

# Towards a European Strategy for Space Exploration

Bernhard Hufenbach

Agrospace, Territory and Research  
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- ✚ European engagement in ISS utilisation and operations
- ✚ The next steps for Mars exploration and MSR preparation
- ✚ Approach for safeguarding European human access to space and future of European human spaceflight beyond ISS
- ✚ Nature and content of European participation to international lunar exploration



## Strategic Options

The European–long–term Strategy calls for positioning space exploration as a global societal project. Different paths towards this goal need to be analysed.

### European–driven Scenario

*medium–term focus on robotic (Mars) missions*

### International Partnership Scenario

*build–up of international space exploration architecture*

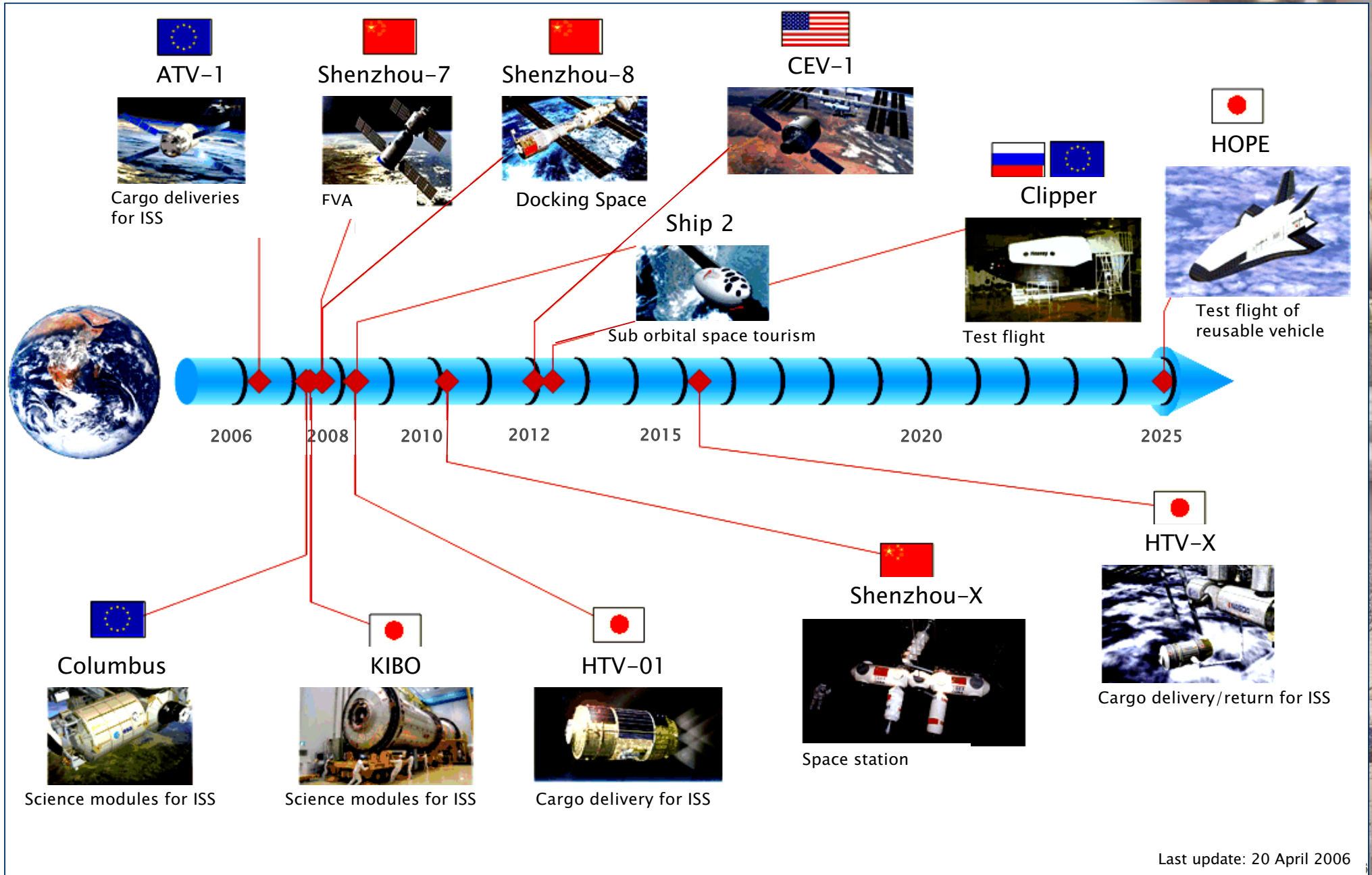
### Participation Scenario

*contribution of selected capabilities to human an robotic mission*

TIME

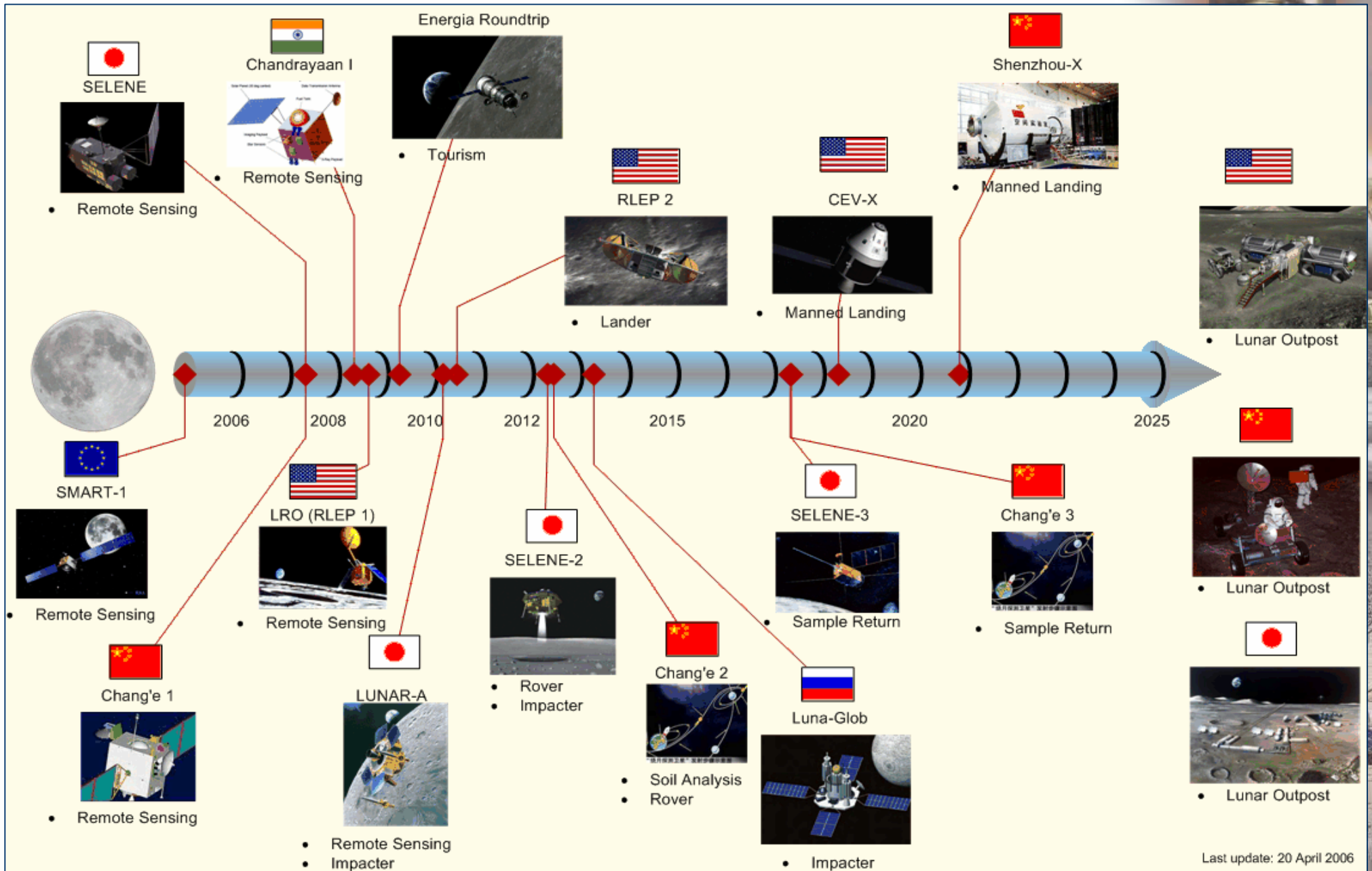


# International Context - Plans for Activities in Low Earth Orbit

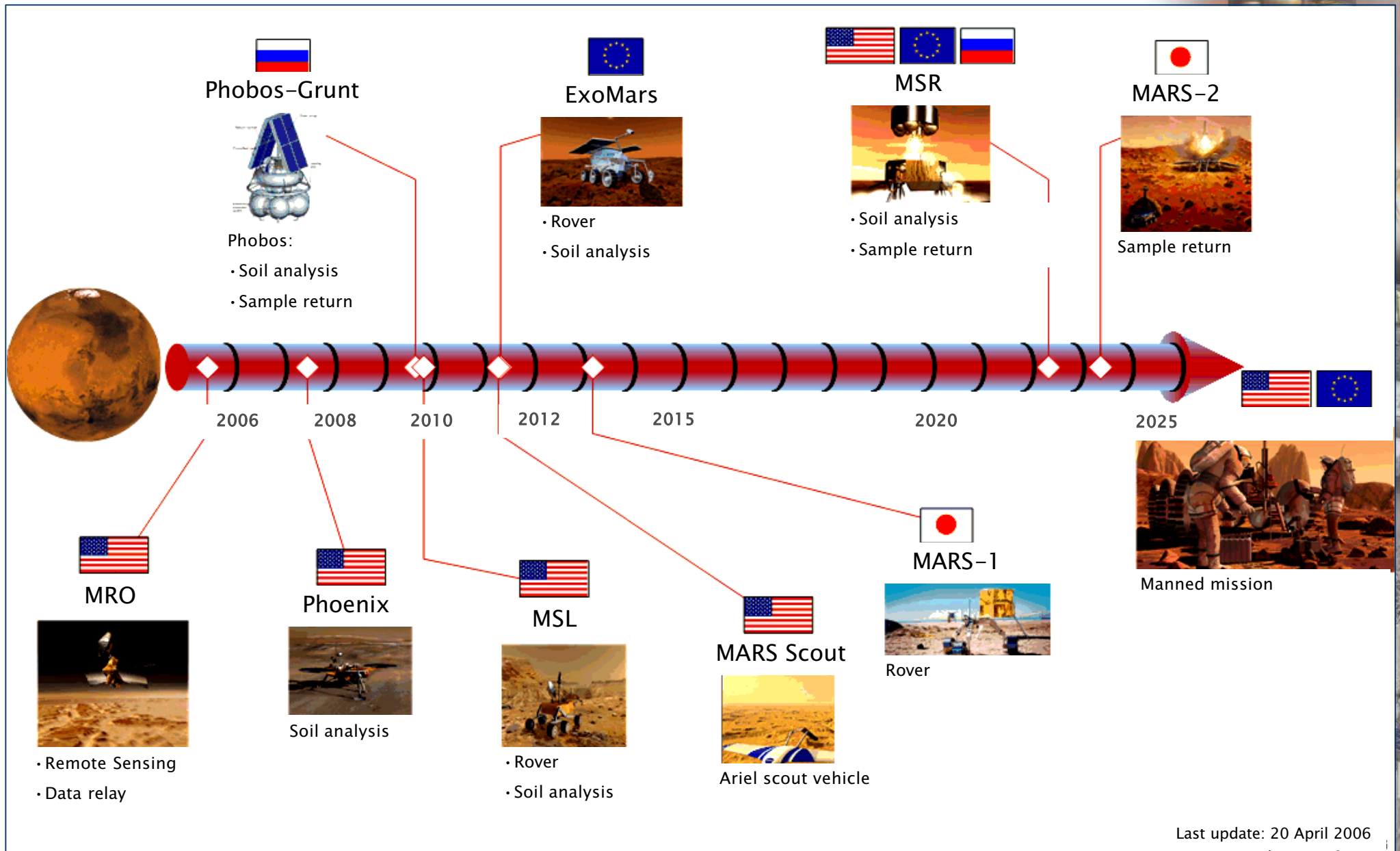


