ESA Strategic Framework for Human Exploration

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Strategic Framework

- ESA DG’s Agenda 2015
- C/M12 Decisions
- Strategic Guidelines-Programmes
- ESA Long-term Plan
Ensure **balanced** European engagement in international robotic and human missions targeting

1. Low Earth Orbit (LEO)
2. The Moon and
3. The Mars system (the Red-planet and its moons)

Considering

- Accessibility and ability to achieve human spaceflight missions
- International context
- Scientific interests
- European technological potential

Enabled through an **integrated mission and technology roadmap** and **long-term strategic partnerships** with international Partners

### ESA Strategic Guidelines for Exploration
#### ESA’s Priority Destinations

<table>
<thead>
<tr>
<th>Destination</th>
<th>Rationale for Destinations</th>
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<tr>
<td><strong>LEO</strong></td>
<td>Currently sole destination for human spaceflight</td>
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<td>ISS Commitments</td>
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<td>Significant, and growing user community, (access to LEO infrastructures beyond 2020 to be addressed)</td>
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<td></td>
<td>R&amp;D leading to socio-economic benefits</td>
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<td><strong>MOON</strong></td>
<td>Declared destination of major international Partners</td>
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<td>Significant number of robotic missions planned/under development</td>
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<td>Most realistic next destination for human spaceflight beyond LEO</td>
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<td></td>
<td>Significant scientific interests</td>
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<tr>
<td><strong>MARS</strong></td>
<td>Very high scientific interests</td>
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<td></td>
<td>Interests of major Partners in international Mars Sample Return mission</td>
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<td>Declared long-term destination for human spaceflight</td>
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• Importance of European initiatives fulfilling European objectives
• International cooperation has been the basis and stabilising factor for European human spaceflight
• Future role of Europe will strongly be shaped by international cooperation
  - Cooperation with NASA on the MPCV opens up additional opportunities in the area of space transportation
  - Partnership with Roscosmos for robotic exploration of Mars opens opportunities for cooperation in the field of lunar exploration.
  - Focus of Chinese space programmes opens future cooperation opportunities for exploitation of LEO
• Focus international cooperation on large infrastructure elements, including transportation vehicles
• Continue to compete on science instruments and associated technologies

Role of ISS

ISS is a critical step and essential enabler for future human exploration at strategic, programmatic and technical level

• Showing the strength, benefits and accomplishments of a multi-lateral partnership
• Demonstrating technologies and operations techniques critical for future missions
• Advancing knowledge related to mitigating risks for human health and performance in space
• Delivering socio-economic return and thereby showcasing the value of future investments in human space exploration
**Human Missions beyond LEO**

**On-going activities develop exciting perspective for future European roles**

Development of Service Module for US Multipurpose Crew Module (MPCV-SM) in the context of the ISS barter

International Berthing and Docking Mechanism, compatible with International Standard (IBDM)

Testing of Engineering Development Unit Soft Docking System

**Moon**

**Near-term Goals**

- Embed future ESA lunar exploration objectives into an integrated international lunar exploration scenario for
  - Gaining access to lunar surface
  - Addressing European lunar exploration goals
  building on
  - ESA-Roscosmos cooperation for ExoMars
  - ESA-NASA cooperation on MPCV
- Ensure attractive and sustained roles for Europe building on past and ongoing technology developments and lunar science definition activities
- Secure European participation to Roscosmos-led Lunar Resource and Lunar Polar Sample Return missions
- Initiate bridging activities in the time-period 2013 to 2014 in preparation of decision at C/M14
ESA Long-term Plan
Exploitation of LEO post 2020

**Service-driven**
- Attract new users by improving services for spectrum of current and future research area
- Stimulate both, cooperation (at institutional and private sector level) as well as competition for improving the service offer

**Continuity**
- Secure continued access to LEO infrastructures for existing user community at sustainable cost levels
- Ensure smooth transition from ISS to post-ISS era

**Synergies**
- Exploit synergies at system and technology-level between development for future LEO exploitation and human exploration

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ESA Long-term Plan
Human Missions beyond LEO

**European Role in Transportation**
- Sustained European role in transportation critical for becoming influential actors in global exploration
- Advancements in transportation key enabler for sustained human exploration beyond LEO
- Affordability considerations drive towards internationally more integrated developments
- Europe can build on the ATV and Ariane programmes

**Importance of ISRU**
- Understanding of potential role of in-situ resources critical for future exploration scenarios

**Human-robotic Partnership**
- Human-robotic partnership key for meeting efficiently, effectively and safely exploration goals
- Demonstration of human-robotic partnership concepts and integration of automated elements in human missions is critical