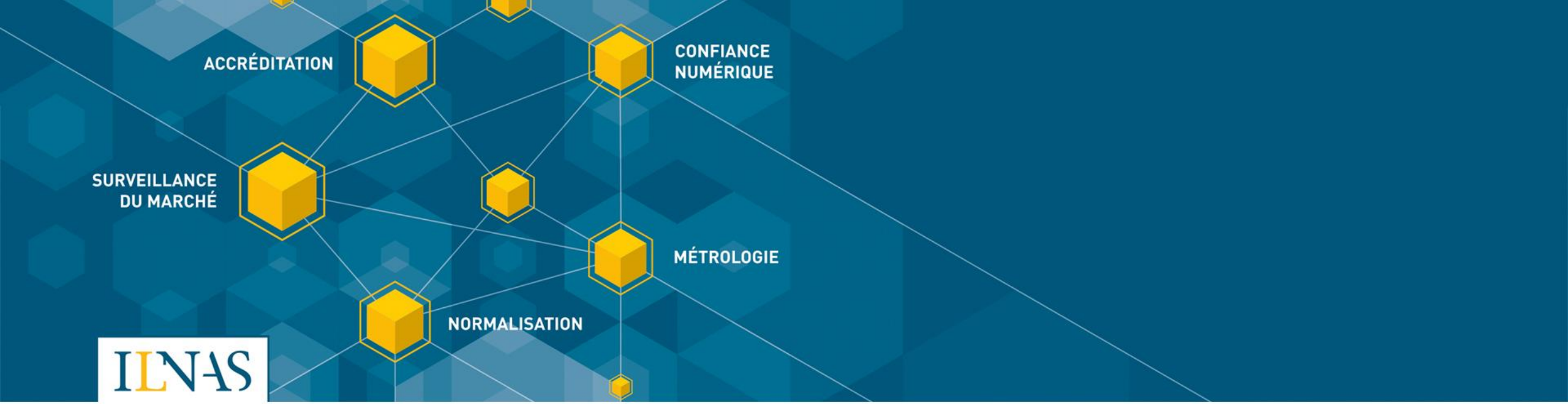
Workshop

Technical Standardization in Space and Sustainability

Tuesday, July 2nd

ILNAS



National standardization strategy 2020-2030 and standardization policies of the “growth” sectors

2nd July 2024

Dr. Jean-Philippe Humbert
Adjoint à la Direction - ILNAS

AGENDA

I - INTRODUCTION OF ILNAS AND ANEC EIG

II - NATIONAL STANDARDIZATION STRATEGY 2020-2030 & STANDARDIZATION POLICIES OF THE “GROWTH” SECTORS

III - FOCUS ON THE SUSTAINABILITY SECTOR

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I - INTRODUCTION OF ILNAS AND ANEC EIG

- **ILNAS**
  - Public administration under the authority of the Minister of the Economy, SME, Energy and Tourism
  - Creation: Law of May 20, 2008
  - Legislation in force: amended Law of July 4, 2014 reorganizing ILNAS
  - Total staff: 62 (July 2024)
  - ISO 9001:2015 certification (Budget and administration department, OLN, Digital Trust department, Market surveillance department, BLM, OEC)

PORTAIL-QUALITE.LU
QUALITE · SECURITE · CONFORMITE
UNE INITIATIVE DE L'ILNAS

- **National Standards Body (OLN)**
  - Composed of 8 persons
  - Close collaboration with the E.I.G. ANEC-N

I - INTRODUCTION OF ILNAS AND ANEC EIG

- **Creation:** October 4, 2010
- **Status:** Economic Interest Group (EIG)
- **Objectives:** Promotion, awareness raising and training, applied research in the field of standardization and metrology in order to support companies' competitiveness in Luxembourg
- **Human resources:** 9 persons, including 4 employees in the standardization department (July 2024)
- **Partners:**

GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Économie

ILNAS

CHAMBRE DES METIERS Luxembourg

CHAMBRE DE COMMERCE LUXEMBOURG

➔ Support for the implementation of the Luxembourg standardization strategy

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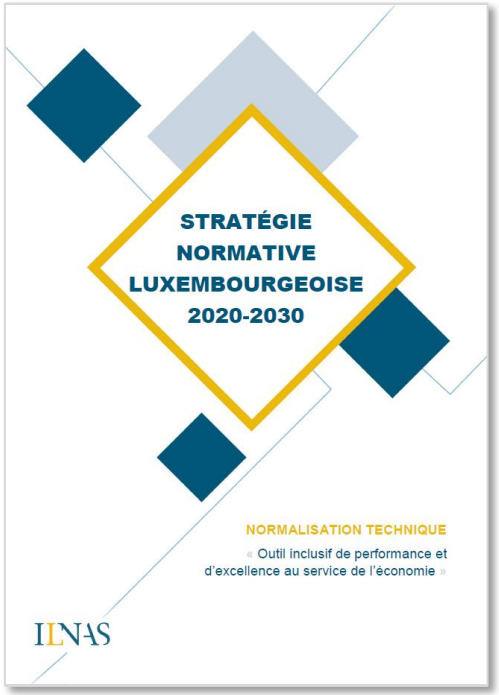
II - NATIONAL STANDARDIZATION STRATEGY 2020-2030 & STANDARDIZATION POLICIES OF THE "GROWTH" SECTORS



Technical standardization

"Inclusive tool for performance and excellence to serve the economy"

PERFORMANCE

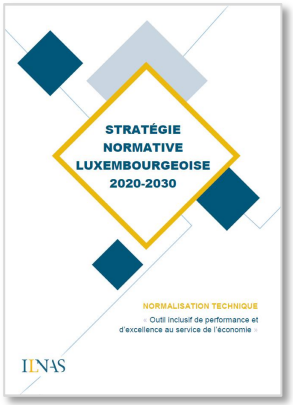
- ❑ **Pillar 1 – Use of relevant technical standards**
- ❑ **Pillar 2 – Involvement in the standardization process**

EXCELLENCE

- ❑ **Pillar 3 – Active participation of the NSB in the European and international standardization organizations**
- ❑ **Pillar 4 – Development of research and education about standardization**

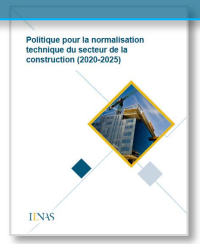
https://portail-qualite.public.lu/dam-assets/publications/normalisation/2020/strategie-normative-luxembourgeoise-2020-2030.pdf

II - NATIONAL STANDARDIZATION STRATEGY 2020-2030 & STANDARDIZATION POLICIES OF THE "GROWTH" SECTORS



3 growth sectors identified

CONSTRUCTION



- Computer Aided Design (CAD)
- Building Information Modelling (BIM)
- 3D printing
- …

INFORMATION AND COMMUNICATION TECHNOLOGIES

AEROSPACE

- Space data processing
- Space traffic management
- Smart Mobility
- …

Identification of trans-sectoral standardization interactions

2024

SUSTAINABILITY

2022

CONFORMITY

II - NATIONAL STANDARDIZATION STRATEGY 2020-2030 & STANDARDIZATION POLICIES OF THE "GROWTH" SECTORS

"Foster and strengthen the national economic sectors involvement in standardization work"

1. Promoting technical standardization to the market
2. Reinforcing the valorization and the involvement regarding technical standardization
3. Supporting and strengthening the Education about Standardization and the related research activities

Policies are based on similar lead projects

II - NATIONAL STANDARDIZATION STRATEGY 2020-2030 & STANDARDIZATION POLICIES OF THE "GROWTH" SECTORS

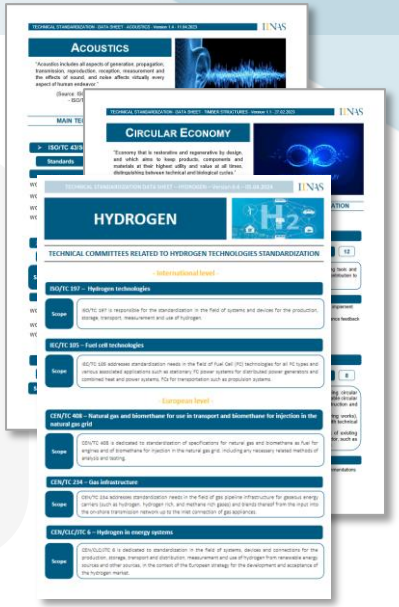
Pillar 1 – Use of relevant technical standards – **Some recent results/developments**

Training catalogue

- 10 trainings/awareness sessions covering the growth sectors
- 3 "general" trainings on standardization

Technical Standardization data sheets

- 9 for the ICT sector
- 7 for the construction sector
- 4 for the sustainability domain



Standards Analyses

- ICT sector (April 2024)
- Construction sector (March 2024)
- Aerospace sector (July 2024)

ILNAS e-shop

2022 → 2023

- +21 % of standards sold
- +108% of licenses sold

→ **2024**: new notification system in the ILNAS eShop to implement its own standards watch

- 9 reading stations to consult standards for free

II - NATIONAL STANDARDIZATION STRATEGY 2020-2030 & STANDARDIZATION POLICIES OF THE "GROWTH" SECTORS

Pillar 2 – Involvement in the standardization process – **Situation in 2024**

2024

→ 317 national delegates in standardization

→ 1.071 registrations in technical committees in total

National Committee ILNAS/TC 108

Telecommunications – Vertical cabling techniques in residential and mixed-use buildings

National Committee ILNAS/TC 109

National standard in the field of geotechnics

National Committee ILNAS/TC 110

National Annex to the standard EN 1916 "Concrete pipes and fittings, unreinforced, steel fibre and reinforced"

INFORMATION AND COMMUNICATION TECHNOLOGIES

93 national delegates

CONSTRUCTION

157 national delegates

AEROSPACE

4 national delegates

CONFORMITY

5 national delegates

II - NATIONAL STANDARDIZATION STRATEGY 2020-2030 & STANDARDIZATION POLICIES OF THE "GROWTH" SECTORS

Pillar 3 – Active participation of the NSB in the European and international standardization organizations

Participation in SDOs **General Assemblies** to represent Luxembourg's interests

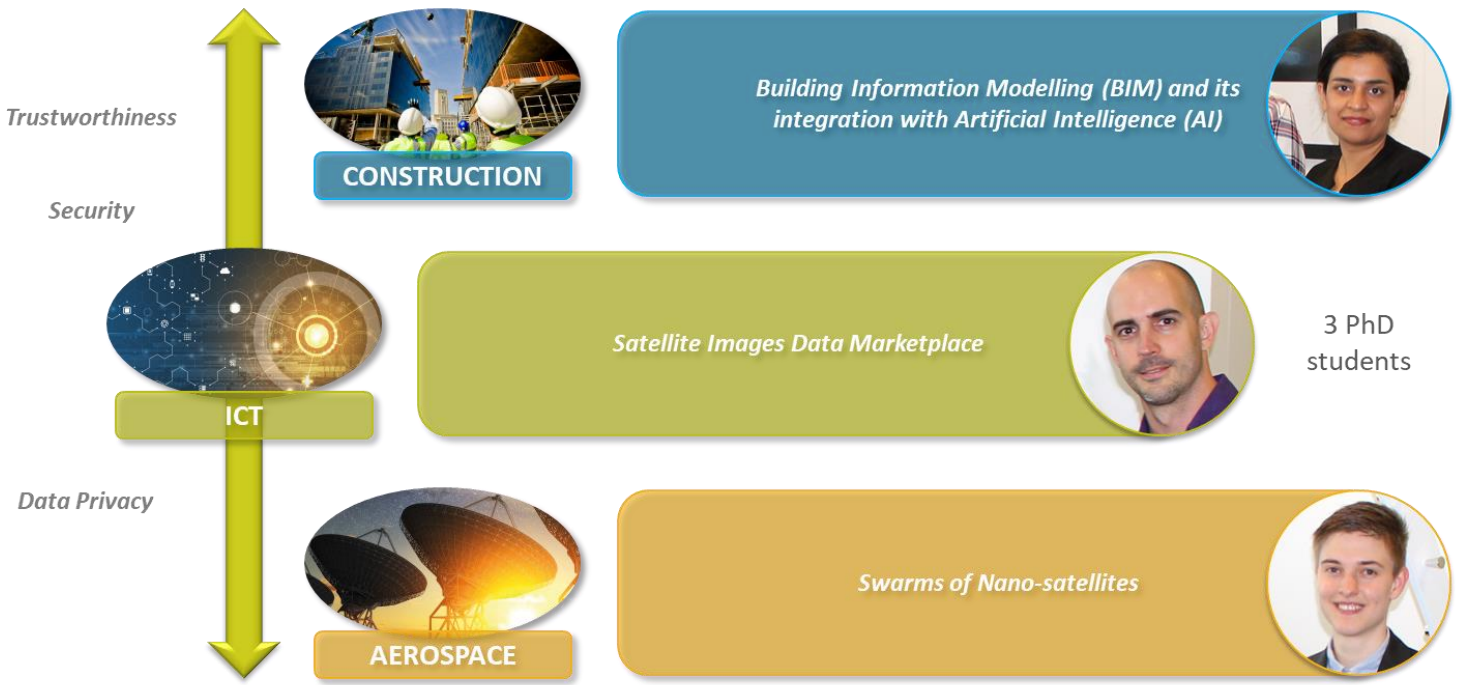
- ✓ CEN-CENELEC
- ✓ ETSI
- ✓ ISO
- ✓ IEC

