European Space Technology Harmonisation

Presentation to SME4Space Open General Assembly

Technology Coordination and Planning Office (TEC-H)

12/09/2018

ESA-TECH-HO-010924

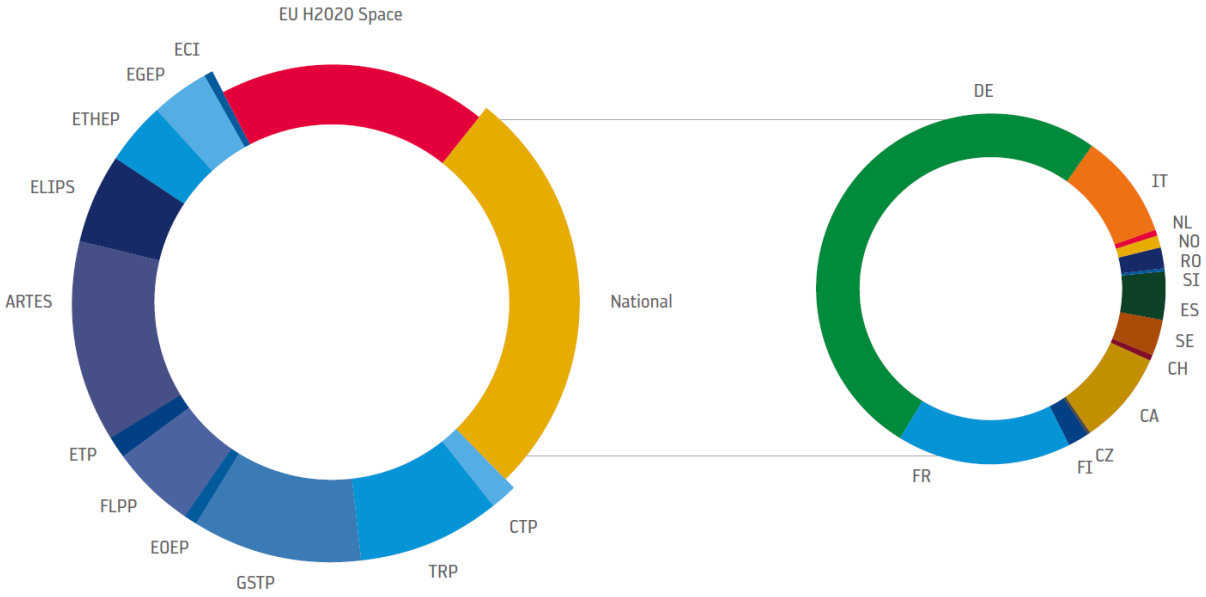
ESA UNCLASSIFIED - For Official Use

PURPOSE OF ESA

"To provide for and promote, for exclusively peaceful purposes, cooperation among European states in space research and technology and their space applications."

