

A satellite in space with solar panels and Earth in the background.

International standards development activities supporting UN COPUOS LTS guidelines

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1 February 2024

UN COPUOS STSC

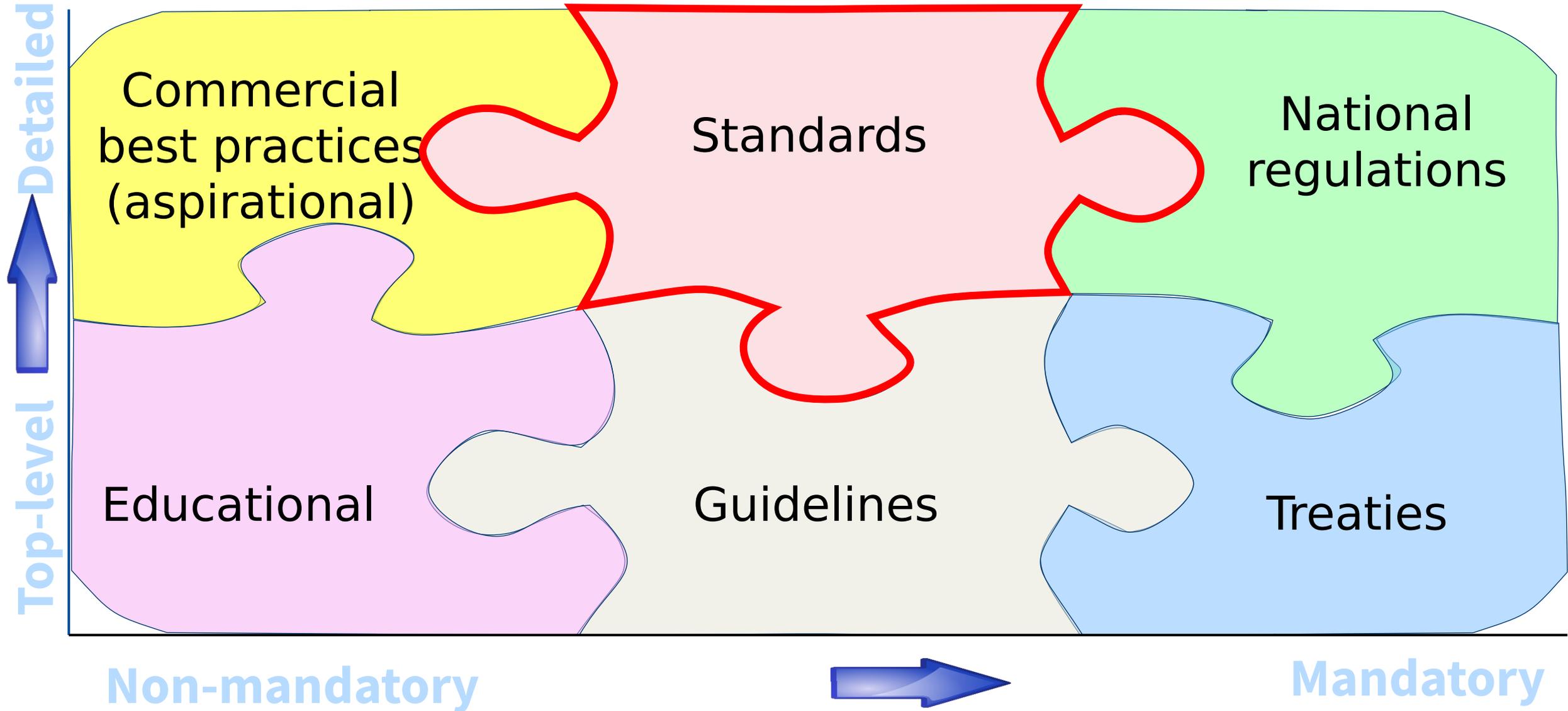
Topics:

- LTS Guideline calls for standards
- Space data exchange standards
- Standardization of best practices

