



ISO Standards and Space Debris

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Outline

- Overview of ISO Organization
- Process of creating ISO standards
- Features of ISO work about space debris
- Typical standards or work items
- Conclusion





The International Organization for Standardization (ISO)

- Based in Geneva, Switzerland
- Established in 1947 to promote standards in international trade, communications, and manufacturing
- Nongovernmental organization without authority to impose its standards



What is a Standard?



- Document, established by **consensus** and approved by a recognized body, that provides, for **common and repeated use**, rules, guidelines or characteristics for activities or their results, **aimed at the achievement of the optimum degree of order** in a given context

Standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits.



What are ISO Standards?



Normative documents, developed according to consensus procedures, approved by the ISO membership and P-members in accordance with ISO/IEC Directives and which has been published by the ISO Central Secretariat.

Normative – What must be done to satisfy the consensus. Indicated by words such as “shall,” “will, and “must.”

Not conditional or discretionary as indicated by words such as “should,” “would,” and “might.”





Membership and Participation

- P-members: All national bodies have the right to participate in the work with an obligation to vote and to contribute to meetings
- O-members: All national bodies may follow the work as an observer, receive committee documents , to submit comments, and to attend meetings but not vote.
- C-members: Correspondent members from countries without national body subscribers.



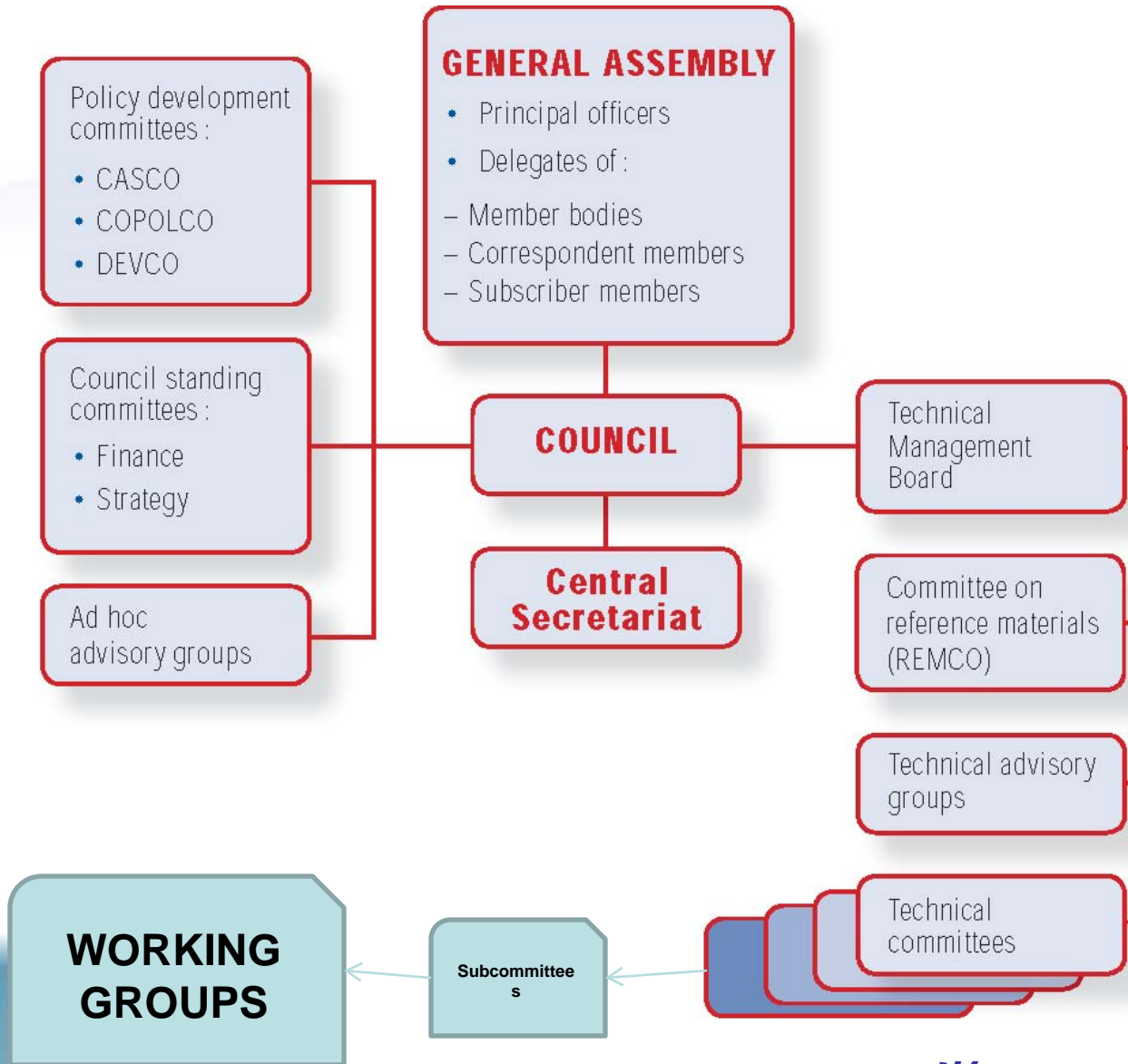


ISO TC 20 SC14 P&O Members

- Brazil (ABNT)
 - Canada (SCC)
 - China (SAC)
 - France (AFNOR)
 - Germany (DIN)
 - India (BIS)
 - Israel (SII)
 - Italy (UNI)
 - Japan (JISC)
 - Russian Federation (GOST R)
 - Ukraine (DSSU)
 - United Kingdom (BSI)
 - USA (ANSI)
 - Argentina (IRAM)
 - Kazakhstan (KAZMEMST)
 - Korea, Republic of (KATS)
 - Poland (PKN)
 - Romania (ASRO)
 - Slovakia (SUTN)
 - Sweden (SIS)
- P-Members 13
- O-Members 7



ISO Management Structure





Working Groups

- A working group comprises a restricted number of *experts* individually appointed by the P members,
- The experts act in a personal capacity and not as the official representative of the P-member
- On completion of its task(s) the working group shall be disbanded