ESA Convention – Article 2

EUROPEAN SPACE TECHNOLOGY HARMONISATION



EUROPEAN SPACE TECHNO R&D	720 M€ / Year
ESA TECHNO R&D	400 M€ / Year

Ref: ESTMP 2017

OBJECTIVES OF SPACE TECHNOLOGY

FUTURE MISSIONS

COMPETITIVENESS OF EUROPEAN INDUSTRY

FOSTERING INNOVATION

CRITICAL SPACE TECHNOLOGIES NON-DEPENDENCE

TECHNO TRANSFER: SPIN-OFF & SPIN-IN

EUROPEAN SPACE TECHNOLOGY HARMONISATION

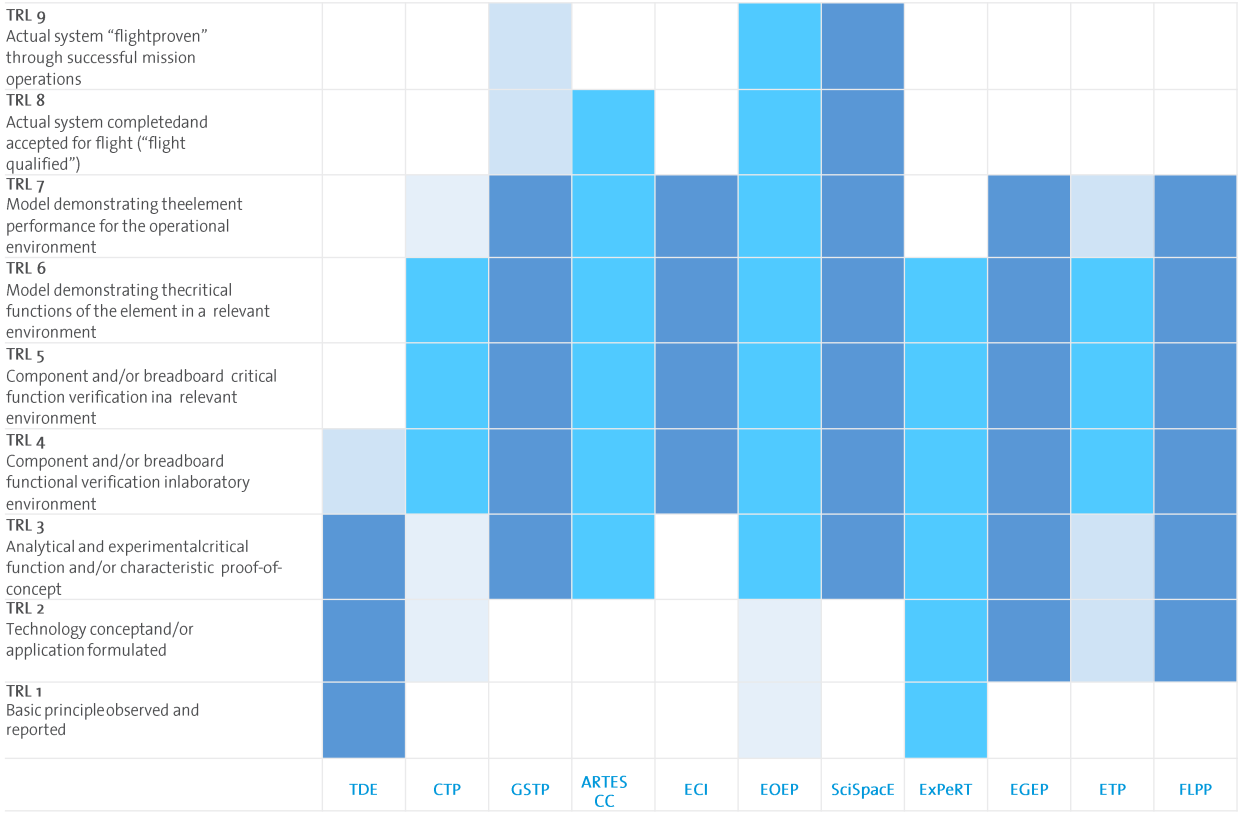
FILL STRATEGIC GAPS & MINIMISE UNNECESSARY DUPLICATIONS

CONSOLIDATE EUROPEAN STRATEGIC CAPABILITIES

COORDINATE EUROPEAN SPACE TECHNOLOGY POLICY & PLANNING

CONTRIBUTE TO ENSURING CONTINUITY BETWEEN TECHNOLOGY & INDUSTRIAL POLICIES

2018 ESA Technology Programme Landscape



- TDE (Technology Development Element)
- CTP (Science Core Technology Programme)
- GSTP (General Support Technology Programme)
- ARTES Core Competitiveness (Advanced Research in Telecommunications Systems)
- ECI (European Component Initiative – now part of TDE)
- EOEP (Earth Observation Envelope Programme)
- SciSpacE (Science in Space Environment)
- ExPeRT (Exploration, Preparation, Research and Technology)
- EGEP (European GNSS Evolution Programme)
- ETP (Exploration Technology Programme)
- FLPP (Future Launchers Preparatory Programme)

The following programme were newly introduced in 2017 and are not yet represented yet on the TRL scale :

- *NAVISP (Navigation Innovation and Support Programme)*
- *InCubed - earth observation optional programme*