UN Long-Term Sustainability guidelines, §II.B: Safety of space operations

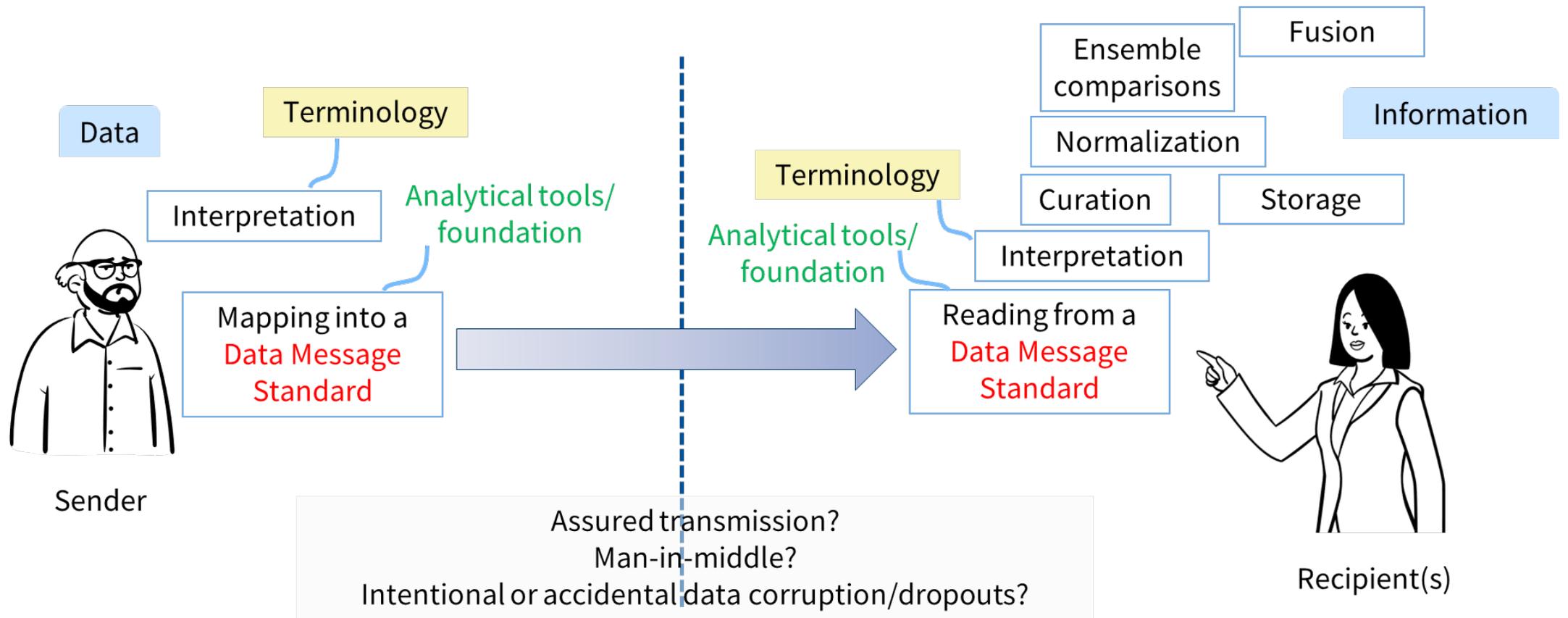
Guideline	Guideline Title
A.2.f	Consider benefits of using standards from ISO, CCSDS, and national standardization bodies...
B.1	Provide updated contact information and share information on space objects and orbital events
B.2	Improve accuracy of orbital data on space objects and enhance the practice and utility of sharing orbital information on space objects
B.3	Promote the collection, sharing and dissemination of space debris monitoring information
B.4	Perform conjunction assessment during all orbital phases of controlled flight
B.5	Develop practical approaches for pre-launch conjunction assessment
B.6	Share operational space weather data and forecasts
B.7	Develop space weather models and tools and collect established practices on the mitigation of space weather effects
B.8	Promote design approaches and operational constructs that increase the trackability of space objects regardless of their physical and operational characteristics
B.9	Take measures to address risks associated with the uncontrolled re-entry of space objects
B.10	Observe measures of precaution when using sources of laser beams passing through outer space

LTS-relevant standards and best practices



Data exchange must be accompanied by integrity (security + quality)