Luxembourg will host the **CEN-CENELEC General Assembly 2025**

Active participation in **strategic technical committees**

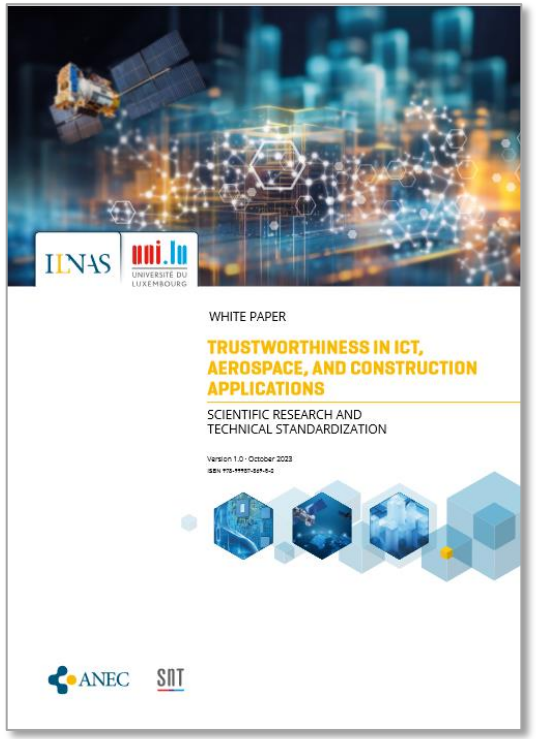
- ✓ National Presidency ISO/IEC JTC 1
- ✓ National Presidency ILNAS/NSC 02 "Conformity"
- ✓ Secretariat ISO/TC 323/WG 5 "Product circularity data sheet"
- ✓ Participation in multiple Technical Committees

Research program "Technical Standardisation for Trustworthy ICT, Aerospace, and Construction" (2021-2024) in collaboration with the University of Luxembourg



3 PhD students

1 postdoc



Master MTECH – ILNAS in collaboration with the University of Luxembourg and the Chamber of Employees

PROGRAMME

STANDARDISATION	ECTS
Smart Secure ICT and Innovation	1
Technical Standardisation	3
TOTAL	4

SMART ICT	ECTS
Smart ICT Technologies I	5
Smart ICT Technologies II	5
TOTAL	10

DIGITAL TRUST FOR SMART ICT	ECTS
Security for Smart ICT I	2
Security for Smart ICT II	3
Trust Architectures for Smart ICT	4
TOTAL	9

TECHNOPRENEURSHIP	ECTS
Management of Business and Technical Innovation	3
Digital Intelligence	2
Legal Aspects	2
TOTAL	7

MASTER THESIS	ECTS
Master Thesis	30
TOTAL	30

mtech.uni.lu

- **332 hours** of teaching
- **60 ECTS**
- **Internship** (+/- 750 hours)
- **Next promotion in September 2024**
- **2 years lifelong-learning**
- **11 Modules**
- **10 students**

With the support of: THE GOVERNMENT OF THE GRAND DUCHY OF LUXEMBOURG Ministry of the Economy

CEN CENELEC ETSI

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III - FOCUS ON THE SUSTAINABILITY SECTOR

III - FOCUS ON THE SUSTAINABILITY SECTOR

Context

- **Analysis "*Sustainability and Technical Standardization*"**
  - Produced by ILNAS in July 2023, covering two main fields of work:
    - Environment
    - ICT and sustainability
  - Crossing standardization developments and national strategies, 11 sub-axes of priority have been validated by the Ministry of the Economy

Circular Economy	E-Waste	Smart Mobility	Renewable Energies - Hydrogen
Sustainable Construction and Renovation	Smart Cities	Energy Efficiency and Green ICT	High Performance Computing (HPC)
Air	Eco conception, Production and Materials	Sustainable Consumption and Production	

60 technical committees, subcommittees and working groups are monitored

- ✓ CEN-CENELEC
- ✓ ETSI
- ✓ ISO
- ✓ IEC
- ✓ ITU-T

III - FOCUS ON THE SUSTAINABILITY SECTOR

Policy on technical standardization in the sustainability sector

1 Promoting technical standardization to the market

- Identify national needs in terms of standardization developments
- Carry out an identification of relevant standards
- Disseminate and promote standardization information to stakeholders

2 Reinforcing the valorization and the involvement regarding technical standardization

- Monitoring of relevant technical committees
- Carry out a monitoring of regulatory aspects in relation to standardization
- Promote the participation of the national market in technical committees and the use of appropriate standards identified

3 Supporting and strengthening the Education about Standardization and the related research activities

III - FOCUS ON THE SUSTAINABILITY SECTOR

Policy on technical standardization in the sustainability sector

1 Promoting technical standardization to the market

2 Reinforcing the valorization and the involvement regarding technical standardization

- **Meetings with national stakeholders in the field of sustainable development and identified sub-axes**
- **Creation of standards packages on specific topics**
  - e.g.: technical sheets on sustainable construction, circular economy, hydrogen or sustainable cities
- **Publication of news/technical reports**
- **Carrying out events promoting technical standardization in the field of sustainable development**

3 Supporting and strengthening the Education about Standardization and the related research activities

- **Research program ILNAS/Uni.lu-SnT (2025-2028)**

- **Internship proposal approaching technical standardization under the prism of sustainable development**
  - An intern has been hired for the summer period (3 months) in order to develop a methodology for assessing the environmental impact of the implementation of a management system standard

- **Proposal for training courses addressing standardization in specific areas.**
  - “Technical standards on Hydrogen technologies” - 28/11/2024
  - “Sustainable construction and technical standardization” - 05/11/2024

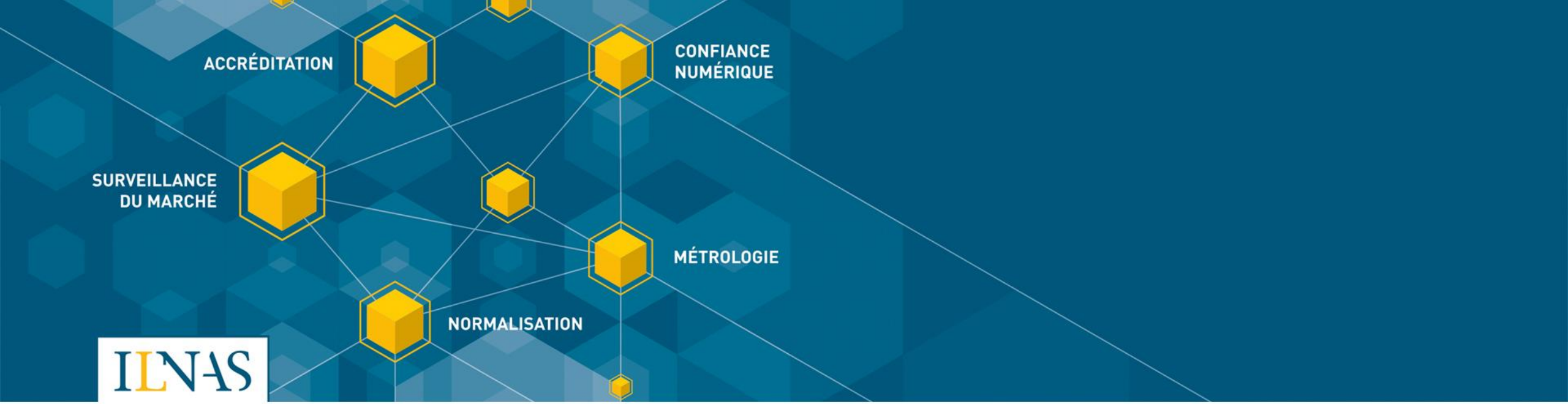
ILNAS

Southlane Tower I · 1, avenue du Swing · L-4367 Belvaux

Tel. : (+352) 24 77 43 - 00 · Fax : (+352) 24 79 43 - 10

E-mail: info@ilnas.etat.lu

www.portail-qualite.lu



National Standardization Policy for the Space Sector and legal framework of standardization

2nd July 2024

Mr. Nicolas DOMENJOUD
Project Officer - ILNAS/OLN

AGENDA

I - NATIONAL STANDARDIZATION POLICY FOR THE SPACE SECTOR

II - LEGAL FRAMEWORK OF STANDARDIZATION

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I - NATIONAL STANDARDIZATION POLICY FOR THE SPACE SECTOR

II - LEGAL FRAMEWORK OF STANDARDIZATION

I - NATIONAL STANDARDIZATION POLICY FOR THE SPACE SECTOR

"Foster and strengthen the national economic sectors involvement in standardization work"

1. Promoting technical standardization to the market
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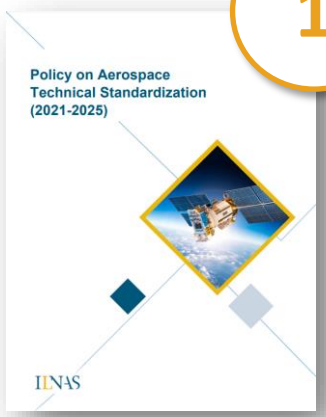
3. Supporting and strengthening the Education about Standardization and the related research activities

→ Policies are based on similar lead projects

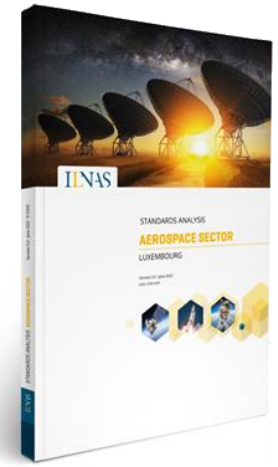


1 Promoting aerospace technical standardization to the market

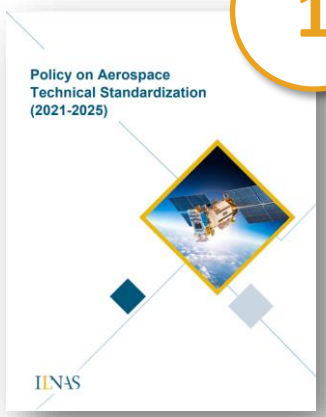
A. Draw up a yearly national standards analysis for the aerospace sector

→ **Sector-based "Snapshot"**

- **This document is composed of different type of information:**



  - Standards watch of the related sector
    - Inventory of standards – both published and under development – at the European and international levels
    - Identification and description of technical standardization committees
    - Mention of the related national representation
  - Relevant national companies, agencies and Fora/Consortia related to the aerospace sector
  - Final report with the results of the above mentioned standards watch and the identified opportunities

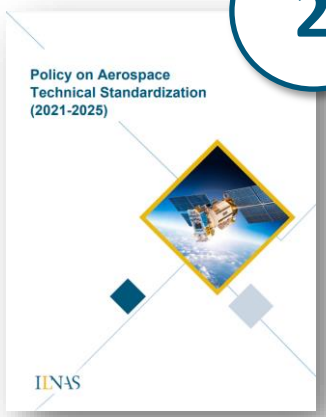


1 Promoting aerospace technical standardization to the market

B. Define a national implementation plan for aerospace technical standardization

- The aim is to **involve targeted stakeholders of the Grand Duchy of Luxembourg in a global approach to standardization** in order to support the sector in terms of competitiveness, visibility and performance, while enhancing the international recognition of Luxembourg at the standards level