HARMONISATION: PARTICIPANTS

ESA Member States

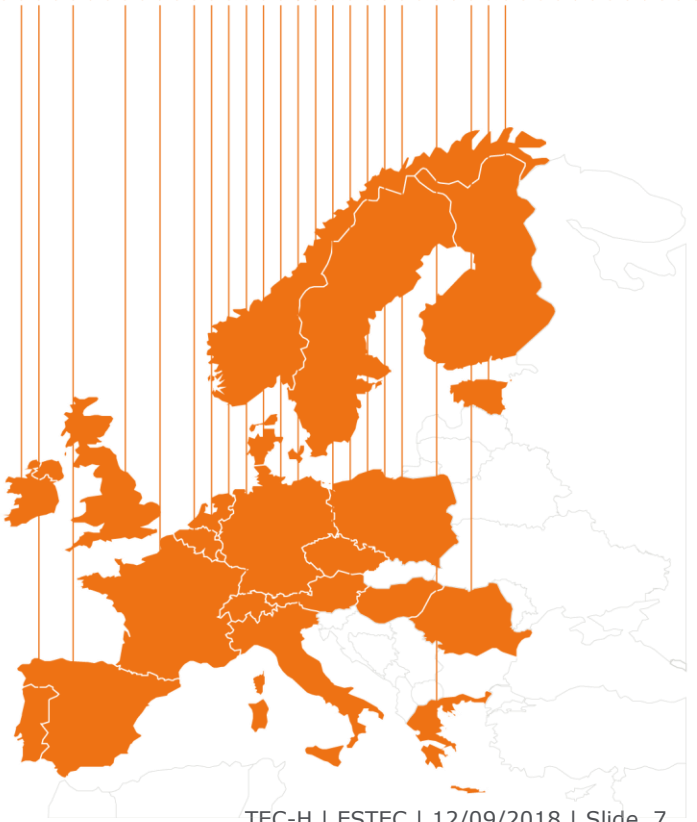
ESA Cooperating States (ECS)

