

9th SYMPOSIUM ON STEPPING STONES TO THE FUTURE: STRATEGIES, ARCHITECTURES,  
CONCEPTS AND TECHNOLOGIES (D3)

Strategies and Architectures to Establish a “Stepping Stone” Approach to our Future in Space (1)

Author: Dr. Maria Antonietta Perino

Thales Alenia Space Espana, Italy, mariaantonietta.perino@thalesalieniaspace.com

Mr. Franco Fenoglio

Thales Alenia Space Italia, Italy, franco.fenoglio@thalesalieniaspace.com

Mr. Jeffrey Apeldoorn

OHB System AG, Germany, Jeffrey.Apeldoorn@OHB-System.de

Mr. Bernhard Hufenbach

European Space Agency (ESA), The Netherlands, Bernhard.Hufenbach@esa.int

Mr. Olivier Mongrard

European Space Agency (ESA), The Netherlands, olivier.mongrard@esa.int

## POTENTIAL EUROPEAN CONTRIBUTIONS FOR HUMAN SPACE EXPLORATION

**Abstract**

Different activities are on-going in Europe to develop a common vision on the future European role in space exploration and to identify a long-term strategic planning for European space exploration activities.

To contribute to this end, taking into account the on-going debates at world-wide level including the impacts of exploration policies and strategies of prospective international partners in particular in USA, Japan and Russia, the European Industry is supporting ESA in defining, analyzing and assessing potential European contributions for future human spaceflight and exploration activities.

The scenario in which these European contributions can be provided have to consider missions to Low Earth Orbit (LEO) and Moon as important stepping stones, deep-space missions including e.g. missions to NEO and to the Martian moons as preparatory steps, for the long-term goal of an international human mission to Mars.

Europe's first involvement can be likely concentrated in exploiting the existing ISS as a test bed for enhancing and proving, as needed through demonstration missions, technologies in several fields like automation and robotics, advanced propulsion and cryogenic management, life support, novel energy sources, advanced re-entry technology, and inflatable habitats.

By exploiting the heritage from past programs and the know-how gained in the latest years by European Industry, future contributions can then span from service and habitable modules (either rigid or inflatable) for orbital infrastructures, to Moon surface elements like pressurized rovers and landers, cargo transportation systems that can evolve to crew transfer vehicles, as well as complex architecture systems for lunar and deep space communication and navigation.

This paper provides an overview of optional European elements identified by an industrial consortium led by Thales Alenia Space - Italia as potential candidates for a long-term strategy of human spaceflight and exploration, identifying their basic features, development approach and operational scenarios.