

SAVOIR

Avionics Reference Architecture

Operability in the SAVOIR Context

Avionics, Data Control & Software Systems Workshop

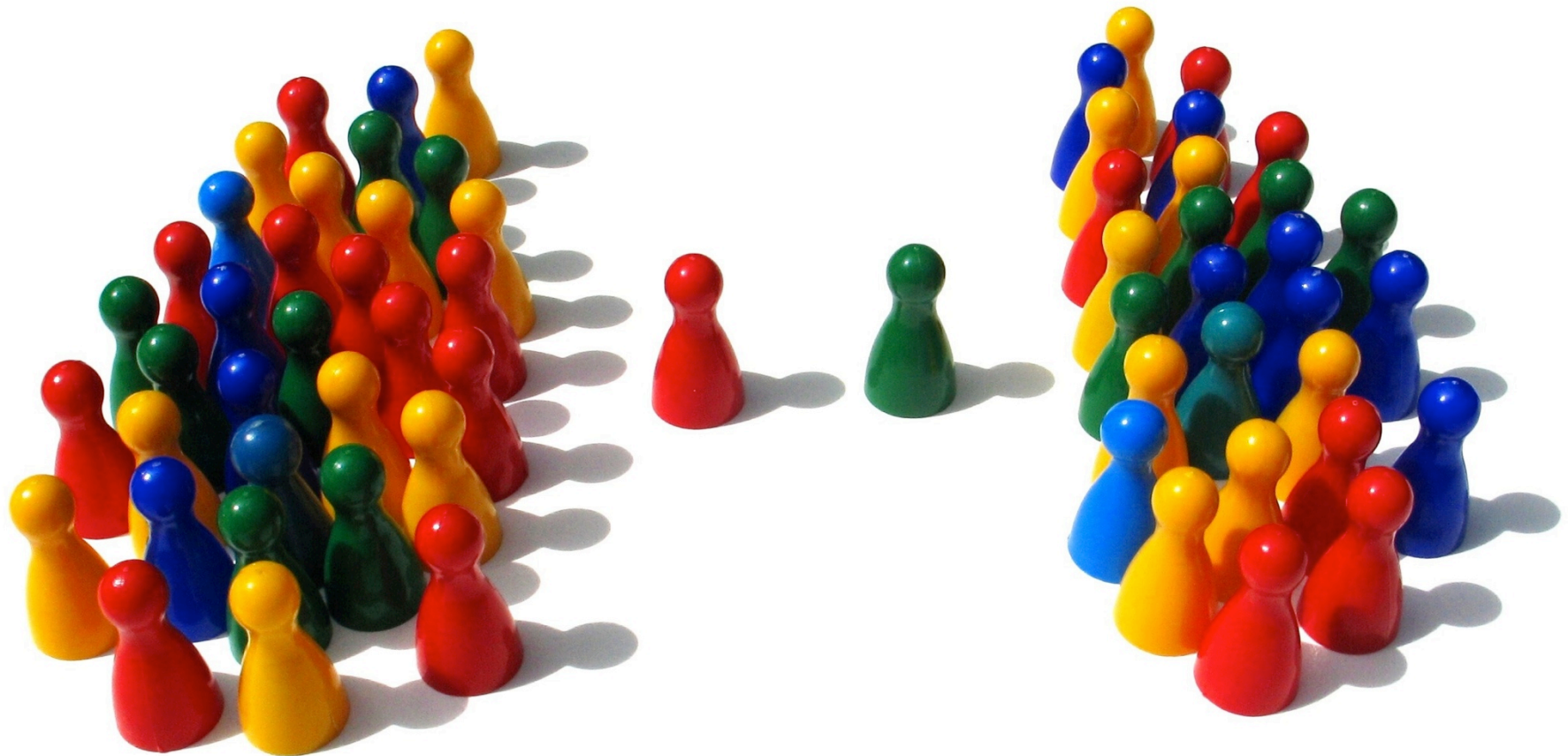
23/10/2012

Implementing Operability





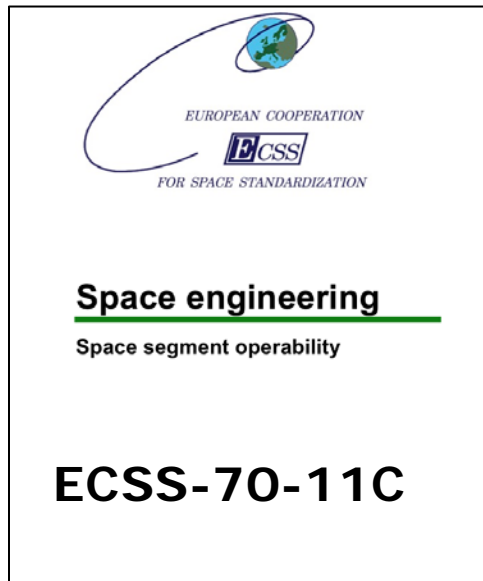
The CCN Standoff & the SOIRD



1. The Spacecraft Operations Interface Document was created to standardise how ESA specified its operability requirements.
