

AWARENESS-RAISING AND CAPACITY-BUILDING RELATED TO THE IMPLEMENTATION OF THE GUIDELINES FOR THE LONG-TERM SUSTAINABILITY OF OUTER SPACE ACTIVITIES (LTS GUIDELINES)

Event 2 - Section B, Safety of Space Operations

22 May 2023

Summary Report

About the Project

[The Awareness-raising and Capacity-building Related to the Implementation of the LTS Guidelines Project](#) is delivered in the context of the 2019 adoption of the Guidelines for the Long-term Sustainability Outer Space Activities (LTS Guidelines) by the Committee on the Peaceful Uses of Outer Space (COPUOS).

Building upon the success of the multi-stakeholder event series organized in 2021, and the [stakeholder study report published](#) in 2022, the third phase of the project once again convenes key players through a new virtual event series. Each event is linked with one section of the LTS Guidelines (A-D), engaging diverse experts in the space field in targeted discussions..

Event #2 - Section B, Safety of Space Operations

To access the recording of the event, please click [here](#).

Panelists:

- **Moderator: Dan Oltrogge**, Chief Scientist and Director of the Center for Space Standards and Innovation - COMSPOC Corporation
- **Amber Charlesworth**, Public Policy, Project Kuiper - Amazon
- **Andrew Ratcliffe**, Chief Engineer - United Kingdom Space Agency
- **Emmanuelle David**, Executive Director - EPFL Space Center
- **Pascal Faucher**, Programme Manager at Defense and Security Directorate - Space Agency of France (CNES); Chairman - European Union Space Surveillance and Tracking Partnership (EU SST)
- **Phee Choosri**, Deputy Executive Director - Geo-informatics and Space Technology Development Agency (GISTDA), Thailand

Summary

The moderator, **Dan Oltrogge** started his intervention by introducing the ten guidelines belonging to Section B. Mr. Oltrogge highlighted an important common

theme of the safety of space operations, that is information sharing. Additionally, Mr. Oltrogge underlined the role of conjunction assessment, space weather, design, and the issue of uncontrolled reentry of space objects relevant to Section B. Even though the 21 guidelines are not mandatory, non-governmental entities, such as commercial operators can use them to build best practices, which then can be also included in national regulations and requirements that are binding on the national level. Furthermore, standards can also play an important role in codifying the LTS Guidelines.

Mr. Oltrogge also introduced the work and role of the Space Safety Coalition, an international organization of satellite operators, government entities, industry representatives, and other key stakeholders that aims to assemble aspirational space operational best practices. Although the best practices are non-binding, signatories of the Coalition endorse and agree to promote and strive to implement the best practices to preserve the space environment for current and future generations.

What is SSC's "Best Practices for the Sustainability of Space Operations" ?

- **A ground-breaking "living" best practices document that:**
 - **Part 1:** Endorses existing international guidelines, standards (IADC, UN, ISO, CCSDS)
 - **Part 2:** Contains **over forty additional specific best practices** to further enhance and secure the long-term sustainability of space operations
 - Initially motivated by perceived unpreparedness for LEO large constellations
 - Originally developed by 36 space operators and relevant industry stakeholders
- **Spans all phases of design and spaceflight, orbit regimes, spacecraft form factors, life cycle phases, and mission types**
- **Although non-normative, signatories "endorse and agree to promote and strive to implement" these best practices to preserve the space operations environment for current and future generations.**
 - Commercial willingness to follow these best practices alleviates need for heavy-handed regulations

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Excerpt from Daniel Oltrogge's presentation on the Space Safety Coalition.

After his first remarks, the moderator gave the floor to each speaker to make observations on the subject.