Last update: 20 April 2006

# International Context – Lunar Exploration Plans

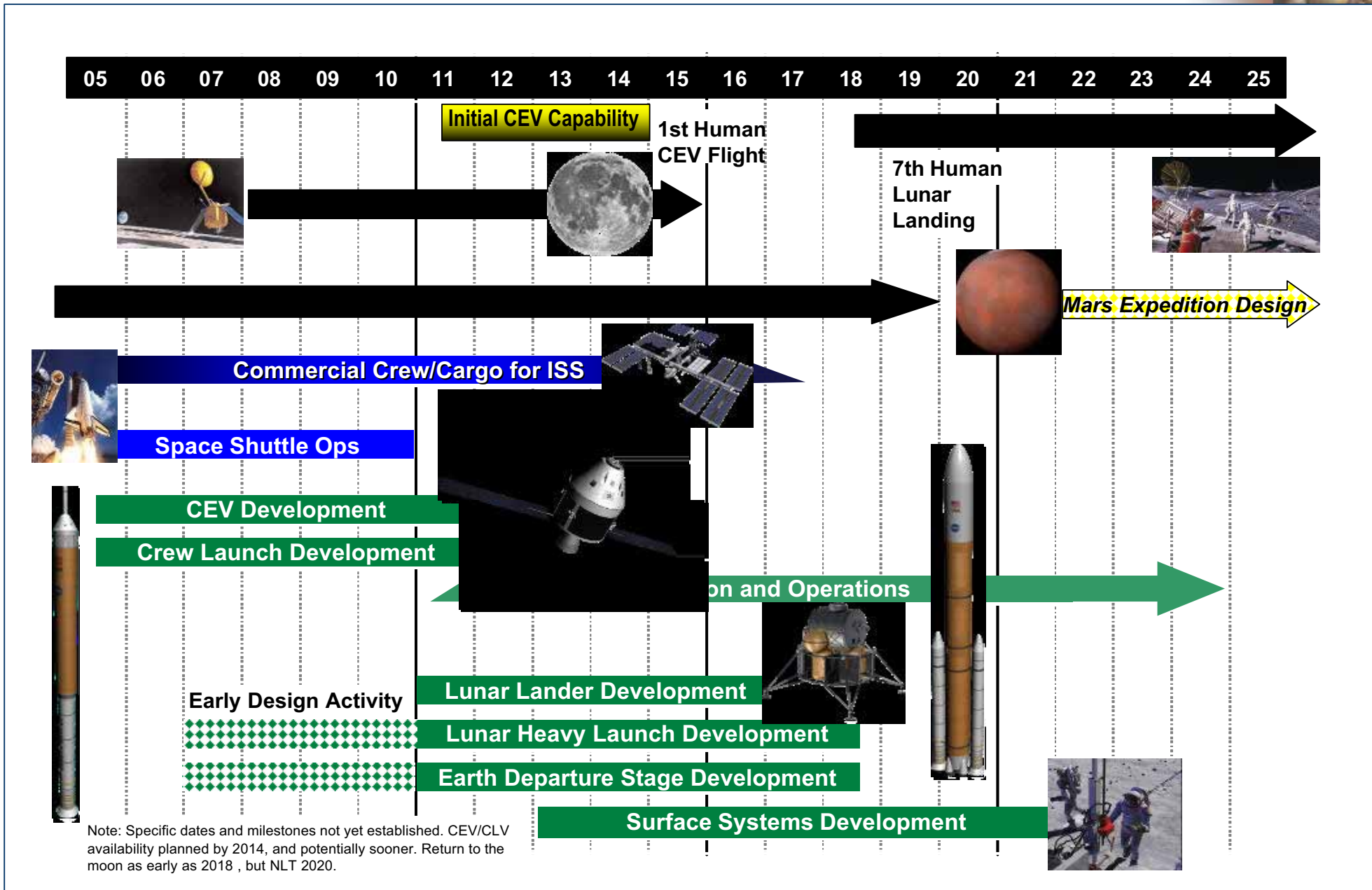


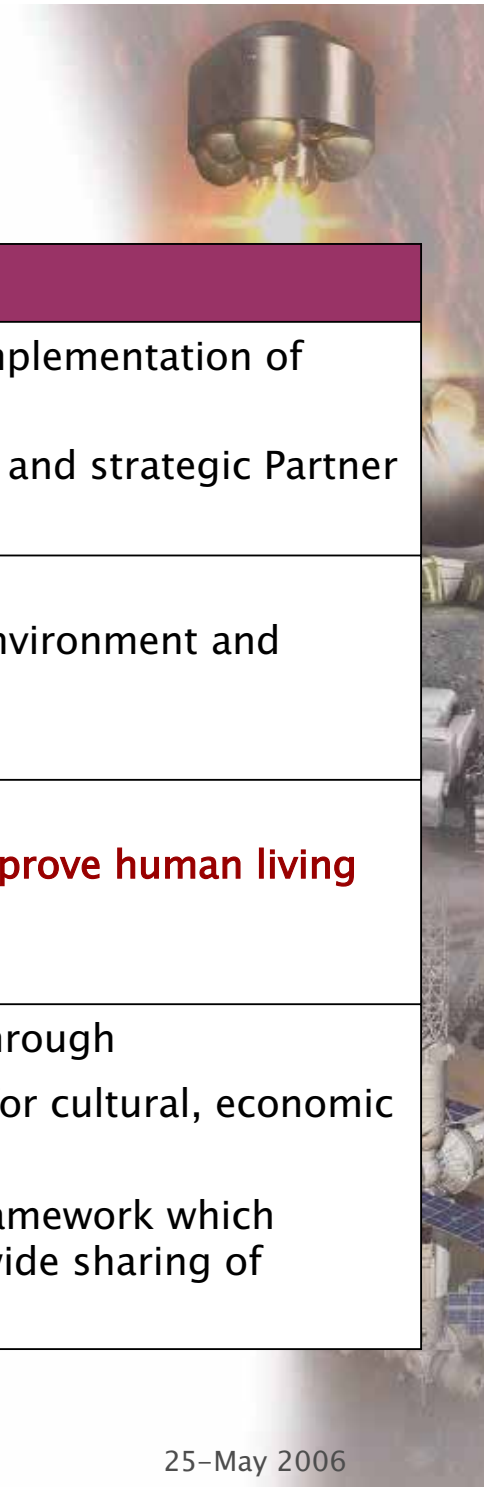
# International Context – Mars Exploration Plans



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# Status of US Space Exploration Programme





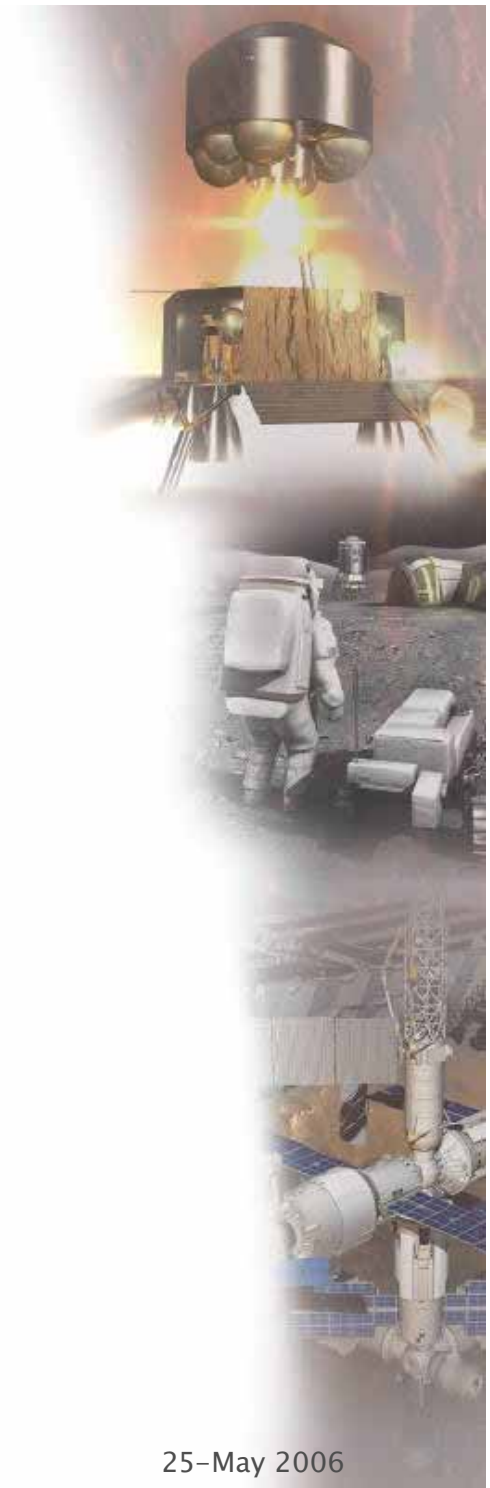
STRATEGIC CORNERSTONES	GOAL
EUROPEANS IN SPACE	<p>Support the European project and implementation of European policies</p> <p>Secure Europe’s position as a visible and strategic Partner within the international context</p>
HABITABILITY AND LIFE BEYOND EARTH	<p>Increase the knowledge of life, its environment and evolution</p>
SUSTAINABLE HUMAN LIFE IN SPACE	<p><b>Create innovation to support and improve human living conditions</b></p>
SHARING THE SPACE ADVENTURES AND BENEFITS	<p>Foster broad societal engagement through</p> <ul style="list-style-type: none"> <li>✚ The creation of new perspectives for cultural, economic and educational development</li> <li>✚ The elaboration of an adequate framework which ensures global participation and wide sharing of benefits</li> </ul>

