Introduction to the ECSS standardisation system

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1. Understanding the ECSS standardisation system

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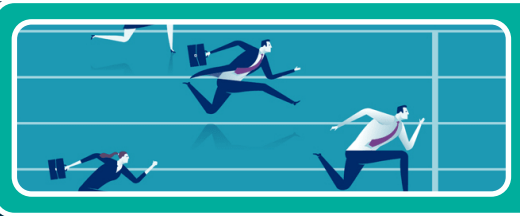
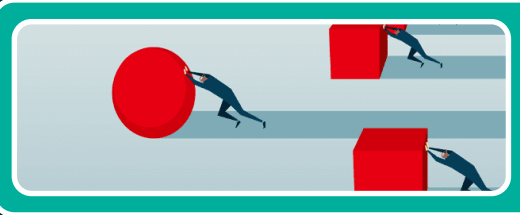
The need for space standards



Competitiveness

Standards have an important economic and social role for enabling our industry to remain competitive on the market and to conquer new markets.



Efficiency

Standards contribute to making the development, manufacturing and supply of products and services more efficient, reliable, safer, and cleaner.

Trade facilitation

Standards allow trading between organizations to progress easier and fairer.

Knowledge transfer

Standards aid in transferring knowledge and enhancing engineering capabilities to smaller or developing organizations.

Education

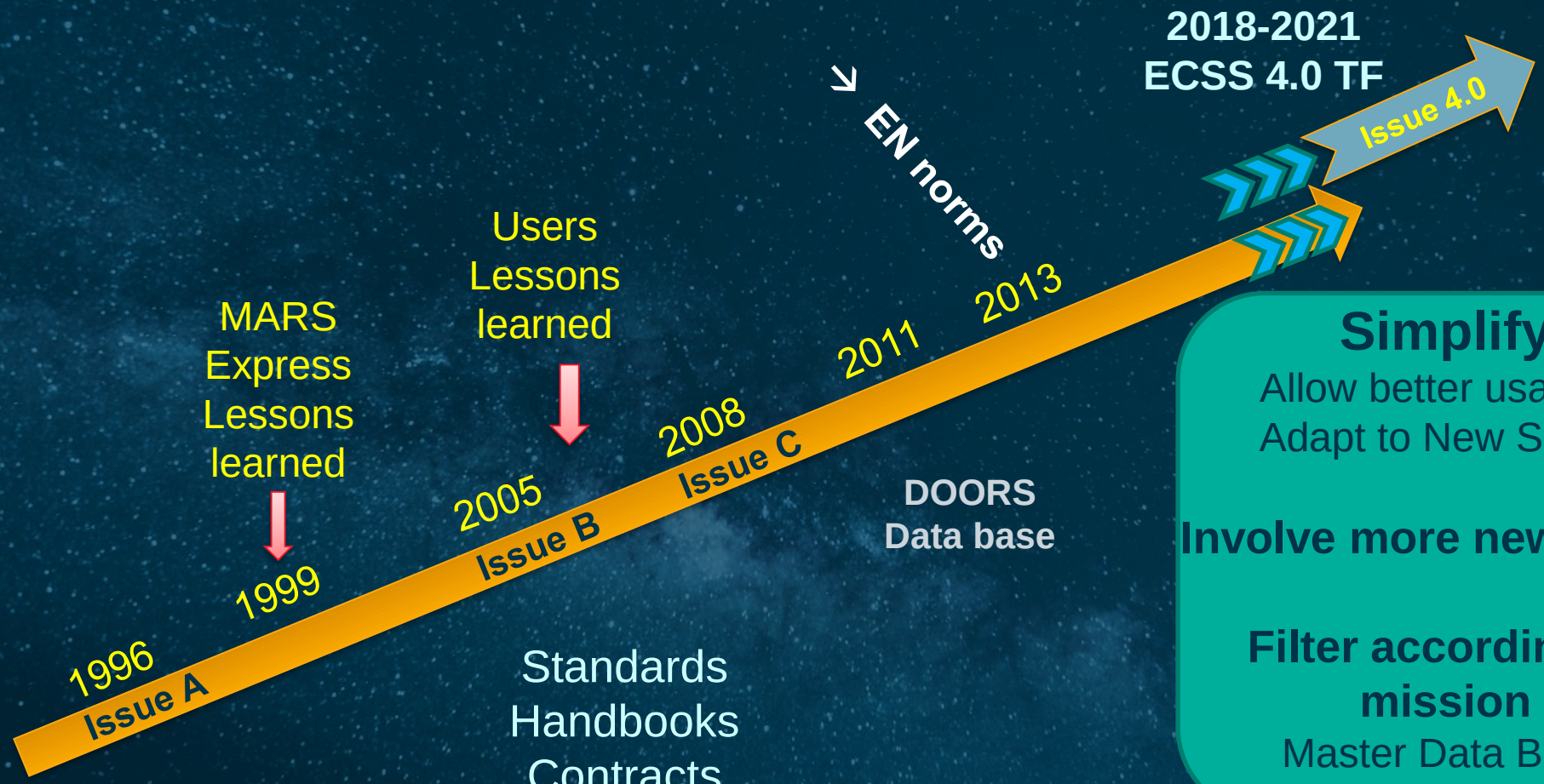
Standards participate to the education of today's and future engineers when conforming to standards is secured, thus, for instance, avoiding designers *reinventing the wheel*.

ECSS and the commitment of its members

- Back in the early nineties, European Space Industry had to satisfy different standardization systems for different customers (ESA, Space national Agencies, other industrial organizations).
- Specifically, the Quality system of each Industry had to be re-aligned to the Quality and Product Assurance requirements of the customer of each project.
- The need of a common standardization system for all European stakeholders was identified and reported in 1994. In 1995 ECSS was created by the signature of its members.
- ECSS members are committed to:
  - Contribute in the development of ECSS documents by:
    - Participating in the ECSS governing bodies
    - Contributing to the development of docs by appointing experts to WGs
    - Providing comments to the docs under development, during their review
    - Providing CRs as needed, and contributing to the feedback process
  - Use the ECSS standards for their Space projects and programmes

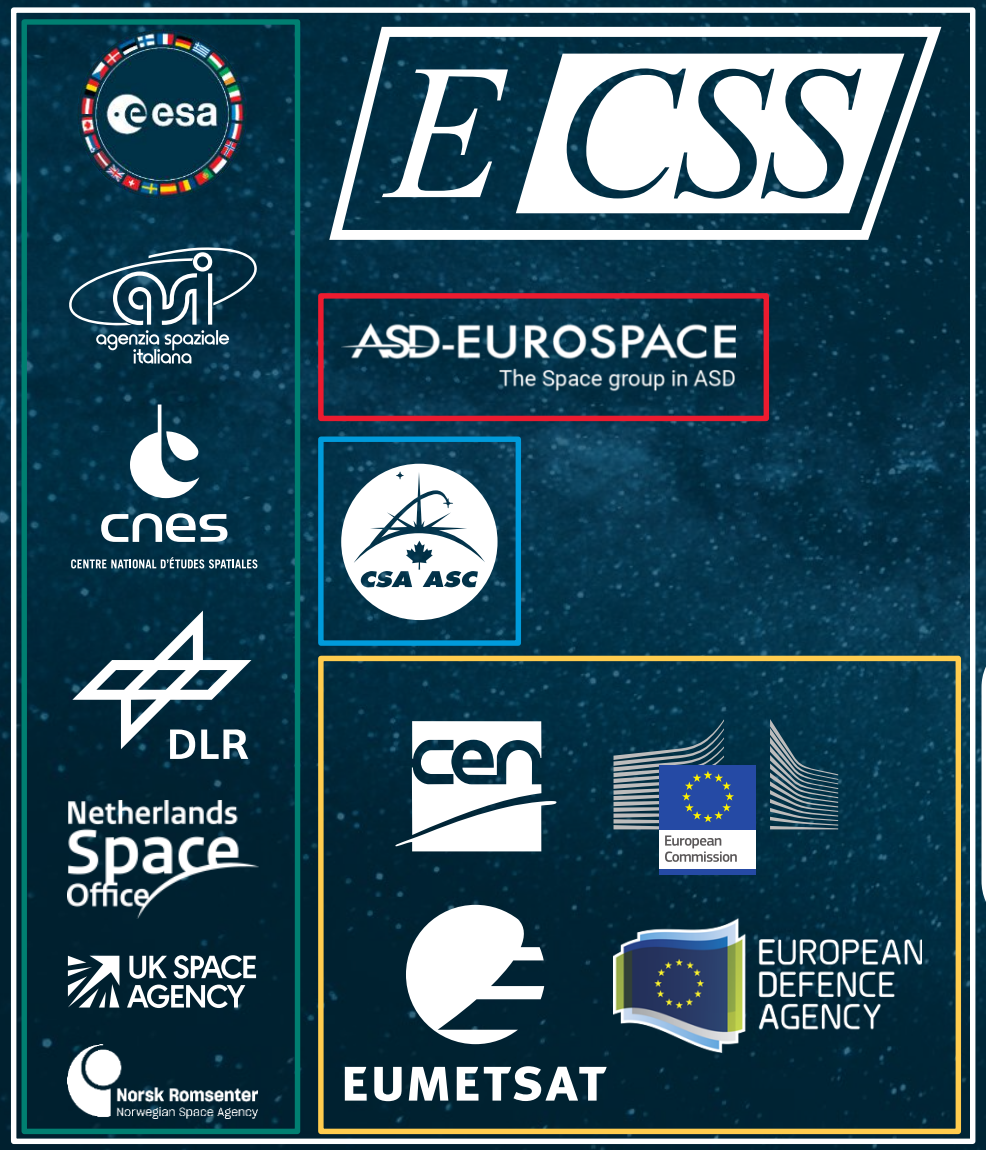
How can you contribute to the development of standards?

ECSS evolution



Courtesy for this Chart:
Fabien Castanet, CNES, TA Chairman

ECSS organisation



voting members – 1 vote each

voting members – 4 total votes

associate member – no votes

observers – no votes

Steering Board

- sets policy and strategy
- 1 rep per agency
- 4 reps for Eurospace

Executive Secretariat (TEC-QES)

- secretariat support to SB & TA
- support WGs in drafting documents in accordance with ECSS rules and procedures
- custody ECSS docs: collect and analyse CRs, NWIPs and Feedback
- administer the ECSS Website

