of activities, including the recognition of outstanding contributors through election and awards. The Academy also facilitates professional communication, develops and promotes new ideas and initiatives, engages the public, and fosters a sense of community among the members.

The International Academy of Astronautics (IAA) is a unique non-governmental organization, composed of over 90 nationalities, established in the sixties by many space pioneers and recognized by the United Nations in 1996. This is an honorary society with an action oriented agenda. Our members work closely with national and international space agencies, industry, and the academic community. The Academy works particularly with the national science and engineering academies, to determine needs and objectives, to help shape policy and forge cooperation by means of conferences and cosmic studies. Currently we have nearly 50 studies under preparation.

We have produced a multilingual database that includes 24 languages; and we have published 5 space dictionaries or lexicons in the last 15 months. The last dictionary published was for space terms in Swahili and a new edition of the Afrikaner dictionary has just been completed. Our Academy publishes a Peer reviewed journal named Acta Astronautica which appears this year in the top ten scientific astronautical journals with the 1st rank in the world, according to citation indices¹. Acta Astronautica have made excellent progress with its new editorial board of 26 members. The impact factor of Acta Astronautica reflects the rate of academic citations of papers in the journal. For the impact factor 2019 reached 2.48 compared to 0.6 in 2010. The number of downloads of Acta Astronautica has doubled between 2010 and 2017 with 0.748 million. The number of pages published for 2018 is 6184.

The IAA has now published more than 75 cosmic studies available on the IAA web site. On this occasion I would like to give you results of an analysis among 42 recent IAA studies that show international involvement of 714 experts from 47 countries. We have created a new book series on the History of Space in addition to the 3 other books series on small satellites, remote sensing and conference proceedings totaling 15 books in two years.

In 2019 the IAA hosted 30 regional meetings and standalone conferences as follows: the IAA Symposium on Moon Farside Negotiations in Paris; 6th IAA Planetary Defense Conference, Washington DC; 12th IAA Symposium on Small Satellites for Earth Observation, Berlin; 7th IAA Conference on Space Technologies: Present and Future, Dnepr; 13th IAA Low-Cost Planetary Missions Conference, Toulouse; 11th IAA Symposium on The Future of Space Exploration, Torino; 2nd IAA SciTech Forum, Moscow; 8th IAA Conference on Space Systems as Critical Infrastructure, Mamaia; IAA Symposium of Space Debris Observations from Basilicata, Castelgrande; 8th IAA Conference on Space Technology Innovation, Shanghai; 6th IAA Space Flight Safety Symposium, Saint-Petersburg; IAA Symposium on Moon Farside Negotiations, Washington DC; Academy Day Washington DC; 2nd IAA Symposium on STEAM for Space Leaders of Tomorrow, MIT, Cambridge; 22nd IAA Humans in Space Symposium, Dubai; 2nd IAA Latin American Symposium on Small Satellites, Buenos Aires; Academy Day, Beijing; International Symposium on Peaceful Space Technology, Zhuhai.

Here are photo highlights from the past few years showing IAA events and symposia. The IAA events are hosted by members and collaborating organizations; they seek to build unique communities of thought leadership in specialized areas of astronautics, allow students and professionals to publish papers and invite new themes to have a formal place within the astronautics communities.

In 2019 the Academy contributed to one third of the International Astronautical Congress program in preparing 13 Symposia totaling 893 papers in 62 sessions bring the Academy contribution to 35% of the entire congress.

I take this opportunity to announce that the 7th IAA Planetary Defense Conference will be held in the UN office in Vienna, in spring 2021.

As noted previously, one role of the IAA is to create a venue to discuss and support emerging initiatives in astronautics. In the remaining time, I would like to highlight the role of several members of the International Academy of Astronautics to develop the Space Sustainability Rating, a voluntary incentive system that rewards space operators who use responsible behavior to reduce the risk of space debris and collisions. Two members of the IAA, including myself Prof. Danielle Wood and Prof Moriba Jah, are members of the international consortium that is designing the Space Sustainability Rating. The SSR consortium includes the World Economic Forum, the European Space Agency, Bryce Space and Technology, the University of Texas at Austin and my institution, the Massachusetts Institute of Technology. Note that this is the same initiative mentioned by the ESA and Japanese delegations in their previous remarks.