## European Strategic Cornerstones – Near-term Issues

STRATEGIC CORNERSTONES	NEAR-TERM ISSUES
EUROPEANS IN SPACE	<ul style="list-style-type: none"> <li>✚ Consolidation and endorsement of European strategy</li> <li>✚ Agreement on approach for safeguarding European human access to space</li> <li>✚ Identification of concrete contributions to European policy objectives</li> </ul>
HABITABILITY AND LIFE BEYOND EARTH	<ul style="list-style-type: none"> <li>✚ Implementation of ExoMars project</li> <li>✚ Consolidation of long-term science priorities</li> <li>✚ International agreement on planetary protection policy</li> <li>✚ Promotion of international Mars Sample Return mission</li> </ul>
SUSTAINABLE HUMAN LIFE IN SPACE	<ul style="list-style-type: none"> <li>✚ <b>Prioritisation of European R&amp;D enabling sustainable human life in space European utilisation of ISS for demonstration of related capabilities</b></li> <li>✚ <b>Definition of European participation to lunar exploration</b></li> <li>✚ <b>Consolidation of innovation framework</b></li> </ul>
SHARING THE SPACE ADVENTURES AND BENEFITS	<ul style="list-style-type: none"> <li>✚ <b>Enabling new ways of broader stakeholder involvement and engagement</b></li> <li>✚ Set-up of adequate international coordination mechanism</li> <li>✚ Assessment of socio-economic opportunities and benefits</li> </ul>

## Elements of Scenario Analysis

- + European rationale and associated stakeholder/ user requirements
- + Roadmap
- + International reference architecture
- + Near-term capability developments, exploration and capability demonstration missions
- + High-level description of major architecture building blocks/ elements
- + Societal benefits and costs over time
- + Major impediment, enablers and risks
- + Operational aspects
- + International coordination and cooperation approach



## Exploration Architecture Elements

### PLANETARY SURFACE

- Habitation
- Mobility and EVA support
- Power provision and management
- Local resource utilisation
- Logistic support services
- Food production**
- Science/ research equipment
- Robotic assistants

- Orbiters
- Landers with Rovers, Sample return

### EARTH-BASED

- Control centres
- Launch sites
- Ground tracking
- Crew medical centres
- Data handling and processing
- Engineering support services
- Education and training
- Test facilities

Robotic Precursor Missions  
the planet and its environment  
enabling capabilities

## Architecture for Planetary in-situ Exploration

for increasing knowledge about  
and demonstrating and testing  
of exploration architecture

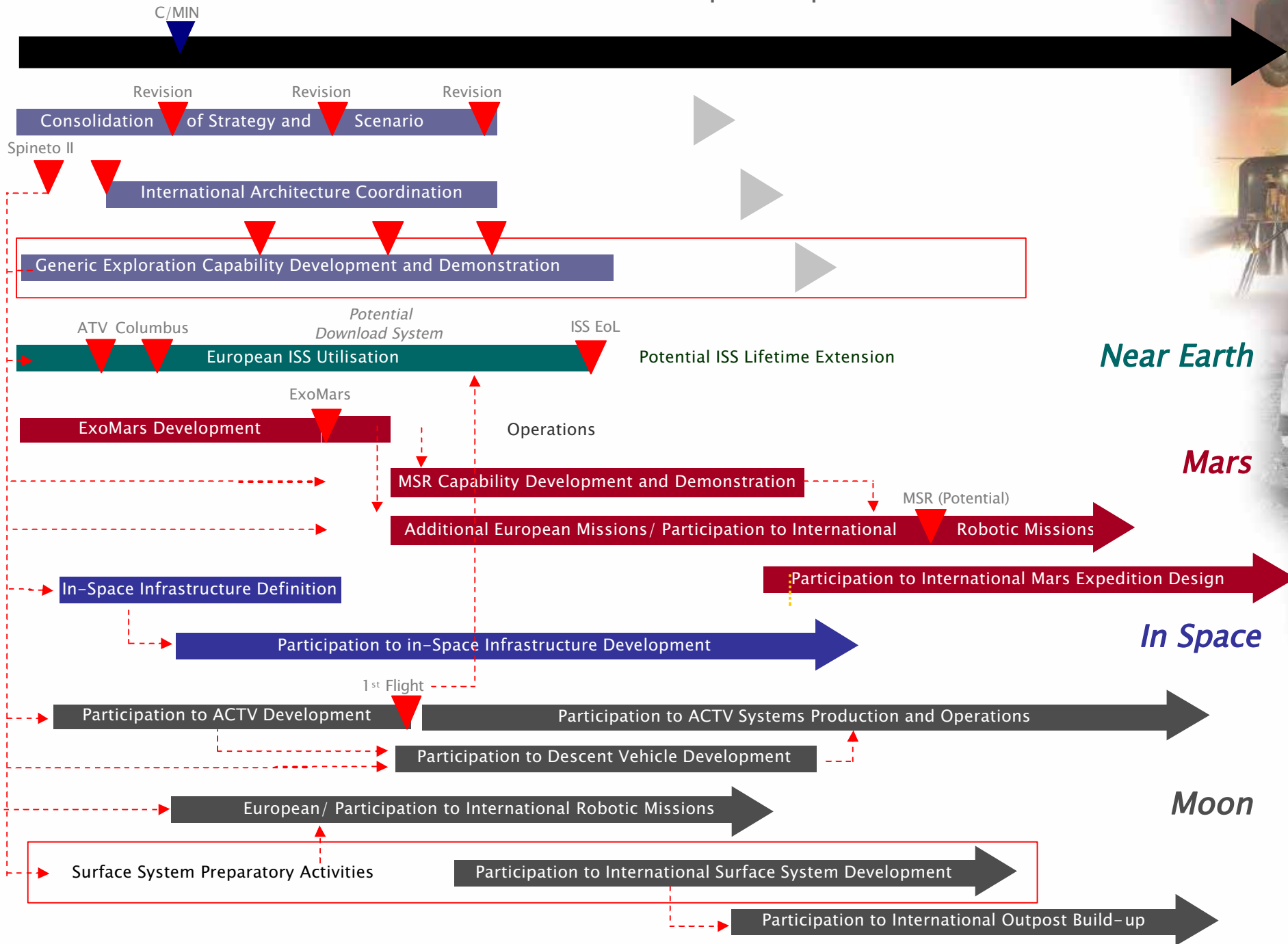
### TRANSPORTATION

- Crew launchers
- Cargo launchers
- Crew and cargo exploration vehicles
- Interplanetary transfer stages
- Planetary descent and landing vehicles
- Planetary ascent vehicles