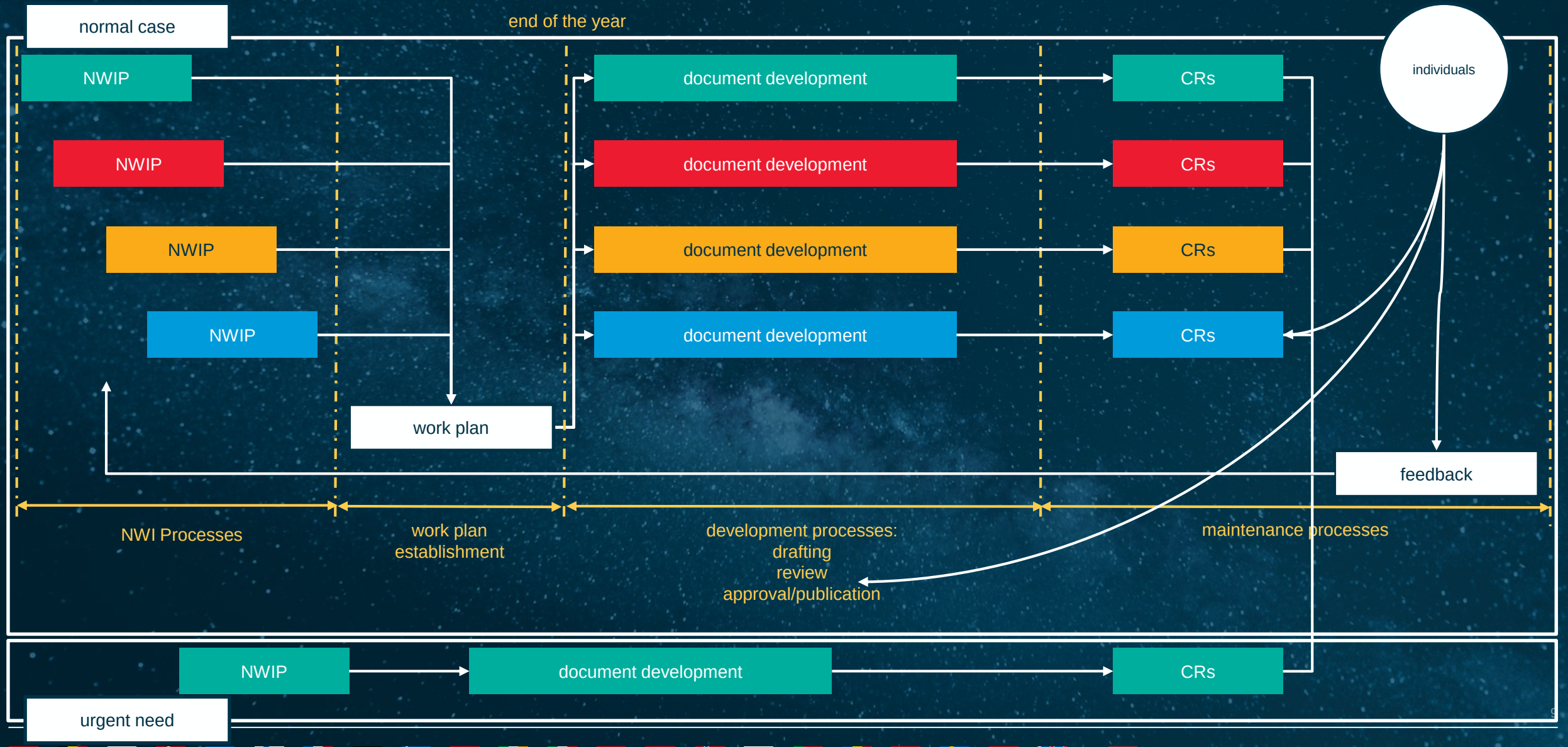
Technical Authority

- day-to-day running
- 1 rep per agency
- 4 reps for Eurospace

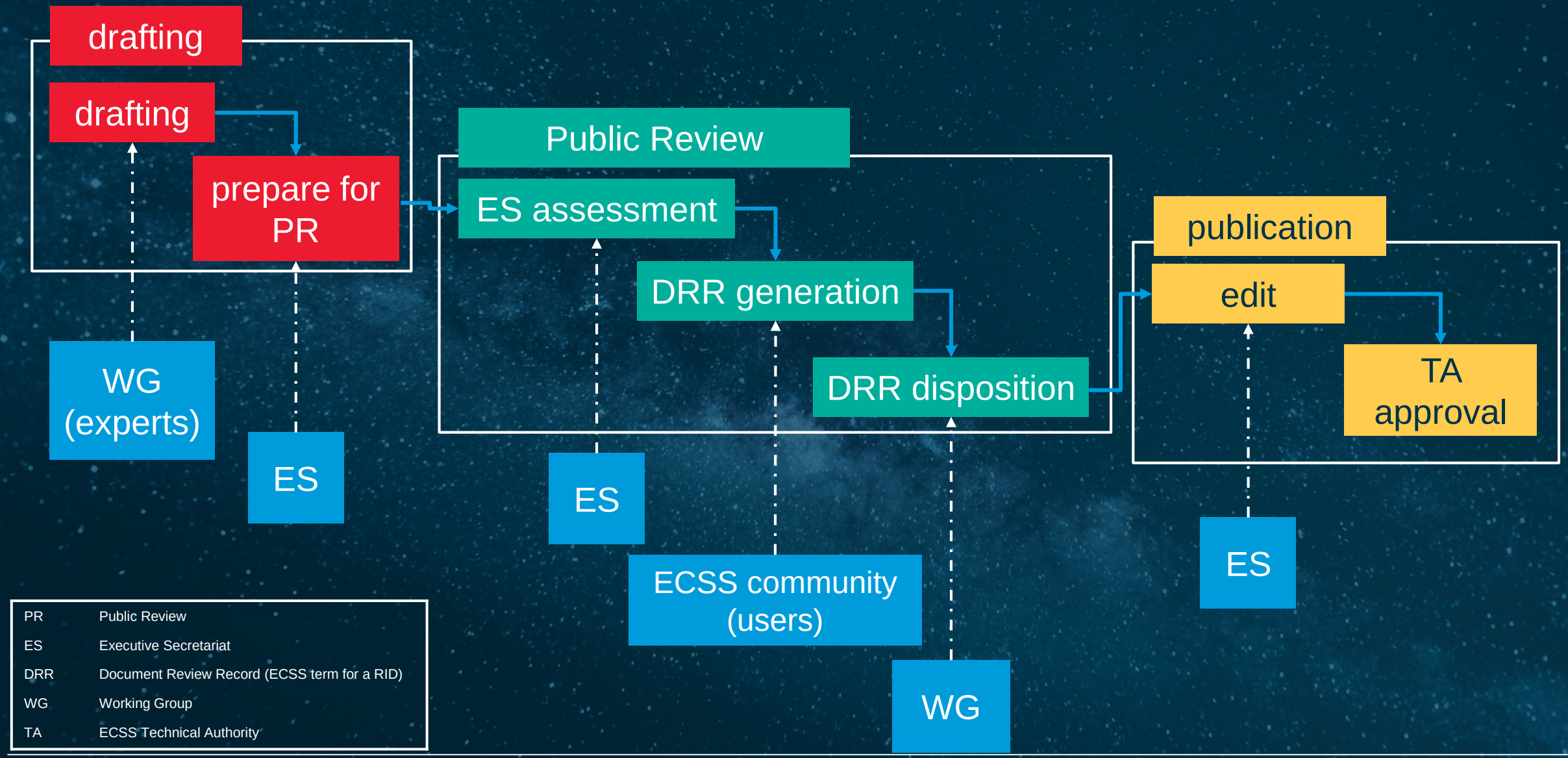
WG

Network of Experts

ECSS document lifecycle



ECSS documents production lifecycle



PR	Public Review
ES	Executive Secretariat
DRR	Document Review Record (ECSS term for a RID)
WG	Working Group
TA	ECSS Technical Authority

ECSS policies – certification and training

- In accordance with ECSS-P-00C #5.5.1.1:
  *ECSS **neither provides nor recognizes** any certification process of suppliers or of products according to ECSS requirements, by any party*.
  However, nothing prevents that individual ECSS members can certify against ECSS on their own behalf.

- In accordance with ECSS-P-00C #5.5.1.2:
  *ECSS **promotes** usage of the ECSS system in European space projects and beyond through information and, as far as practical, through the **training of potential users**. In addition, **ECSS does not endorse** the development of third party training courses related to the ECSS system.*
  Therefore:

  - ECSS welcome training from individual ECSS members (e.g. the current training)
  - ECSS will not endorse the training of non-ECSS partners

ECSS policies – translation of documents

In accordance with ECSS-P-00C #5.7:

*ECSS documents are written in the **English language ONLY**.*

ECSS members may translate them into another language, provided that:

- It is communicated to the ECSS Secretariat
- The translating ECSS member remains the sole and total responsible
- The translations are not part of the ECSS system, and therefore they shall bear a different identification number
- The translation shall clearly identify which ECSS original document(s) have been used.
- No approval from nor duties for any ECSS entity (e.g. SB or ES)
- Translation cannot be sold.
- No ECSS recognition nor maintenance of the translation

ECSS policies – copyright and use

In accordance with ECSS-P-00C #5.8:

Copyrights and use by ECSS members:

- ESA holds ECSS copyrights on behalf of the ECSS members.
- No ECSS document may be reproduced without the explicit consent of ESA.
- However, this **consent is granted to ECSS members** for their own use and for their (sub)contractors

Use by non-ECSS members:

- Process:
  - Only under request to ECSS ES.
  - ECSS ES will propose an agreement based on the present conditions
  - Final version of the agreement, to be approved by the ECSS SB
- Conditions:
  - Direct use of ECSS rather than re-writing quoting ECSS → This will avoid inconsistencies
  - ECSS copyright is acknowledged, together with the exact reference and potential modifications of ECSS documents.
  - If translations are performed, the translated documents shall be made available to ECSS.

ECSS policies – interfaces with other SDOs (1/6)

- It is the ECSS policy to avoid the development of documents, if an existing or planned document on the subject from other SDO is considered suitable for ECSS use.
- If the document exist, two cases are possible:
  - It is suitable *as is*. **No additional action needed** (it will be cross-referenced By ECSS docs)
  - It is usable, but needs some modifications for full suitability. Then it may be adopted via an **Adoption Note**.

    NOTE: An Adoption Note lists one by one all the clauses/paragraphs/requirements:
    - To be deleted
    - To be modified (and then including the modified text)
    - To be added (and then including the added text)
- An external document may be adopted as:
  - A standard (and then call *AS* in the ECSS terminology, e.g. ECSS-U-AS-10 *Space debris mitigation*).
  - A handbook, and then call *AH* in the ECSS terminology. At the moment (2021), no document has been adopted as a handbook.
- No intention in ECSS to adopt documents as *TM*.

ECSS policies – interfaces with other SDOs (2/6)

- If the document under development, or planned by the other SDO is of ECSS interest, three scenarios are considered:
  1. ECSS decides not to participate at all in the development, and when the document is published, apply the *adoption policy* explained in the previous viewgraph.
     The risk is that if the final product is not suitable, ECSS will have to generate its own document.
  2. ECSS does not contribute directly to the drafting, but it comments the document during the Public Review and monitor the dispositions and implementation.
     This permits certain control on the final product, but it does not ensure that it will meet the ECSS needs.
  3. ECSS decides to fully cooperate with the other SDO in the complete development of the document, by providing experts to the WG and producing comments during the PR.
- Approaches 2 and 3 above will need an (either ad-hoc or formal) agreement between ECSS and the SDO.
  Therefore three types of cooperation are foreseen:
  - Liaison
  - Ad-hoc agreement
  - Formal agreement

ECSS policies – interfaces with other SDOs (3/6)

General ECSS **objectives** for cooperation with other SDOs:

- Ensure that, where international consensus and recognition is essential in order to allow **global interoperability** and/or common policies and treaties, standards are developed in conjunction with the appropriate SDO [at international level ISO/TC20/SC14]
- **Avoid duplication and conflicts** between standards that are planned to be used for space application by the European and international community
- Take into account **inputs & feedback**, in an agreed format, from all stakeholders, in particular liaison SDO like ISO, in the preparation / maintenance / evolution of ECSS standards

ECSS policies – interfaces with other SDOs (4/6)

- **Liaison**

  No collaborative activities, only mutual visibility. Performed at TA level.
- **Ad-hoc cooperation**

  Performed in accordance with an SB mandate to the TA of limited scope.

  Example, cooperation with CCSDS, only for those CCSDS documents considered of ECSS interest.
  - No direct ECSS involvement during drafting, but formal ECSS contribution to the PR by commenting the draft document – considering that most of the ECSS members (the Space Agencies) are also members of CCSDS and there is a consultation of positions at ECSS level
- **Formal agreement**

  Signed by both organizations. The SB will sign on behalf of ECSS.
  - For MUTUAL RECOGNITION

    Example, agreement **with ISO** for mutual recognition of the two organisations. Collaboration is decided on an ad-hoc basis (SEE NEXT SLIDES)
  - For FORMAL COOPERATION

    Example: A new formal cooperation agreement (MoU, memorandum of understanding) **with CEN/CENELEC** have been signed for full cooperation (SEE NEXT SLIDES)

ECSS policies – interfaces with other SDOs (5/6)

Cooperation with ISO:

- ISO has two sub-committees for space:
  - ISO TC20/SC13, for space data handling and communications.
    It is constituted by CCSDS (of which ESA is a member).
  - ISO TC20/SC14, for any other subject on space standardization.
    ECSS (of which ESA is a member) has a limited cooperation with it:
    - A formal agreement exists for mutual recognition (ISO-ECSS), and
    - Presently ad-hoc ECSS cooperation with ISO exists for:
      - Space Debris series of standards
      - Solar panels and cells (ISO 11221, 15386 and 23038)
- ISO has other non-aerospace specific committee that ECSS is interested in: TC209 *Cleanliness*, for which ECSS is now in the process of establishing a formal relationship

ECSS policies – interfaces with other SDOs (6/6)

Cooperation with CEN/CENELEC

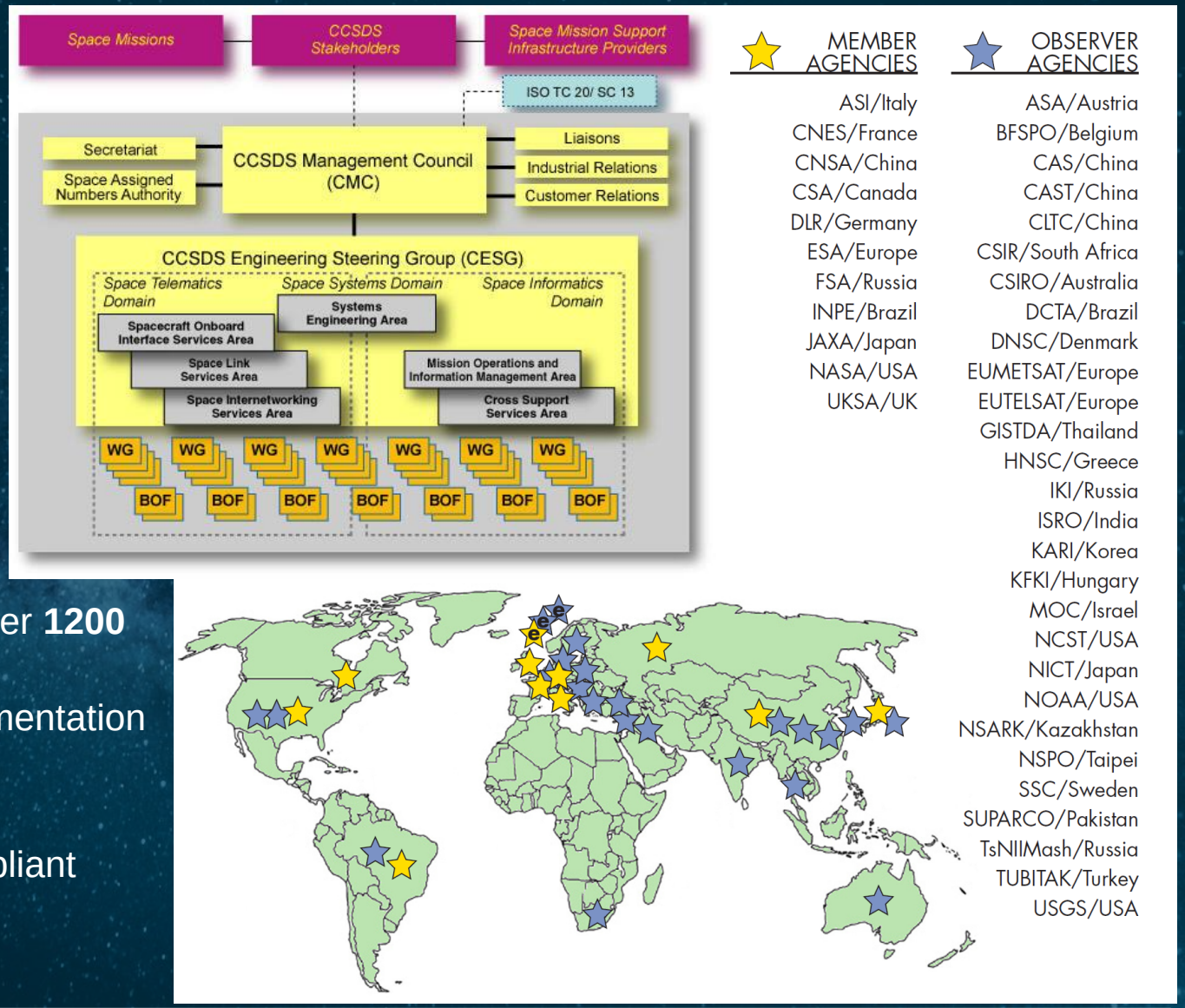
- CEN/CENELEC received in 2011 a EC mandate (M469) for Space standardization.
  This mandate addressed standardization in 10 sectorial dossiers (covering both upstream and downstream standards).
  NOTE: Not all are of ESA/ECSS interest.
  NOTE: Some *downstream standards* may need to be observed by ESA/ECSS, since they may have some *upstream impact*
- CEN/CENELEC contacted ECSS to avoid *reinventing the wheel*. As a result of this contact, a CEN/CENELEC – ECSS MoU was signed in May 2013, covering:
  - Transfer and maintenance of existing ECSS standards as European Norms (EN)
  - ECSS involvement in the development of new EN standards for space:
    - If ECSS initiates upstream, ECSS will lead and will invite CEN to participate.
    - If CEN initiates upstream, ECSS may decide to lead. If so, ECSS will lead and CEN will participate. Otherwise, CEN will lead and ECSS will participate.
    - If CEN initiates downstream, CEN will lead and will invite ECSS to participate.

Consultative Committee for Space Data Systems

Consultative Committee for Space Data Systems

Agency-led international committee
- 11 Member agencies
- 26 Observer Agencies
- 133 Commercial Associates & 13 Liaisons

Also functions as an ISO Committee
TC20/SC13 - Space Data & Info Transfer Systems



CCSDS standards used by over **1200** missions:
https://public.ccsds.org/implementations/missions.aspx

over 143 COTS CCSDS-compliant hardware

European Space Components Coordination

ESCC
European Space Components Coordination

Harmonisation Task

- Performed under the auspices of the **Space Components Steering Board (SCSB)** supported by a **Policy and Standards Working Group (PSWG)** and a **Components Technology Board (CTB)**.
- The SCSB was set up by way of a Founding Act enacted on the 8th October 2002. This act represents an agreement between *Space Agencies*, *European Space Industry* (component users) and *European Component Manufacturers* (component providers) to cooperate in the field of EEE parts for application in Space programmes.