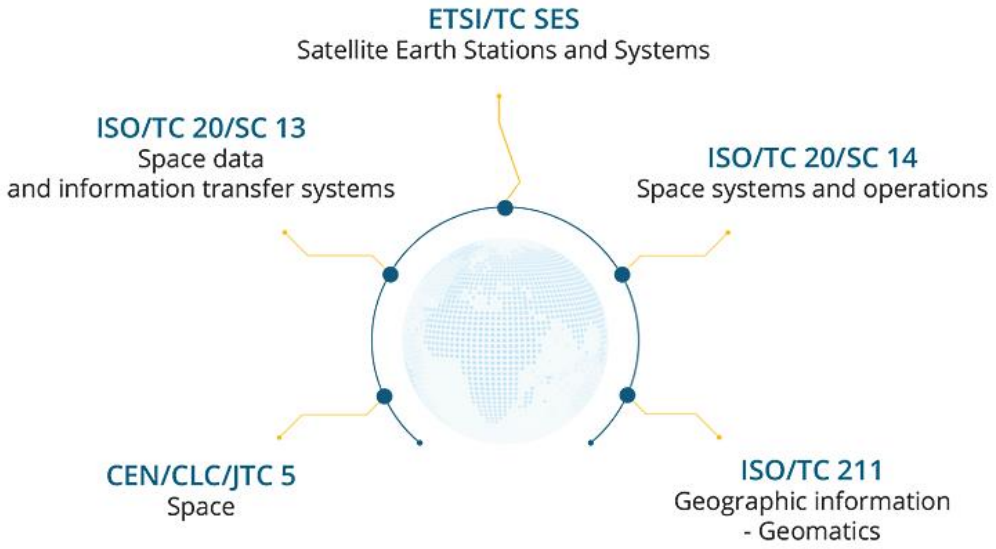
- The implementation plan is drawn up on a yearly basis in order to ensure that it is in line with the national standardization priorities

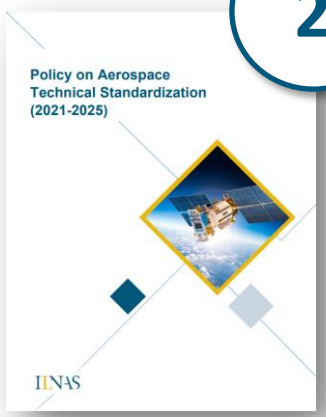


2 Reinforcing the valorization and the involvement regarding technical standardization

A. Participate in relevant technical committees

- In order to provide the most relevant information on technical standardization to the national aerospace community, ILNAS analyzed the national market needs of this specific sector in order to define a list of relevant technical committees
- These technical committees are followed by ILNAS in order to provide the most relevant information to the interested national actors



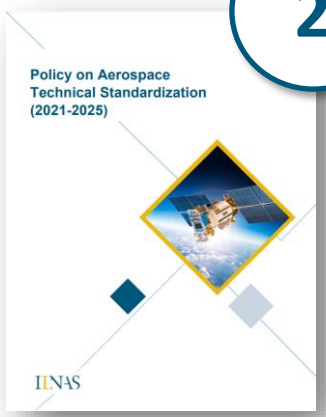


2 Reinforcing the valorization and the involvement regarding technical standardization

B. Promote the participation of the national market in technical standardization committees and the use of relevant standards

1) Promote the use of the ILNAS reading stations

- Free consultation of European (CEN, CENELEC & ETSI), international (ISO & IEC) and national (ILNAS & DIN) standards
- More than 200.000 normative documents at your disposal
- National network currently composed of 9 reading stations



2 Reinforcing the valorization and the involvement regarding technical standardization

B. Promote the participation of the national market in technical standardization committees and the use of relevant standards

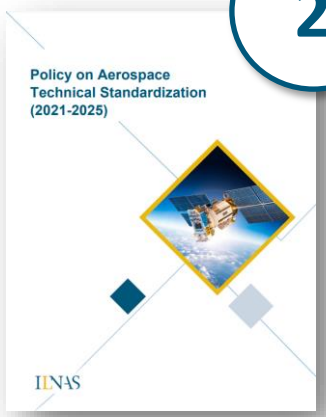
2) Organize events to promote participation in technical standardization committees and the use of relevant standards in the aerospace sector

3) Meet and raise the awareness of the national stakeholders (companies, national agencies, Fora/Consortia, etc.) of the aerospace sector

Organization of the Workshop “Technical Standardization in Space and Cybersecurity” (June 2023)

Participation in the Conference “Who leads the way in the new era of space? The new actors of international space law” – Pannel “The new governance in space” (May 2024)

20.11.2024 – SAVE THE DATE “Awareness session - Introduction to standardization in space domain”



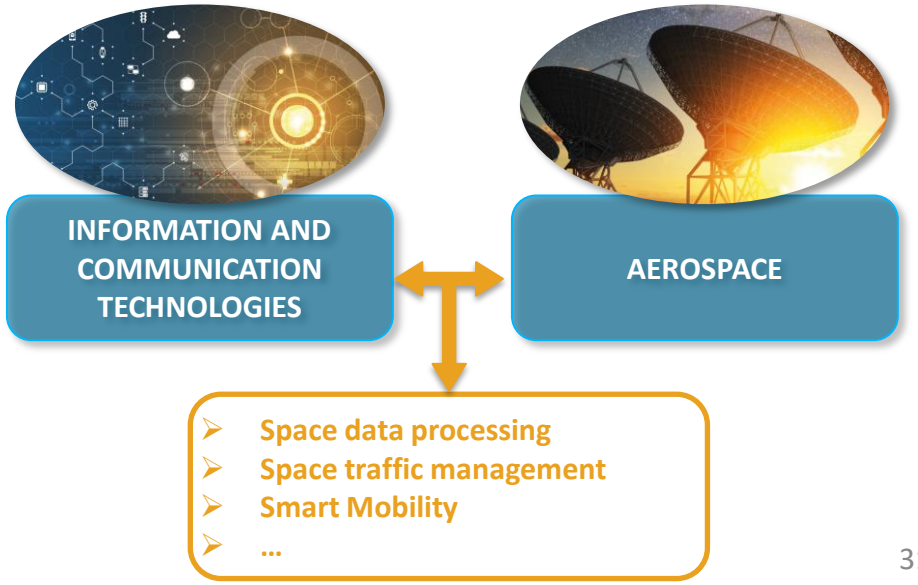
2 Reinforcing the valorization and the involvement regarding technical standardization

C. Create transversal links with the ICT domain

- The aerospace sector is evolving in parallel with the development and the usage of ICT.

→ **It is important to create transversal links with technical standardization of the ICT domain in order to identify new opportunities for common developments**

- Relevant information will be provided to the national stakeholders active in the aerospace sector, in order to allow them :
  - to improve the efficiency of their processes
  - to facilitate communication
  - to identify new business opportunities
  - to develop new markets



3 Supporting and strengthening the Education about Standardization and the related research activities

- **ILNAS is constantly reinforcing the research and innovation activities related to technical standardization in the aerospace sector, notably by defining and carrying out new research and education projects**

Support to the PhD students involved in the research program "Technical Standardisation for Trustworthy ICT, Aerospace, and Construction" (2021-2024)

Law
–
Master in Space, Communication and Media Law

Computer Science
–
Master in Space Technologies and Business
in collaboration with:

UNIVERSITÉ DU LUXEMBOURG
LUXEMBOURG SPACE AGENCY
SnT

3 lectures provided in the space-related Masters of the University of Luxembourg (November-December 2023)

AGENDA

I - NATIONAL STANDARDIZATION POLICY FOR THE SPACE SECTOR

II - LEGAL FRAMEWORK OF STANDARDIZATION

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What are the differences between standards and legislation

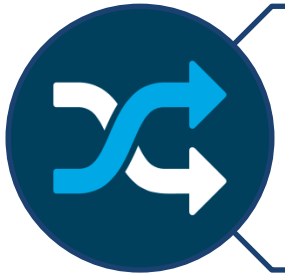
Standards	Legislation
Voluntary	Mandatory
Consensus-based	Imposed by Law
Developed by independent organizations	Established by public authorities
Revised every 5 years	Revised when legislators decide
Provide specifications and tests methods	Sets requirements to protect public interests

II - LEGAL FRAMEWORK OF STANDARDIZATION

The role of technical standardization in the EU legal framework

Increasing the competitiveness of European companies

Improve general convergence of international standards to eliminate technical barriers to trade



Facilitate access to new markets

- **Before 1985**

  - Technical requirements for goods/services/processes were defined in legal acts
    - Mandatory
    - Set by legislator – **competencies?**
    - Revised on the legislator decision – **pertinence of content according to the evolution of the technologies?**

→ **TOO HEAVY AND COMPLICATED FOR LEGISLATORS**

- **Since "COUNCIL RESOLUTION of 7 May 1985 on a new approach to technical harmonization and standards" 85/C 136/01**

  - **"Essential requirements"** set in EU directives/regulations
  - **"Technical specifications"** are defined in the standards (so-called **harmonized standards**)
  - Definition of the principle of the **"presumption of conformity"**

II - LEGAL FRAMEWORK OF STANDARDIZATION

Why does the European Commission accept standards as source for technical requirements?

- Existence of legal framework which gives the fundamental characteristics of European standardization

Fundamental characteristics

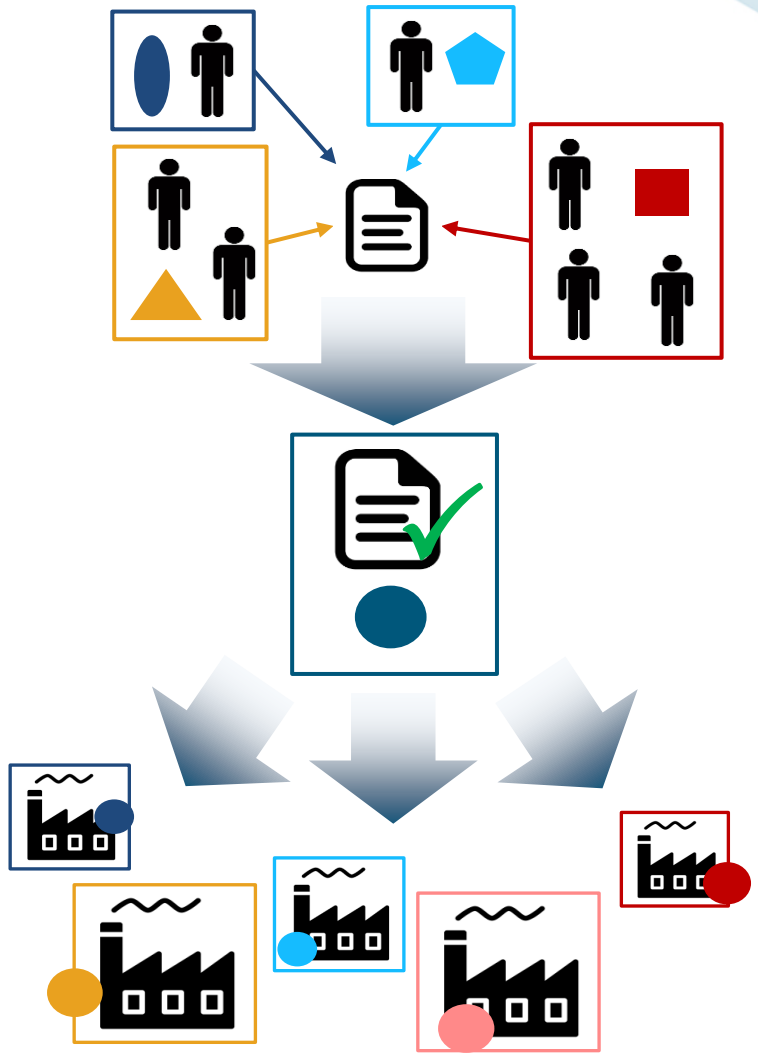
Reference document

Transparency

Openness

Consensus

Independence



- **Firewall:** European Commission is still part in the technical specifications development but act as verifier

II - LEGAL FRAMEWORK OF STANDARDIZATION

The role of technical standardization in the EU legal framework

EU Directive / EU Regulation

Standardisation request

Harmonised standards

Publication in the OJEU

Adoption by the National Standards Bodies of the Member States

II - LEGAL FRAMEWORK OF STANDARDIZATION

Future of standards for space might also cover the legal aspect

- **Upcoming publication of the EU Space Law**
  - Standardization request could be issued by EC → standards translating “essential requirements” into “technical specifications” will have to be drafted
  - Recognized standardization bodies (CEN/CENELEC/ETSI) would be in charge of these activities
- **Respect of the requirements of these so-called “harmonized” standards will be (highly) recommended to be compliant with related regulation/directive (principle of presumption of conformity)**