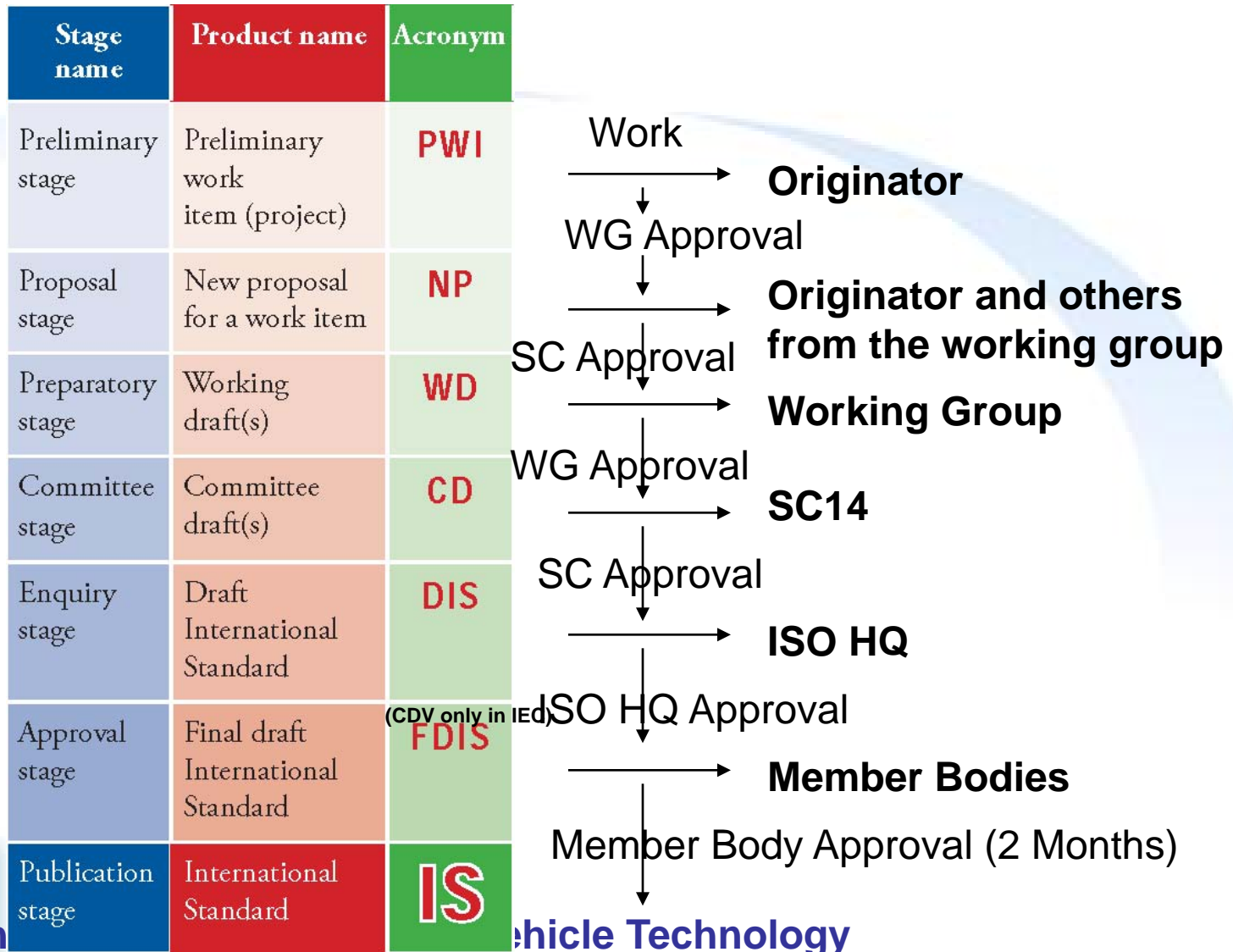


ISO Products

- **International Standard:** A voluntary, consensus, normative statement of requirements for a process or item.
- **Technical Specification:** the subject in question is still under development or where there is yet sufficient consensus
- **Technical Report:** data of a different kind such as information on the "state of the art." Reports are informative, not normative.

Technical Specifications are meant to become standards eventually, Technical Reports are not.

Standards Development Process





Schedule Guidance

- Working draft (if not supplied with the proposal): 6 months
- Committee draft: 12 months
- Enquiry draft: 24 months
- Approval draft: 33 months
- Published standard: 36 months

The technical management board may also instruct the secretariat of the technical committee or subcommittee concerned to submit the latest available draft for publication as a Technical Specification