Executive Task

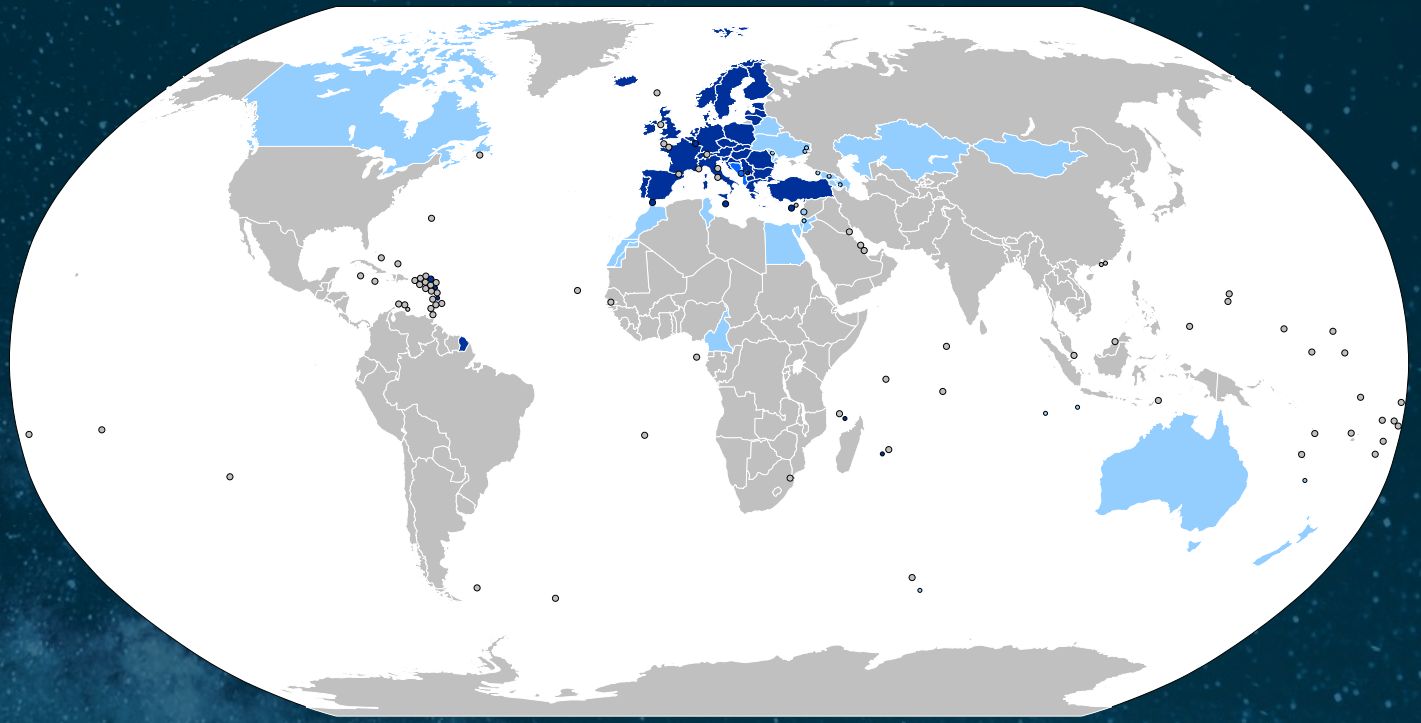
- Carried out by the **ESCC Executive** which is provided by the Space Agencies participating in ESCC.
- The primary responsibility of the Executive is to:
  - provide an organisation for the custody and management of the **ESCC Specification System**
  - manage the related tasks of *evaluation and qualification of components*
  - manage the related tasks of *certification of components and component manufacturers*.

SDO comparison

organisation	ECSS	CCSDS Consultative Committee for Space Data Systems	ESCC European Space Components Coordination
geographical scope	Europe	worldwide	Europe
membership	space agencies and industry	space agencies	space agencies and industry
business scope	standardisation	standardisation	standardisation and component/manufacturer certification
standardisation scope	space standardisation (project management, engineering, product assurance, sustainability)	space communications and data handling (to enable interoperability)	EEE space components (addressed to component manufacturers)
website	ecss.nl	ccsds.org	spacecomponents.org escies.org
ESA point of contact	TEC-QES	TEC-ED OPS-GD	TEC-QES

CEN

- CEN is an EU/EC-endorsed standardisation body (together with CENELEC and ETSI)
- Members are national standardisation bodies (eg DIN), mainly from Europe, with a few partner organisations in other countries
- In essence, a European analogue of ISO (CENELEC is the analogue of IEC)
- CEN and CENELEC operate Joint Technical Committees in areas of common interest
- CEN/CENELEC received a CE mandate (M469) for Space standardisation in 2011, leading to the establishment of **JTC5 *Space*** and the MoU with ECSS (see table → for list of working groups)
- National projects are usually legally-required to use CEN standards
- **CEN standards are not freely-available**



WG1	Navigation and positioning receivers for road applications
WG2	Space Situational Awareness Monitoring
WG6	Upstream standards (ie transfer of ECSS standards to European Norms)
WG7	Future activities in space standardization
WG7	SBAS receivers performances for Maritime applications

2. The ECSS standardisation documentation model

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ECSS document types

standards

- normative documents
- for direct use in invitations to tender and business agreements
- content limited to verifiable requirements – state what to do, not how to do it

handbooks

- non-normative documents
- provide guidelines and/or a collection of data

technical memoranda

- non-normative documents
- provide useful information to the space community
- content not yet mature for a standard or handbook

Characteristics of an ECSS standard

express **what** to do, not how

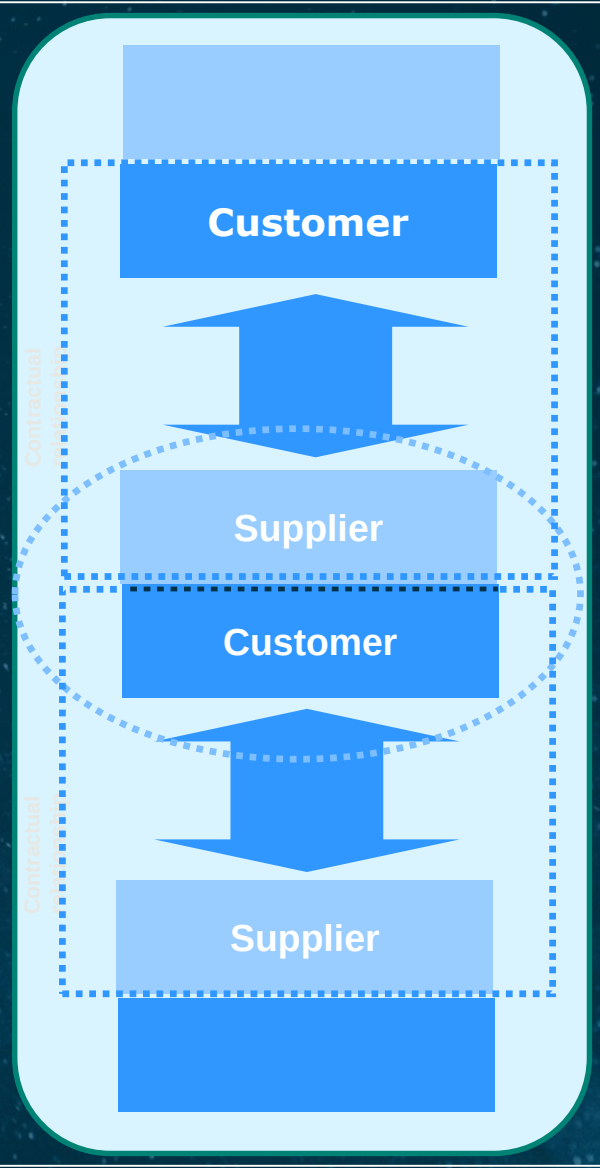
- the procedural aspects not normally covered
- procedural aspects should go in handbooks

express what to do in terms of regulatory provisions

- requirements
- recommendations
- permissions

provisions focused on a contractual relationship

- contractual model defined in ECSS-S-00



Focus on contractual relationship

Customer = organization or person that receives a product as part of a business agreement

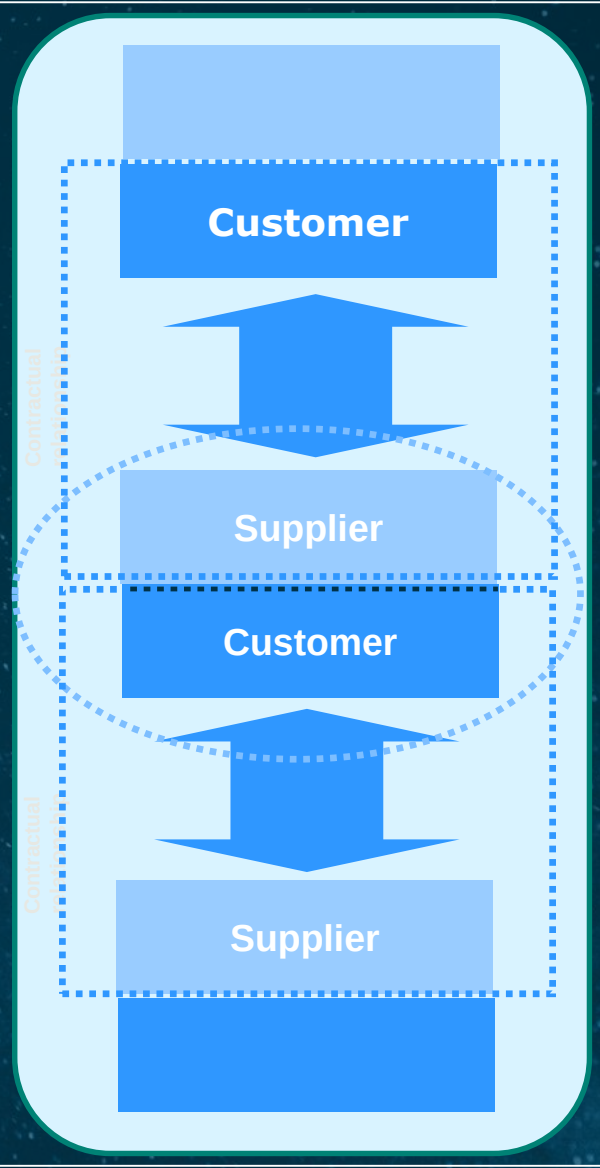
Supplier = organization or person that provides a product as part of a business agreement

Note: the term product covers: services, software, hardware, documentation, and processed materials

- All space project actors are either a customer, a supplier, or both.

Business agreement = legally binding agreement, for the supply of products, between two or more actors in the customer-supplier chain

- Business agreements are recorded in a variety of forms, such as:
  - ✓ Contracts
  - ✓ Memoranda of understanding
  - ✓ Inter-governmental agreements
  - ✓ Inter-agency agreements
  - ✓ Partnerships
  - ✓ Bartering agreements
  - ✓ Purchase orders



ECSS documentation structure

S-Branch
standardisation system description

- define the system of standardisation documents
- specifies how to use it in Space projects

branches

disciplines

M-Branch space project management	Q-Branch space product assurance	E-Branch space engineering	U-Branch space sustainability
M-10 project phases and implementation	**Q-10** product assurance management	**E-10** system engineering	**U-10** space debris mitigation
M-40 configuration and information management	**Q-20** quality assurance	**E-20** electric, electronic, and optics	**U-20** planetary protection
M-60 cost and schedule management	**Q-30** dependability	**E-30** mechanical	
M-70 integrated logistic support (ILS)	**Q-40** safety	**E-40** software engineering	
M-80 risk management	**Q-60** EEE components	**E-50** communications	
	Q-70 materials, mechanical parts and processes (MMP&P)	**E-60** control engineering	
	Q-80 software product assurance	**E-70** ground systems and operations (GSO)	

Denomination of ECSS documents

$$ECSS - \begin{Bmatrix} S \\ M \\ Q \\ E \\ U \end{Bmatrix} - \begin{Bmatrix} ST \\ AS \\ HB \\ AH \\ TM \end{Bmatrix} - \langle number \rangle \langle version \rangle$$

<S, M, Q, E or U> represents the branch

- S for ECSS system, the top level document that gives a general introduction into ECSS and the use of ECSS documents
- M for Management, Q for Product assurance, E for engineering, and U for Sustainability

<ST, AS, HB, AH or TM> is the type of document

- ST for standard, AS for adopted as standard, HB for handbook, AH for adopted as handbook, and TM for technical memo

<Number> is one or two groups of two digits each

- one group of two digits to identify those documents with more generic requirements
- two groups of two digits to identify those with more specific requirements
- the difference is not to indicate higher relevance of some standards with respect to others

<version> is a letter from A onwards, representing the issue. It may include also a Rev index, from 1 onwards.

Example:

S-ST-00C
ECSS System
(standard)

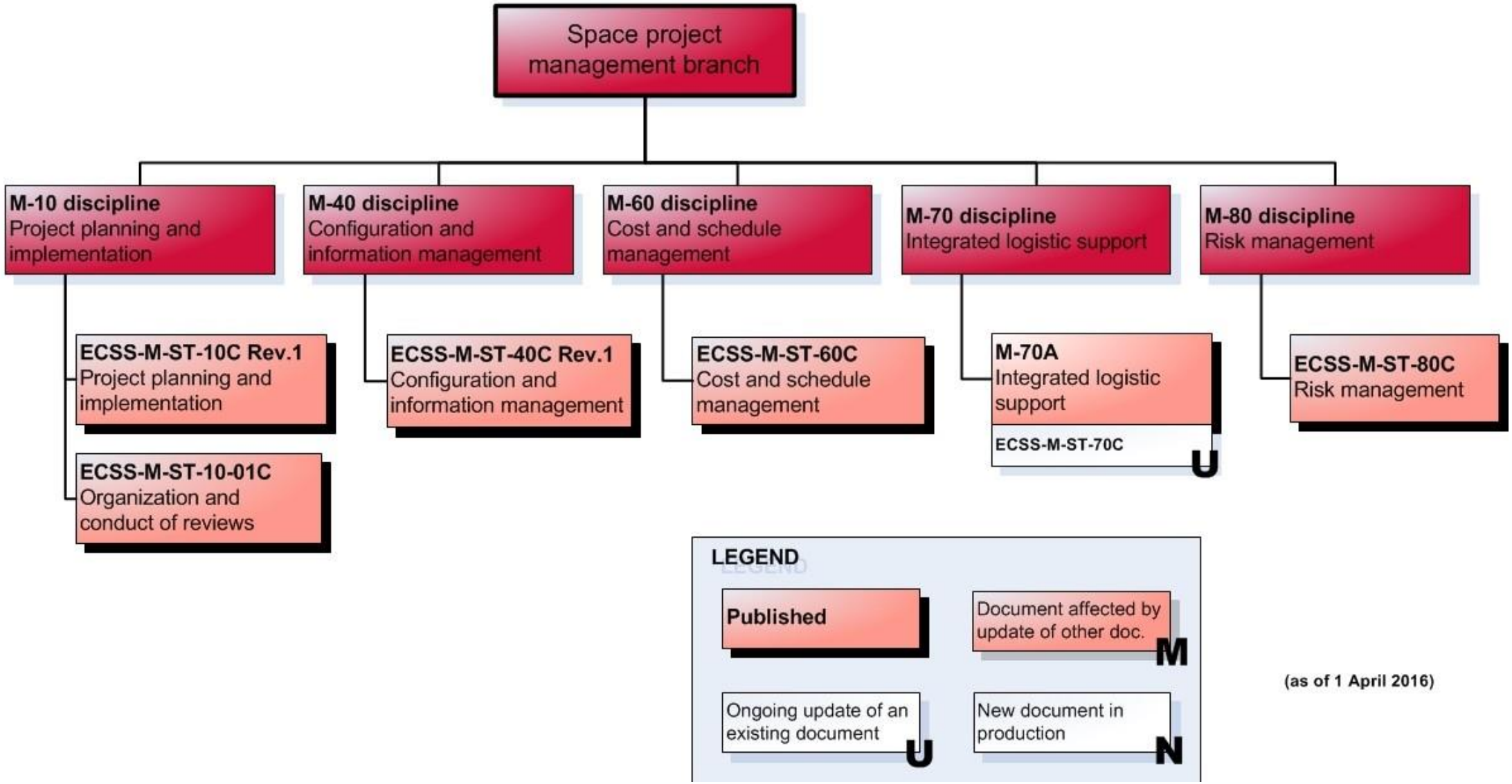
E-ST-50C
Communications
(standard)

