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International Organization for Standardization (ISO) activities for Long-Term Sustainability (LTS) of Space Activities

Dan Oltrogge
Center for Space Standards and Innovation

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International Organization for Standardization (ISO) activities for Long-Term Sustainability (LTS) of space activities

Dan Oltrogge, Center for Space Standards and Innovation
About ISO

• ISO established in 1947 to promote standards in international trade, communications, and manufacturing
  • ISO general consultative status with UN ECOSOC since 1947

• ISO is an independent, non-governmental organization made up of members from national standards bodies of 163 countries

• “World's largest developer of international standards”

• “One country, one vote”
Globally, international standards …

… provide a reference framework and a common language to facilitate trade and technology transfer

… prioritize describing performance requirements and interfaces

… are verifiable and well-suited for contractual mechanisms

… ensure shared technical knowledge and compatibility

… provide scientific basis for health, safety and environmental legislation

Voluntary, consensus international standards can overcome political barriers, diplomatic objectives, and competitive rivalries.
ISO Governance Structure

• ISO General assembly and secretariat based in Geneva

• ISO has 245 technical committees
  • 100 000+ subject matter experts
  • 22 000 international standards
  • Languages: English, French, Russian
ISO air and space standards developed in TC20

- ISO/TC 20 develops and maintains standards for aircraft and space vehicles, including:
  - materials, components and equipment for construction and operation of aircraft and space vehicles
  - equipment used in the servicing and maintenance of these vehicles
- Over 600 published standards
- Over 200 in development

ISO TC 20/SC 1 Aerospace electrical requirements
ISO TC 20/SC 4 Aerospace fastener systems
ISO TC 20/SC 6 Standard atmosphere
ISO TC 20/SC 8 Aerospace terminology
ISO TC 20/SC 9 Air cargo and ground equipment
ISO TC 20/SC 10 Aerospace fluid systems and components
ISO TC 20/SC 13 Space data and information transfer systems
ISO TC 20/SC 14 Space systems and operations
ISO TC 20/SC 15 Airframe bearings
ISO TC 20/SC 16 Unmanned Aircraft Systems
ISO TC 20/SC 17 Airport Infrastructure
SC13 develops international space data standards

• SC13 is operated by the Consultative Committee for Space Data Systems (CCSDS)
  • Comprised of 11 space agencies
  • Standards available through ISO and also at: https://public.ccsds.org/default.aspx

• LTS-relevant CCSDS navigation data exchange messages:
  • Orbit Data Message (ODM)
  • Conjunction Data Message (CDM)
  • Tracking Data Message (TDM)
  • Attitude Data Message (ADM)
  • Events Data Message (EDM)
  • Reentry Data Message (RDM)
SC14 develops best practices for space

- Space Systems & Operations
  - SC14/WG3: Space operations international standards.
  - SC14/WG7: Orbital debris mitigation international standards.

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SC14 core space debris mitigation standards

ISO TC20/SC14

- WG1 Design
- WG2 Integ. / test
- WG3 Operations
- WG4 Environment
- WG5 Management
- WG6 Materials
- WG7 Debris

16158: Avoiding collisions
16164: Disposal of satellites in LEO
16699: Disposal of orbital stages
23339: Propellant mass estimation
26872: Disposal of satellites at GEO
27852: Determining orbit lifetime
27875: Re-entry risk management

14200: Meteoroid / debris models

11227: Test procedures for ejecta
16126: Survivability against impacts
16127: Prevention of s/c break-ups
18146: Space debris mitigation design and operations manual for S/C
20590: Space debris mitigation design and operations manual for LV
20893: Detailed debris mitigation requirements for LVOS
21095: Procedure for limiting re-entry risk
23312: Detailed debris mitigation requirements for S/C
24113: Space debris mitigation requirements

* [bracketed standards] will be merged/replaced
WG7 Orbital Debris Working Group

- IADC guidelines have been codified as ISO standards through WG7’s Orbital Debris Mitigation Work Program since 2009

**24113:2019(est)**

*Space debris mitigation requirements*

- **23312**
  - Detailed space debris mitigation requirements for spacecraft (Consolidation of 16127, 16184, 23339, and 26872)

- **20893 [EXPANDED]**
  - Detailed space debris mitigation requirements for launch vehicles (Consolidation of 16699 and 20893)

- **27852**
  - Orbit lifetime estimation

- **27875**
  - Re-entry risk

- **TR-16158**
  - Avoiding collisions

- **14200**
  - M/OO environment models

- **16126**
  - Survivability against impact

- **11227**
  - Test procedure: impact ejecta

**Supporting technical reports**

- **TR-18146**
  - Debris mitigation design and operation manual for spacecraft

- **TR-20590**
  - Debris mitigation design and operation manual for launch vehicles

Legend:
- S/C-related
- LV-related
- Not published yet

TR: Technical Report
Published ISO documents addressing LTS guidelines*

### Published ISO Documents

- **SC13 SC14**
  - No current standard or work project
  - SC13/SC14 already have a standard or work project to address LTS need
  - Need for international standard explicitly identified in LTS guideline

### Safety of Space Operations

- **Safety of space operations**
- **Legend**
  - SC13/SC14 already have a standard or work project to address LTS need
  - No current standard or work project
  - Need for international standard explicitly identified in LTS guideline
Compendium of space debris mitigation standards

• Appreciate UNOOSA assistance adding international standards to “Compendium document (5 Sep 18)“

Space governance framework

IADC: Exchange, facilitate, review research; identify debris mitigation options

UN COPUOS consensus best practices (5 treaties + 21 LTS guidelines)

ITU best practices

Commerially viable international standards (ISO, CCSDS, etc.)

SDA: Self-formed STC
GVF: Global VSAT Forum
ESOA: EU S/C Ops
SIA: Satellite Industry
CSSMA: Smallsat Freq Mgmt
SIG: Satcom Innov Group
GSC: Global Sat. Coalition
Others…