The role of standards for space activities could be extended to a legal context

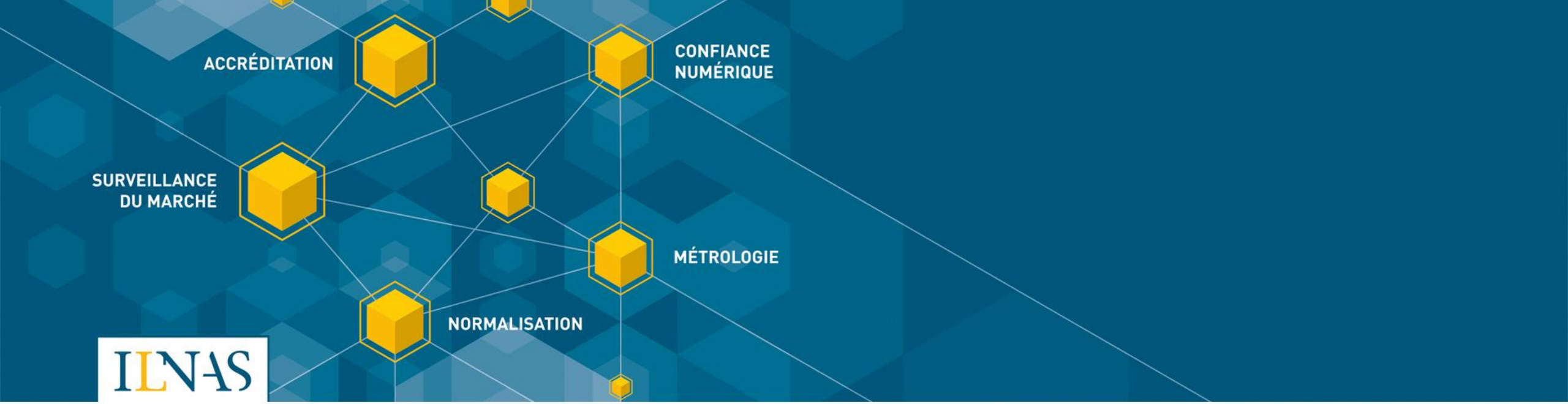
ILNAS

Southlane Tower I · 1, avenue du Swing · L-4367 Belvaux

Tel. : (+352) 24 77 43 - 00 · Fax : (+352) 24 79 43 - 10

E-mail: info@ilnas.etat.lu

www.portail-qualite.lu



Workshop – Technical Standardization in Space and Sustainability

Standardization for sustainability in space

&

Presentation of national space standardization developments

2nd July 2024

Dr. Lucas CICERO – Aerospace and Technical Standardization Project Officer, ILNAS/OLN

Agenda

I. Standardization generalities

II. Standardization for sustainability in space

III. National Space standardization developments

   a) Standards Analysis – Aerospace sector

   b) National Standardization Commissions

I. Standardization generalities

II. Standardization for sustainability in Space

III. National Space standardization developments

a) Standards Analysis – Aerospace sector

b) National Standardization Commissions

Defined in Regulation (EU) No 1025/2012 on European standardization

" 'standard' means a technical specification, adopted by a recognised standardisation body, for repeated or continuous application, with which compliance is not compulsory"

(1) technical specification: document that prescribes requirements to be fulfilled by products, services, processus, competencies, etc.

(2) recognised standardisation body: standard publication is limited to

(3) repeated or continuous application: aims to cover well established activities

(4) compliance is not compulsory: up to you to follow them… or not !

I. Standardization generalities

Global view

Coherence	Transparency	Openness	Consensus-based	Voluntary	Independence
Coherence between UE members, but with the international standardization	Standardization draft is known and disclosed	Open and inclusive participation to all stakeholders (SMEs, industries, government, research institute, etc.)	Les points de vue de tous les intéressés sont pris en compte : fabricants, vendeurs, utilisateurs, groupes de consommateurs, etc.	Standard application is voluntary	Standardization should not defend interest of one party

Standards when used in a voluntary way

Innovation

- Reflect the **state of the art**
- Competitiveness will force companies to constantly think to **innovation**

During operational activities

- Improve of work **efficiency**

Standards can be used to set requirements during trades

Trust

- Reassure customers about the **quality**, **compatibility** and **performance** of products and services
- Guarantee a certain level of **quality** of products and services over time and regardless of the geographical area
- By defining clear expectations, standards establish **trust** between partners

Common language

- **Common language** between different economic actors
- By defining interfaces to improve **interoperability**

Standard can support legislation

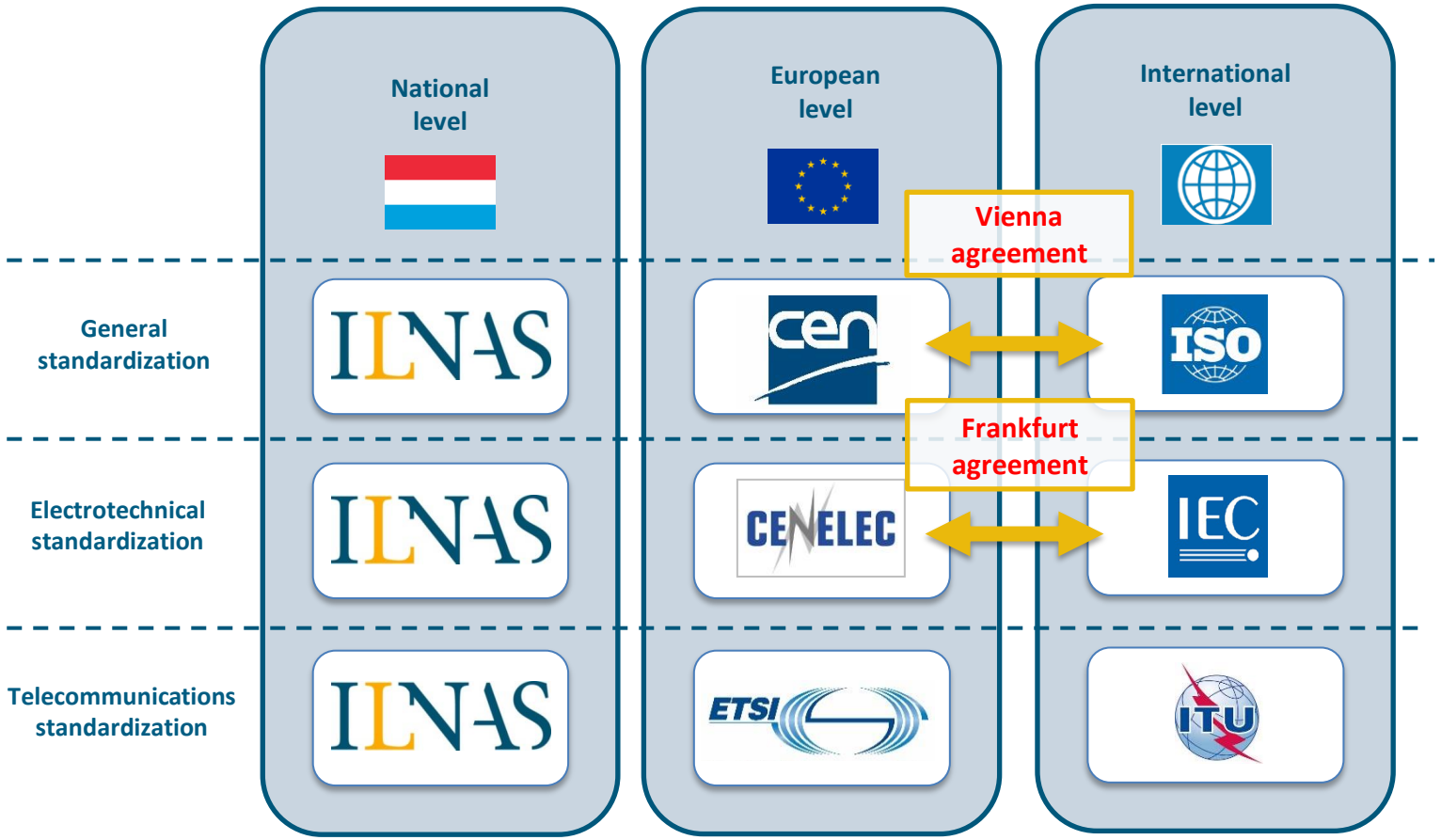
Safety

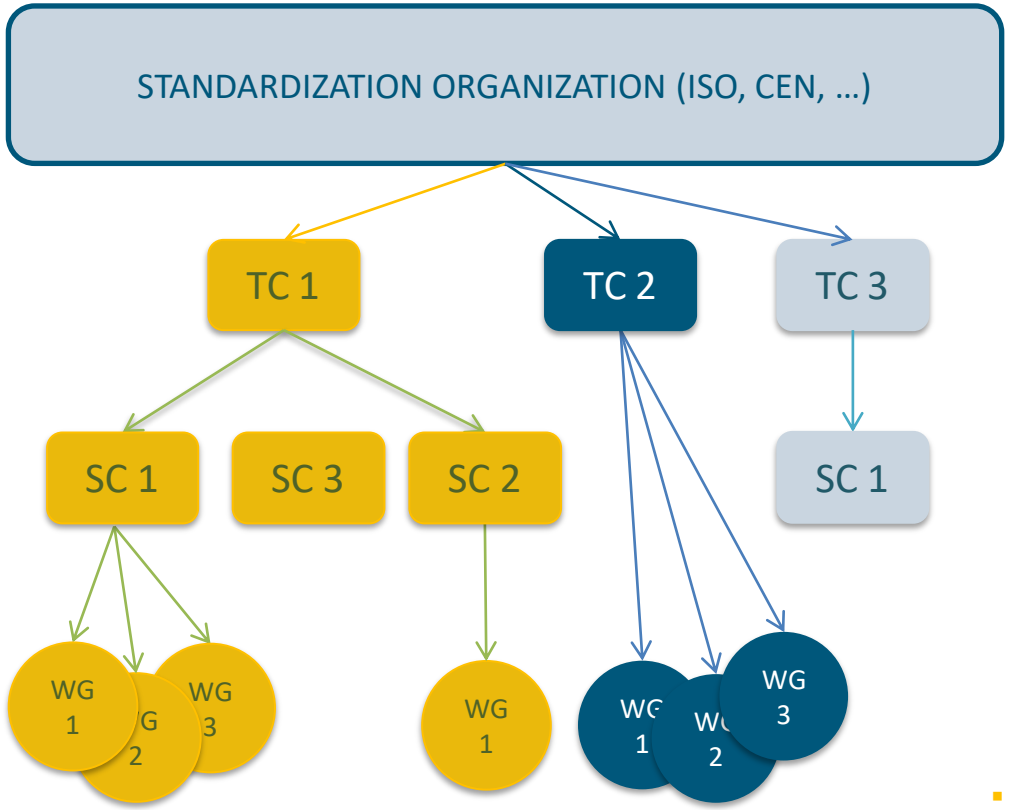
- Competitiveness will force companies to constantly think to **innovation**