As noted by many delegations throughout this meeting, the ever-increasing amount of space debris continues to pose a threat to valuable space assets. The reliance on space assets coupled with an expected growth of large constellations of micro-satellites and nano-satellites emphasize the critical need to foster responsible behavior by all actors to ensure long-term sustainability of the space environment. If we consider the average annual launch rates observed in the last decade, and we assume that future break-ups of satellites will likely occur at average historic rates of 8 per year, the number of debris objects in space will steadily increase. As a consequence, the probability for catastrophic collisions will also grow progressively.

The 21 Guidelines for the Long-term Sustainability of Outer Space adopted by COPUOUS promote actions that satellite operators can take to reduce the risk of collisions. Several examples are shown on the slides to illustrate. The focus is on sharing information about physical characteristics of the satellites and operational plans; seeking to predict conjunctions; and selecting design features that increase trackability or reduce time on orbit.

It appears that incentives are needed to encourage space operators to apply the practices encouraged by the 21 Guidelines for the Long Term Sustainability of Outer Space, especially when they increase the cost of space missions. In many countries and industries rating systems encourage firms and institutions to pay for responsible behavior. It is a growing trend to use a rating system to publicly display the sustainable practices and credentials of a firm or institution. Rating systems provide a framework to assess decisions about design, construction, operation, and maintenance of a system and consider the system's impact on sustainability. The most well-known sustainability rating tools are the green building rating systems that were designed in response to rising energy costs. Following the pattern of rating systems in other fields, the World Economic Forum Global Future Council on Space Technologies conceived of the Space Sustainability Rating as a complementary way of addressing the orbital challenge by encouraging responsible behavior in space.

The main objective of the Space Sustainability Rating is to create an **incentive** for satellite operators to **design** missions compatible with sustainable operations and to **operate** missions in a manner that achieves mission objectives & service quality, while reducing potential harm to the orbital environment and the impact on other operators.

The Space Sustainability Rating is not a new set of guidelines, but a system to celebrate satellite operators who go beyond the minimum requirements to demonstrate sustainable behaviour.

Two key ideas are at the core of the Space Sustainability Rating. The term "**Environmental Capacity**" refers to the number & distribution of mission compatible with a **stable evolution** of the environment with an acceptable risk of collisions. A mathematical model can be used to evaluate how much of the environmental capacity has been used by the missions already operated in space. The term "**Mission Index or Space Traffic Footprint**" refers to an aggregated numerical value that captures the impact on the space environment of the **design** and **operations** of objects involved in a mission. The definition is largely based on the effort of the operator to mitigate space debris and its consequences.

The Space Sustainability Rating is proposed as a composite indicator, meaning that it is one number that combines multiple quantitative and qualitative calculates. The Space Sustainability Rating will be a function of the Environmental Capacity, the Mission Index (also known as the Space Traffic Footprint) and other Operators Actions. The current work of the team is to define the methods to calculate these parameters and apply them to case study missions.

The team designing the Space Sustainability Rating is considering the parameters shown on the slides as potential ingredients of the rating system in the following categories: physical parameters, concept of operations, space situational awareness and processes.

The Space Sustainability Rating was recently presented at the IAA Conference on Space Situational Awareness in Washington DC in January 2020.

The Space Sustainability Rating will be presented at the IAA Conference on Space Traffic Management at University of Texas at Austin in February 2020.

The Space Sustainability Rating team is eager to dialog with delegates about their questions regarding the rating. Please contact me after this session if you have further questions. National governments can support the Space Sustainability Rating by raising awareness among space stakeholders in your country, communicating about actions that space operators can take to increase sustainability of their space missions and including references to the rating system in national space policy frameworks.

You can be ensured, Madam Chair that the International Academy of Astronautics will remain proactive in contributing to the goals and programs that make the United Nations Committee on the Peaceful Uses of Outer Space a very unique organization for the benefit of all nations. I thank you for your attention.

Submitted respectfully by:
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ⁱ https://scholar.google.com/citations?view_op=top_venues&hl=en&vq=eng_aviationaerospace