European Commission

European Defence Agency

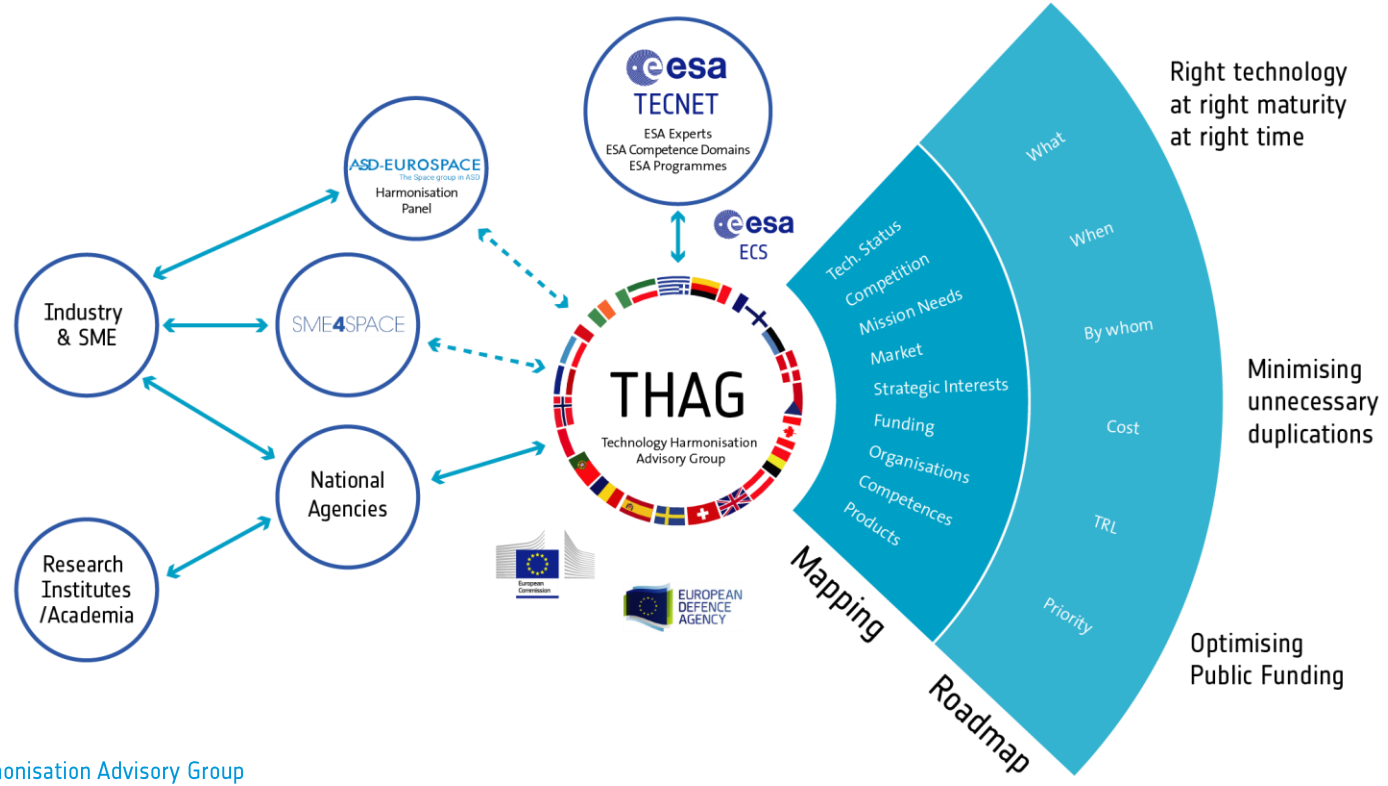
Eurospace & SME4space

Industry and Research Organizations



https://www.sme4space.org/european-space-technology-harmonisation/

HARMONISATION: AN INCLUSIVE PROCESS



THAG: Technology Harmonisation Advisory Group

HARMONISATION: FROM MAPPING TO ROADMAP

1 Harmo RM = 1 Technology Topic

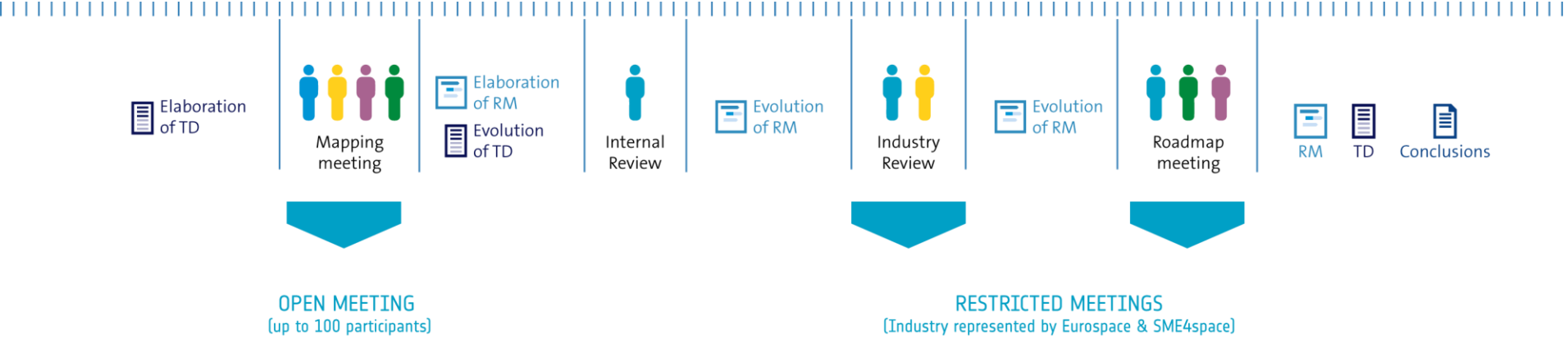
~ 10 new RM / year

All RMs since 2001

129 RMs
6300 Harmo RM act
4.3 B€

Active RMs

50 RM
3000 Harmo RM act
700 M€



ESA Industry THAG EC - European Commission

HARMONISATION: Industry Consolidated Inputs

- Companies can approach directly their THAG delegates for expressing concerns, requests or inform on their capabilities for any Harmo topic under discussion.

- However, most of the inputs from Industry are channeled via Eurospace and SME4Space with a split of the companies to be contacted by each association being based on whether the entity is a SME.
    - Both associations present their separate findings at the Mapping Meeting;
    - For the Roadmap Industry Review, Eurospace and SME4Space present consolidated inputs for the Roadmap under discussion.

HARMONISATION: WHICH TECHNOLOGIES

55 Harmonised Technology areas with CD

CD1
- ✓Optical Detectors, Visible Range
- ✓Optical Detectors, IR Range
- ✓Micro-Nano Technologies - MEMS
- ✓Photonics new

CD2
- ✓Electrical Motors
- ✓Deployable Booms & Inflatable Structures
- ✓Solar Array Drive Mechanisms
- ✓Electric Propulsion Pointing Mechanisms (EPPMs)
- ✓Position Sensors
- ✓Technologies for Hold Down, Release, Separation and Deployment Systems
- ✓Pyrotechnic Devices
- ✓Two-Phase Heat Transport Systems
- ✓Cryogenics and Focal Plane Cooling
- ✓Composite Materials
- ✓Additive Manufacturing
- ✓Coatings new