Big challenges

- Provide a **common answer** to tackle global problems *e.g. climate changes*

Standards organizations





Standardization organization structure

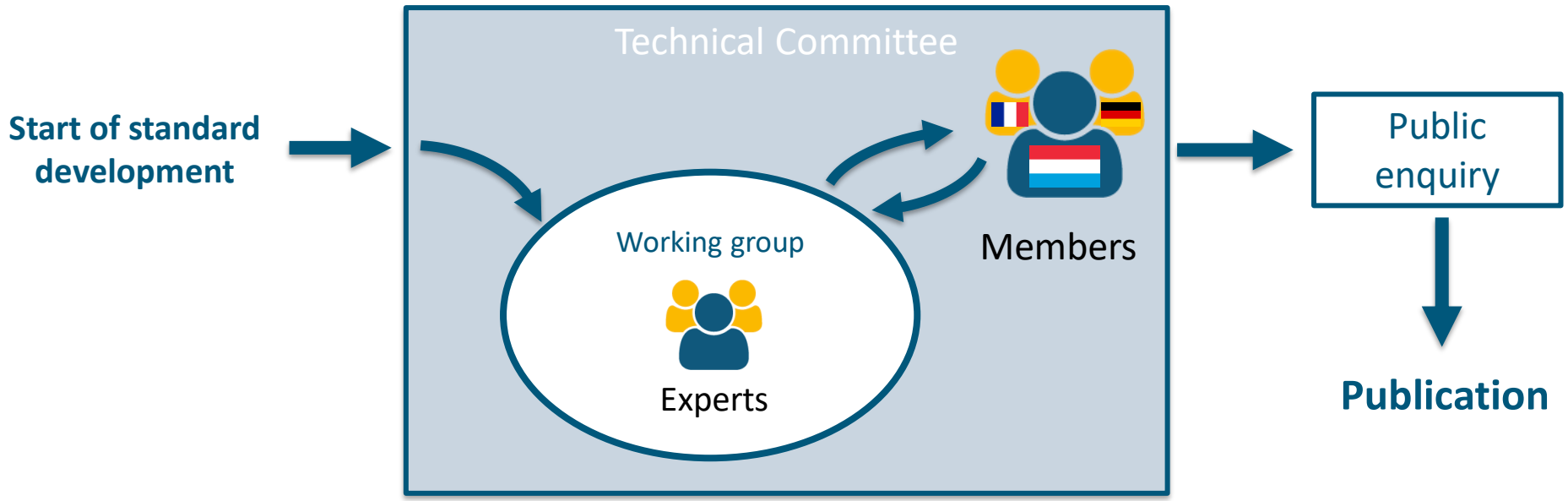
- **Presence of several Technical Committees and Subcommittees, covering specific domains**
  - *e.g. ISO/TC 207/SC 1 - Environmental management systems*
- **Presence of Joint Technical Committee**
  - *e.g. ISO/IEC JTC 1 - Information technology*
- **Tackling very specific topic**

- **TC**: *Technical Committee*
- **SC**: *Subcommittee* – Entity established within a TC responsible for a large work program (focuses on an area of interest of the TC)
- **WG**: *Working Group* - Group established by a TC or SC that develops standards project(s) within the scope of activity of the TC/SC

Generalities

- Can be triggered through a national standardization body or technical committee itself
- Development possible at national, European or international level
- Some rules exists in Europe → **Regulation (EU) No 1025/2012 on European standardization**

  e.g. a national standard shall not compete with European standard



I. Standardization generalities

II. Standardization for sustainability in Space

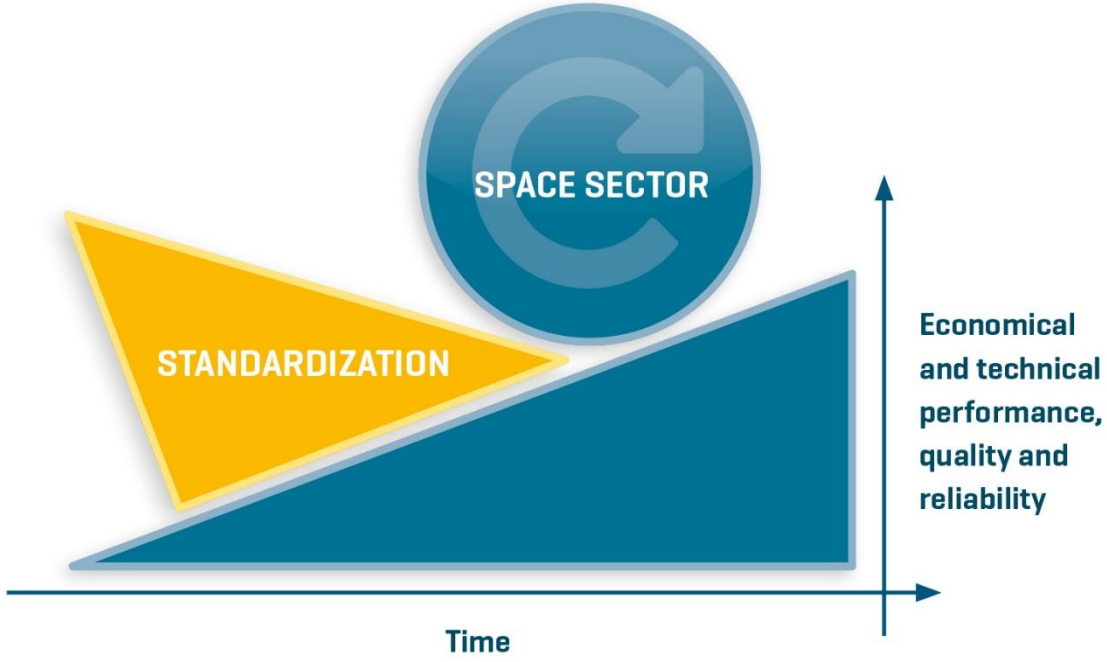
III. National Space standardization developments

a) Standards Analysis – Aerospace sector

b) National Standardization Commissions

Standardization as a support for the space sector development

- International cooperation
- Facilitate interface of systems
- Ensure interoperability, notably with other sectors (such as ICT)
- Reduce technical barriers between stakeholders
- Increase user confidence and mitigate liability
- **Support the EU legislation with the upcoming EU Space Act and the harmonized standards development**

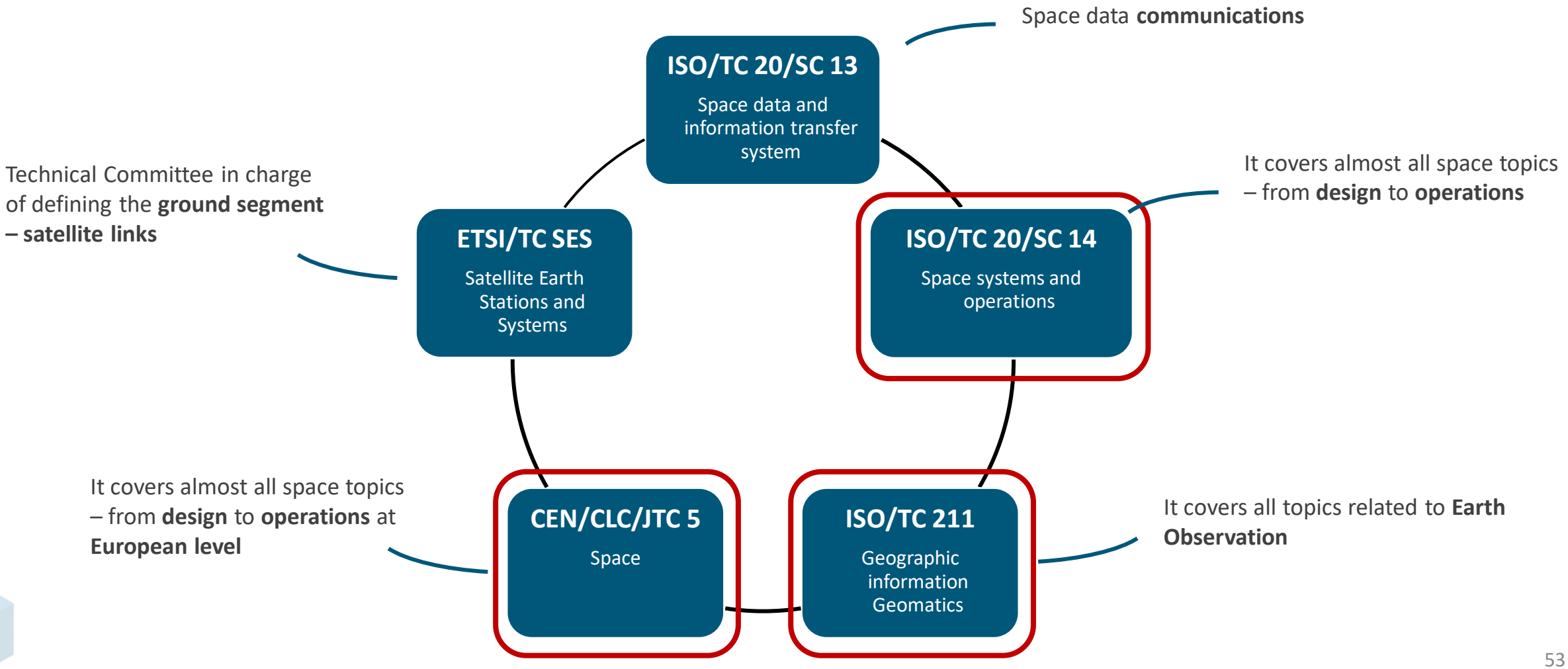


Global overview of Space Technical Committees

- **International level**
  - **4** Technical committees
  - **23** Sub-committees

- **European level**
  - **10** Technical committee
  - **6** Sub-committees

Main technical committees supporting space activities



ISO/TC 20/SC 14 - Space systems and operations

- Scope
  - Standardization of manned and unmanned space vehicles that include management of space programs, design, test, production, launch, maintenance, operation, and disposal of space vehicles, and for the environment in which the space programs operate.

- Structure

ISO/TC 20/SC 14/WG 1	Design engineering and production
ISO/TC 20/SC 14/WG 2	System requirements, verification and validation, interfaces, integration, and test
ISO/TC 20/SC 14/WG 3	Operations and support systems
ISO/TC 20/SC 14/WG 4	Space environment (natural and artificial)
ISO/TC 20/SC 14/WG 5	Space System Program Management and Quality
ISO/TC 20/SC 14/WG 6	Materials and processes
ISO/TC 20/SC 14/WG 7	Orbital Debris Working Group
ISO/TC 20/SC 14/WG 8	Downstream space services and space-based applications

- Secretariat : ANSI (US)
- Published standard : **193** standards
- Sustainable standards : **31** standards !
- Standard projects: **43** projects

CEN/CLC JTC 5 - Space

- Scope
  - This TC covers all standardization activities in CEN and CENELEC related to space, including dual use aspects, systems of systems, as well as upstream and downstream applications, inasmuch as these topics are not covered by any other existing technical body in CEN or CENELEC or by the European Cooperation for Space Standardization (ECSS) or ETSI, therefore it is important and necessary that it coordinates its work with relevant technical bodies in ETSI. It develops European Standards that are needed to support the implementation of EU-level space projects.

- Structure

Working group	Title
CEN/CLC/JTC 5/WG 1	Navigation and positioning receivers for road applications
CEN/CLC/JTC 5/WG 2	Space Situational Awareness Monitoring
CEN/CLC/JTC 5/WG 6	Upstream standards
CEN/CLC/JTC 5/WG 7	Future activities in space standardization
CEN/CLC/JTC 5/WG 8	SBAS receivers performances for Maritime applications
CEN/CLC/JTC 5/WG 9	Galileo Timing Receivers

- Secretariat : DIN (Germany)
- Published standard : **207** standards
- Sustainable standards : **7** standards
- Standard projects: **17** projects
- **Memorandum of Understanding with ECSS in order to have cooperation and no duplication**

ISO/TC 211 - Geographic information/Geomatics

- Scope
  - This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth. Within the scope of geographic information, these standards may specify methods, tools, and services for data management. Data management is understood to include acquiring, processing, analyzing, accessing, presenting, and publishing data for users and systems

