



Promoting Space Sustainability

ISO and CCSDS Space
Standards

ISO

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Implementation of the Guidelines for the Long-term Sustainability (LTS) of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space

Operational Case Studies

Established in 1947, the International Organization for Standardization (ISO¹), working in partnership with the Consultative Committee for Space Data Systems (CCSDS²), develops consensus international standards that promote the responsible and sustainable use of space. As reflected on the United Nations Office of Outer Space Affairs (UNOOSA) “Compendium of space debris mitigation standards adopted by States and international organizations” document³, ISO and CCSDS develop and maintain standards that are critical to enabling the safe and efficient use of space. Standards exist to codify, in an implementable and verifiable way, what international guidelines such as the LTS guidelines seek to accomplish. ISO space standards are, and since the dawn of the space age have been, an integral part of this complex and inter-connected framework.

¹ <https://www.iso.org>

² <https://public.ccsds.org>

³ <https://www.unoosa.org/oosa/en/ourwork/topics/space-debris/compendium.html>

I. Short description of the outer space activity [1000-word max.]

Space debris and a lack of space data exchange standards are detrimental to space sustainability. To address this, ISO and CCSDS have developed technical standards for space data exchange, design, test, operations, management, materials, and debris mitigation.

ISO has 248 Technical Committees consisting of over 100,000 subject matter experts, who collectively have developed 24,000 international standards. Standards expressly focused on space are developed in ISO Technical Committee 20. Space data and information transfer systems are addressed by TC20 Subcommittee 13 (TC20/SC13) which operates in duality with CCSDS and consists of eleven member and 29 observer agencies.

ISO TC20/SC13 develops international space data message standards. SC13, functionally equivalent to and operated in duality with The Consultative Committee for Space Data Systems or CCSDS, comprises 11 space agencies globally. SC13 and CCSDS co-publish 135 active publications addressing space data and information transfer systems. These standards are downloadable at no cost⁴ and address the following functional areas:

- Space Internetworking Services
- Mission Ops. And Information Management Services
- Spacecraft Onboard Interface Services
- System Engineering
- Cross Support Services
- Space Link Services

In the area of space systems and operations, ISO TC20/SC14 has 180 published space standards with an additional 45 in development. develops standards that capture best practices for space systems and operations. All disciplines of SC14's seven working groups are relevant to long-term sustainability of space activities. SC14 working groups (WGs) are:

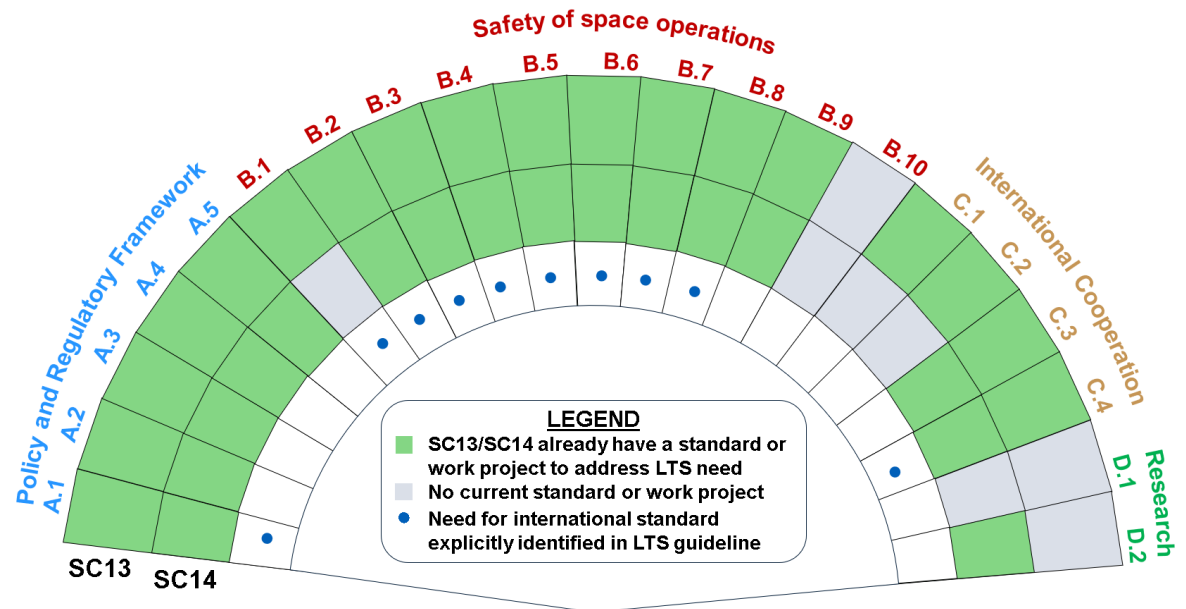
- WG 1: Design, engineering, and production
- WG 2: Interfaces, integration, and test
- WG 3: Operations and ground support
- WG 4: Space environment (natural and artificial)
- WG 5: Space system programme management and quality
- WG 6: Materials and processes
- WG 7: Orbital debris