CD3
- ✓Avionics Embedded Systems
- ✓On-Board Payload Data Processing
- ✓Data Systems and On Board Computers
- ✓Microelectronics - ASIC & FPGA
- ✓On-Board Software
- ✓AOCS Sensors and Actuators (Part I & Part II)
- ✓On-Board Radio Navigation Receivers
- ✓RF & Optical Metrology
- ✓TT&C Transponders and Payload Data Transmitters

CD4
- ✓Solar Generators and Solar Cells
- ✓Electrochemical Energy Storage
- ✓Power Management and Distribution

CD5
- ✓Power RF Measurements & Modelling
- ✓Critical Active RF Technologies
- ✓Frequency and Time Generation and Distribution (Space & Ground)
- ✓Technologies for Passive Millimetre & Submillimetre Wave Instruments
- ✓Array Antennas
- ✓Reflector Antennas
- ✓RF Metamaterials and Metasurfaces
- ✓Microwave Passive Hardware
- ✓Technologies for Optical Passive Instruments (Stable & Lightweight Structures)
- ✓Technologies for Optical Passive Instruments (Mirrors)
- ✓Optical Communication for Space
- ✓Lidar Critical Subsystems
- ✓Ground Station Technology

CD6
- ✓Automation and Robotics
- ✓Life Support Technologies new

CD7
- ✓Fluid Mechanic and Aerothermodynamics Tools
- ✓Chemical Propulsion - Micropropulsion and Related Technologies
- ✓Chemical Propulsion - Components (including Tanks)
- ✓Electric Propulsion Technologies

CD8
- ✓Functional Verification and Missions Operations Systems

CD9
- ✓System Modelling and Simulation Tools
- ✓System Data Repository
- ✓Multibody Dynamic Simulation
- ✓Thermal & Space Environment S/W Tools and Interfaces
- ✓Big Data from Space

CD10
- ✓Radiation Environments & Effects
- ✓De-orbiting Technologies new

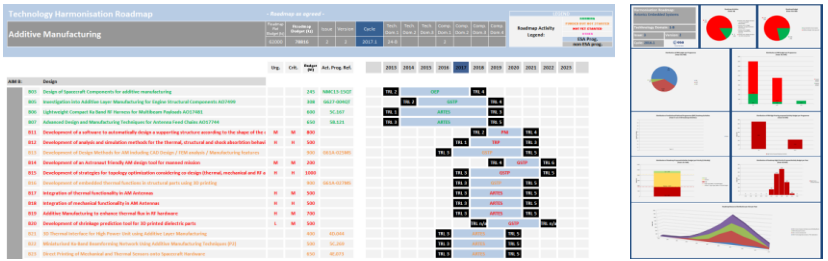
HARMONISATION: OUTPUTS

Technical Dossiers (TD)