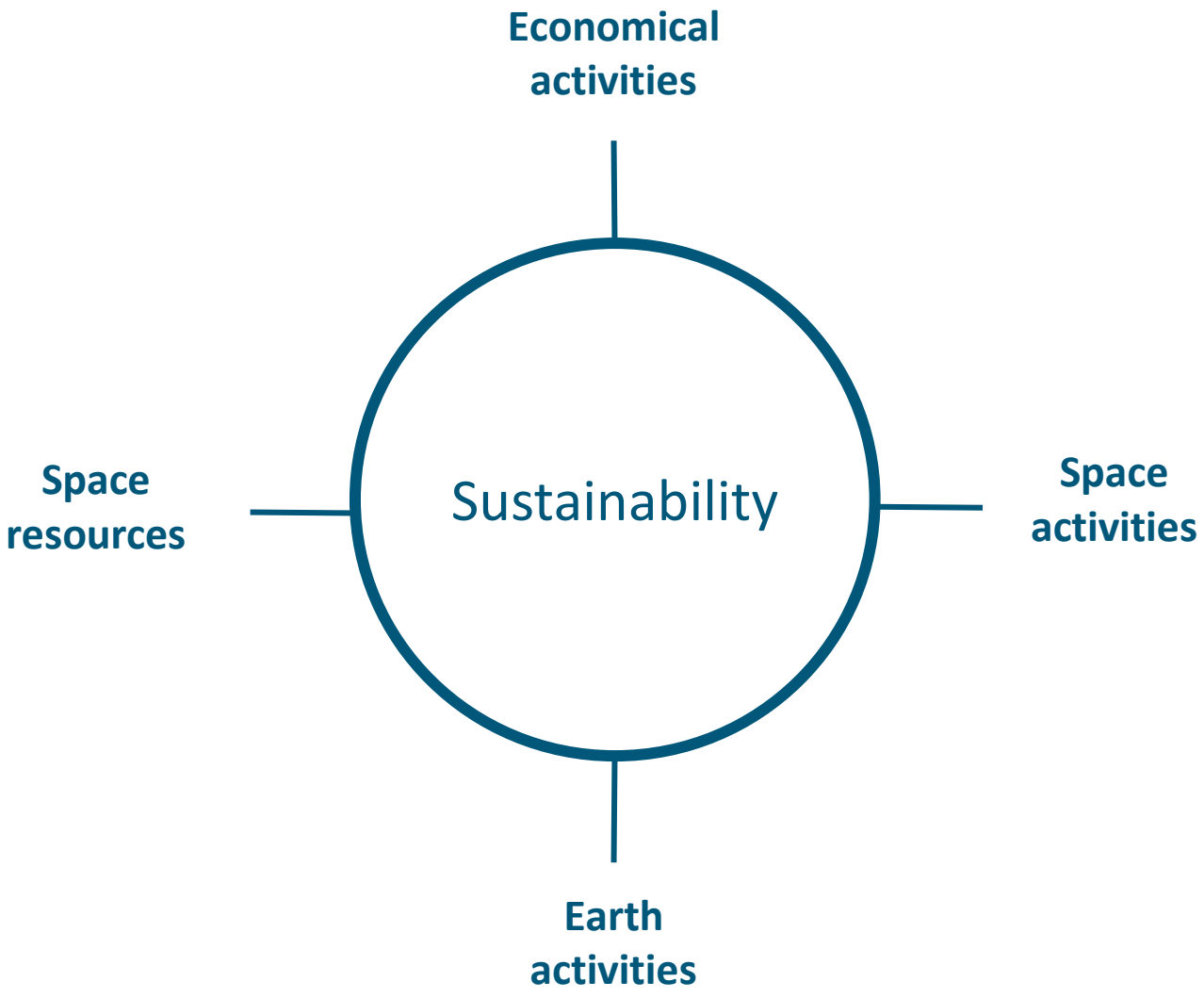
- Structure

ISO/TC 211/WG 1	Framework and reference model
ISO/TC 211/WG 4	Geospatial services
ISO/TC 211/WG 6	Imagery
ISO/TC 211/WG 7	Information communities
ISO/TC 211/WG 9	Information management
ISO/TC 211/WG 10	Ubiquitous public access

- Secretariat : SIS (Sweden)
- Published standard : **97** standards
- Standard projects: **27** projects

II. Standardization for sustainability in space

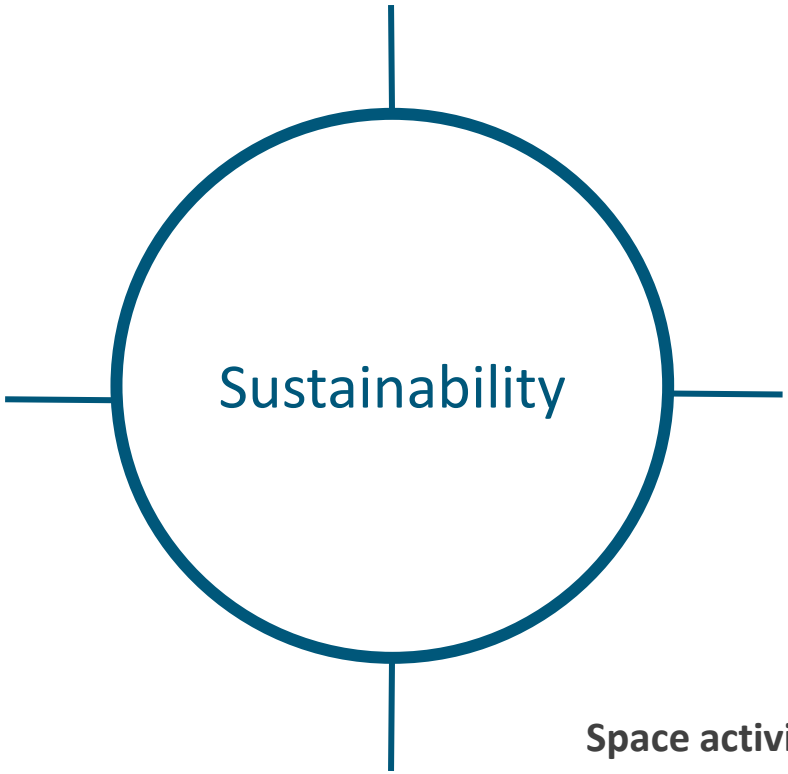
Luxembourg Space Agency – Stratégie Spatiale 2023-2027



https://gouvernement.lu/dam-assets/documents/actualites/2022/12-decembre/stratgie-spatiale-2023-2027.pdf

II. Standardization for sustainability in space

Standardization topics and space sustainability



Sustainable usage of Space

- Space debris mitigation
- Space surveillance and tracking
- In-space operations and servicing
- Space environnement

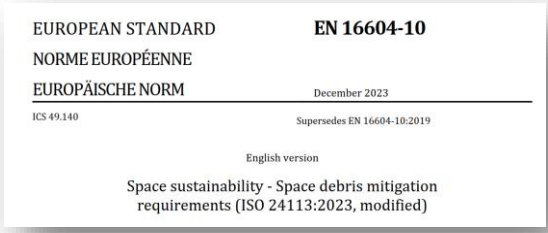
Space activities supporting Sustainable Developments Goals

- Earth Observation
- Satellite communication
- Environmental monitoring
- Space object re-entry

- Standards supporting **Space Debris Mitigation**

EN16604-10:2023	Space sustainability - Space debris mitigation requirements (**ISO 24113:2023**, modified)
ISO 20893:2021	Space systems - Detailed space debris mitigation requirements for launch vehicle orbital stages
ISO 23312:2022	Detailed space debris mitigation requirements for spacecraft
ISO/TR 20590:2021	Space debris mitigation design and operation manual for launch vehicle orbital stages
ISO 14200:2021	Space environment (natural and artificial) — Process-based implementation of meteoroid and debris environment models (orbital altitudes below GEO + 2 000 km)
ISO 11227:2012	Space systems — Test procedure to evaluate spacecraft material ejecta upon hypervelocity impact
ISO 11227:2012/Amd 1:2021	Space systems — Test procedure to evaluate spacecraft material ejecta upon hypervelocity impact — Amendment 1: Oblique impacts and Annex C update
ISO 16126:2014	Space systems — Assessment of survivability of unmanned spacecraft against space debris and meteoroid impacts to ensure successful post-mission disposal
ISO/TR 18146:2020	Space systems — Space debris mitigation design and operation manual for spacecraft
ISO 21347:2005	Space systems — Fracture and damage control
EN 16603-32-01:2021	Space engineering - Fracture control

- Standards supporting **Space Debris Mitigation**
  - **EN16604-10:2023** *Space sustainability - Space debris mitigation requirements (ISO 24113:2023, modified)*
    - **Goal:** Reduce space debris goal by translating the mitigation guidelines from ITU and IADC into engineering practices
    - Based on **ISO 24113:2023** and also includes the context and scope of **ECSS-U-AS-10C Rev.2**
    - Provides information about the protected regions around Earth
    - Set requirements in terms of:
      - Amount of debris
      - Lifecycle of debris
      - Orbit position of debris
      - Probability of break-up
      - Documentation


EUROPEAN STANDARD EN 16604-10
NORME EUROPÉENNE
EUROPÄISCHE NORM
December 2023
ICS 49.140
Supersedes EN 16604-10:2019
English version
Space sustainability - Space debris mitigation requirements (ISO 24113:2023, modified)

  - **ISO 23312** *Space systems — Detailed space debris mitigation requirements for spacecraft*
    - **Goal:** Support the high-level standard **ISO 24113:2023/EN16604-10:2023** by focusing requirements applicable to spacecraft
    - Provides **a list of specific technical requirements** with standards references depending on sub-system (ex. Electrical systems, propulsion systems, etc.)
    - List of good practices during design, operations and disposal which support the fulfilment of debris mitigation requirements as defined in the top-level standard


INTERNATIONAL STANDARD ISO 23312
First edition
2022-07
Space systems — Detailed space debris mitigation requirements for spacecraft
Systèmes spatiaux — exigences détaillées pour la diminution des débris spatiaux relatifs aux satellites

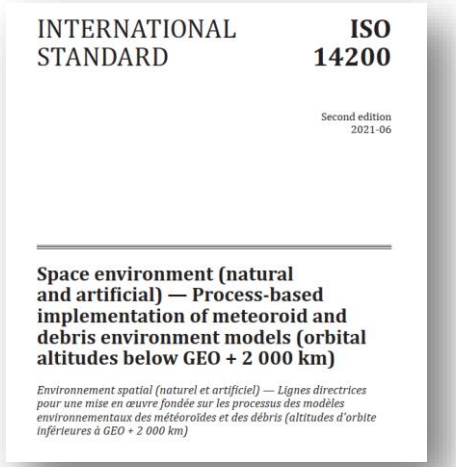
- Standards supporting **Space Debris Mitigation**

  - **ISO 14200:2021** *Space environment (natural and artificial) — Process-based implementation of meteoroid and debris environment models (orbital altitudes below GEO + 2 000 km)*

    - **Goal** : support the impact flux assessment associated to the spacecraft orbit
    - Provides a list of 6 models for asteroid environment and 5 models for debris environment
    - Support also the process to select and implement the chosen model
    - Flux information can be used in
      1. the selection of the spacecraft operation orbit in mission analysis,
      2. the evaluation of the safety of specific orbit(s),
      3. the prediction of the frequency of collision avoidance operations, and
      4. the design of suitable impact protection, especially for critical components.

  - **ISO 16126:2014** *Space debris mitigation requirements (adopted in Europe with EN16604-10:2023)*

    - **Goal :** impact risk assessment to ensure a successful post-mission disposal
    - Two procedures are defined : simple impact risk analysis or detailed impact risk analysis
    - Both are basing their analysis on the identification of critical components and the limits defined by the customer/manufacturer
    - The standard provides also the methodologies to calculate the ballistic limit and the probability analysis
    - Support **ISO 14200:2021**


INTERNATIONAL STANDARD
ISO 14200
Second edition 2021-06
Space environment (natural and artificial) — Process-based implementation of meteoroid and debris environment models (orbital altitudes below GEO + 2 000 km)
Environnement spatial (naturel et artificiel) — Lignes directrices pour une mise en œuvre fondée sur les processus des modèles environnementaux des météoroïdes et des débris (altitudes d'orbite inférieures à GEO + 2 000 km)


INTERNATIONAL STANDARD
ISO 16126
First edition 2014-04-01
Reviewed and confirmed in 2023
Space systems — Assessment of survivability of unmanned spacecraft against space debris and meteoroid impacts to ensure successful post-mission disposal
Systèmes spatiaux — Évaluation de la capacité de survie des véhicules spatiaux non habités face aux débris spatiaux et aux impacts de météoroïdes pour garantir une élimination efficace d'après-mission

- Standards supporting **Space Debris Mitigation**
  - **ISO 11227:2012** *Space systems — Test procedure to evaluate spacecraft material ejecta upon hypervelocity impact*
    - **Goal** : Evaluate material ejecta when impacted by space debris or natural meteoroids
    - Provides guidelines to calibrate the testbed by setting standard test parameters
    - Supports the characterization of the impact
    - Gives model to evaluate the ejecta


INTERNATIONAL STANDARD
ISO 11227

First edition
2012-09-15

Reviewed and confirmed in 2017

Space systems — Test procedure to evaluate spacecraft material ejecta upon hypervelocity impact

Systèmes spatiaux — Mode opératoire d'essai pour l'évaluation des éjectats de matériaux des véhicules spatiaux résultant d'impacts à hypervitesse

II. Standardization for sustainability in space

- Standards supporting **In-space operations and servicing**

- **ISO 24330:2022** Rendezvous and Proximity Operations (RPO) and On Orbit Servicing (OOS) - Programmatic principles and practices