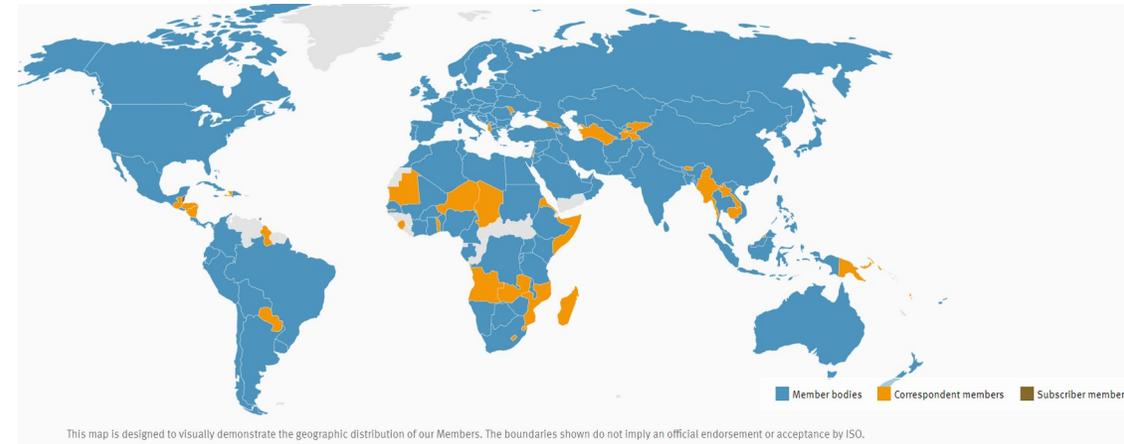
- Ensuring data exchange integrity between and within space systems includes:
 - Data creation, data format, interpretation, exportation, transmittal, ingestion, re-interpretation, normalization, curation, comparison, analysis/fusion, and storage.



About International Organization for Standardization (ISO)

- “World's largest developer of international standards”
- ISO established 1947 to promote standards in int’l trade, comm., 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 169 countries
- ISO is coordinated by a Central Secretariat based in Geneva
- ISO has 826 technical committees and subcommittees (TCs/SCs)
 - 100 standards per month
 - 100 000+ subject matter experts
 - 25 000 international standards
 - Languages: English, French, Russian
- “One country, one vote”

■ 167 Member bodies
■ 39 Correspondent members
■ 4 Subscriber members



ISO air and space standards developed in TC20

- ISO Technical Committee 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 676 published standards and 77 in development

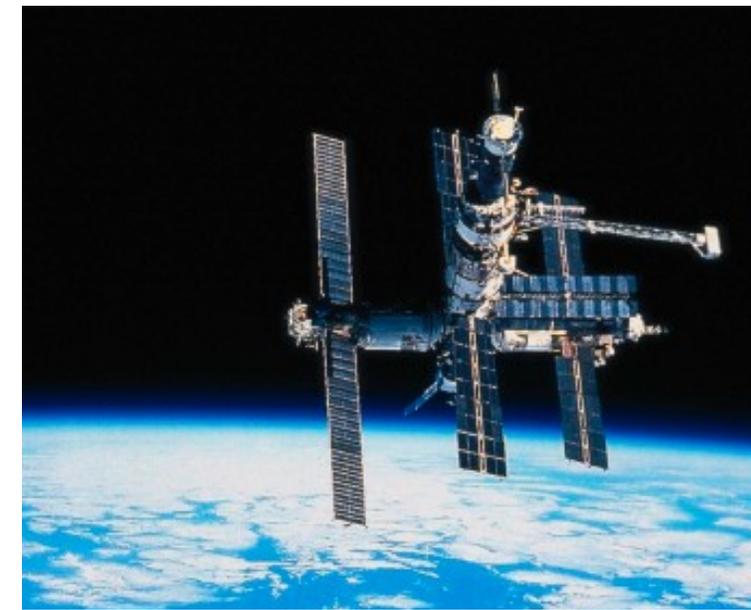
- **TC20/Subcommittee 13 (SC13):**

- Data and info sharing standards

Particular emphasis of recently-adopted United Nations Long Term Sustainability Guidelines is that of data exchange

- **TC20/Subcommittee 14 (SC14):**

- Best practices, norms of behavior standards



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

CCSDS & SC13 develop international space data standards

- Consultative Committee for Space Data Systems (**CCSDS**) operates **ISO TC20/SC13**

- Comprised of 11 space agencies



- Standards available through ISO and also at: <https://public.ccsds.org/default.aspx>

- CCSDS navigation data exchange messages:

- Attitude Data Message (ADM)
- Conjunction Data Message (CDM)
- Events Data Message (EDM)
- Orbit Data Message (ODM)
- Pointing Request Message (PRM)
- Reentry Data Message (RDM)
- Tracking Data Message (TDM)
- In development: Launch Data Message (LDM)
- In development: Fragmentation Data Message (FDM)

LTS-relevant data exchange standards

CCSDS
The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

ATTITUDE DATA MESSAGES

RECOMMENDED STANDARD
CCSDS 504.0-B-1

Note: This current issue includes all updates through Technical Conposium 1, dated June 2018.