The SC14 Working Group 7 was initially formed as the Orbital Debris Coordination Working Group in 2003. Formalized in SC14 as WG7 in 2012, this Working Group's primary goal continues to be to codify IADC guidelines and industry best practices as international standards for contractual incorporation and potential national regulatory adoption. Its work program is well represented by the top-level ISO Standard 24113: Space Debris Mitigation Requirements; lower-level space debris mitigation standards derive from the high-level requirements contained in ISO 24113.

⁴ <https://public.ccsds.org/Publications/default.aspx>

II. Connection with the LTS Guidelines [500-word max.]

Collectively, ISO/CCSDS standards address many of the 21 LTS guidelines as shown in the outer (SC13/CCSDS) and middle (SC14) arcs respectively in the figure below. Green shading indicates that ISO and CCSDS standards either directly or indirectly address the LTS guideline clauses indicated by the labels on the outer perimeter of the figure. The blue dots in the inner-most arc denote LTS guidelines that explicitly call for standards; as shown, ISO/CCSDS publishes standards that meet this requirement.



While all of TC20's SC13 (CCSDS) and SC14 working groups and functional areas are relevant to space sustainability, the space data message standards assembled by the CCSDS Navigation Working Group (NAVWG), and space debris mitigation standards developed by SC14, represent a significant contribution to space sustainability.