2. This document was eventually included in the ITT to Industry.
3. ECSS Standards for Operability
4. Packet Standards adopted
5. There is a strong desire in Operations and in Industry to have a standard

Operability is formally specified in the ESA ITT issued to Industry :

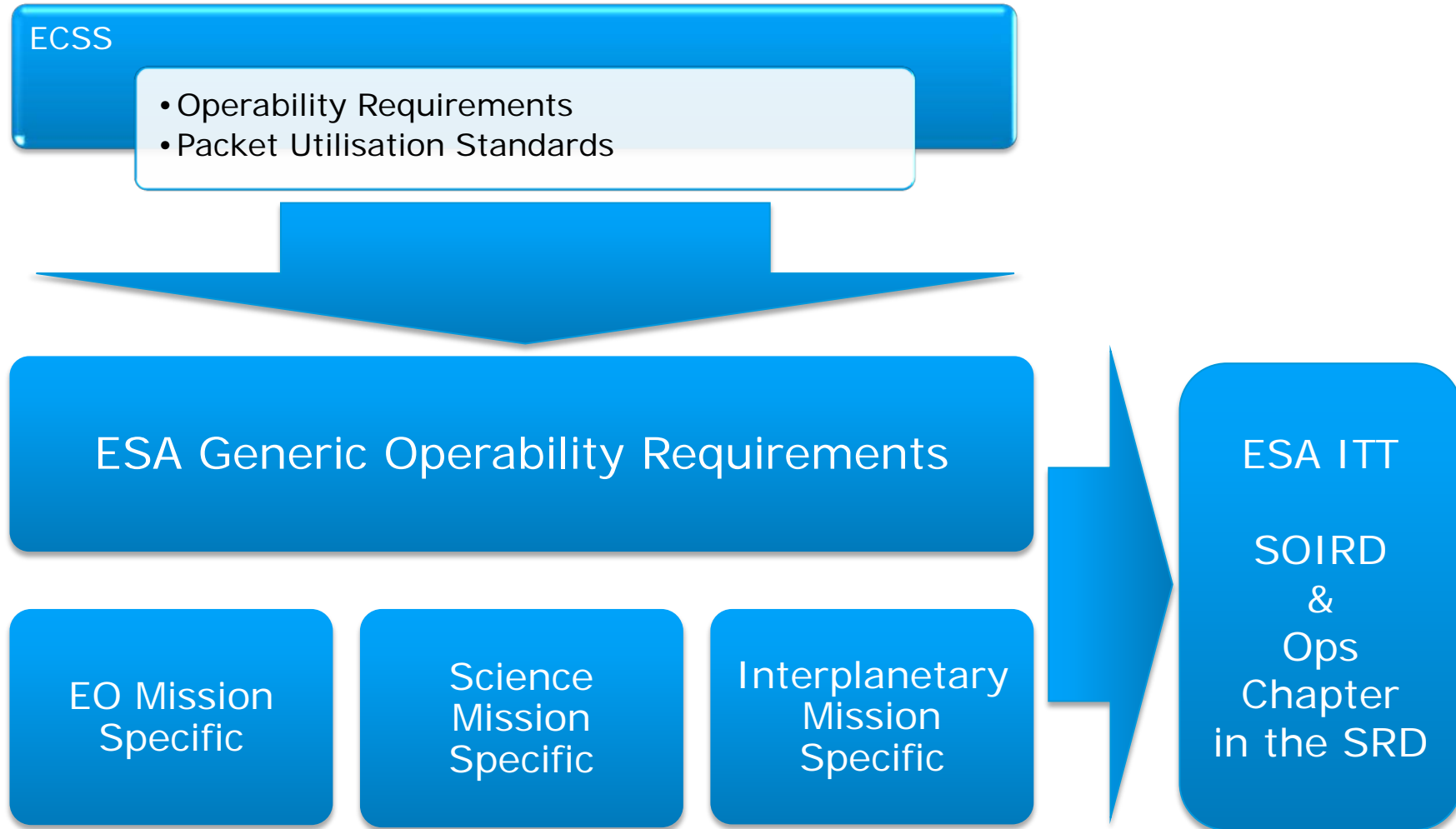
- Spacecraft Operations Interface Requirements Document, SOIRD
- Operability Requirements Chapter of the System Requirements Document