### SPACE-BASED SERVICES

- Telecommunication
- Navigation
- Remote sensing
- Weather forecast
- Vehicle servicing
- In-orbit assembly

# Timeline of Possible European Exploration Activities



*Near Earth*

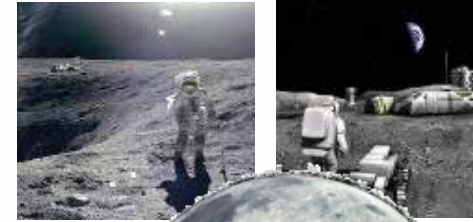
*Mars*

*In Space*

*Moon*

# Roadmap for International Cooperation

Cooperative capability development



Surface Capabilities



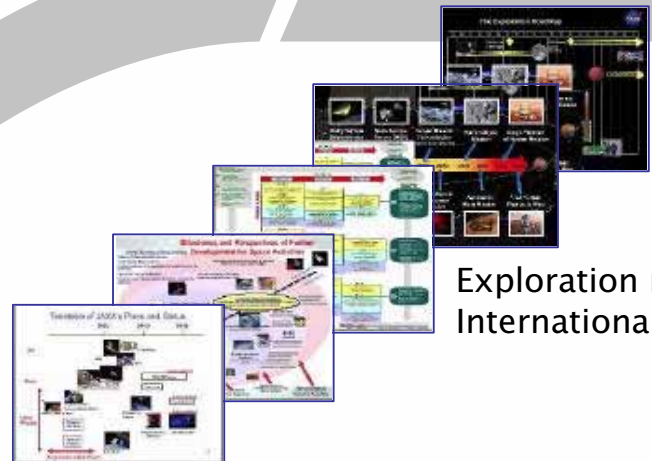
Co-operative missions



Joint operations of planetary infrastructure

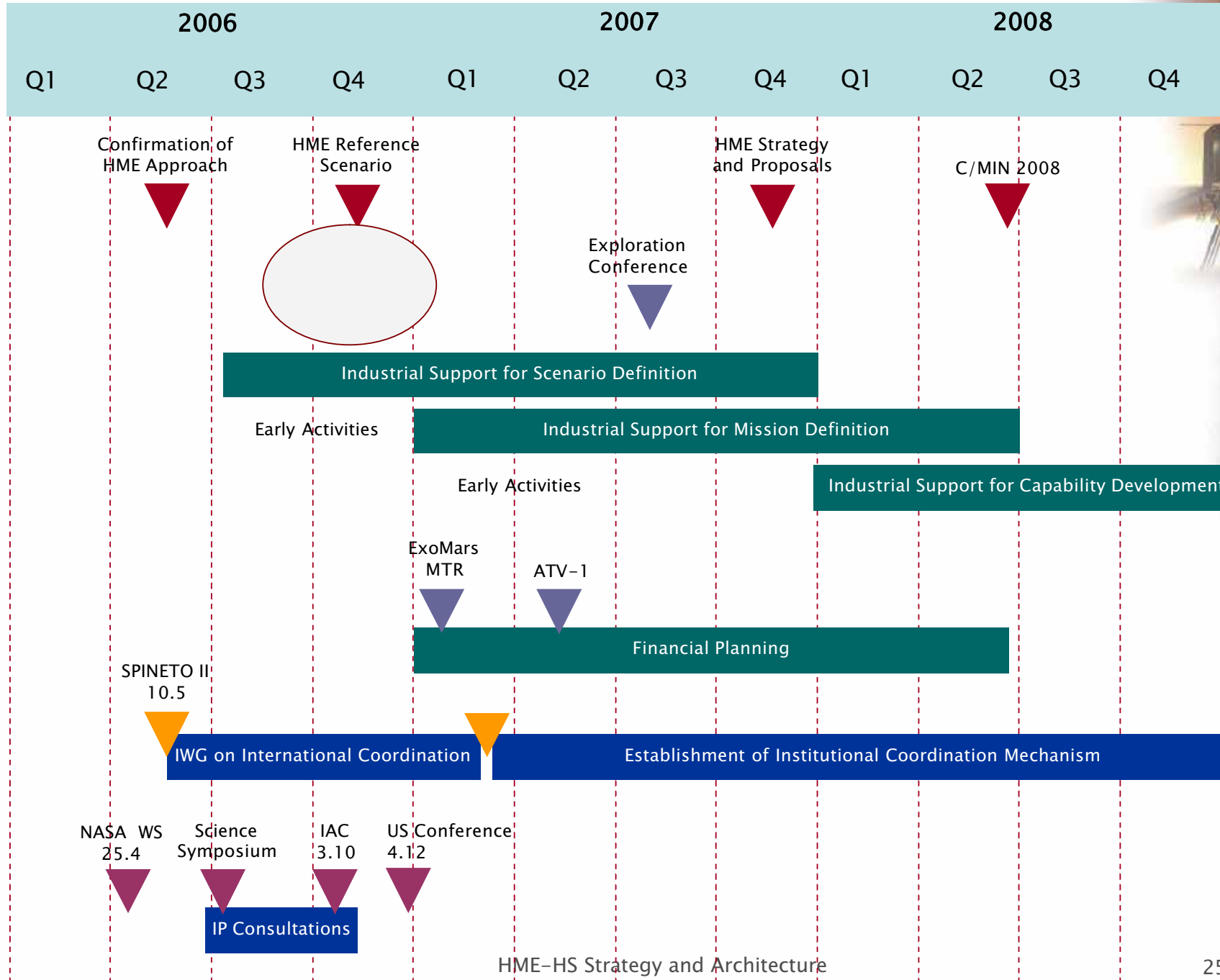


Coordination of architecture and roadmap

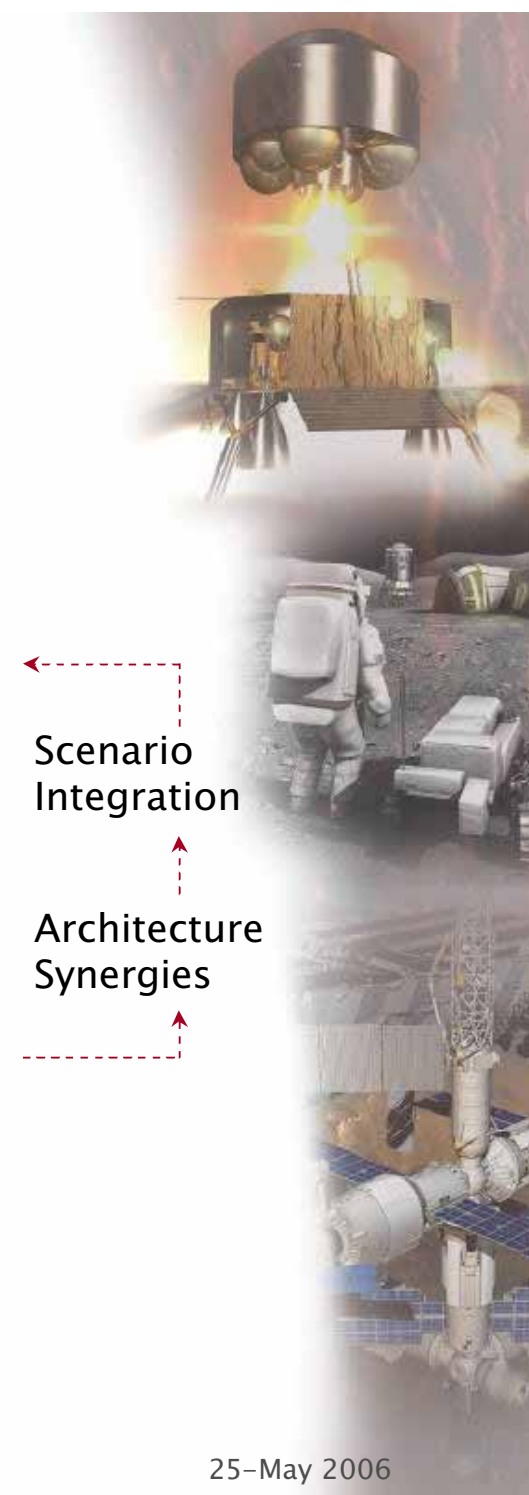
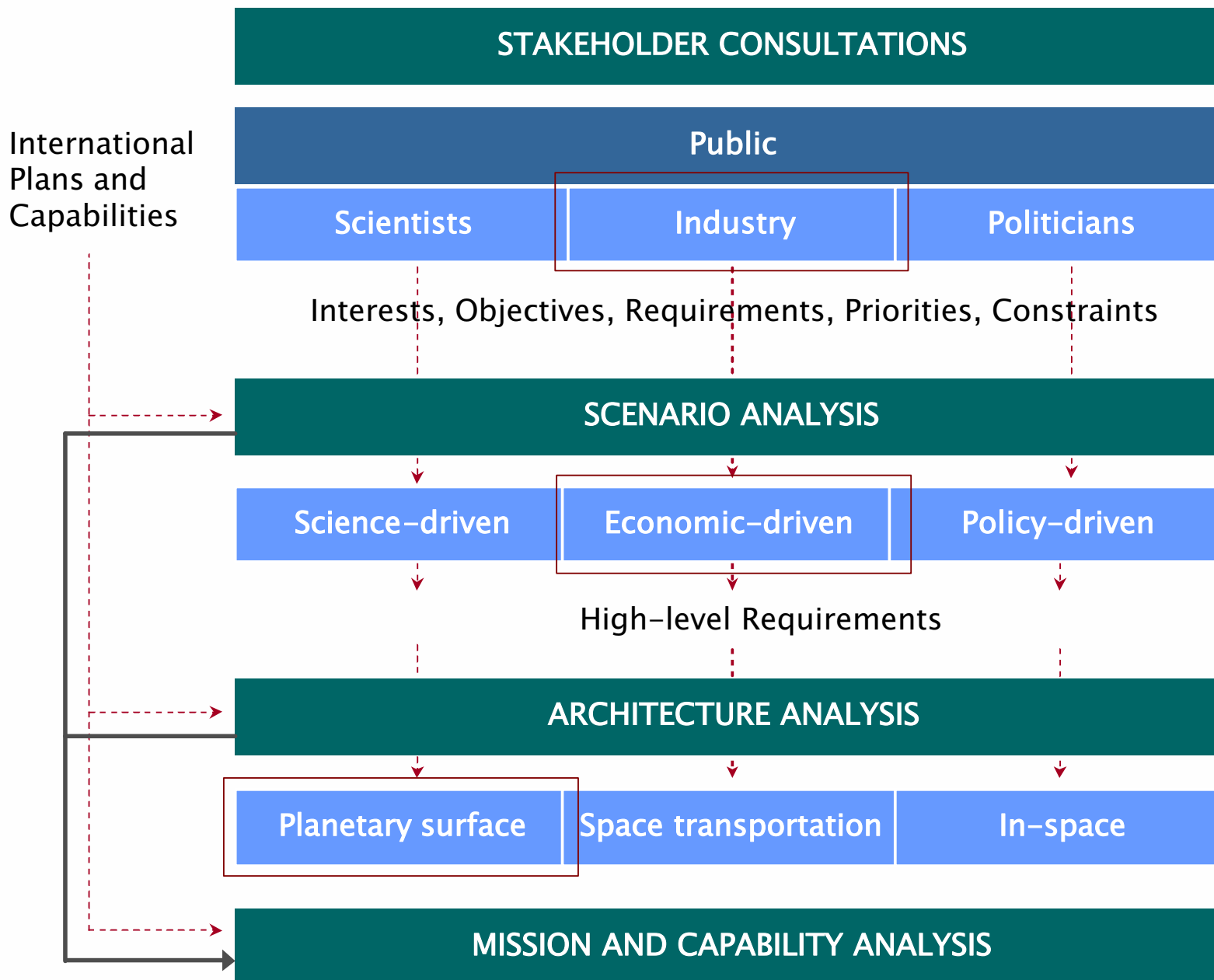