ICMdb

Endorsed by IPC

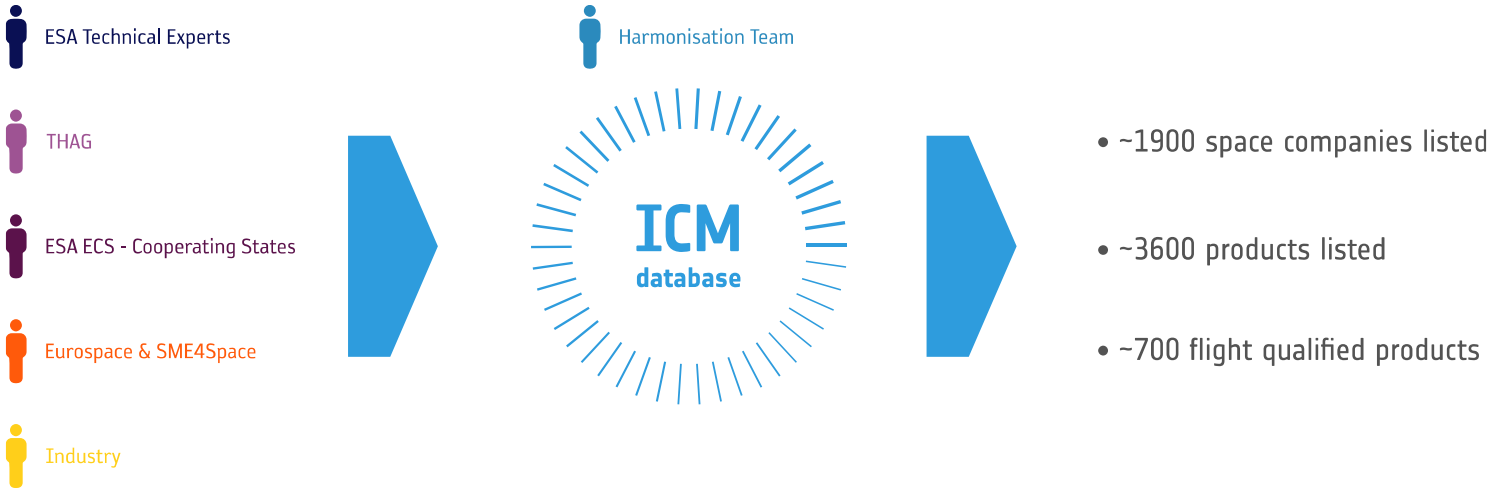
Diffusion of information



Roadmaps (RM)

Harmonisation Tracking System

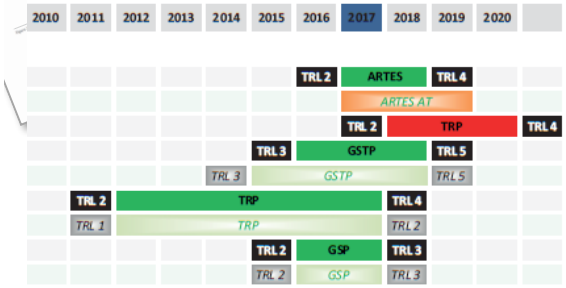
HARMONISATION TOOL: ICMDB



HTS REPORT 2017

- The **Harmonisation Tracking System (HTS) Report** provides an overview and detailed report on the level of implementation of the agreed Harmonised Roadmaps in ESA and Member State technology programmes
- HTS has been improving over the past years.
  - Broader range of statistics
  - New data visualisation: RM as agreed and their implementation

			Urg.	Crit.	Budget (k€)	Act. Prog. Ref.	Supplier
AIM A:		Computer Architectures					
	A02	Fault-Tolerant and Commercial Off The Shelf-based On Board Computer			500	4A.060	
		Fault-Tolerant and Commercial Off The Shelf-based On Board Computer			*500*	*4A.060*	
	A03	Miniaturized High Available Computer	M	M	1000		
	A04	Single Board Computer Core - Phase 3			3400	G521-002ED	
		Single Board Computer Core (Phase 3)			*3400*	*G521-002ED*	*RUAG SPACE AB*
	A05	Data Handling system Design and Proof of Concept for Modular systems of microsystems			360	T701-164ED	
		Data handling system design and proof-of-concept for modular system-of-microsystems approach			*360*	*T701-164ED*	*STAR-DUNDEE LTD*
	A06	HIPNOS - High Performance Avionics Solution for advanced and complex GNC systems			150	AO/1-8410/15/NL/LF	
		HIPNOS - High Performance Avionics Solution for advanced and complex GNC systems			*150*	*AO/1-8410/15/NL/LF*	



HTS Report 2017 is available on HDMS

HARMONISATION: DIFFUSION OF INFORMATION

DOCUMENT DISTRIBUTION

- Sharepoint
  - http://www.esa.int/Our_Activities/Space_Engineering_Technology/Technology_Harmonisation
- Harmonisation document management system (HDMS)
  - https://tec-polaris-int.esa.int/eclipse/
- Webpage
  - https://tec.prox.esa.int/TEC-H/Harmonisation/SitePages/Home.aspx

COMMUNICATION

- Harmo conferences
- Brochure
  - https://esamultimedia.esa.int/multimedia/publications/Harmonisation_of_European_Space_Technology/

- Harmonisation Tracking Report

- ESTMP

The European Space Technology Master Plan

- Comprehensive overview of Technology in Europe, built together with all stakeholders
- First ESA-EC joint edition
- 1500 copies distributed
- Available on HDMS

Space is an important and strategic sector for Europe.

Activities in the space sector contribute to sectorial policies, enable responses to societal challenges, effectively contribute to smart growth and the competitiveness of the European economy, and support jobs. This was emphasised in the Joint Statement on the "Shared Vision and Goals for the future of Europe in Space", signed in 2016 by the European Commission on behalf of the EU and the European Space Agency (ESA).

The standing of Europe as a global player in space is reinforced by its important position in all segments of the space economy.