↓

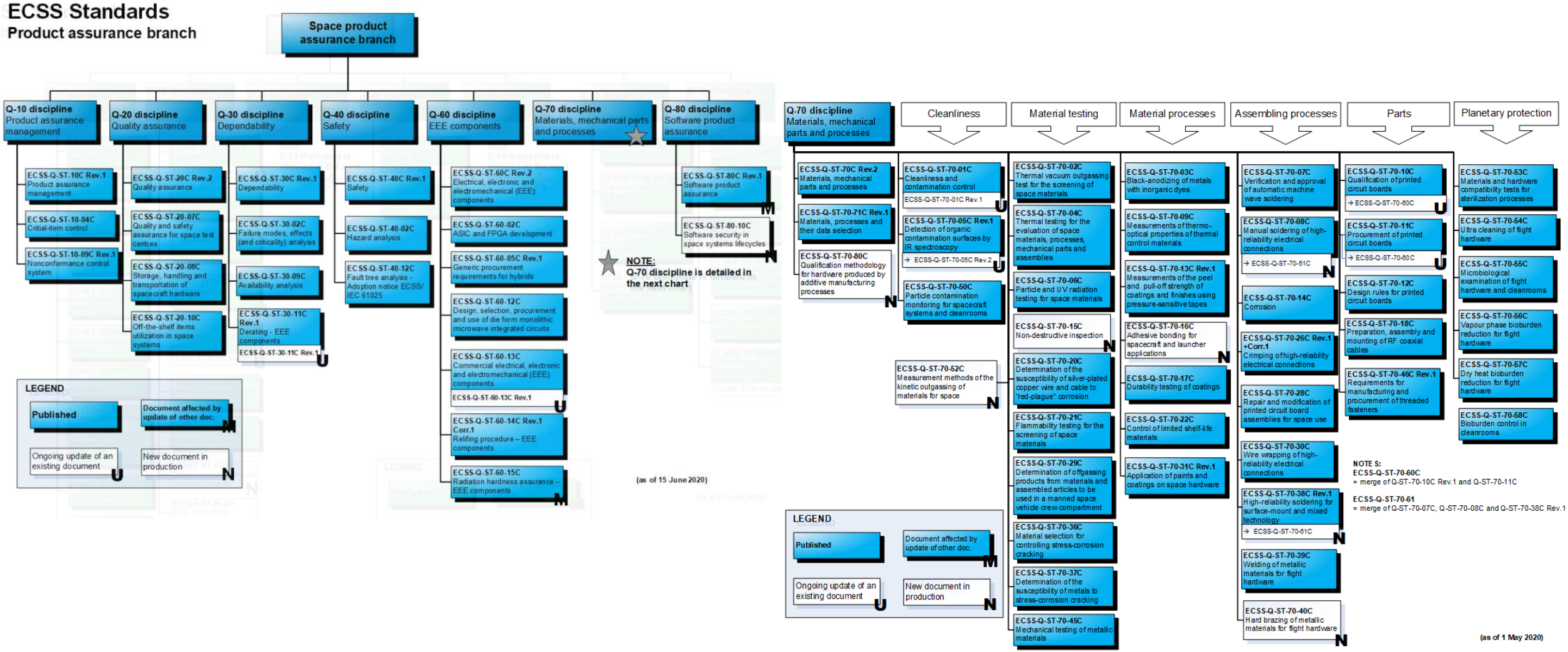
E-ST-50-05C
Radio frequency and modulation
(standard)

E-HB-50A
Communications
(handbook)