ISO and Space Debris



- Orbital debris, space junk, or waste
- Space collisions, explosion, and re-entry risk.



New suite of ISO standards



- Here comes in a new suite of ISO standards
- To ensure the safe disposal of spacecraft
- To determine orbit lifetime
- Best practices in astro-dynamics
- The standards form a basis for establishing behavioral norms and codes of conduct, helping to sustain activities in space.

Reducing the growth of orbital waste is a priority.





Top-level standard

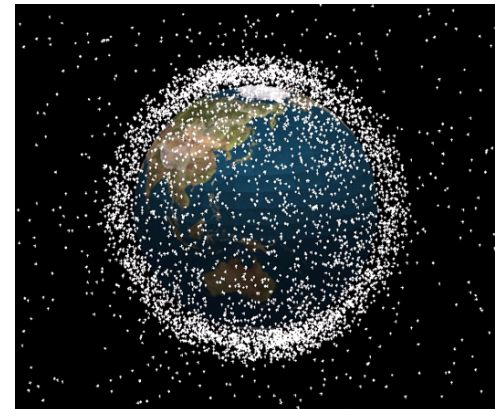
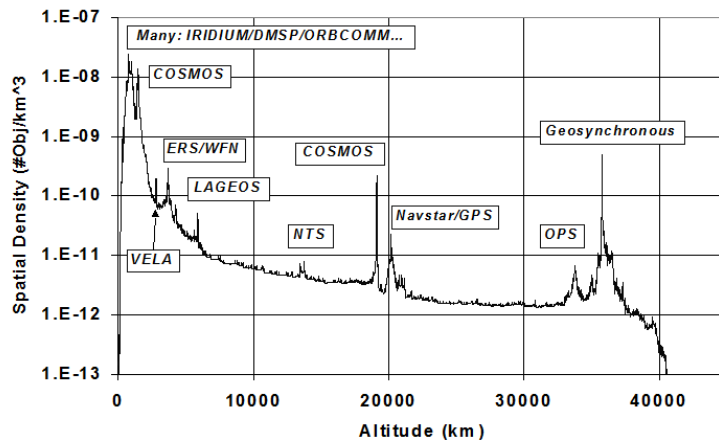
- Top-level standard, ISO 24113:2011
- *Space systems – Space debris mitigation requirements*
- Adds normative substance to practical / realistic actions
- Preserves the productivity and benefits
- The scope is broader than safety or interoperable design practices.
- The ECSS adopted, many national space agencies contribute to the standard.