The first speaker of the event, **Andrew Ratcliffe** emphasized that the United Kingdom Space Agency (UKSA) plays a major role in delivering the UK's national space strategy. UKSA focuses most of their resources behind eight priorities, one of these which – Mr. Ratcliffe noted – was space and sustainability. UKSA has various projects from technology development to new missions, which they hope will

contribute to the preservation of the space environment for future generations. The UK has also put significant importance on the appropriate regulation and licensing of the country's commercial space operators. As per implementing Section B, Mr. Ratcliffe highlighted the publishing of the [United Kingdom's Registry of Outer Space Objects](#) addressing the need to share information on space objects within **Guideline B.1**, and the establishment of the UK's [Monitor your Satellites Service](#) to provide conjunction alerts to the UK operators which addresses the need within **Guideline B.4**. Lastly, Mr. Ratcliffe highlighted that sharing various approaches relevant to the implementation of the LTS Guidelines is inevitable to converge on good practices and to identify capacity building efforts.

The second speaker, **Pascal Faucher** began his remarks by putting emphasis on the collective interest of all nations to timely implement the LTS Guidelines. Mr. Faucher continued his introduction by stating that Section B contains very pragmatic and concrete guidelines, such as sharing information on space objects, or performing conjunction assessment. In terms of **Guideline B.4**, for example, Mr. Faucher introduced France's space surveillance and tracking capabilities, which involves synergy between governmental and private actors. Additionally, Mr. Faucher mentioned the work of the European Union Space Surveillance and Tracking (EU SST) a partnership of 15 EU Member States by 2023, who jointly orient their capabilities to provide operational services in collision avoidance. In the final part of his intervention, Mr. Faucher addressed the importance of space weather activities, concerning **Guideline B.6 and B.7**, and highlighted the role of a group of experts on space weather, which was set up in France, under coordination by CNES and with participation of more than 40 experts from various research institutes and governmental agencies.

Phee Choosri introduced the Geo-informatics and Space Technology Development Agency (GISTDA) - the space agency of Thailand - and some of its activities relevant to the LTS Guidelines. Thailand has not ratified the [Liability Convention](#) and the [Registration Convention](#) yet. However, Mr. Choosri stressed that through the national register maintained by GISTDA, Thailand registers its launched space objects, including information on changes in the orbital position, as well as space objects that are not in orbit anymore. Such registration data is also forwarded to UNOOSA. Thailand is also in the process of drafting its national space law, which will include rules on safety of spacecraft operation, information sharing (**Guideline B.1**), conjunction assessment and monitoring (**Guideline B.4 and B.5**). Mr. Choosri continued his speech by reflecting on Thailand's conjunction assessment system, consisting of four areas, that are: screening of orbital objects;

prediction analysis; collision awareness strategy; and a visualization tool. Lastly, Mr. Choosri touched upon the space weather capabilities of Thailand, including an observation infrastructure, and a space weather forecast system.

In her introduction, the fourth speaker, **Emmanuelle David**, explained the background of the [Space Sustainability Rating](#), (SSR) which came into existence as a voluntary mechanism and tool to assess and quantify sustainable design and operational decisions, taken by space operators. The SSR went live in June 2022 and has been hosted by the EPFL Space Center. In late 2022, an association under Swiss law was created to perform the operation.

Ms. David highlighted that the SSR supports missions that implement design and operation of space objects that goes beyond current best practices, enabling the operator to demonstrate its own pursuit towards responsible and sustainable operation in space. The SSR consists of six modules, highlighting key related decisions by space operators throughout all phases of the mission. These modules include: (1) the mission index to estimate the mission's marginal contribution to overall orbital risk; (2) collision avoidance capabilities; (3) ability and willingness of the operator to share data on the mission; (4) the mission's detectability, identification and tracking; (5) the operator's compliance with applicable standards and regulations; and (6) commitment to use or demonstration of the use of on-orbit servicing and external services. Ms. David emphasized that the modules have a direct link to **Guideline B.1, B.2, B.4 and B.8**.