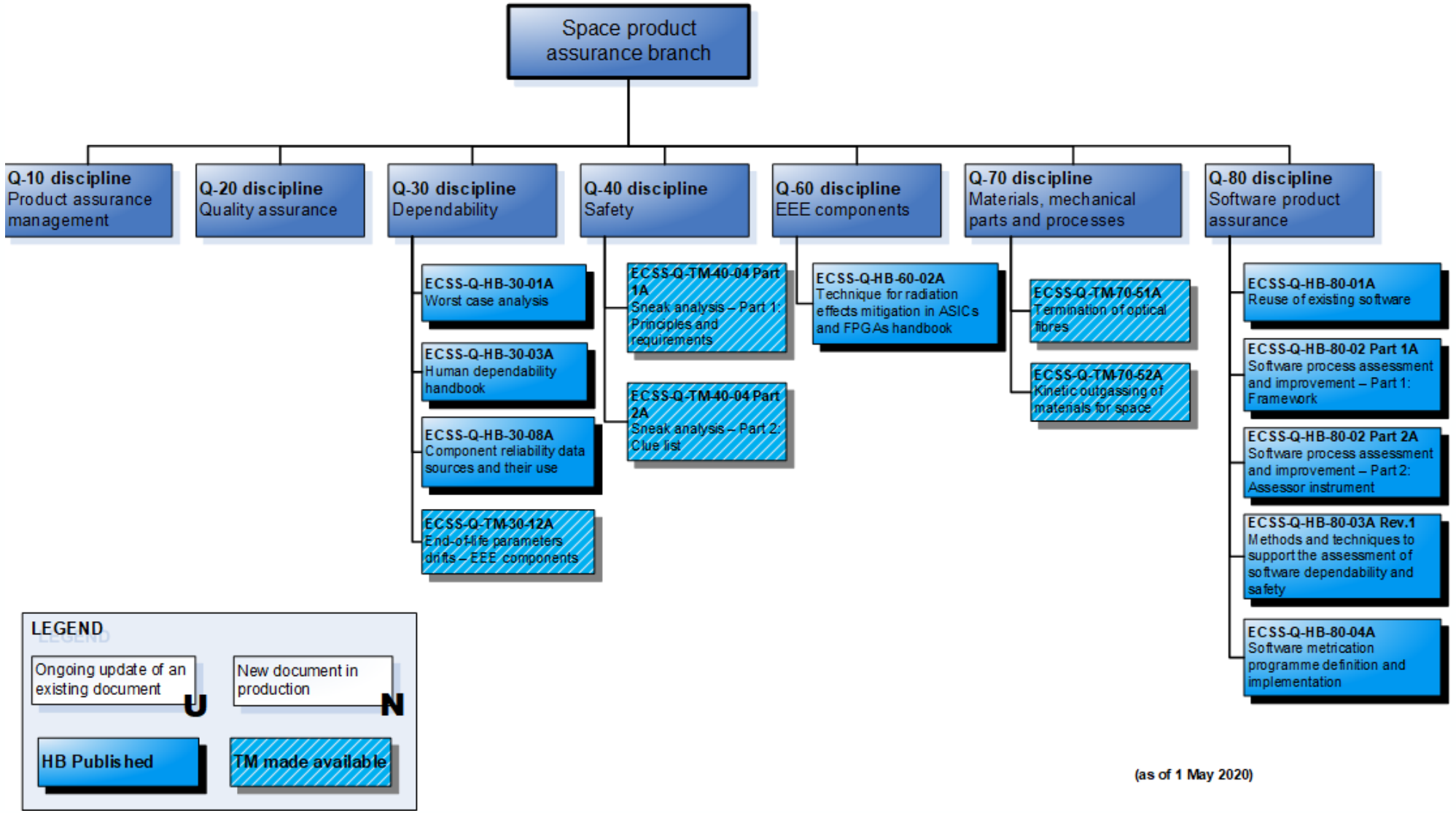
ECSS published documents – M-branch



ECSS published standards – Q-branch

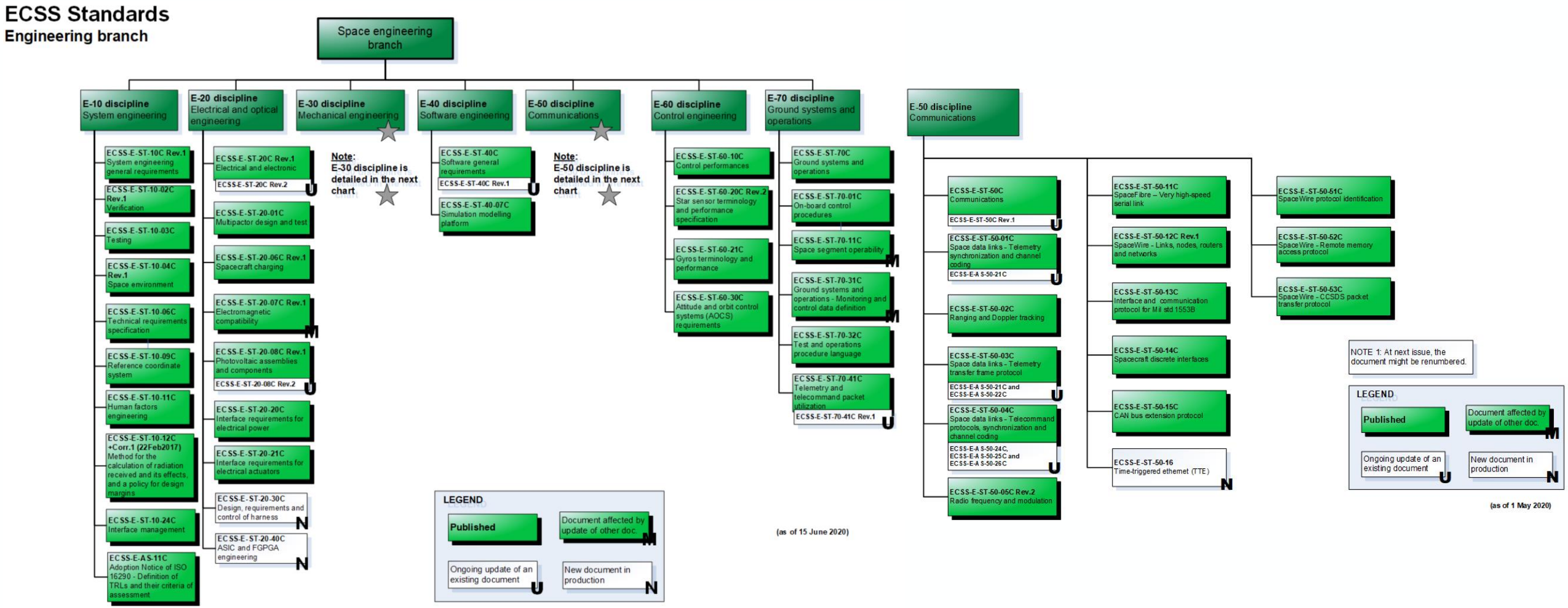


ECSS published HB/TM – Q-branch

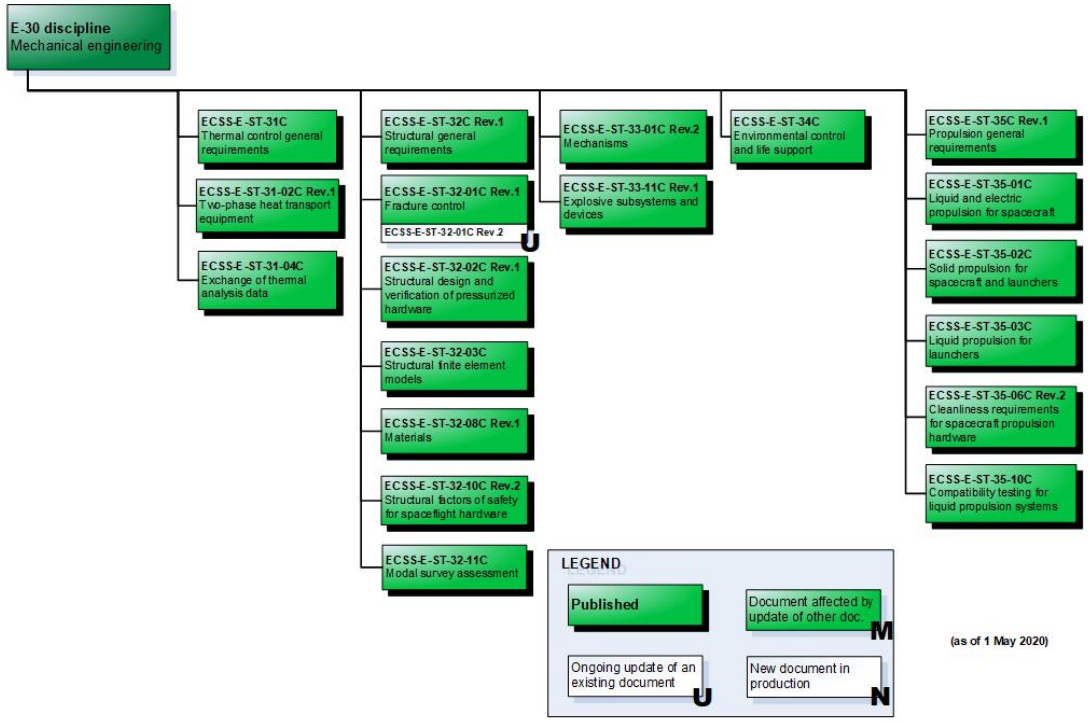


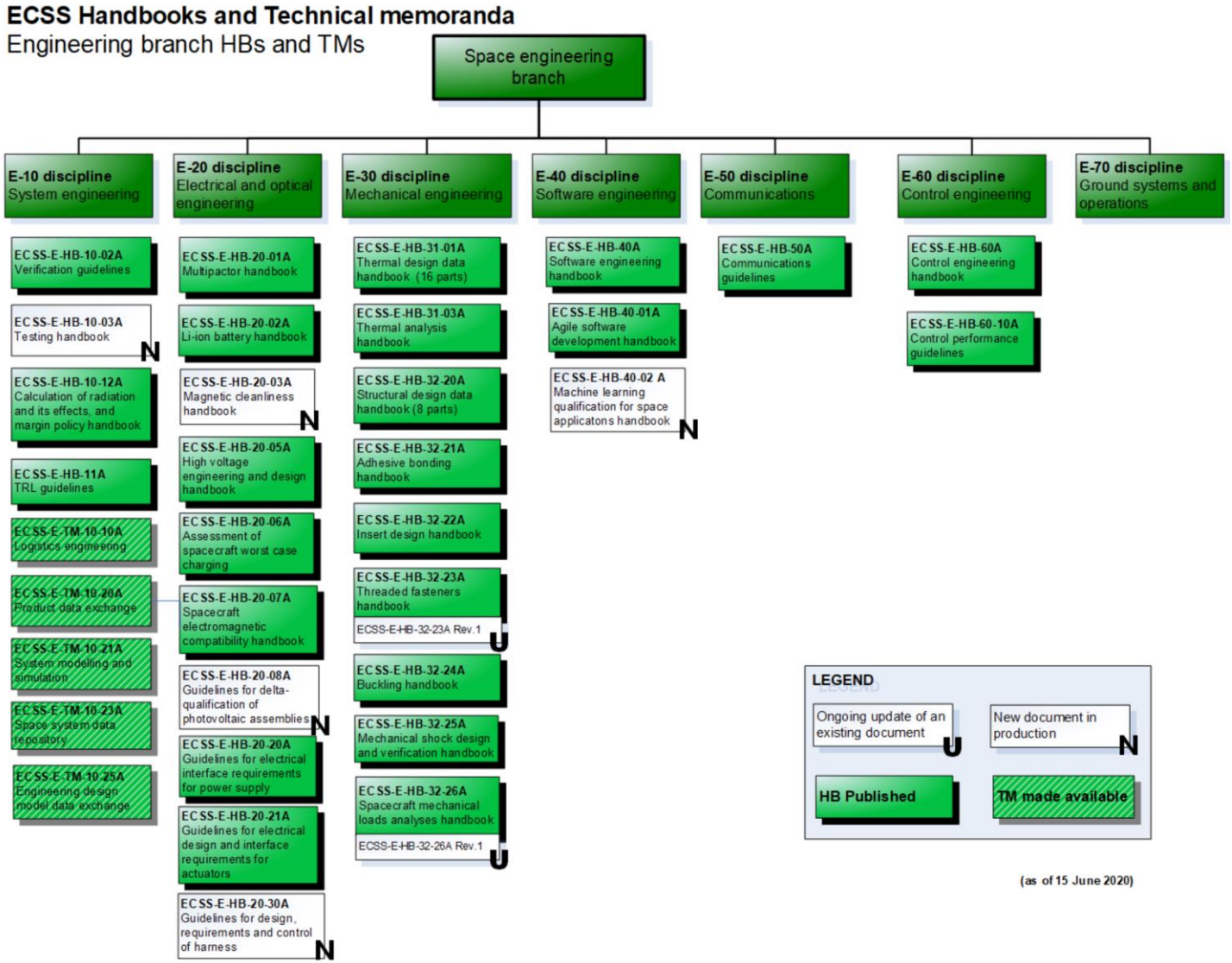
(as of 1 May 2020)

ECSS published standards – E-branch



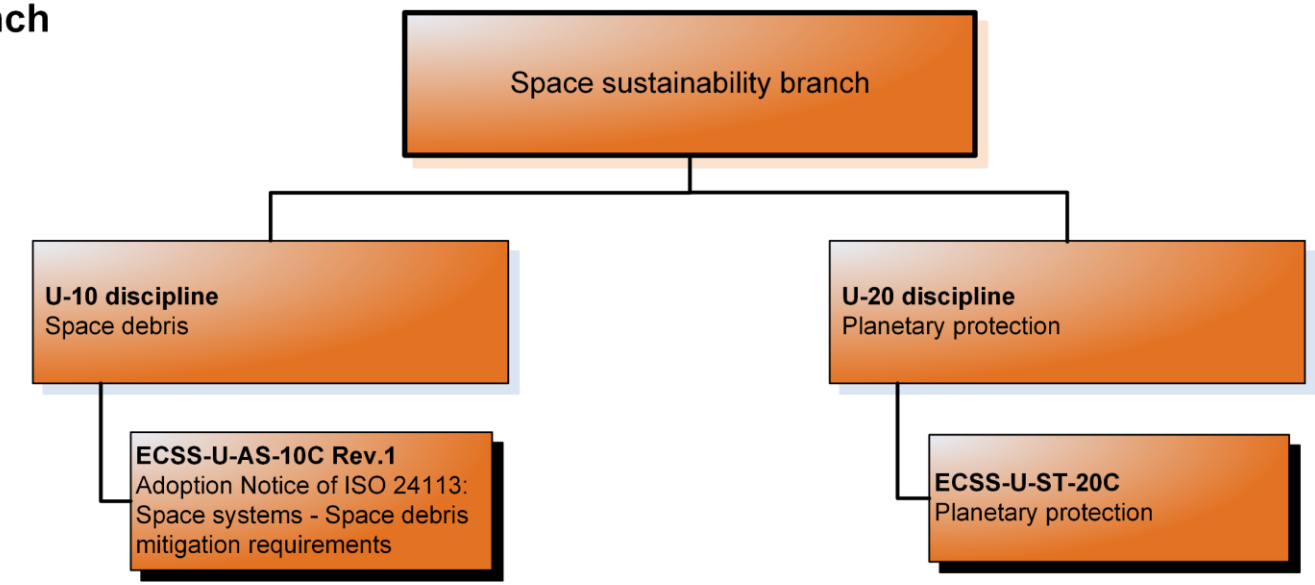
ECSS published documents – E-branch

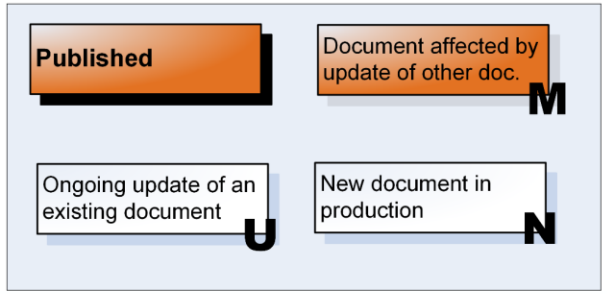




ECSS published documents – U-branch

ECSS Standards
Sustainability branch





(as of 3 December 2019)

The set of ECSS standards as a system

- ECSS was started with the aims to develop a single coherent set of space standards, either adopted from other SDOs or developed by ECSS itself, for the use of the entire Space community.
- This implies that **repetition and overlapping among standards should be avoided**.
  If an existing part of a document needs to be addressed in a second one, it is not repeated but a reference to the first one should be done.
- Two types of references:
  - **Normative references**, which are references from a normative statement (e.g. a requirement), incorporating as part of such a requirement a part of other document. They exist ONLY in standards, and are listed in *Normative references*.
  - **Informative references**, which are references from a non-normative (i.e. informative) statement. They may exist in standards, handbooks and TMs. In standards, they are listed in *Bibliography.* In HBs & TMs, are listed in *References*.

- **ECSS is a consistent and coherent set of standards**
- **ECSS standards shall NOT be used in isolation**

Example: standards applicable to a software project

- Software is specifically covered by the following ECSS standards: ECSS-E-ST-40 (SW engineering) and ECSS-Q-ST-80 (SW PA).
- However, these two documents are not enough to run a Space contract, even if the contract includes only SW.
- Examples of other ECSS standards which **may** need to be included are:
  - ECSS M-ST-10 *Project planning and implementation* for e.g. the definition of the project phases.
  - ECSS-M-ST-10-01 *Organization and conduct of reviews*
  - ECSS-M-ST-40 *Documentation and configuration management* for e.g. the SW configuration control
  - ECSS-E-ST-10 *System Engineering* for e.g. DDF, DJF, Technical Specification, …
  - ECSS-E-ST-10-02 *Verification*
  - ECSS-Q-ST-10-09 *Non-conformance control system*
  - ECSS-Q-ST-30 *Dependability* and Q-ST-40 *Safety* for e.g. criticality definition

Characteristics of ECSS standards and requirements

- intended for direct use in *business agreements:*
  - specific legal langue **not** used
  - language used aims to **avoid variations in interpretation**
  - clearly state the obligations of each actor (customer/supplier)
- This leads to **5 golden rules**:
  1. clear identification of what is part of the obligations of the contract (ie normative) and what is guidance/informative and not part of the contract
  2. clear physical separation between obligations and informative/guidance material
  3. clear identification (by a **unique** reference number) of individual normative provisions
  4. are requirements are clear, unambiguous, and **verifiable**
  5. all normative cross-references (internal and external) are to the appropriate paragraphs

The 5 golden rules (1/2)

1. **Clear identification of what is really part of the obligations of the contract** (i.e the normative statements), and **what is only guidance** and therefore **is not part of the contract**.
   In ECSS normative statements are identified as follows:
   - Requirements, with **shall/shall not**
   - Recommendations, with **should/should not**
   - Permissions, with **may/need not**
2. **Clear physical separation between obligations and guidance material**. In ECSS a combination of all the following approaches is used:
   - Guidance material is covered in a specific clause(s). Normally Clause 4 is used to explain the principles. It is also usual that the first sub-clause of each main clause is used to introduce the subject.
   - For a unit of guidance/informative material, informative annexes can also be used.
   - For small pieces of information related to a specific requirement, NOTES to such a requirement are used.

The 5 golden rules (2/2)

3. **Clear identification (by an *unique* identifier) of individual normative provisions**.
   In ECSS, each requirement, recommendation and permission is individually tagged with an identifier. This is fundamental for two purposes:
   - For an easy and unambiguous **tailoring**
   - For an efficient control of the **verification** process.

4. **All the requirements are clear, unambiguous, feasible, and *verifiable*.**
   Writing verifiable requirements has proved to be sometimes a challenge at the time of writing the standard. However, ECSS consider that this is a MUST for any ECSS standard.

5. All **normative cross-references** (internal or external) **are to the appropriate paragraphs** (i.e. they don't make mandatory a complete document, when only some paragraphs are applicable)

Structure of an ECSS standard

- ❑ **change log, ToC, *[introduction]***
1. **Scope**
   clear and concise identification of the coverage and applicability of the standard
2. **Normative reference**
   listing **only** documents referenced from requirements
3. **Terms, definitions, and abbreviations**
4. ***[Principles and/or background]***
   containing **only** informative/guidance material
5. **Requirements**
   containing the normative provisions
   it may contain some NOTES and a few guidance sub-clauses with only guidance material
6. ***[More requirements]***

n. ***[Pre-tailoring (per product type and project phase)]***
only mandatory if the standard is subject to pre-tailoring

- ❑ ***[Annexes]***
  Normative annexes (DRDs) – always first
  Informative annexes
- ❑ **Bibliography**
  lists documents references from informative/guidance text

mandatory clauses
[optional caluses/sections]

normative reference = reference to another standard explicitly done from a requirement
- references done from informative text go in the bibliography
- if a document is not mentioned in the normative clauses of the standard it **shall not** be listed in normative references, irrespective of its importance – it shall go in bibliography

DRD = Document Requirements Definition
- normative annexes → they are requirements
- specify the content of a deliverable document
- do not specify the format, only the information to be provided
- always referenced from a requirements specifying who, when, and how often the document shall be provided – the DRD only specifies the content

3. Application of ECSS standards in space projects

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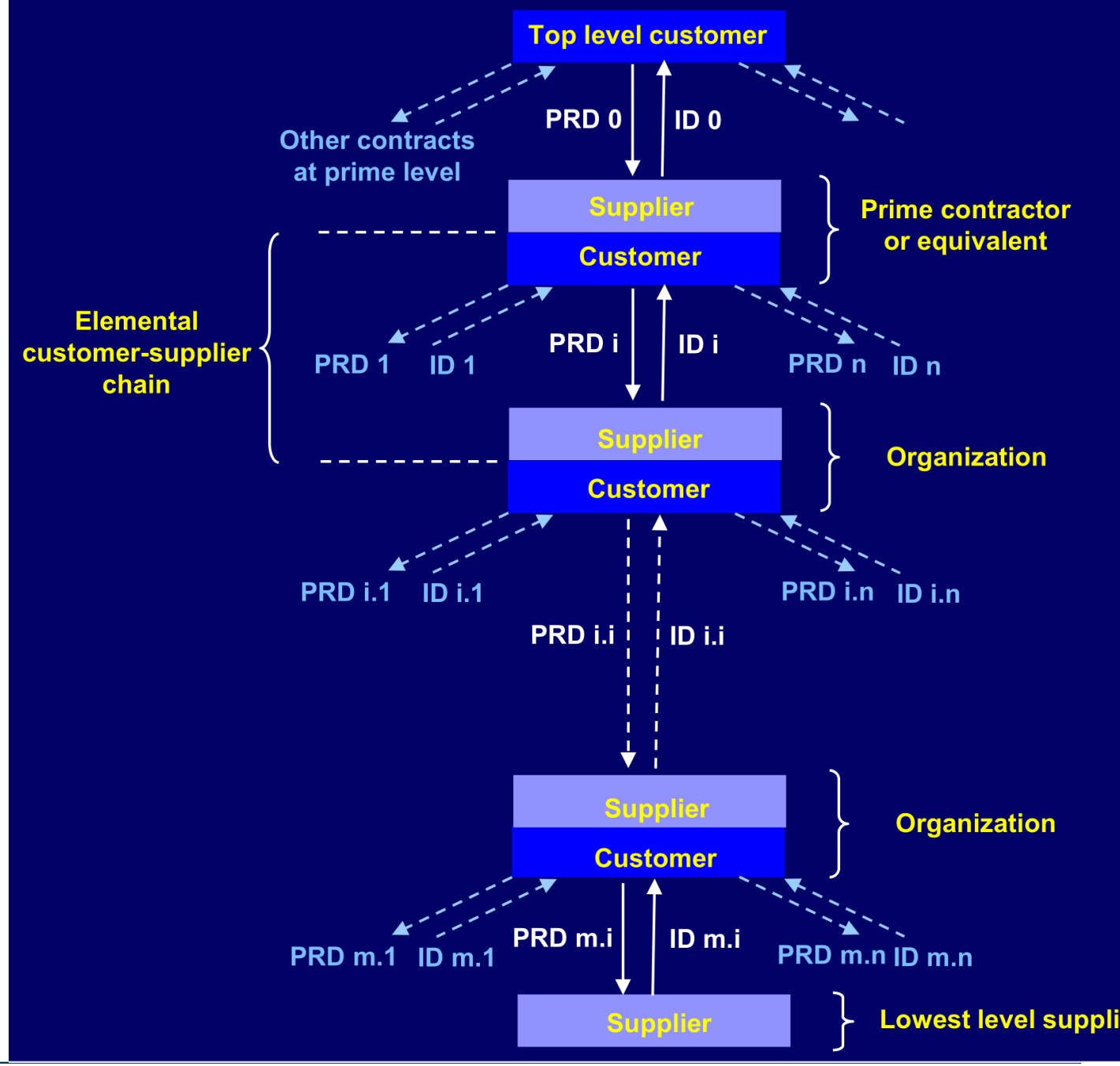
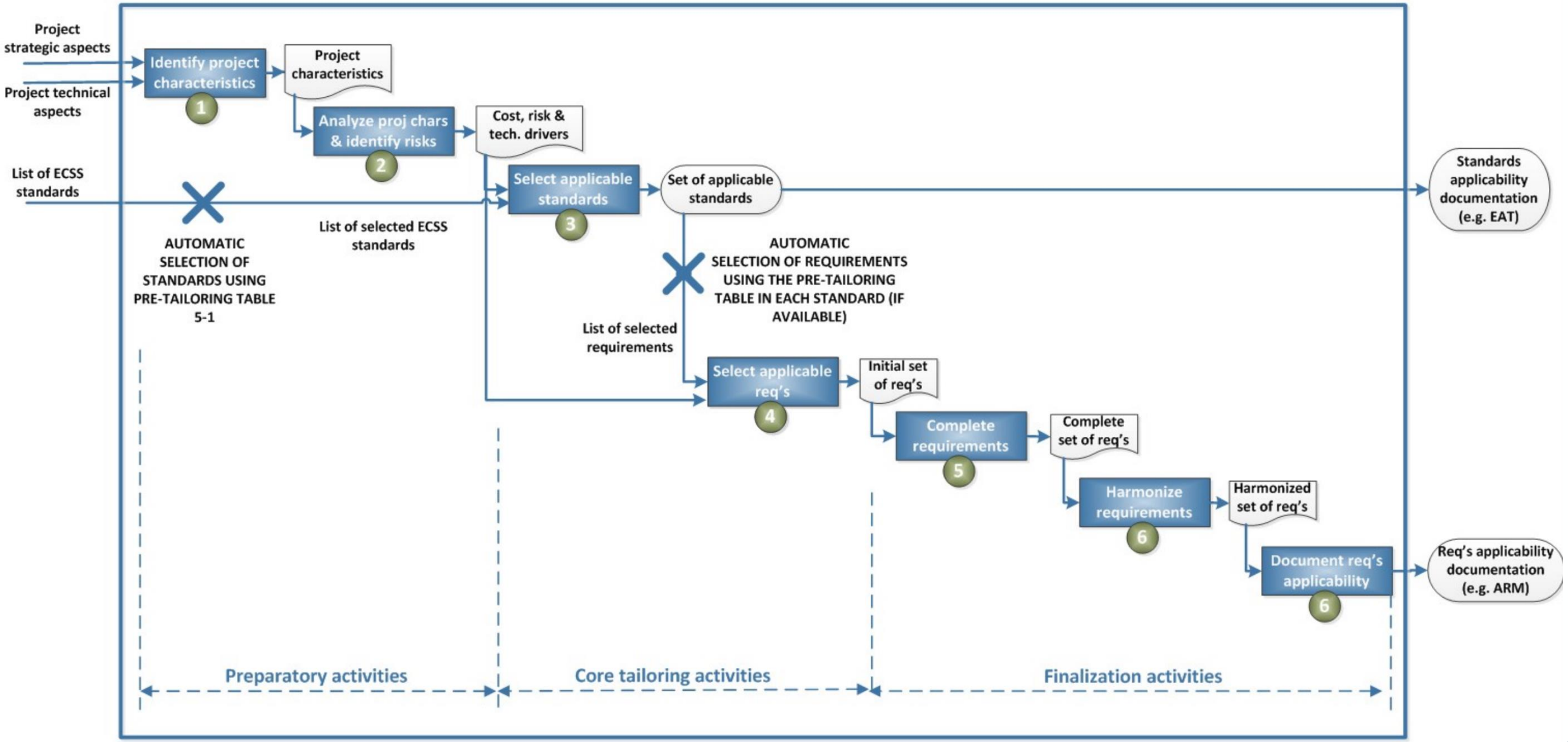
Tailoring