Features: Absolutely crucial



- Any organization that does not use them becomes a threat to all in space and on Earth
- Re-entry management standard
- Avoiding collisions standard



Features: Practical and realistic



- ISO TC20 SC14 WG3/ODCWG
- 1st normative implementation of long-standing guidelines of the Inter-Agency Space Debris Coordination Committee (IADC).
- IADC guidelines are well known but only advisory
- ISO has enhanced their applicability by transforming them into a set of normative standards
- Driven and required by the imperatives of the space policies of many countries, and by civil and commercial activities



Features: Practical and realistic



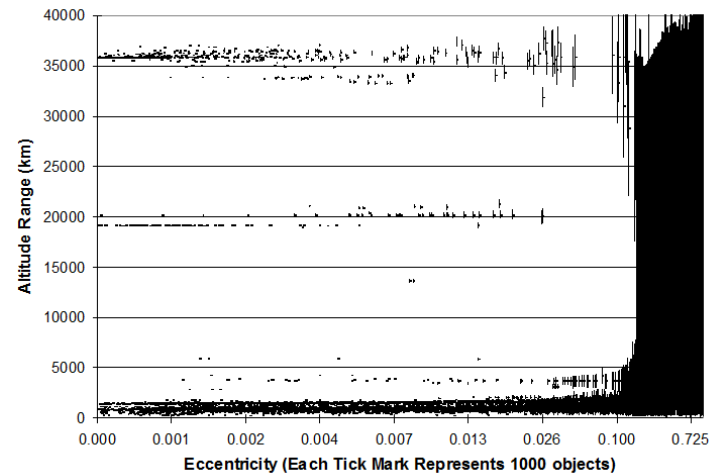
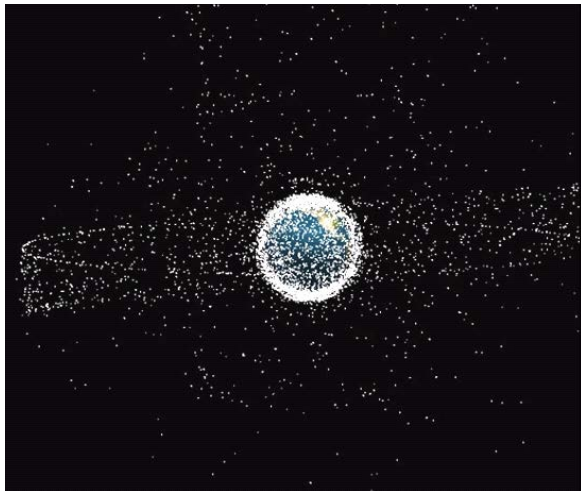
- ISO development has injected a practical, cost-conscious element that was previously absent.
- ✓ Example: discussions about limiting particulate emissions of solid rocket motors
- ✓ Example: Orbit Life time estimation
- *provides an internationally agreed approach and guidelines for orbit lifetime analysis for more confident and uniformly accepted lifetime estimates.*
- ✓ WG4 Space environment, has prominently brought the latest research to space weather effects.





Features: Flexibility and change

- Be tailored to need / well-controlled modification process
- Change with the scientific progress and understandings
- Reviewed and modified or withdrawn at intervals consistent with the ability of industry to respond





How ISO WGs contribute



ISO/TC 20/SC 14 promotes interoperability, expand competitive commercial opportunity, and stimulate innovation and progress. Its work facilitates confident space commerce in the face of marginally predictable phenomena.

None of this would be possible without the exemplary collaboration of the subcommittee's working groups (WGs), which enables interdisciplinary accomplishments, enhancing standards in all areas concerning space. They include :

- **WG 1, *Design engineering and production*, guides the design and engineering processes that make it possible to mitigate debris, such as design guidelines for systems to purge volatile propellants at end of mission, mitigating the likelihood of debris-proliferating explosions**