BLUE BOOK
May 2008

CCSDS
The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

CONJUNCTION DATA MESSAGE

RECOMMENDED STANDARD
CCSDS 508.0-B-1

Note: This current issue includes all updates through Technical Conposium 2, dated October 2017.

BLUE BOOK
June 2013

CCSDS
The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

ORBIT DATA MESSAGES

RECOMMENDED STANDARD
CCSDS 502.0-B-3

BLUE BOOK
April 2023

CCSDS
The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

POINTING REQUEST MESSAGE

RECOMMENDED STANDARD
CCSDS 509.0-B-1

Note: This current issue includes all updates through Technical Conposium 2, dated October 2023.

BLUE BOOK
February 2018

CCSDS
The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

RE-ENTRY DATA MESSAGE

RECOMMENDED STANDARD
CCSDS 508.1-B-1

Note: This current issue includes all updates through Technical Conposium 1, dated October 2017.

BLUE BOOK
November 2019

CCSDS
The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

TRACKING DATA MESSAGE

RECOMMENDED STANDARD
CCSDS 503.0-B-2

Note: This current issue includes all updates through Technical Conposium 1, dated October 2017.

BLUE BOOK
June 2020

CCSDS
The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

LAUNCH DATA MESSAGES

DRAFT RECOMMENDED STANDARD
CCSDS 507.1

PINK BOOK

CCSDS 507.1 Page 1 April 2026

CCSDS
The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

FRAGMENTATION DATA MESSAGES

DRAFT RECOMMENDED STANDARD
CCSDS 508.2

PINK BOOK

CCSDS 508.2 Page 1 April 2026

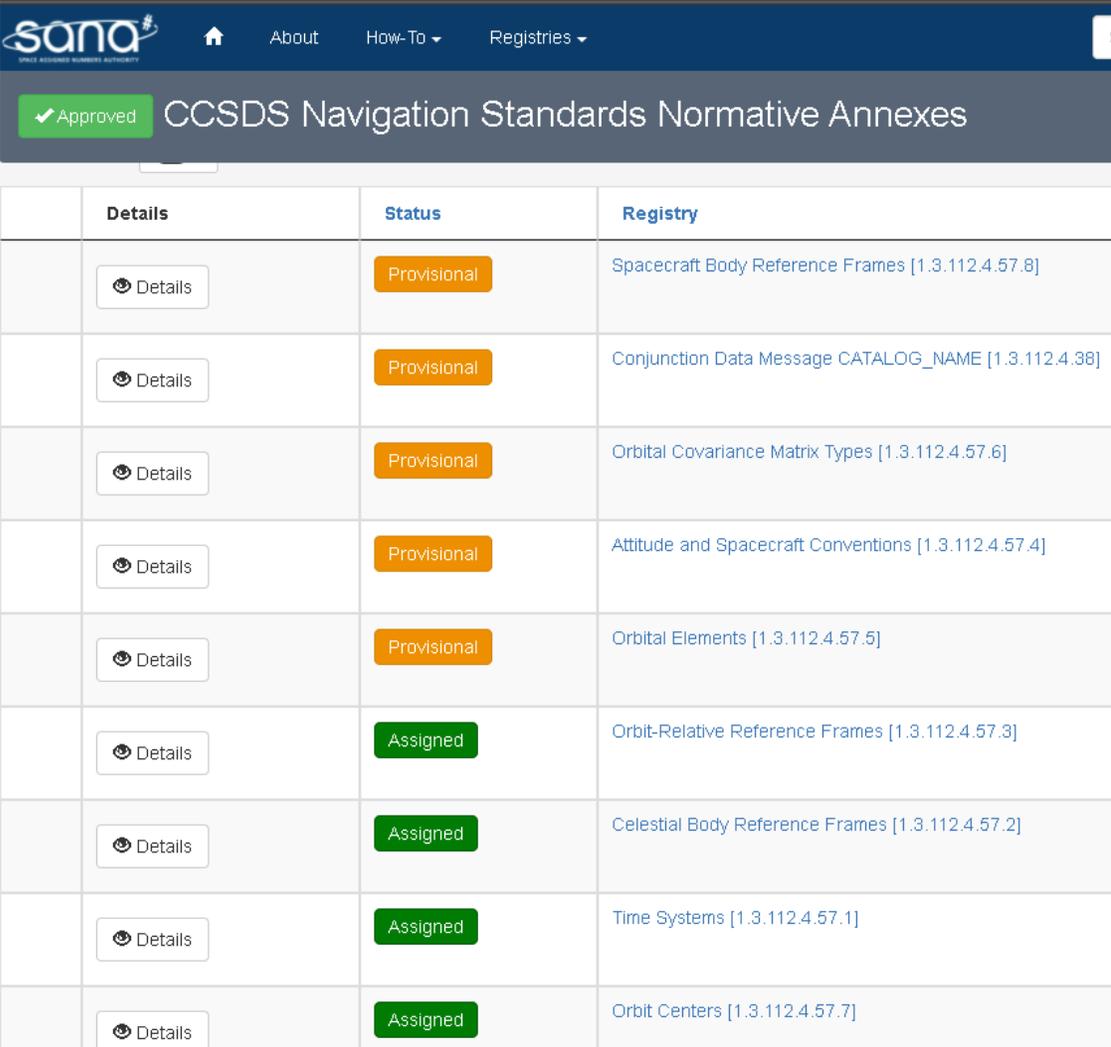
Mapping of CCSDS data exchange standards to STM