Today's challenges for the space sector are characterised by changing paradigms and new user needs, an increasing number of spacefaring countries and new private actors, as well as an increasing reliance on space. The space sector is becoming more diverse and complex. As competition and cooperation intensify, Europe needs to ensure a strong foundation in excellence in science and technology and foster a strong and innovative industrial base. This will allow Europe remain at the forefront of global space developments and reap the benefits of space research, science and exploration.

Continued European coordination is essential to build synergies and make use of the resources and diverse competencies of all actors - ESA, EU and Member States.

The process of Technology Harmonisation established by ESA in 2001 to coordinate and harmonise technology activities of ESA, its Member States and other European stakeholders, has been continuously evolving in terms of scope and involvement of actors. ESA and the European Commission have initiated discussions with Member States on the further evolution of the role of harmonisation to strengthen coordination with a view to using harmonisation as an instrument of coordination at European level, for which it was designed.

We are pleased to introduce this jointly prepared document embodying the spirit of active cooperation on technology. This is another step towards an enhanced coordination on technology helping to ensure complementarity between EU, ESA and Member States' activities.

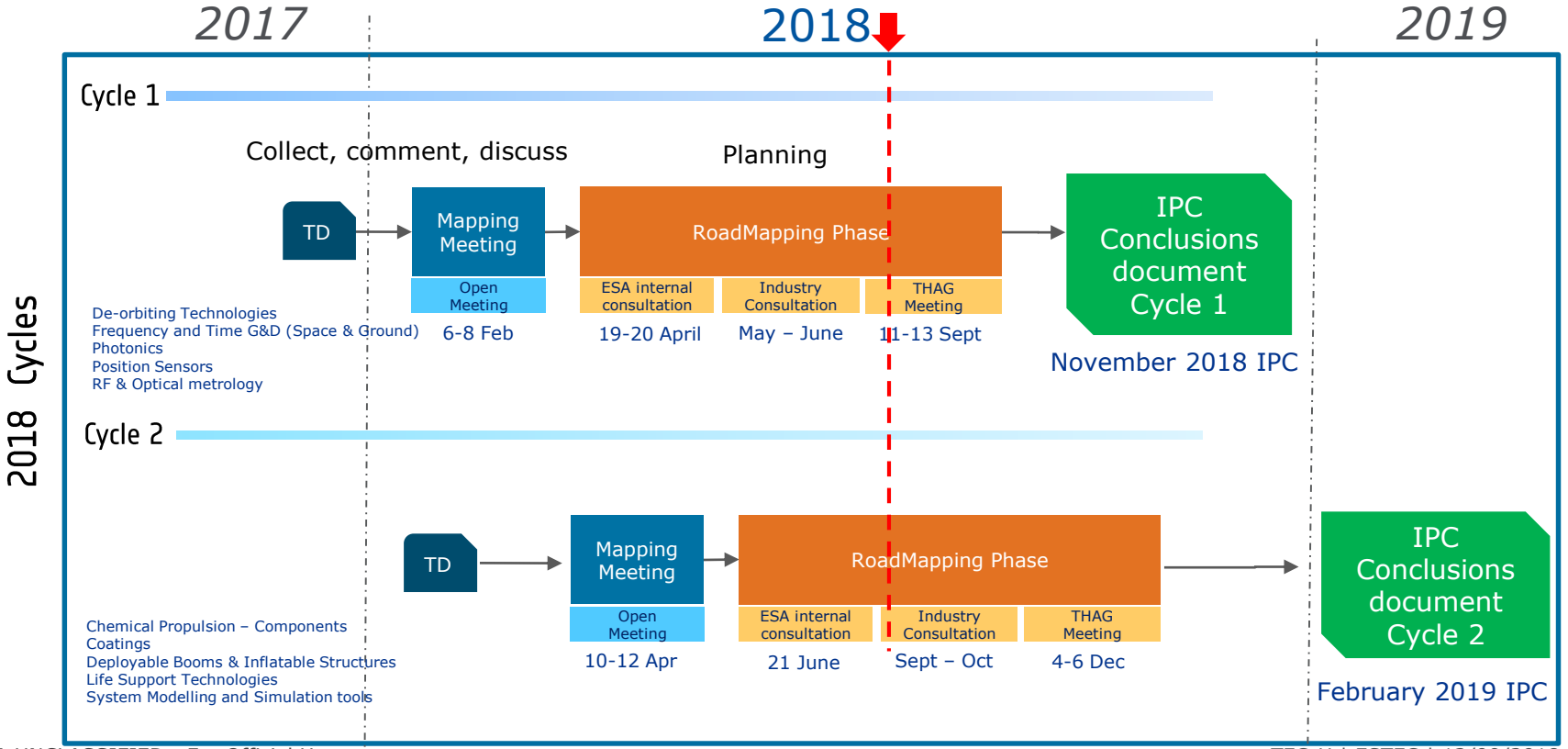
The 2017 edition of the European Space Technology Master Plan (ESTMP) provides a comprehensive overview of technology in Europe to support your decisions on technology.

