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
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

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-
**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 though priorisation 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 Maaping Meeting.

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**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.
HARMONISED TECHNOLOGIES
2000-2009

- Automation and Robotics
- Cryogenics and Focal Plane Cooling
- SAR
- On Board Radio Navigation Receivers
- Thermal SW tools & Space Environment SW LF
- Aerothermodynamics tools
- Energy Storage (Batteries)
- Microelectronics
- Chemical propulsion (Components, Micropulsion)
- 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

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