	Published CCSDS messages and standards									Devel		Proposed	Potentially useful new CCSDS messages for STC												
	Attitude Data Message	Conjunction Data Message	Digital Motion Imagery	Orbit Data Message	Pointing Request Message	Radio Freq & Mod. Systems	Re-entry Data Message	Space Data Link Security Std	Time Code Formats	Tracking Data Message	Events Message		Fragmentation Data Message	Launch Data Message	Navigation Composite Message	Anomaly Message	Earth Orientation Parameters Msg	Geolocation Data Message	EMI Data Message	RF Characteristics Message	RPO/OOS Data Message	Situation Report Message	Space Catalog Mapping Msg	Space Weather Data Message	Spacecraft CAD Message
Attitude	•			•	•				•				•												
Conjunctions	•	•		•	•				•				•		•								•		
Maneuvers				•					•				•		•						•				
Orbit & errors				•					•				•		•							•	•		
“Phonebook”				•									•		•							•	•		
Reentry							•						•		•								•		
RF, RFI, Geoloc						•							•		•	•									
RPO/OOS			•	•		•	•		•			•	•		•	•		•	•	•	•	•	•	•	•
Space catalog				•	•				•			•	•		•	•					•	•	•	•	•
Space events	•	•		•		•			•	•	•	•	•		•		•			•		•	•	•	•
S/C chars, SoH				•					•	•			•		•		•	•		•				•	
Sensor track/obs					•				•	•		•	•		•					•					•
STC system	•	•		•			•	•	•	•	•	•	•		•		•	•	•	•	•	•	•	•	•

SANA registry normative content

<https://sanaregistry.org/>

- **SANA:** Single central location to register "a variety of standards-related information, such as protocol identifiers, agencies, service and data providers, XML schema, a glossary of terms, and other information that is used across CCSDS"
- NavWG maintains normative annexes on SANA:
 - Celestial, orbit-relative, and S/C body frames
 - Catalog names
 - Covariance matrix types
 - Attitude and spacecraft conventions
 - Orbit elements
 - Time systems
 - Orbit centers
 - Gravity models
 - Atmosphere models
 - Orbit and orbit averaging types
 - Spacecraft activity/ops status



Details	Status	Registry
 Details	Provisional	Spacecraft Body Reference Frames [1.3.112.4.57.8]
 Details	Provisional	Conjunction Data Message CATALOG_NAME [1.3.112.4.38]
 Details	Provisional	Orbital Covariance Matrix Types [1.3.112.4.57.6]
 Details	Provisional	Attitude and Spacecraft Conventions [1.3.112.4.57.4]
 Details	Provisional	Orbital Elements [1.3.112.4.57.5]
 Details	Assigned	Orbit-Relative Reference Frames [1.3.112.4.57.3]
 Details	Assigned	Celestial Body Reference Frames [1.3.112.4.57.2]
 Details	Assigned	Time Systems [1.3.112.4.57.1]
 Details	Assigned	Orbit Centers [1.3.112.4.57.7]