Exploration roadmaps of International partners

# Process for Preparation of C/MIN 2008

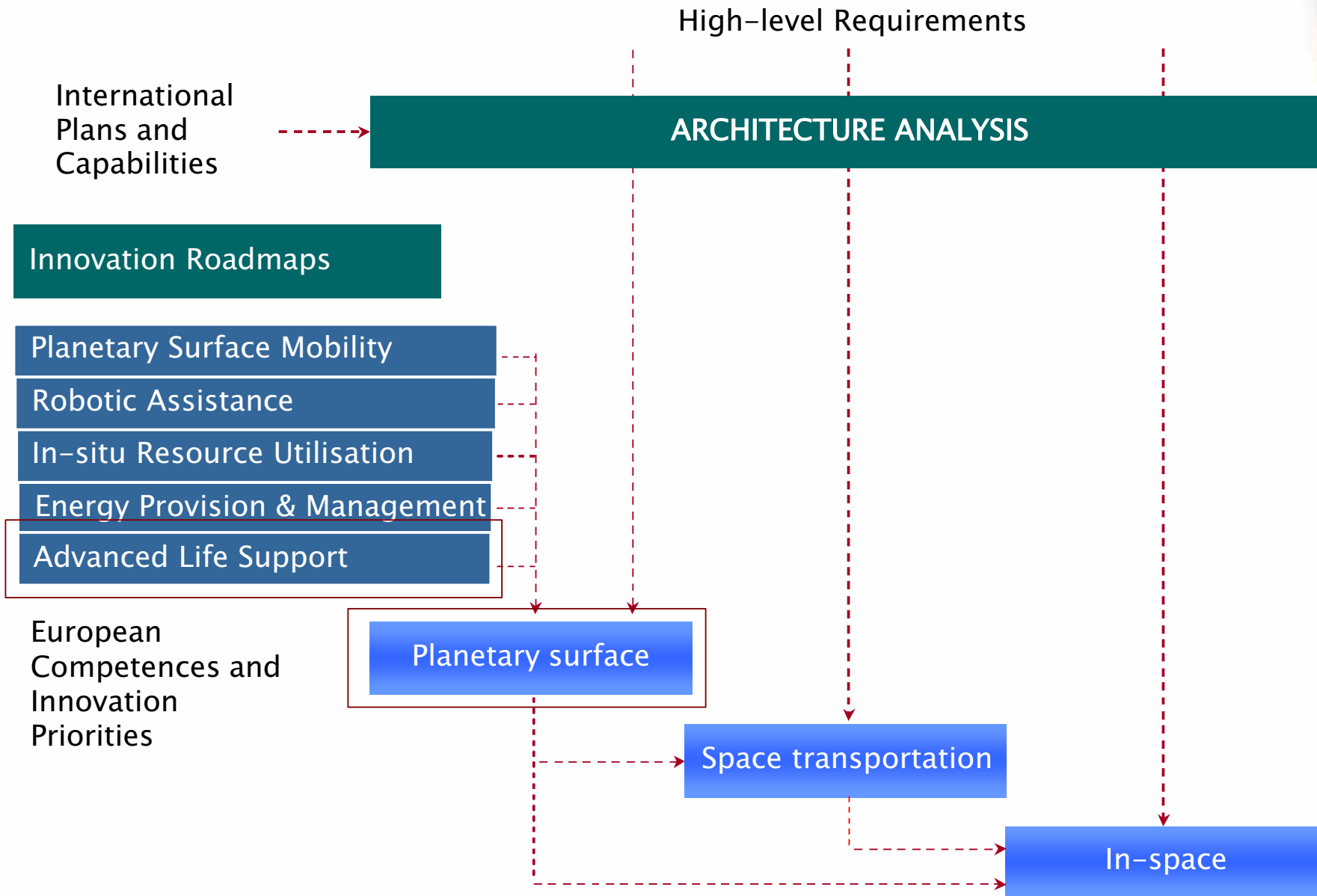


# Strategy Development



Scenario Integration  
Architecture Synergies

# Architecture and Capability Analysis



# Analysis of Lunar Exploration Scenarios - European Interests



◆ Overall Total