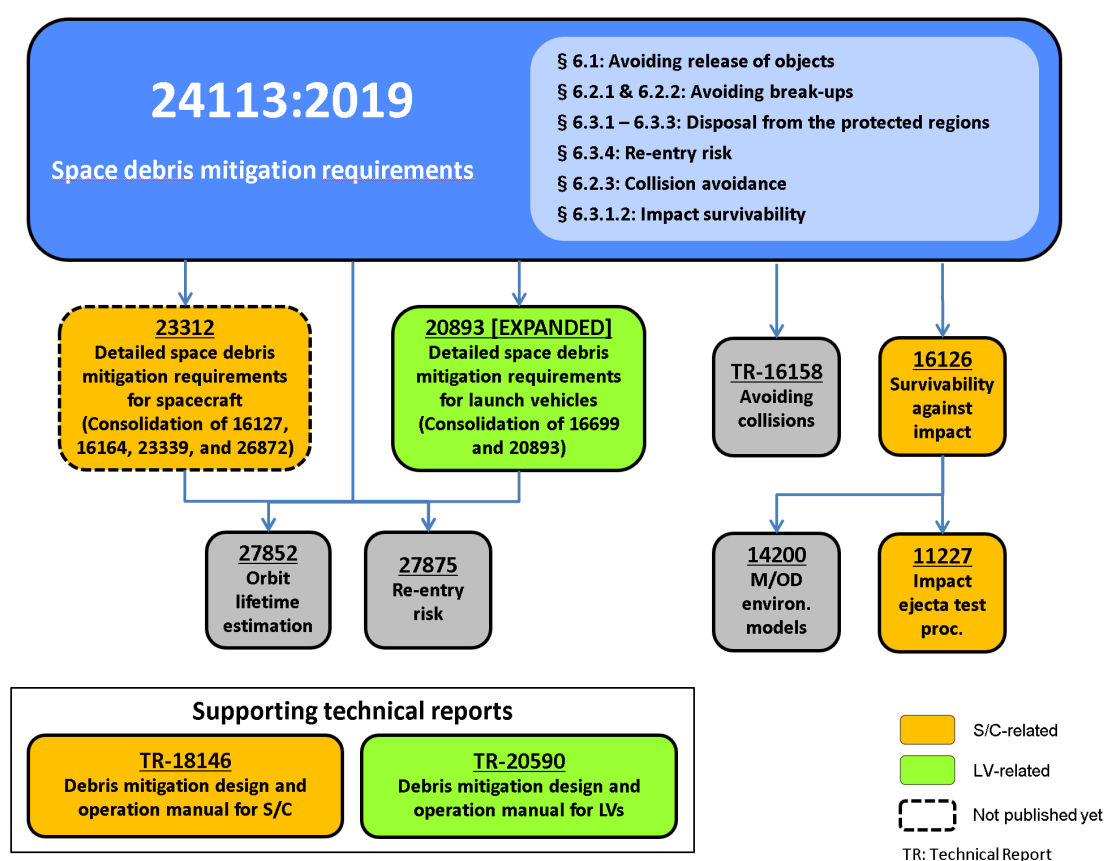
A primary focus of the 21 LTS guidelines is on the collection, sharing and dissemination of launch, space object, conjunction assessment, space weather, space debris, and re-entry data and derived information. Sharing of procedures and related LTS experiences and capacity building are also a prominent theme. ISO and CCSDS standards foster data exchange (structure, provenance, content, capacity to collect/generate) and enable the timely, comprehensive, consensus-based sharing of space data such as orbital information, close approach parameters, tracking data, attitude data, re-entry data, and sensor pointing parameters. The Orbit Data Message is the most widely downloaded NAVWG standard today, and for conjunction assessment, the Conjunction Data Message has become the gold standard for sharing information on potential collision risks.

The navigation data messages developed by the NAV WG include:

- Orbit Data Message (ODM)
- Conjunction Data Message (CDM)
- Tracking Data Message (TDM)
- Attitude Data Message (ADM)
- Events Data Message (EDM)
- Re-entry Data Message (RDM)

Another primary focus of the LTS guidelines is on the timely, accurate and comprehensive identification and mitigation of potential collision risks. SC14's standards comprehensively address this and other space sustainability topics, including debris mitigation, mission design, spacecraft design, testing, launch, operations, disposal, and human casualty risk. Space debris mitigation standards, developed in SC14's **WG 3** (Operations), **WG 4** (Environment) and **WG 7** (Orbital Debris Mitigation), are of particular relevance to the Long-Term Sustainability of Space Activities.

The figure below illustrates how the ISO 24113 standard contains the top-level space debris mitigation requirements, from which the lower-level space debris mitigation standards are derived.



III. Lessons learned [500-word max.]

The development of consensus space standards that codify best practices and expected norms of behaviour is one of, if not the, most critical approaches to achieving long-term sustainability of space activities. ISO, established seventy-four years ago to promote standards for international trade, communications, and manufacturing, holds general consultative status with the United Nations Economic and Social Council (or ECOSOC) since its formation. Most UN agencies working on technical activities have liaison status with ISO, and ISO is an official observer to UN COPUOS. ISO is a world leader in the development of space-related standards and has learned and incorporated much knowledge about how to build consensus, capacity-build, develop, promote, and disseminate standards.

The standards that ISO and CCSDS have developed in support of space data exchange, spacecraft design, test, operations, management and debris mitigation are a vital element of global efforts to ensure the long-term sustainability of space activities.