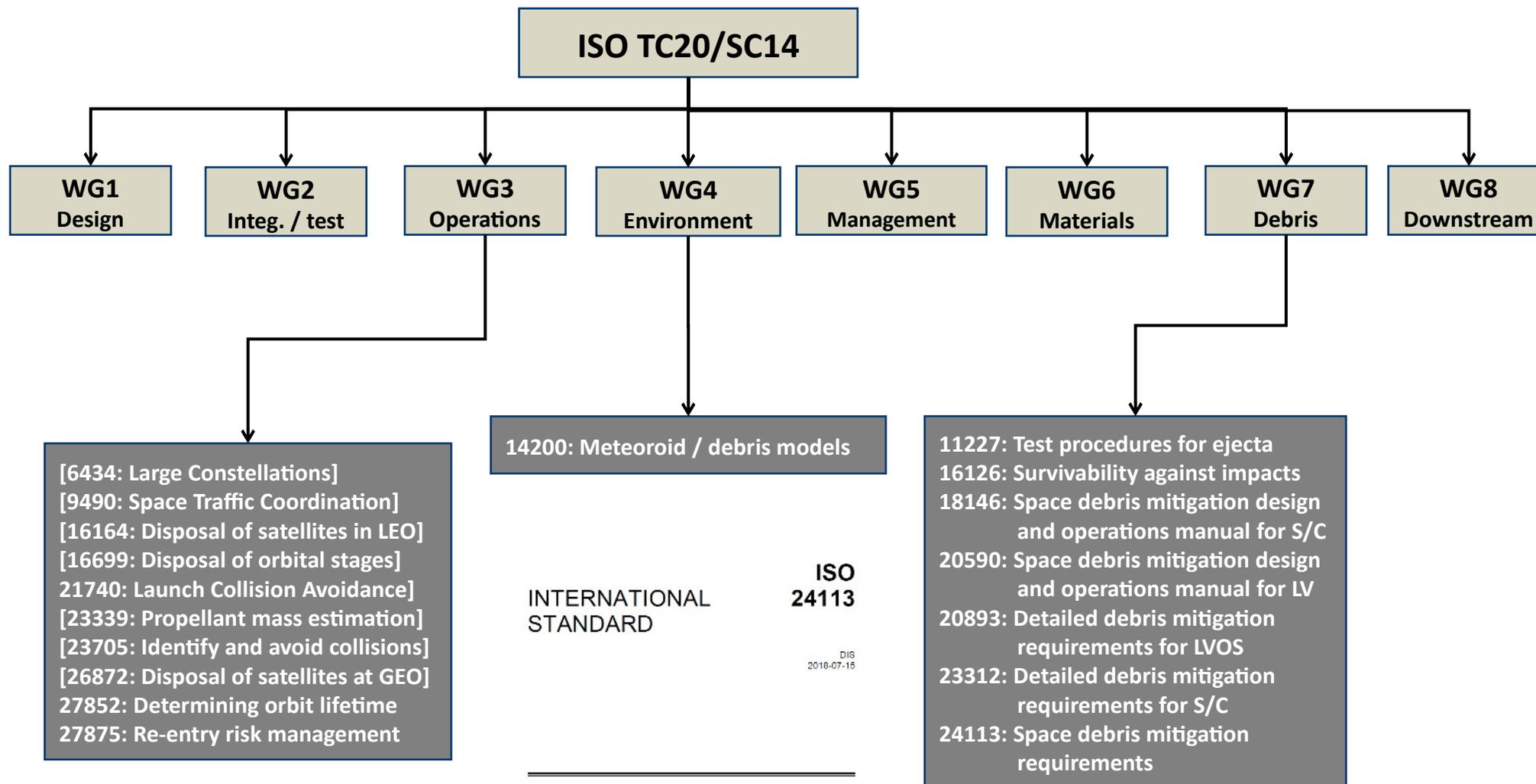
https://sanaregistry.org/r/navigation_standard_normative_annexes/

SC14 develops best practices for space safety and sustainability

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

Working Group		Convener
WG 1	Design, engineering and production	Japan
WG 2	Interfaces, integration and test	United States
WG 3	Operations and ground support	Germany
WG 4	Space environment (natural and artificial)	Russia
WG 5	Space system programme management and quality	France
WG 6	Materials and processes	Japan
WG 7	Orbital debris	United Kingdom
WG8	Downstream services (including GNSS)	France + Japan