- ECSS standards are made applicable at each level of the customer-supplier chain by adapting them to the specificities of the project, at this level. This adaptation process is called **tailoring**.
- Project requirements within the PRD are therefore composed by 2 sets:
  - Requirements specific to the project
  - ECSS Requirements, once tailored to the project
- **Tailoring shall be performed by the customer**, at each level of the customer-supplier chain.



The tailoring process



The ECSS applicability table (EAT)

ECSS Applicability table (EAT)

Project/Programme:
Contract information:
Originator:

Mission type:
Issue date:
Event generation:

Standard	Applicability (A / T / >> /NA)	Justification (including justification of the use of other standard instead of)

A: Standard fully applicable without tailoring
M: Standard applicable with tailoring. For each of these standards, the generation of a EARM is expected.
>> See meaning in #5.2.1a and Table 5-1. Standard applicable at a lower level of product and to be tailored by the customer of this lower level
NA Standard not applicable at all

The ECSS Applicability Requirement Matrix (EARM)

ECSS Applicability requirement matrix (EARM)

Project/Programme:
Issue date:
Event generation:
Product type:

Contract information:
Originator:
Standard reference:

THE COMPLETE SET OF REQUIREMENTS IN THE STANDARDS IN THE EAT ARE APPLICABLE, WITH THE MODIFICATIONS STATED IN COLUMNS 2 TO 6 OF THIS EARM					
1. ECSS Standard	2. ECSS Req. identifier	3. Org. Req. identifier	4. Applicability (M/D/N)	5 Modified or New requirement (Full text)	6. Justification (Only in case of M, D or N in column 4)

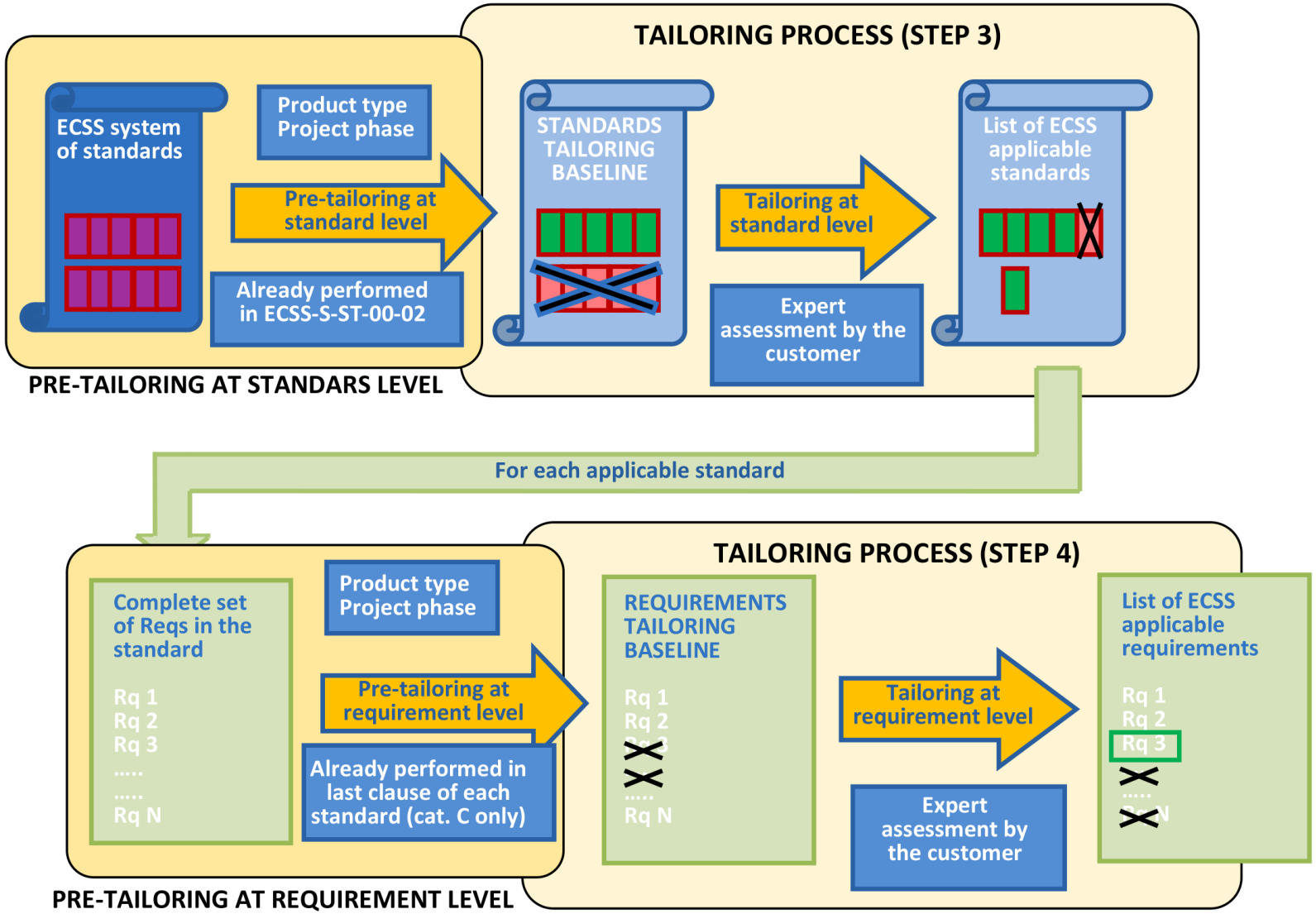
NOTE: Column 3 is provided to give the users the capability of using their own requirement identification system, in parallel with the identification of the requirement in the applicable standard (Column 2).	M: Requirement applicable with Modification D: Requirement Deleted, not applicable N: New requirement (requirement added)

Pre-tailoring (1/5)

- Tailoring of the whole set of requirements for a specific application has demonstrated to be a non-trivial very heavy task.
- It is however acknowledged that a number of requirements may not be meaningful for specific type of project or for specific phases of a project.
- It was therefore considered of ECSS interest to identify possible *types of products* and establish the associated applicability of standards/requirements. This view is shared by all ECSS Space Agencies, and considered of crucial importance by Eurospace.
- The impact of pre-tailoring is that **it will reduce dramatically the *Baseline for tailoring*** (input to steps 3 and 4 in the general tailoring process).
  It will NOT eliminate the need of the final tailoring by the customer.

- **Pre-tailoring and tailoring have different actors:**
  - **Pre-tailoring will be a *pre-cooked* list of standards, and a *pre-cooked* list of requirements in every standard subject to pre-tailoring (published at the time of producing the standard).**
  - **Tailoring is to be done specifically by every project by the project itself.**
- **Pre-tailoring matrices are present is standards published after 2015 and subject to pre-tailoring**

Pre-tailoring (2/5)



Pre-tailoring (3/5)

Pre-tailoring of the list of requirements per applicable standard (before tailoring step 4)

In respect to pre-tailoring, standards may fall in 3 categories:

- **Category C – Complete**: The standard needs no pre-tailoring, because it is applicable as a whole to a particular type of product, during a given phase. Example: Black anodizing.
- **Category I – Implicit**: The standard has been built such that the pre-tailoring is implicit to its structure. Example: ECSS-E-ST-10-02 *Testing*, which clauses are organized as *Testing for space segment equipment*, *Testing for space segment element*, *Pre-launch testing*.
- **Category E – Explicit**: The pre-tailoring of the document is included (per product type and per project phase), in explicit tables within the document (see next slide)

Pre-tailoring (4/5)

Input for step 3 – tailoring of the **list of standards** – Pre-tailoring table attached to **ECSS-S-ST-00-02C DRAFT1**

			Space segment		Launch segment		Ground segment				
Standards	Title	Space system	Element & sub-system	Equipment	Element & sub-system	Equipment	Element & sub-system	Equipment	Ground Support Equipment	Software	Comments
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
ECSS-S-ST-00	Description, implementation & general requirement	X	X	X	X	X	X	X	X	X	
ECSS-S-ST-00-01	Glossary of terms	X	X	X	X	X	X	X	X	X	
ECSS-M-ST-10	Project planning and implementation	X	X	X	X	X	X	X	X	X	
ECSS-M-ST-10-01	Organization and conduct of reviews	X	X	X	X	X	X	X	X	X	
ECSS-M-ST-40	Configuration and information management	X	X	X	X	X	X	X	X	X	
ECSS-M-ST-60	Cost and schedule management	X	X	X	X	X	X	X	X	X	
ECSS-M-70	Integrated logistic support	X	X	X	X	X	X	X	X	X	
ECSS-M-ST-80	Risk management	X	X	X	X	X	X	X	X	X	
ECSS-Q-ST-10	Product assurance management	X	X	X	X	X	X	X	-	X (1)	(1) for SW as referred to by ECSS-Q-ST-80
ECSS-Q-ST-10-04	Critical item control	X	X	X	X	X	X	X	-	X (1)	(1) for SW as referred to by ECSS-Q-ST-80
...											
ECSS-E-ST-70-11	Space segment operability	X	X	X	-	-	-	-	-	-	
ECSS-E-ST-70-31	Ground systems and operations - Monitoring and control data definition	X	X	X	-	-	X	X	X	-	
ECSS-E-ST-70-32	Test and operations procedure language	X	X	-	-	-	X	-	-	-	
ECSS-E-ST-70-41	Telemetry & telecommand packet utilization	X	X	X	-	-	X	X	X	-	applicable only to products managing packet TM or TC with CCSDS format
ECSS-U-AS-10	Adoption Notice of ISO 24113: Space systems – Space debris mitigation requirements	X	X	X	X	X	-	-	-	-	
ECSS-U-ST-20	Planetary protection	X	X	X	X	X	X	X	X	X	

Pre-tailoring (5/5)

Input for Step 4 – tailoring of the set of requirements (**per standard**)

Table in each standard needing **explicit** pre-tailoring (category E) – **example** from **ECSS-E-ST-10C Rev. 1**

Table 7-2: Pre-tailoring matrix per "Space product types"

ECSS req. #	Space system	Space segment element and sub-system	Space segment equipment	Launch segment element and sub-system	Launch segment equipment	Ground segment element and sub-system	Ground segment equipment	Ground support equipment	Software	Comments
5.1a	X	X[1]	//[2]	//[2]	-	-	-	-	-	[1] applicable at element level: for subsystem level - see [2] [2] applicability should be defined/tailored at each level for next lower level, depending on product heritage, engineering complexity and industrialization context.
5.1c	X	X[1]	-	//[2]	-	-	-	-	-	[1] applicable at element level: for subsystem level - see [2] [2] applicability should be defined/tailored at each level for next lower level, depending on product heritage, engineering complexity and industrialization context.
5.1d	X	X[1]	//[2]	//[2]	-	-	-	-	-	[1] applicable at element level: for subsystem level - see [2] [2] applicability should be defined/tailored at each level for next lower level, depending on product heritage, engineering complexity and industrialization context.
5.2.1a	X	X	X	X	-	-	-	-	-	

Feedback (1/2)

- The process relies on individual inputs provided to ECSS, from each ECSS partners:
  - Inputs are collected and merged by the ES and make them available to TAARs for assessment and recommendation to TA.
  - **Each ECSS organization (eg ESA) shall implement its own internal Feedback Process**
- Potential outputs of the feedback process are:
  - Change Requests to existing standards
  - NWIP (add/modify/split or group standard)
  - TA recommendation to improve overall ECSS system (eg improve Website, add/remove discipline/branch, standard cancelation, modify drafting rules, ...)