How ISO WGs contribute

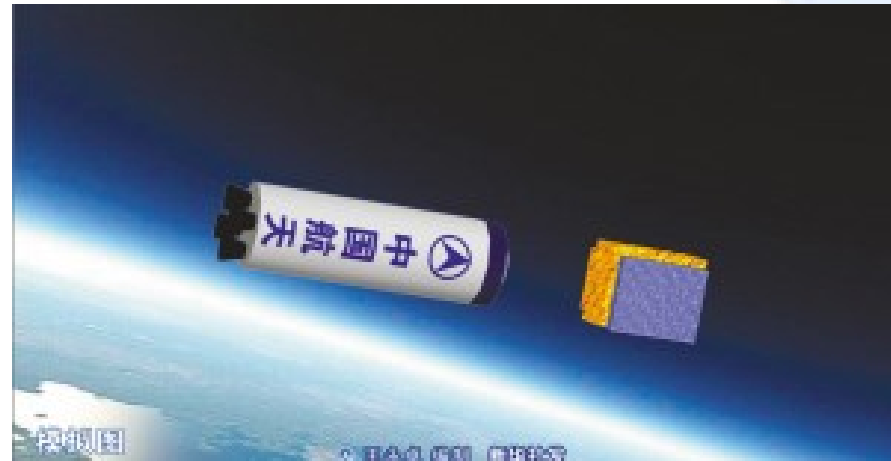
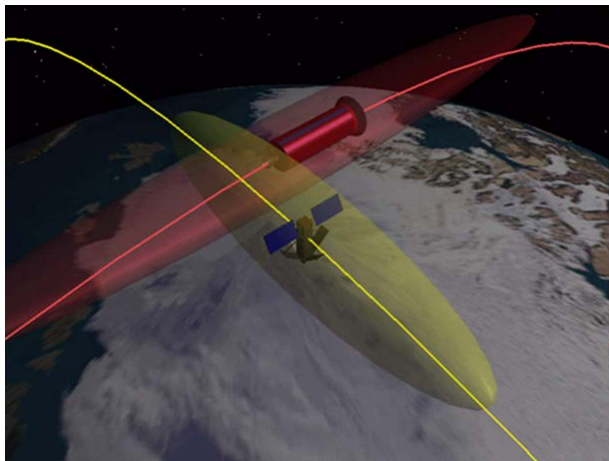
- **WG 2, *Interfaces, integration and test*, assures proper implementation through testing and qualification of systems that incorporate space standards**
- **WG 3, *Operations and ground support*, and the Orbital Debris Coordination Working Group ensures debris matters are considered in SC 14 developments**
- **WG 4, *Space environment*, contributes normative assessments and recommendations for the state and growth of the space debris environment**
- **WG 5, *Programme management*, standardizes the management process throughout the development and operation cycle to make debris mitigation traceable and verifiable;**
- **WG 6, *Materials and processes*, develops standards for materials used in spacecraft and the living environments in manned space vehicles.**





Typical standards or work items

- Launch window estimation & collision avoidance
- Relative Motion Analysis Elements for Launch Vehicle/Spacecraft Separation



Typical standards or work items



- Re-entry risk management for unmanned spacecraft and launch vehicle orbital stages
- Disposal of satellites operating at geosynchronous altitude
- Relative Motion Analysis Elements for Launch Vehicle/Spacecraft Separation
- Orbital Determination and Estimation
- Avoiding Collisions with Orbiting Objects



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Typical standards or work items

- Disposal of Orbital Launch Vehicle Stages
- Disposal of satellites operating in or crossing Low Earth Orbit
- Orbit Lifetime Estimation





Summary and Conclusion

- Overview of ISO Organization
- Process of creating ISO standards
- Features of ISO work about space debris
- Typical standards or work items



- The End
- Thank you!
- Q&A





ULTIMATE GUIDANCE

- **ISO Standards are to promote collaboration, interoperability, innovation, and market development**
- **ISO is not to be used to**
 - Further particular industrial or national interests
 - Invalidate existing practice
 - Promote individual research or accomplishment
 - Favor products or information that is not readily available at low or no cost.
 - Gain information or advantage



What is “Consensus?”



- “**General agreement**, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interests and by a process that **takes into account the views of all parties concerned** and attempts to reconcile any conflicting arguments.
 - **Consensus does not imply unanimity**
- In case of doubt concerning consensus, approval by a two-thirds majority of the P-members of the technical committee or subcommittee voting may be deemed to be sufficient



Membership Privileges and Sanctions



- Every national body whether P or O has the right to vote on enquiry drafts
- A national body may, at any time, begin or end membership or change its membership
- A P member may be reduced to an O member if it has been persistently inactive and has failed to make a contribution to 2 consecutive meetings or has failed to vote on questions formally submitted.

**Do not cast positive or negative votes just to remain a P member.
Abstention still counts as a vote for this purpose.
Neglecting to vote at all is nonparticipation.**





The Secretariat

- **The Secretariat is a compensated activity that provides technical and administrative services**
- **The secretariat is responsible for monitoring, reporting, and ensuring active progress of the work.**
- **The secretariat is responsible for meeting preparation and documentation**
- **A secretariat shall act in a purely international capacity and maintain a register of the membership of its working groups.**

The American Institute of Aeronautics and Astronautics has been appointed by ISO to be Secretariat of SC13 and SC14





ISO Liaisons

- **Liaison organizations can include manufacturer associations, commercial associations, industrial consortia, user groups and professional and scientific societies.**
- **Liaison organizations shall be multinational**
- **A liaison organization shall be willing to make a contribution to ISO or IEC as appropriate.**
- **A liaison organization shall have a sufficient degree of credibility and representation within its defined area of competence**





Types of Liaisons

- **Category A: Organizations that make an effective contribution to the work of the technical committee or subcommittee**
- **Category B: Organizations that have indicated a wish to be kept informed of the work of the technical committee or subcommittee.**
- **Category D: Organizations that make a technical contribution to and participate actively in the work of a working group.**