- Standards supporting **Space Surveillance and Tracking**

- **ISO 11233:2014** Space systems — Orbit determination and estimation — Process for describing techniques
- **ISO 27852:2016** Estimation of orbit lifetime
- **EN 16604-30-03:2020** Space - Space Situational Awareness Monitoring - Part 30-03: Observation System Data Message (OSDM)
- **ISO/TR 16158:2021** Space systems – Avoiding collisions among orbiting objects
- **ISO 26900:2024** Space data and information transfer systems — Orbit data messages

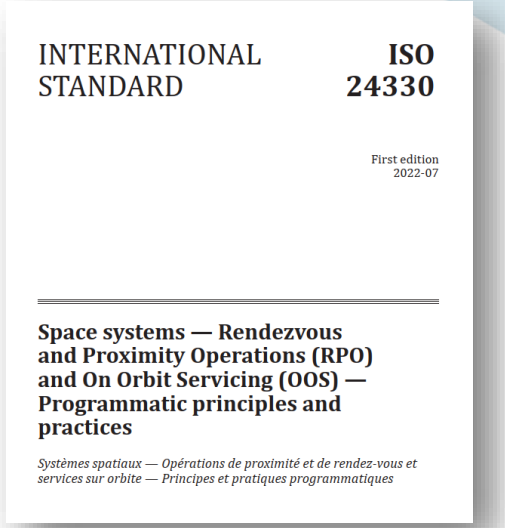
- Standards supporting **Re-entry management**

- **ISO 27875:2019** Re-entry risk management for unmanned spacecraft and launch vehicle orbital stages

II. Standardization for sustainability in space

Standardization topics and space sustainability

- Standards supporting **In-space operations and servicing**
  - **ISO 24330:2022** *Rendezvous and Proximity Operations (RPO) and On Orbit Servicing (OOS) - Programmatic principles and practices*
    - **Goal** : Provides high level requirement for RPO and OOS
    - Created within CONFERS standardization forum
    - Covers communication between participants, transparent reporting/notification of operations
    - Details the different phases of RPO/OOS
    - Bridges requirements to *Outer Space Treaty* articles
- Standards supporting **Re-entry management**
  - **ISO 27875:2019** *Re-entry risk management for unmanned spacecraft and launch vehicle orbital stages*
    - **Goal** : To assess, reduce and control risk during spacecraft Earth's atmosphere re-entry
    - Provides guidelines based on ISO 17066 to assess the risks associated to re-entry
    - Helps the stakeholders to identified all elements impacting the assessment
    - Gives process to take decision with regards to the risk assessment
    - Examples of re-entry assessment and mitigation plan


INTERNATIONAL STANDARD

ISO 24330

First edition
2022-07

Space systems — Rendezvous and Proximity Operations (RPO) and On Orbit Servicing (OOS) — Programmatic principles and practices

Systèmes spatiaux — Opérations de proximité et de rendez-vous et services sur orbite — Principes et pratiques programmatiques


INTERNATIONAL STANDARD

ISO 27875

Second edition
2019-02

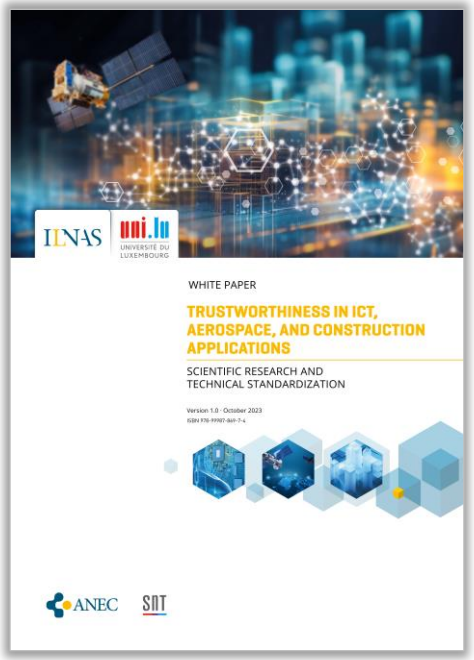
Space systems — Re-entry risk management for unmanned spacecraft and launch vehicle orbital stages

Systèmes spatiaux — Gestion du risque de la rentrée pour les étapes orbitales des véhicules spatiaux non habités et des lanceurs spatiaux

- Standards supporting **Space Environment**

EN 16604-20:2020	Space sustainability - Planetary protection
ISO/TR 23689:2024	Space environment (natural and artificial) — Space weather information for use in space systems operations
ISO/TR 23989:2020	Space environment (natural and artificial) — Operational estimation of the solar wind energy input into the Earth's magnetosphere by means of the ground-based magnetic polar cap (PC) index
ISO/TR 11225:2012	Space environment (natural and artificial) — Guide to reference and standard atmosphere models
ISO 12208:2015	Space environment (natural and artificial) — Observed proton fluences over long duration at GEO and guidelines for selection of confidence level in statistical model of solar proton fluences
ISO 15390:2004	Space environment (natural and artificial) — Galactic cosmic ray model
ISO 16695:2014	Space environment (natural and artificial) — Geomagnetic reference models
ISO 16698:2019	Space environment (natural and artificial) — Methods for estimation of future geomagnetic activity
ISO 17520:2024	Space environment (natural and artificial) — Cosmic ray and solar energetic particle penetration inward the magnetosphere — Method of determination of the effective vertical cut-off rigidity
ISO 17761:2015	Space environment (natural and artificial) — Model of high energy radiation at low altitudes (300 km to 600 km)
ISO/TR 18147:2014	Space environment (natural and artificial) — Method of the solar energetic protons fluences and peak fluxes determination
ISO/TS 21979:2018	Space environment (natural and artificial) — Procedure for obtaining worst case and confidence level of fluence using the quasi-dynamic model of earth's radiation belts
EN 16603-10-04:2021	Space engineering - Space environment

- Standards supporting **Earth Observation**
  - Every standards from **ISO/TC 211 !**
  - **Sensors**
    - **ISO/TS 19159 series** - Geographic information — Calibration and validation of remote sensing imagery sensors and data
    - **ISO 19130 series** - Geographic information — Imagery sensor models for geopositioning
  - **Metadata**
    - **ISO 19115 series** - Geographic information — Metadata
  - **Quality**
    - **ISO 19157-1:2023** - Data quality — Part 1: General requirements
    - **ISO/TS 19158:2012** - Quality assurance of data supply
  - **Cataloguing and storage**
    - **ISO 19144 series** - Classification systems
    - **ISO 19127:2019** - Geodetic register



- Standards supporting **Sustainable utilization of space resources**
  - Currently no standard developed inside ISO/TC 20/SC 14 and CEN/CLC/JTC 5
    - Exception: **ISO 10788:2014** - Space systems — Lunar simulants
    - But few Technical Committees can support activities:
      - ISO/TC 82 - Mining
        - SC 8 - Advanced automated mining systems
          - **ISO/AWI TR 3502** - Reference framework and architecture for advanced automation and autonomy
          - **ISO/CD 23725** - FMS interface to autonomous haulage
      - ISO/TC 127 - Earth-moving machinery
        - SC 1 -Test methods relating to safety and machine performance
          - **ISO 6483:1980** - Earth-moving machinery — Dumper bodies — Volumetric rating
          - **ISO 7451:2007** - Volumetric ratings for hoe-type and grab-type buckets of hydraulic excavators and backhoe loaders
      - ISO/TC 110/SC 4 - Rough-terrain trucks
      - ISO/TC 182 – Geotechnics
      - ISO/TC 190 – Soil quality

I. Standardization generalities

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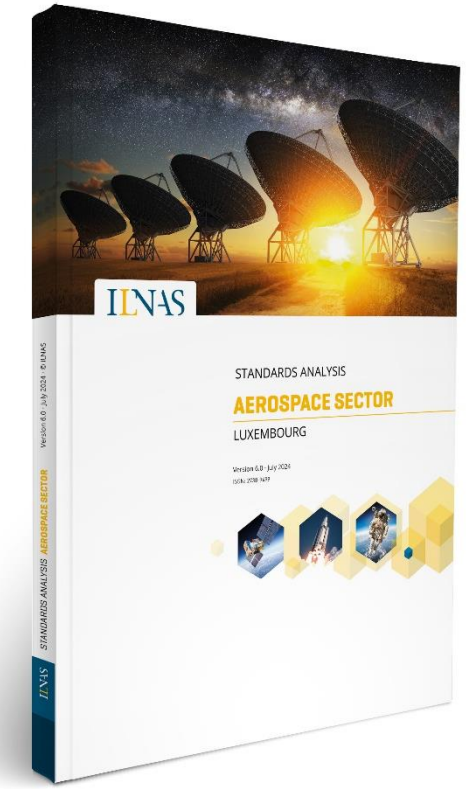
a) Standards Analysis – Aerospace sector

b) National Standardization Commissions

III. National Space standardization developments

a) Standard Analysis – Aerospace sector



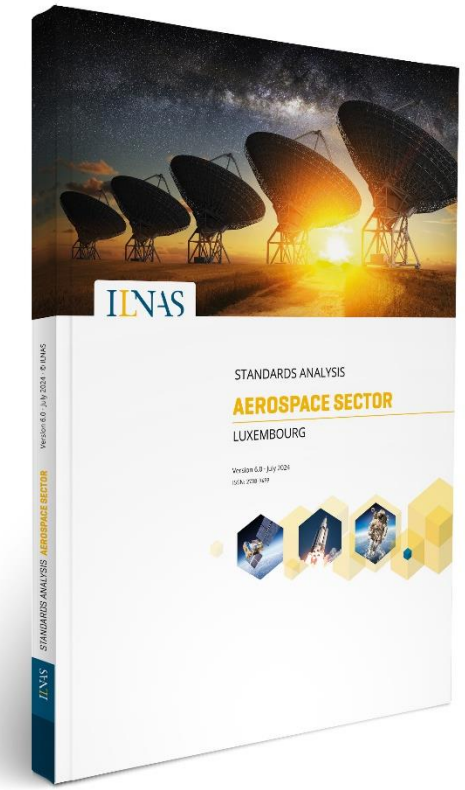
Main information
The importance of technical standardization in the Aerospace sector

Purpose
To help you identify :
- Relevant technical committees related to the Aerospace sector
- Relevant standards and projects addressing the Aerospace sector

What aims?
- Sources of technical standards that might impact/help you
- Understand the importance of technical standardization in Aerospace sector
- Identify standards development connected to your business in which participating in their development could be of interest

DOWNLOAD THE NEW STANDARDS ANALYSIS OF THE AEROSPACE SECTOR 2024 V.6.0

https://gd.lu/3Gx6KN



Part 1

Introduction to Aerospace sector
- Aerospace overview
- Aerospace market economy

Part 2

Standardization in the field of Aerospace
- Standards organizations and standards development process
- The importance of technical standardization in the Aerospace sector

Part 3

Opportunity for the national market
- How can technical standardization benefit the national market?
- How to become a national delegate and the advantage to be one?