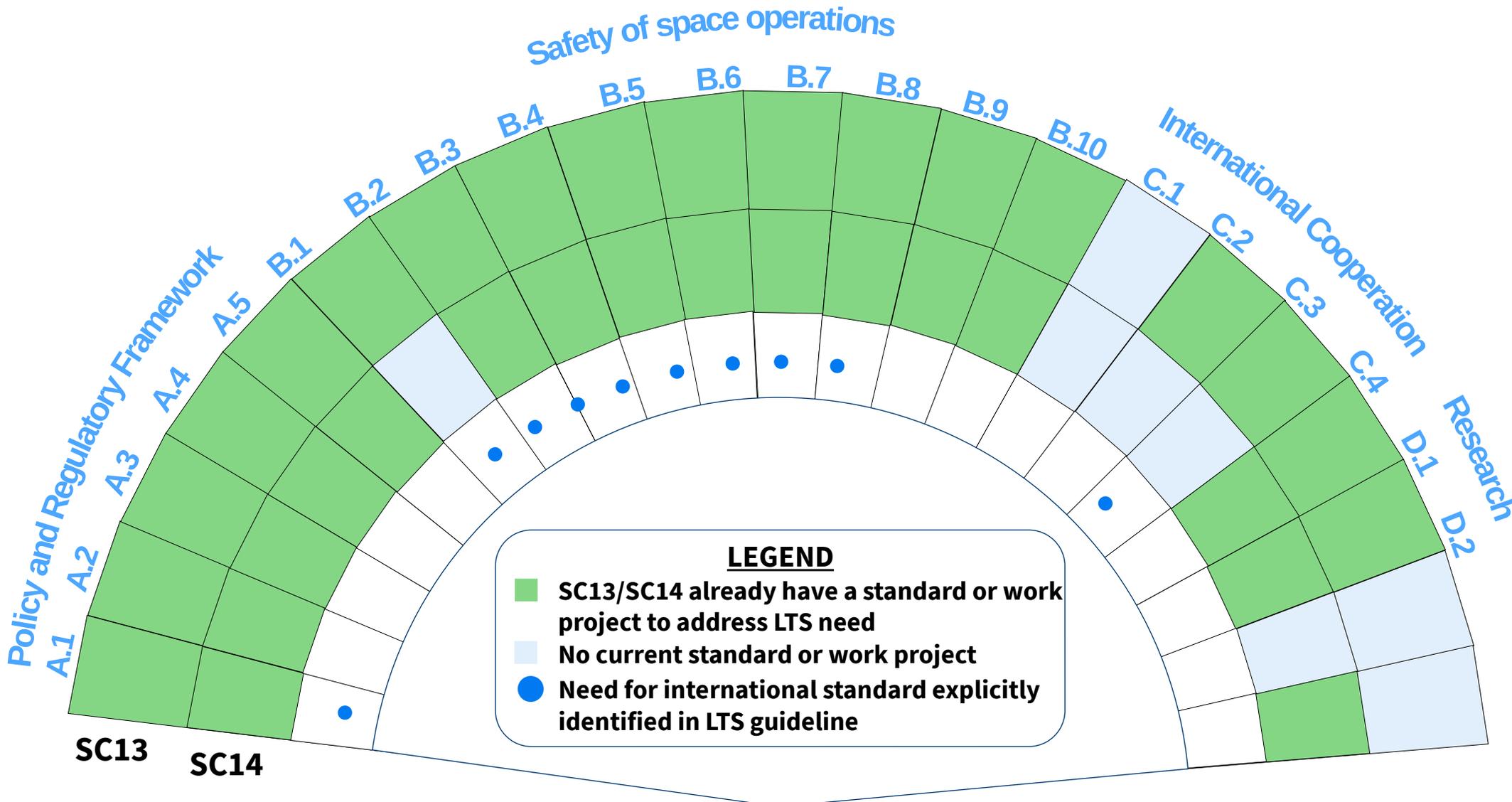
SC14 core space debris mitigation standards