Feedback (2/2)

- Feedback from ECSS user (which includes Space Agencies and Eurospace) is required by ECSS-S-ST-00C Rev. 1 *System description and implementation* (→ **it is a requirement on the *users***)
- The **feedback process** is defined in ECSS-D-00B *ECSS organization and processes* (→ **it is a process for *developers***)
- At the present, feedback will only apply for project using ECSS Issue C (or later)
  - The calendar is being consolidated by ES based on each ECSS partner input
- The overall feedback process relies on three pillars
  - **C-ARM** analysis (at Project ITT level)
  - **Inquiry board and LL** & feedback from project at major reviews (PDR/CDR/FAR/CR)
  - **ECSS Questionnaire** (on-line version & TA triggered campaigns)

ECSS DOORS database

- DOORs is a commercial SW from IBM for requirement management
- It is designed for management of requirements during their lifecycle, including flowing down to (sub)contractors
- The tool, customized for Space requirement management purposes, and the database with all the ECSS standards version C (or later), is available under request to ESA.
- The application and the database with all ECSS (standards and requirements) in version C or later, is available under request to ESA.
- Advantages:
  - Powerful. It permits full requirement configuration control, at all levels in the customer-supplier chain, including full traceability to the original requirements.
- Disadvantages:
  - It needs a license → not usable universally.
  - Expensive, both the license and in terms of learning time
- ECSS has produce a DOORS database of all ECSS requirements
- Now this database is approved by the ECSS SB and available

4. Dissemination of ECSS information

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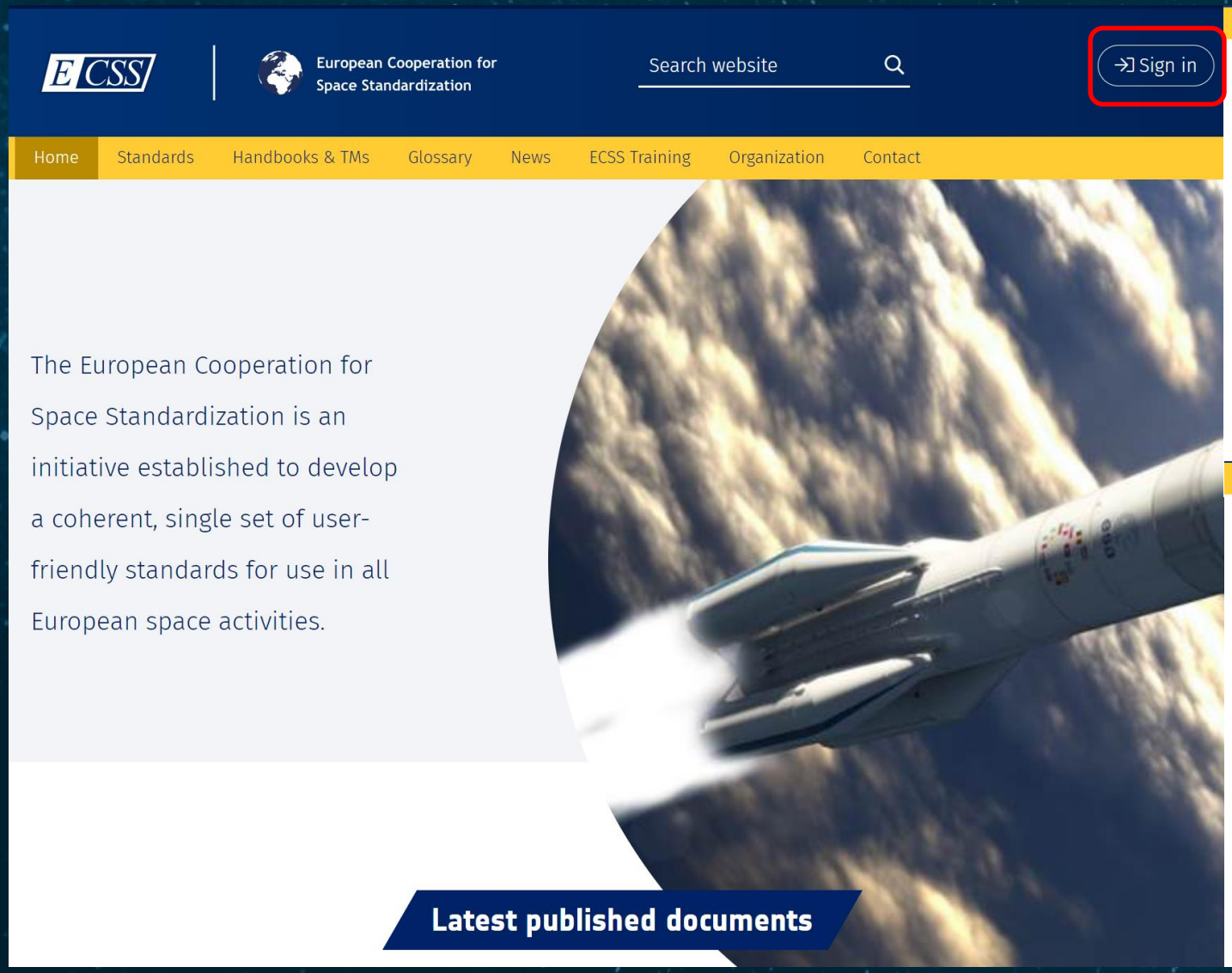
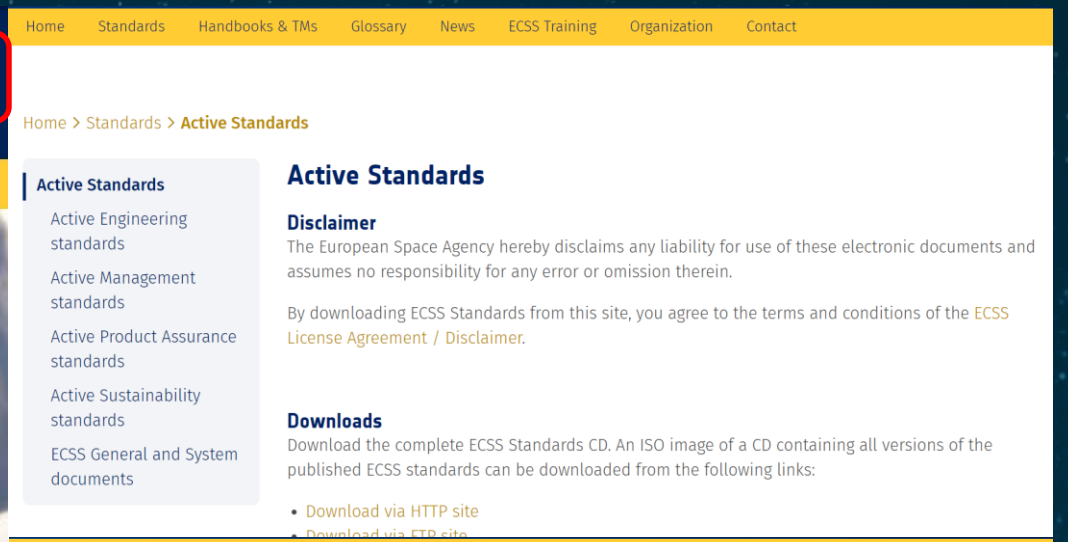
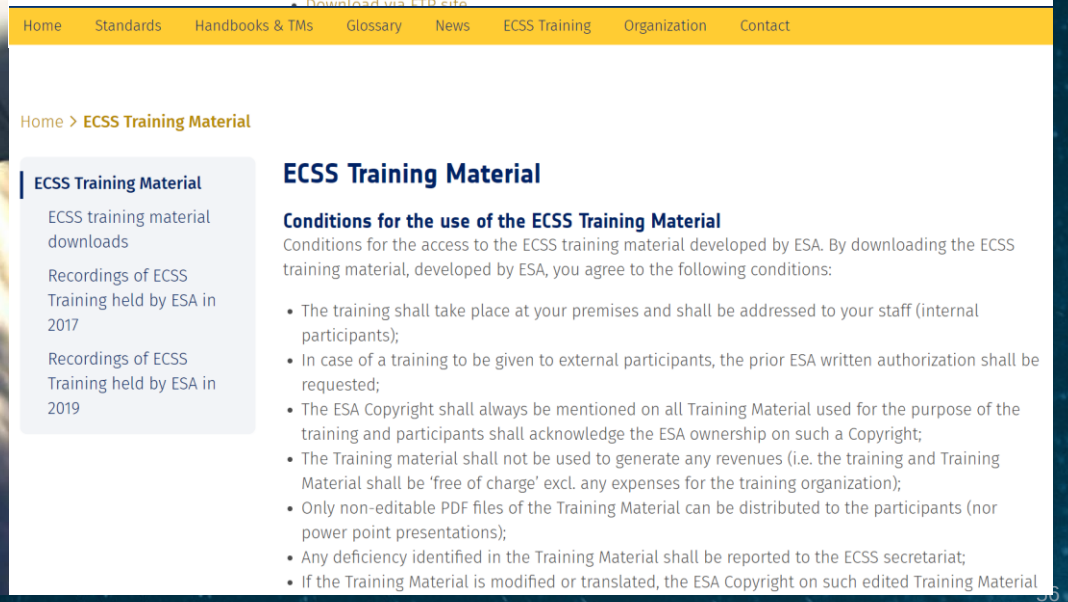
ECSS website (ecss.nl)



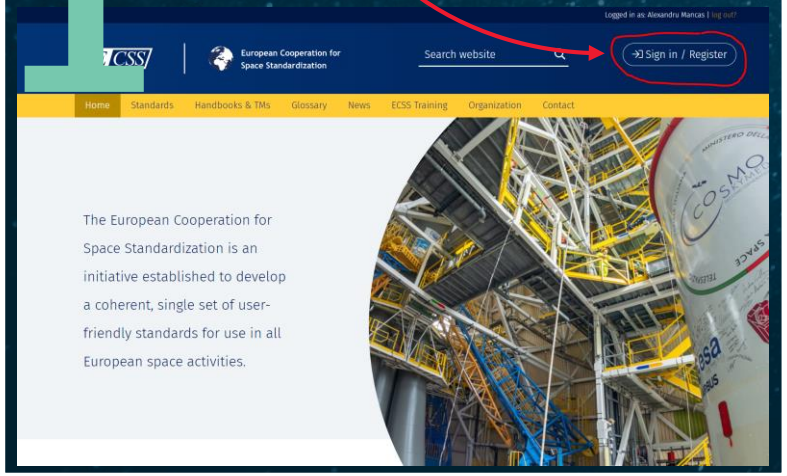




Creating an ECSS account and logging in

go to ecss.nl and click on the ***Sign in / Register*** button

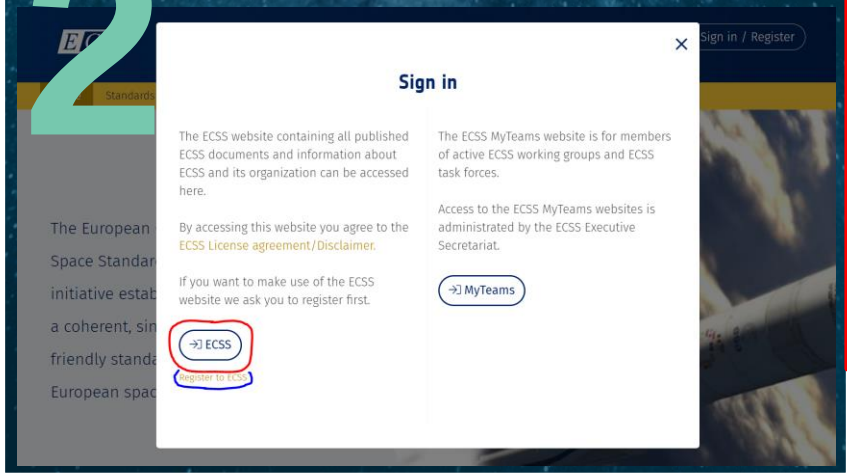
1



if you do not have an account: click on the ***Register to ECSS*** button

if you have an account: click on the ***ECSS*** button

2



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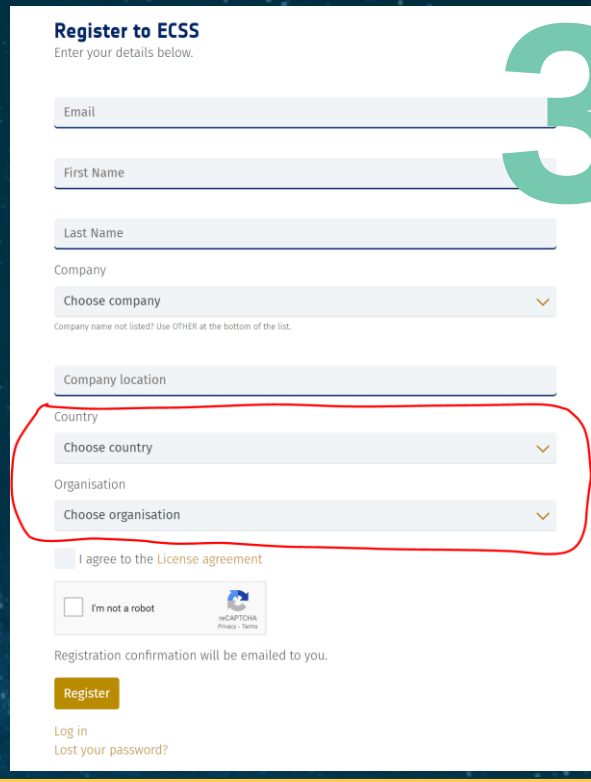

if you have an account: fill in username and password

Downloading ECSS documents

ECSS | European Cooperation for Space Standardization

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Home | Standards | Handbooks & TMs | Glossary | News | ECSS Training | Organization | Contact

- Active Standards
- Superseded Standards
- Document Tree
- DRD List And Word Versions Of DRDs (28Aug2017)
- Documents For Developers
- Document Production Status
- DOORS Database Download
- ECSS Applicability Requirement Matrix (EARM)
- ECSS Support Material
- Online Change Request Form
- ECSS Change Request Form (Excel File)