Part 4

Aerospace Sector standards watch
- List of relevant Technical Committees

Part 1

Aerospace overview

Europe

- Political guidance
- Funding programs and projects
- Entities

Luxembourg

- Aerospace policy and partnership
- Legal framework
- Entities

Aerospace market economy

Dynamic development areas

- Telecommunications
- Earth Observation
- Satellite Navigation

Promising development areas

- Space debris
- Space tourism
- Small satellite launch services
- Information and Communication Technology (ICT)
- Space resources
- Cybersecurity

Part 2

Standardization

"an inclusive tool for performance and excellence to serve the economy"

- Founding principles
- Standard development process
- Benefits of standardization
- Recognized standardization bodies
- **Fora and consortia** related to Space domain
- Effectiveness and relevance

Part 3

Standardization opportunities for the national market

- National market can **benefit from the definition of the future market rules.**
- The **common ground** provided by technical standardization is essential in the Aerospace sector as external cooperation is almost always involved. It can **extend the market and increase the number of partnerships.**
- Different possibilities for national stakeholders:
  - Free consultation of standards
  - Standards usage
  - Comment standards under public enquiry
  - Standards development
  - Propose new standards project

Part 4

List of relevant Technical committees

- **Regrouped into 5 parts:**
  - Solely dedicated to the space sector, with a wide range of applications
  - Telecommunication
  - Earth Observation
  - Technical areas (mechanical, electrical…)
  - Systems engineering, Quality, Safety and Management processes

- **5 major technical committees:**
  - **ISO/TC 20/SC 14** - Space systems and operations
  - **ISO/TC 20/SC 13** - Space data and information transfer systems
  - **CEN/CLC/JTC 5** - Space
  - **ISO/TC 211** - Geographic information/Geomatics
  - **ETSI/TC SES** - Satellite Earth Stations and Systems

Part 4

Technical Committees

CEN/CLC/JTC 5 Space			
GENERAL INFORMATION			
Creation date	1987	Secretariat	DIN (Germany)
Chairperson	Mr. Legrand Thierry	Secretary	N/A
Scope	This technical committee covers all standardization activities in CEN and CENELEC related to space, including dual use aspects, systems of systems, as well as upstream and downstream applications, inasmuch as these topics are not covered by any other existing technical body in CEN or CENELEC or by the European Cooperation for Space Standardization (ECSS) or ETSI, therefore it is important and necessary that it coordinates its work with relevant technical bodies in ETSI. It develops European Standards that are needed to support the implementation of EU-level space projects.		
Structure	WG 1 Navigation and positioning receivers for road applications WG 2 Space Situational Awareness Monitoring WG 6 Upstream standards WG 7 Future activities in space standardization WG 8 SBAS receivers performances for Maritime applications WG 9 Galileo Timing Receivers		
Webpage	https://standards.cencenelec.eu/dyn/www/f?p=205:7:0::::FSP_ORG_ID:887985&cs=17D471F6F920904967AFC18C2BDA2F89F		
STANDARDIZATION WORK			
Published standards	207	Projects	14
EUROPEAN MEMBERS			
P-Members	35 (including **Luxembourg**)		17

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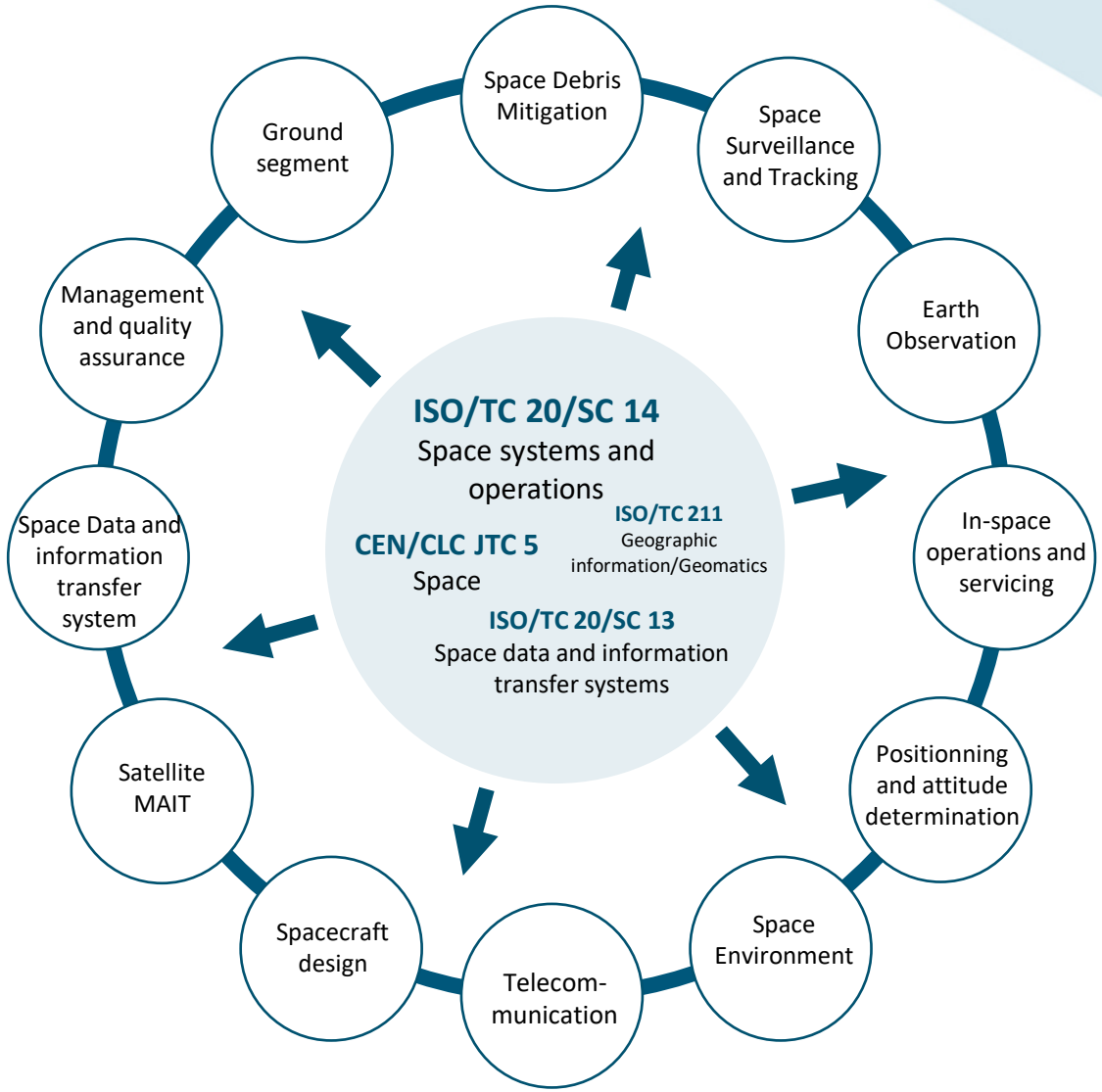
III. National Space standardization developments

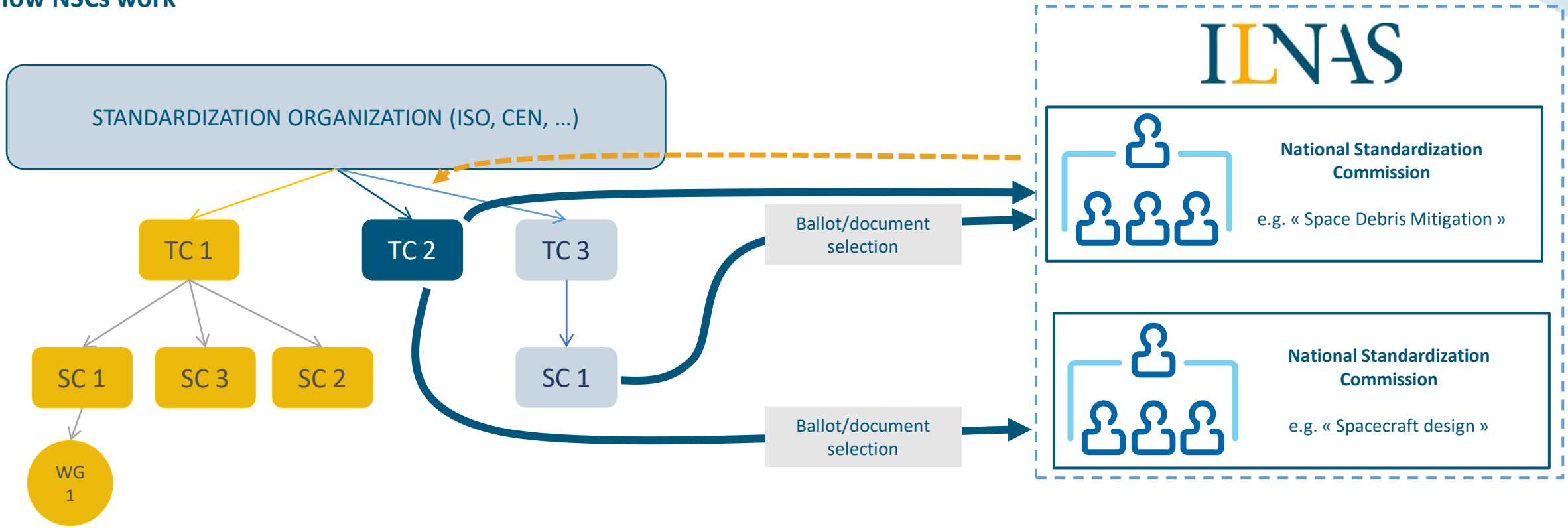
b) National Standardization Commissions

Set-up of National Standardization Committees « Space »

- European and international technical committees covered a broad areas of topics
- Delegates' expertise can not cover all the different domains addressed by the technical committees
- **Set-up of National Standardization Commissions with narrower topics**



How NSCs work

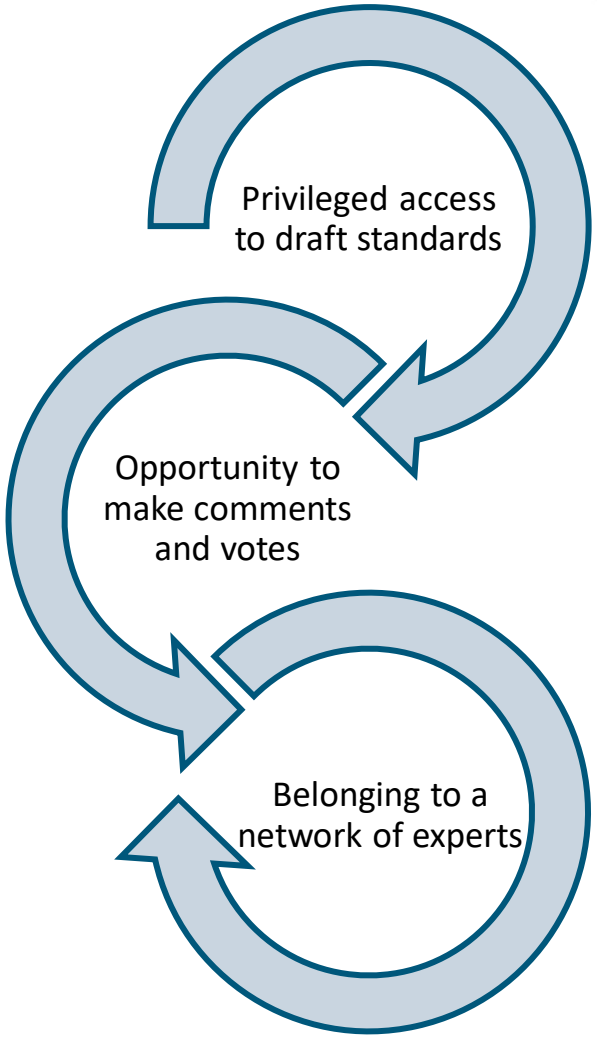


→ **The participation to NSCs is open to every national experts**

How to become a national delegate and the advantage to be one?

- **Why get involved in standards development?**

  - Access drafts standards and influence their content based on your know-how
  - Collaborate to defend common interests
  - Learn about your competitors and their positions in meetings
  - Promote your organization and your skills at national, European and international levels
  - Propose new standards projects
  - Increase your knowledge regarding the state of the art in standardization of your core business
  - Anticipate the evolution of your activity sector's good practices
  - Integrate strategic network of national, European or international experts



How to become a national delegate and the advantage to be one?

- **Becoming a delegate**

  - **What are the tasks?**
    - Technical support for standard development activities
    - Provide your expert's view in WG decision
    - Be part of the different development meeting (national, European or international)
    - Provide your position to defend Luxembourg interests

  - **Who can participate?**
    - Every socio-economic actor in Luxembourg with a certain expertise

  - **Costs: just time**
    - The participation in Luxembourg is free of charge

  - **How to register?**
    - Your can apply to become a national delegate in standardization by completing the registration form "ILNAS/OLN/F001a" (Initial registration) or "ILNAS/OLN/F001b" (Additional registration)*

Conclusion

Technical standardization in the Aerospace sector

- Standard application is voluntary and everyone can participate to standardization
- Founding principles of standards provides trust in their content
- Standards have benefits which can be useful for everyone, in all daily scenarios
- Five Technical Committees (European and international) cover most of the space activities
- ILNAS is currently setting-up NSCs which will be focused on specific topics

Technical standardization for sustainability in Space activities

- Space debris mitigation is currently well covered and standardization supports legal act (*e.g. Outer Space Treaty*)
- Subjects such as Space Surveillance and Tracking and In-Space operations and servicing started to be developed, but development could increase in the near future (EU Space Law ?)
- No standard for Space Resource exploitation and utilization currently

Thank you for your attention!

ILNAS

Southlane Tower I · 1, avenue du Swing · L-4367 Belvaux

Tel. : (+352) 24 77 43 - 00 · Fax : (+352) 24 79 43 - 10

E-mail: info@ilnas.etat.lu

www.portail-qualite.lu