Thank you to all those who have contributed to the European Harmonisation process, with a special mention for those who have provided input and prepared this edition of the ESTMP.

Jan Woerner
Director General
European Space Agency

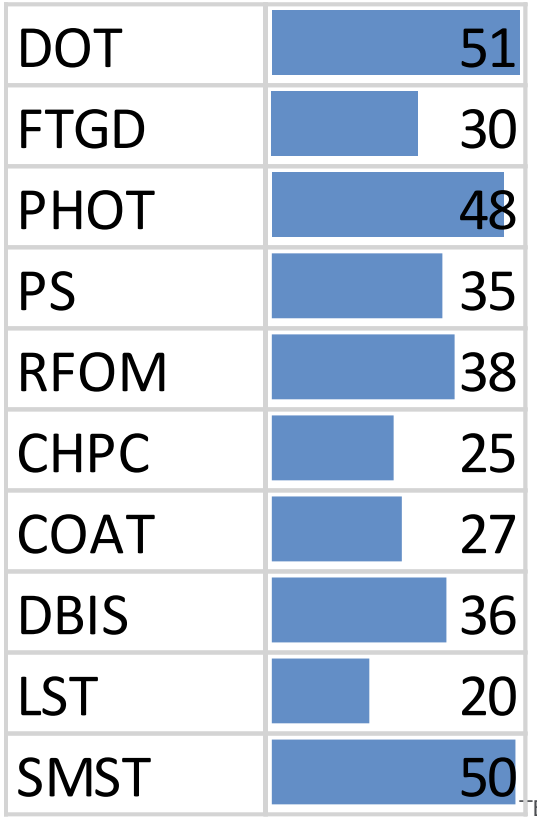
Lowri Evans
Director General of Internal Market, Industry, Entrepreneurship and SMEs
European Commission

Harmonisation Planning 2018



SME4Space participation to Harmonisation in 2018

Example: Number of experts (from SMEs) involved by SME4Space on different topics



DOT - De-orbiting Technologies
FTGD - Frequency and Time G&D (Space & Ground)
PHOT - Photonics
PS- Position Sensors
RFOM - RF & Optical metrology
CHPC - Chemical Propulsion – Components
COAT - Coatings
DBIS - Deployable Booms & Inflatable Structures
LST - Life Support Technologies
SMST - System Modelling and Simulation tools

List of 2019 Harmonisation Topics

	Title	Acronyms	CD
1st Cycle	Chemical Propulsion - Micropropulsion	CHPM	CD07
	Composite Materials	CM	CD02
	Cryogenics ad Focal Plane Cooling	CRYO	CD02, CD05
	Electrochemical Energy Storage	ECES	CD04
	Power Management and Distribution	PMD	CD04

	Title	Acronyms	CD
2nd Cycle	Big Data from Space	BD	CD03, CD08, CD09
	Fluid mechanics and Aerothermodynamic Tools	ATD	CD07
	On-Board Radio Navigation Receivers	OBRNR	CD03
	Technologies for Optical Passive Instruments - Mirrors	TOPI-M	CD05
	Technologies for Optical Passive Instruments - Stable and Lightweight Structures	TOPI-SLS	CD05, CD02

Benefits for SMEs in participating to the Harmonisation

- Influence the setting of priorities for technology innovations and future Space R&D developments
- Obtain broad awareness on ESA and European activities on your technology topics of interest
- Gain exposure within the community
- Get an opportunity for establishing partnerships with other European players
- Have the opportunity to meet and engage with ESA experts on the different specific topics

Conclusions

- The Harmonisation of the European Space Technology R&D activities coordinates among all actors of European space sector to establish a strong technology base as a key to the worldwide competitiveness of European Industry and to the success of future space missions.
- SME4SPACE is the main channel for SME participation in the Harmonisation process.
- SME4SPACE has a mailing list, where each expert can subscribe to the Harmo topics of their interest - https://www.sme4space.org/harmo-ml/

ANY QUESTIONS?

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