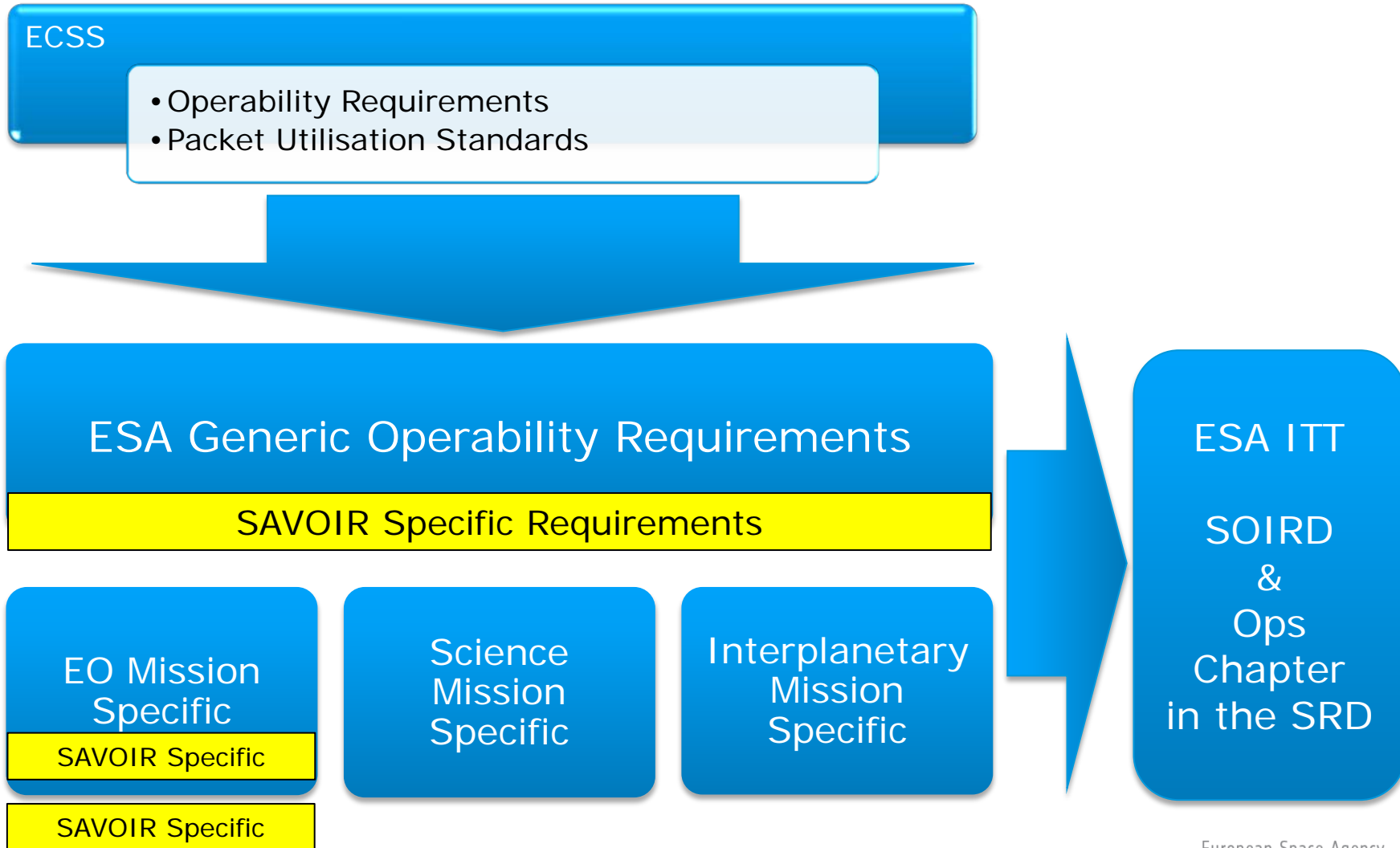
These requirements are tailored from the ECSS Operability Requirements for:

- **Earth Observations,**
- **Science missions,**
- **Interplanetary missions.**

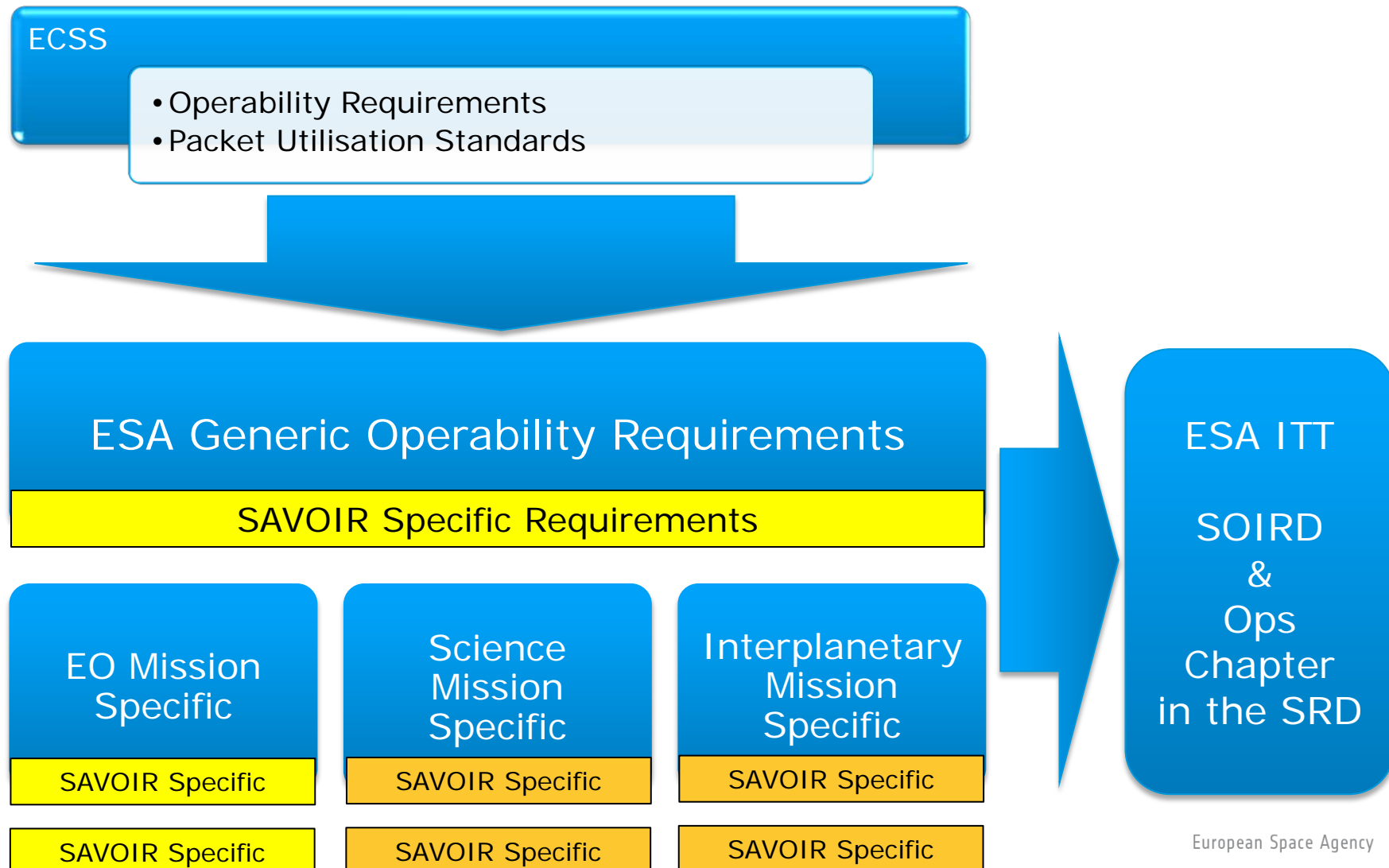
ECSS & ESA Operability in the ITT



Savoir Identified Operability Requirements



Extending the Savoir Operability Requirements



Major aspects identified to be addressed



- There are several operational functions that are not currently covered in the ECSS. Primarily these are:
 - File Transfer,
 - Specific EO Timeline Management,
 - Diagnostics Triggering Actions,
 - CFTP, and
 - Expansion of some monitoring functions.
- There are also some ECSS requirements which, although not major, do not appear to be used by ESA missions.

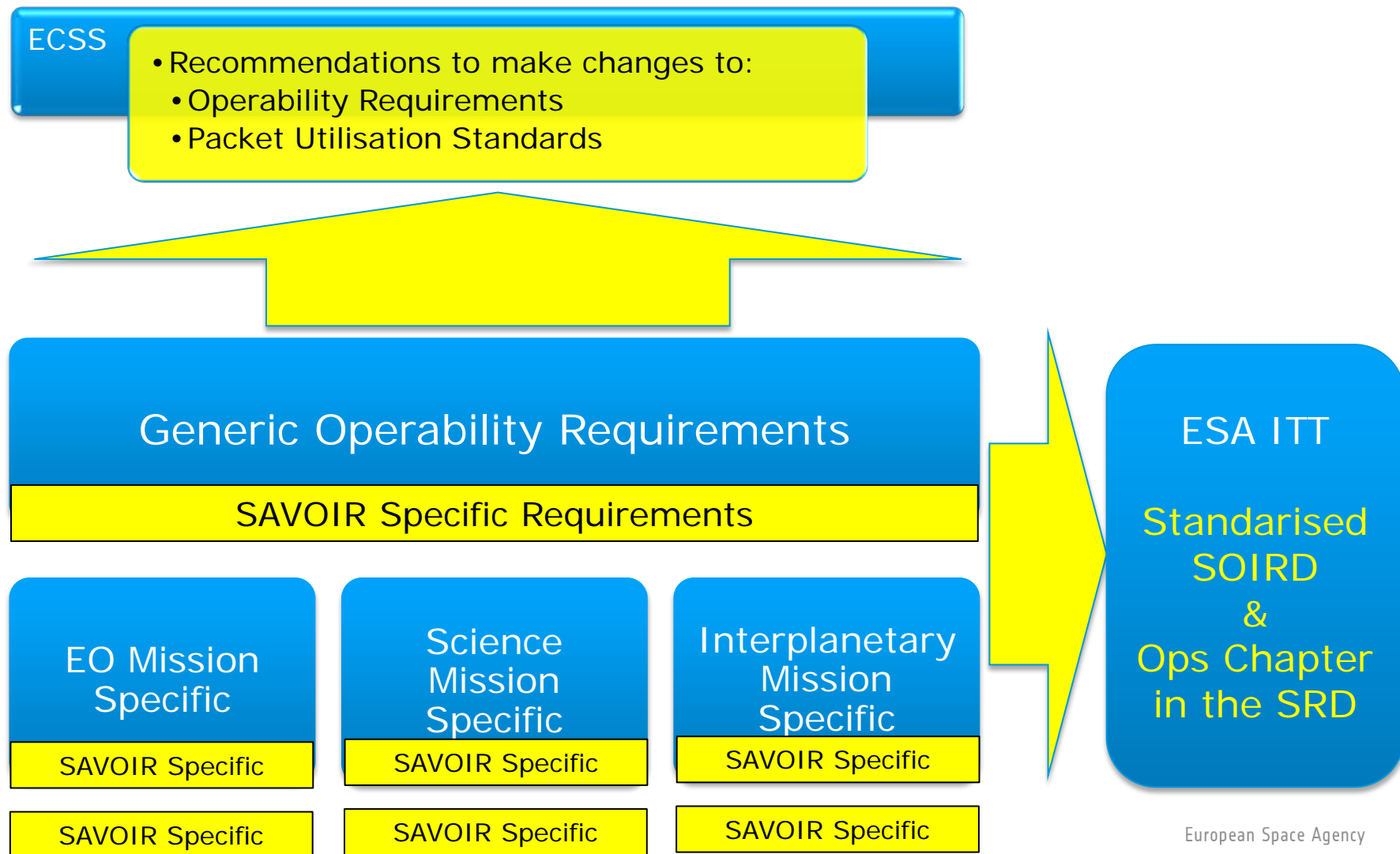
Harmonising Operability Requirements:

- Initiate an internal ESA review of the current SRDs and SOIRD with the aim to consolidate the format and specification wording where possible into generic cross-mission requirements with mission family specific adaptations.
- Provide this consolidated template to the SAVOIR ASRA Advisory Group for review.

Addressing the Standards:

- Using the output from the SAVOIR Space – Board document with the internal ESA review of the current ESA SOIRDs, make a consolidated proposal to the ECSS Operability and PUS Boards for aligning the ECSS with SAVOIR recommendations, current practices and including missing functionality.

ESA & Savoir Operability Requirements



Aspects outside SAVOIR to be addressed



Change in Approach

- Space Programmes wish to capitalise on previous investments and push for a maximum re-use of requirements from a previous similar mission.
- Space Programmes often prefer to include the SOIRD Major Requirements into a specific chapter of the SRD, to give the requirements an increased emphasis.

Validation & Demonstration

- Implementing and validating new functionality in the Ground Segment for In-Orbit Validation, e.g. OpsSat, End to End System Validation

Thank you for your attention



Any Questions?

4 General requirements

- 4.1 Introduction
- 4.2 Observability
- 4.3 Commandability**
- 4.4 Compatibility
- 4.5 Safety and fault tolerance
- 4.6 Flexibility
- 4.7 Testability
- 4.8 Deactivation

5.2	Missionlevel
5.2.1	Security
5.2.2	Control functions
5.2.3	Uplink and downlink
<u>5.3</u>	<u>Telemetry</u>
<u>5.3.1</u>	<u>Telemetry design</u>
5.3.2	Diagnostic mode
5.4	Datation and synchronization
<u>5.5</u>	<u>Telecommanding</u>
<u>5.5.1</u>	<u>Telecommand design</u>
<u>5.5.2</u>	<u>Critical telecommands</u>
<u>5.5.3</u>	<u>Telecommand transmission and distribution</u>
<u>5.5.4</u>	<u>Telecommand verification</u>
5.6	Configuration management
<u>5.6.1</u>	<u>Modes</u>
5.6.2	Onboard configuration handling
5.7	Onboard autonomy
5.7.1	Introduction
5.7.2	General autonomy
<u>5.7.3</u>	<u>Autonomy for execution of nominal mission operations</u>
5.7.4	Autonomy for mission data management
5.7.5	Onboard fault management
5.8	Requirements specific to the telemetry and telecommand packet utilization standard
5.8.1	Application process and service design

<u>5.8.2</u>	<u>Statistical data reporting</u>
5.8.3	Memory management
5.8.4	Function management
5.8.5	Onboard operations scheduling
5.8.6	Onboard monitoring
5.8.7	Large data transfer
<u>5.8.8</u>	<u>Telemetry generation and forwarding</u>
5.8.9	Onboard storage and retrieval
5.8.10	Onboard traffic management
5.8.11	Onboard operations procedures
<u>5.8.12</u>	<u>Eventtoaction coupling</u>
5.9	Equipment and subsystemspecific
5.9.1	Onboard processors and software
5.9.2	Power supply and consumption
5.9.3	Telemetry, tracking and command (TT&C)
5.9.4	Attitude and orbit control
5.9.5	Mechanisms
5.9.6	Thermal control
5.9.7	Payload

Additional functions:

File Transfers & Management

Parameter Mgt & Functional Monitoring