In her introductory remarks, the last speaker, **Amber Charlesworth** welcomed the tendency of including the views of the industry relevant to the high-level discussions on the implementation of the long-term sustainability of outer space activities. Ms. Charlesworth continued her speech by presenting the mission of Amazon Kuiper, Amazon's low Earth orbit satellite broadband initiative, which will provide fast affordable connectivity to millions of customers in unserved and underserved communities around the world. In order to secure the delivery of its mission, Amazon recognizes the need to help protect the various environments in which the company operates, both on Earth and in space. Concerning the LTS Guidelines therefore, Ms. Charlesworth highlighted that Amazon Kuiper well aligns its activities with **Guideline B.1**, as the mission objective is sharing information with their operators and relevant to their satellites' predictable trajectories, which assists other spaceflight operators to set and adjust flight paths accordingly. Relevant to **Guideline B.2**, Amazon is planning to conduct active collision avoidance throughout its mission and use available sources, such as space situational awareness data to assess conjunction warning. Ms. Charlesworth finished her

introduction by underlining **Guideline B.8**, with respect to the design of the Kuiper system, which includes an active propulsion system on every satellite in the constellation. Such design, according to Ms. Charlesworth, gives Amazon the ability to control each satellite throughout every phase of its mission to maintain distance from other spacecraft and avoid existing debris in low Earth orbit, with the inclusion of sufficient propellant for the mission. Besides individual satellite design, Ms. Charlesworth added, Amazon also prioritizes space safety relevant to the architecture of its overall Kuiper constellation. Consequently, among others, the constellation system will rely on active deorbiting at the end of their mission within a year of their mission ending.

During the discussion of the event, questions posed by the event participants were addressed by the panelists. Some questions considered the incentivization of space actors in implementing Section B of the LTS Guidelines. **Mr. Faucher** addressed the topic by highlighting the role of the private sector. Mr. Faucher continued that even though the LTS Guidelines was adopted by Member States of the Committee on the Peaceful Uses of Outer Space (COPUOS), by now it is companies who operate most satellites in orbit, thus the views, experiences and practices of the space companies should be more integrated. In this regard, **Guideline B.4** on performing conjunction assessment is crucial, according to Mr. Faucher, including having free access to such (public) services by any operators.

Mr. Ratcliffe stressed that the safety of space operations is a key element, which runs through all sections of the LTS Guidelines. In addition, Mr. Ratcliffe highlighted the importance of capacity building and information sharing, so stakeholders can learn from existing implementation practices and share their own experience. It is therefore critical that more actors join the discussion to learn from each other. Mr. Ratcliffe also touched upon the importance of the Inter-agency Space Debris Coordination Committee (IADC) Guidelines, which provides guidance related to the prevention and mitigation of space debris.

In terms of questions relevant to the SSR, **Ms. David** stressed that the SSR is designed to reflect on current sustainable practices, and to encourage sustainable behavior of actors. It is a great advantage of the SSR, Ms. David highlighted, that the applicant entity's sustainability level is assessed, and communicated to the entity. Moreover, based on the assessment, the SSR Team provides a set of recommendations to reach a more desired level of sustainability across the various modules. Ms. David further suggested that the assessment should be made as early

as possible (from the early design phase) of a space mission to ensure that the implementation of the recommendations has the lowest cost impact to the entity.

Mr. Choosri highlighted in his remarks the crucial factor of outreach, awareness and organization of multiple workshops across various disciplines to ensure the safety of space operations.

Last, **Ms. Charlesworth** reflected on the question of what was missing from Section B in her opinion and stated, among other elements, that satellite maneuverability or the question of natural decay time of spacecrafts should be also included in the topics under safety of space operations. Ms. Charlesworth continued, to account for changing technology, the space community should adopt data-driven standards for setting risk response thresholds that are regularly reevaluated to help ensure the long-term sustainability of outer space. In terms of incentivization, Ms. Charlesworth provided her first-hand experience in stating that the private sector is the most motivated sector to achieve a sustainable space environment.

Conclusion

In their short concluding remarks, the panelists stressed the key role of the implementation of the LTS Guidelines in ensuring the safety of space operations. They further highlighted the importance of sharing experiences on the implementation of the LTS Guidelines through multistakeholder discussions and the inclusion of the private sector.

[The project entitled "Awareness-raising and capacity-building related to the implementation of the LTS Guidelines"](#) is made possible through funding support provided by the UK Space Agency.