Space systems — Space debris mitigation requirements

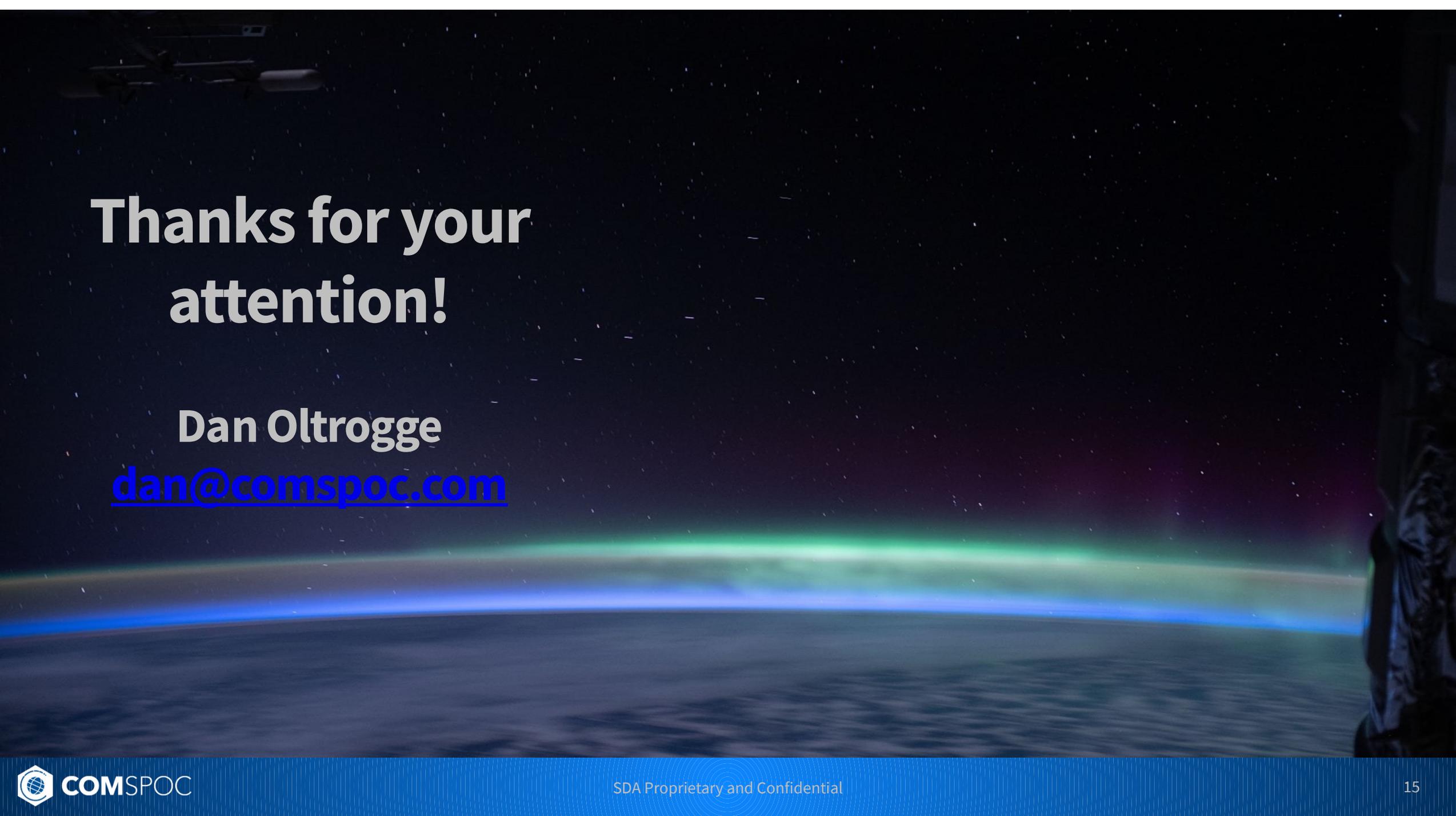
Systemes spatiaux — Exigences de mitigation des debris spatiaux

Published ISO documents addressing LTS guidelines*



Summary

- Space increasingly dangerous from orbital debris and security standpoints.
 - Challenging new era for SSA, SDA, STCM, and Space Environment Preservation.
 - Globally, must adhere to existing debris mitigation and space operations best practices & international standards.
 - Spacecraft operators, SDA users, and regulators need better STCM information.
- Must **standardize** our space safety and sustainability terminology.
- Must **standardize** how we exchange space data and information.
- Must **standardize** design, launch, on-orbit, and disposal best practices.

A photograph of an astronaut in a white spacesuit floating in space. The Earth's horizon is visible below, showing a blue atmosphere and a green aurora. The background is a dark starry sky.

**Thanks for your
attention!**

Dan Oltrogge

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