- Active Handbooks
- Superseded Handbooks
- Technical Memoranda (TM's)
- Superseded Technical Memoranda
- Handbooks & Technical Memoranda Architecture
- Document Production Status
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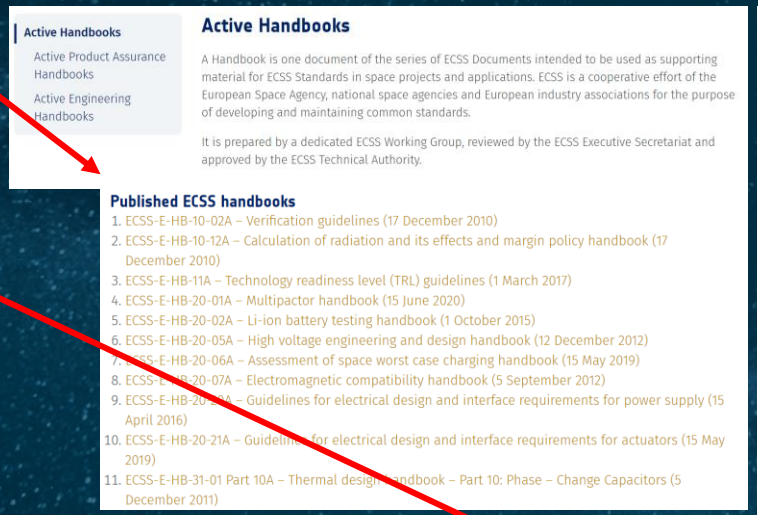
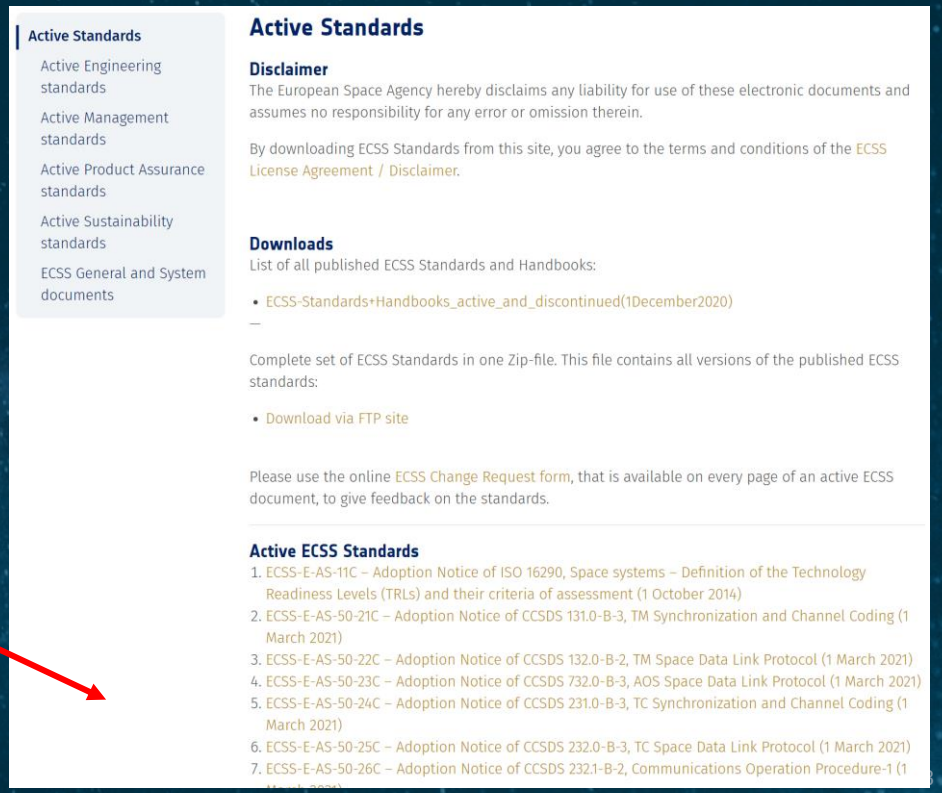
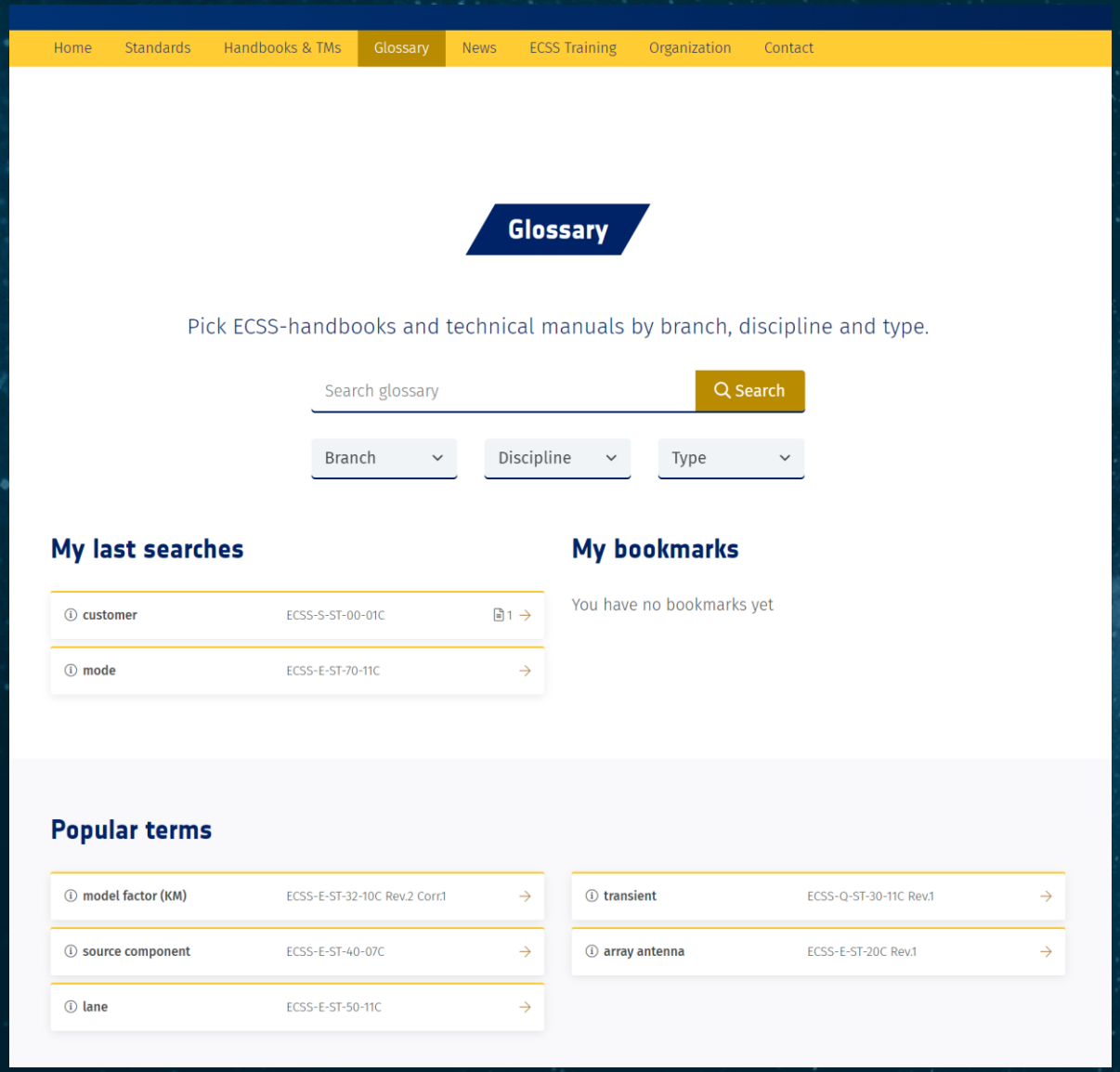
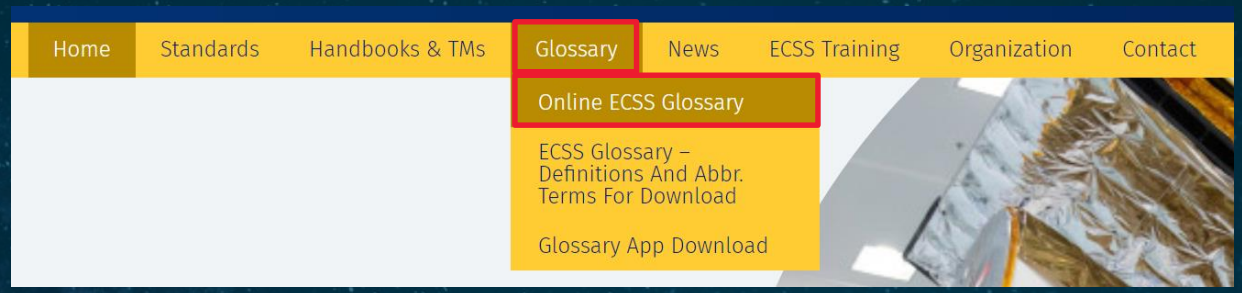




The ECSS Glossary of terms



https://ecss.nl/glossary/



CCSDS (ccsds.org)

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About CCSDS

Want to know more about CCSDS

Read More

What is CCSDS?

The Consultative Committee for Space Data Systems (CCSDS) is a multi-national forum for the development of communications & data systems standards for spaceflight.

Leading space communications experts from 28 nations collaborate in developing the most well-engineered space communications & data handling standards in the world.

The goal to enhance governmental & commercial interoperability & cross-support, while also reducing risk, development time & project costs.

More than 1000 space missions have chosen to fly with CCSDS-developed standards.

New to CCSDS

Frequently asked questions about CCSDS

Materials that provide a quick overview of CCSDS's current activities

Finding and Using CCSDS Standards

Access the CCSDS library of publications

The Space Assigned Numbers Authority (SANA) is the registrar function for the protocol registries created under CCSDS.

Working Within CCSDS

View CCSDS documents currently under review and find information on submitting RIDs.

Collaborative Work Environment Visitors: Enter the CWE area to view public documents in the CCSDS working groups. Request a CWE ID to fully engage in the technical teams.

Management S

) is the executive management oversight grou
al Delegate. These Members select the CMC c
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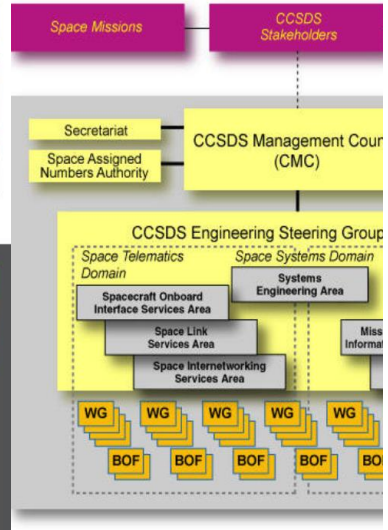
tisfied in a timely manner. Click on the boxes b



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ABOUT PUBLICATIONS

Publications

Locate CCSDS Documents by Book Color, CCSDS Area, or by using the Interactive Space Data System Reference Model (see below). To better understand the CCSDS Standards Development Process click here.

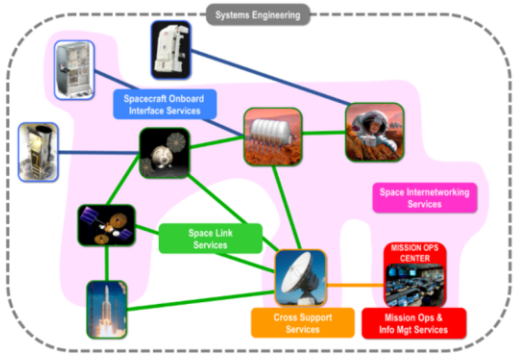
Publications Sorted by Book Color

- Blue: Recommended Standards
- Magenta: Recommended Practices
- Green: Informational Reports
- Orange: Experimental
- Yellow: Record
- Silver: Historical
- All Active Publications

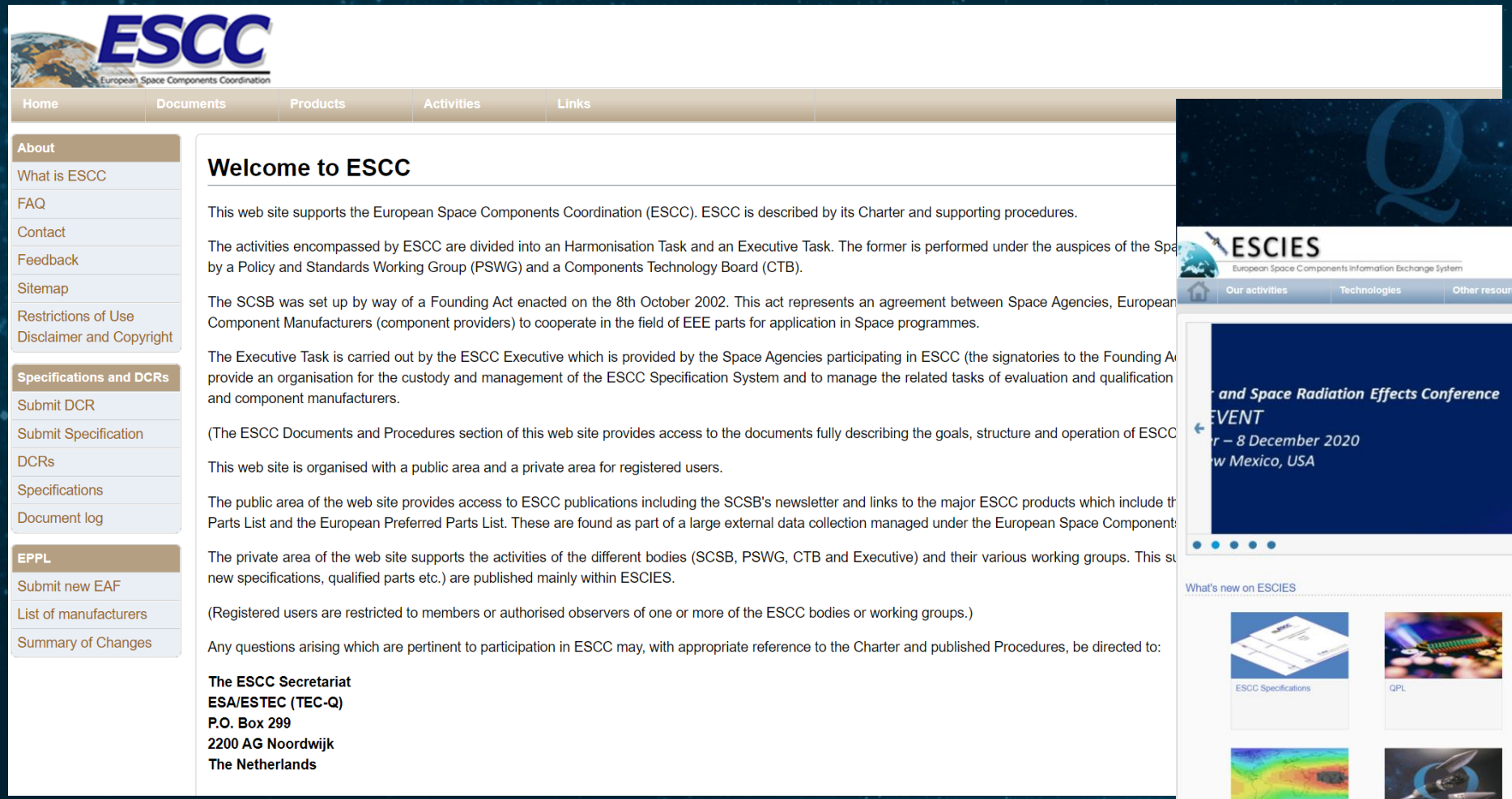
Publications Sorted by CCSDS Area

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

Interactive Technical Area Reference Model: Please click on a Technical Area link below to find the associated CCSDS Documents.



ESCC (escies.org and spacecomponents.org)



Requirements and Standards Section

TEC-QES