



**EUROPEAN SPACE TECHNOLOGY
HARMONISATION**

European Space Policy:

"The ESA led-process of harmonising technology development programmes provides transparency on research across Europe and paves the way for improved coordination."

The European Harmonisation process:

- Implemented since 2000, it provides to all European actors the framework and the key instruments to coordinate Space Technology at European level
- More than 50 technologies harmonised
- Active participation of all Delegations, more than 1000 Professionals from more than 200 entities

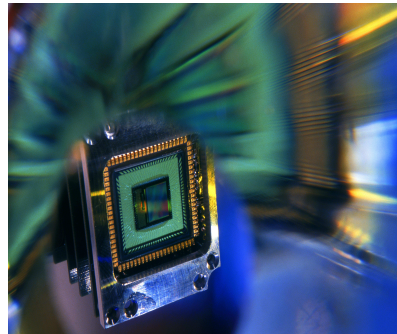
2

European Space Agency

MAIN OBJECTIVES



- “Fill strategic gaps” and “Minimize unnecessary duplications”
- Consolidate European Strategic capabilities
- Achieve a coordinated and committed European Space Technology Policy and Planning
- Ensure continuity and coherence between Technology and Industrial Policies



3

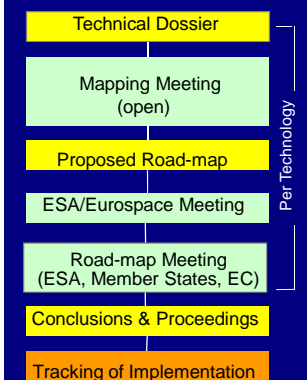
European Space Agency

HOW TECHNOLOGY HARMONISATION WORKS



- Participants are ESA Member State Delegations (THAG), European Industry, Eurospace and ESA directorates. EC, EDA, PECS countries, SME4Space are invited.
- Space Technologies are addressed one at a time (typically 8 per year – 2 semesters)
- The Harmonisation is based on 2 meetings:
 - Technology Mapping
 - Technology Roadmap
- Agreed Conclusions are endorsed by IPC
- Complete Proceedings are issued after meetings
- Implementation monitored
- Aim to revisit Technologies every 3 to 5 years

Selection of technologies to harmonise (for the year) - Harmo. WORKPLAN-



4

European Space Agency

EUROPEAN SPACE TECHNOLOGY HARMONISATION



Process:

- Takes into account European developments, capabilities and budgets to enhance the complementary roles of various European Stakeholders
- Relies on exchange of information, on results of on-going developments and future plans
- Contributes to a better understanding of European national and industrial priorities, contributes to redressing European dependency issues through prioritisation of strategic and critical technologies developments
- Requires consensus and is implemented on a voluntary basis

Technical Dossier:

- Outline of all the technical information that is relevant to the technology considered, analysing state of the art, mission needs, market perspectives, technology trends and requirements
- Coordinated with ESA Programmes for comments before release
- Used in preparation of the mapping meeting and updated to include the information gathered at the Mapping Meeting

5

European Space Agency

EUROPEAN SPACE TECHNOLOGY HARMONISATION



Roadmap:

- Development Approach: identify activities that would satisfy the Technology Requirement, incl. Ranking of priorities
- Schedule for each activity
- Costs: definition of budget and identification of technology programme for which the activity should be proposed.

Implementation and Tracking

- Consistency of ESA technology plans or activities shall be verified/ensured
- National Delegations keep their organisations informed and promote activities for consideration in their national programmes
- Harmonisation Tracking System reports on a regular basis on the current status of implementation of each individual roadmap

6

European Space Agency

HARMONISED TECHNOLOGIES 2000-2009



- Automation and Robotics
- Cryogenics and Focal Plane Cooling
- SAR
- On Board Radio Navigation Receivers
- Thermal SW tools & Space Environment SW I/F
- Aerothermodynamics tools
- Energy Storage (Batteries)
- Microelectronics
- Chemical propulsion (Components, Micropropulsion)
- Electrical Motors
- Ground Systems SW
- On Board Computer and Data Systems
- On Board Payload data processing systems
- On Board Software
- TTC transponders and Payload Data Transmitters
- Pyrotechnics Devices
- Two Phase Heat Transport Systems
- Power Management and Distribution
- Inflatable and deployable structures
- Solar Arrays Drive Mechanisms
- Deployable Booms
- Upper stage propulsion
- Optical communication for space
- Microwave Power Breakdown Modelling and Characterisation
- Antenna Reflectors
- Technologies for Hold-down, Release and Separation Systems
- Critical Microwave RF Payload Technologies
- Electric Propulsion Technologies
- Electric Propulsion Pointing Mechanism
- Solar Cells and Solar Generators
- AOCS Sensors and Actuators
- High Pressure Tanks and Vessels
- Components for Electric Propulsion
- Composite Materials
- Space Radiation Environment Models and In-orbit Monitors
- Radiation Test Facilities and Engineering Tools
- Array Antennas
- Lidar Critical Solid State Technologies
- Frequency & Time Generation
- Fuel Cells
- Technologies for Optical Remote Passive Instruments
- Technologies for Passive mm and sub-mm Wave Instruments
- System Design and Verification
- Technologies for Formation Flying Metrology
- Position Sensors


OUTPUT OF TECHNOLOGY HARMONISATION



Per Technology addressed:

- **Mapping** of the situation inside and outside Europe, including identification of critical issues. **Technical Dossiers** provide complete overview
- **Technology Roadmaps** agreed at European Level with ESA (TEC and Programme Directorates), National Delegations and Industry
- **Recommendations** agreed with ESA, National Delegations and Industry
- ESA Industrial Policy Committee (IPC) endorses all through **Conclusions** document (1 per Semester)
- All Harmonisation documentation (for all cycles) has been made available on the Harmonisation Document Management System (<https://harmostrat.esa.int>)

OUTPUT OF TECHNOLOGY HARMONISATION




Technology Harmonisation Items 2010

1. Semester 2010
 1. Avionics Embedded Systems
 2. On-Board Software
 3. Lidar Critical Technologies
 4. Technology for Passive Millimetre and SubMillimetre Wave Instruments

2. Semester 2010
 1. Frequency & Time Generation (Space and Ground) - >2011
 2. Deployable Booms/Inflatable Structure
 3. Chemical Energy Storage
 4. Composite Materials

9
European Space Agency

OUTPUT OF TECHNOLOGY HARMONISATION



Technology Harmonisation Items 2011

1. Semester 2011
 1. Frequency & Time Generation (Space and Ground)
 2. Chemical Propulsion - Micropropulsion
 3. Technologies for Optical Passive Instruments - Detectors

2. Semester 2011
 1. On-Board Payload Data Processing
 2. Data Systems and On-Board Computers
 3. Microelectronics
 4. Array Antennas

10
European Space Agency