

Technology Roadmaps for Space Exploration (09)
Enabling Technologies for Exploration (3)

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ITALIAN TECHNOLOGICAL CAPABILITIES TO POSSIBLE FUTURE HUMAN EXPLORATION
ARCHITECTURE MISSIONS

Abstract

The international community is currently engaged in finding opportunities for cooperation in future human spaceflight missions. International cooperation is driven by several different stakeholder objectives and constraints, along with individual proven engineering capabilities at national and industrial level. In this context, the identification of potential contributions from space faring Nations to international cooperation efforts is a driving key factor to evaluate future human space exploration architectures sustainability and effectiveness. The definition of a roadmap for future space exploration activities will be enabled by the definition of potential destinations, as recently discussed in the Global Exploration Conference in Lucca (Italy) on November 10, 2011. This paper presents a survey and an analysis framework for the identification of potential Italian contributions to the future global human space exploration enterprise. The analysis aims at defining the structure of a mapping between flight-proven and projected Italian technological capabilities with foreseen key technology needs for the global exploration enterprise. Italy features a proven record of successful cooperation in international human spaceflight activities, in particular within the International Space Station program. The identification of potential Italian contributions is of interest to evaluate cooperation activities in future human space exploration missions. The technological survey proposed in the paper is based on interviews with Italian stakeholder representatives and a review of past architecting studies for human missions as done by the international community, with particular focus on the United States, Europe and Italy itself. The paper successively analyzes some of the most important current Italian technological capabilities taking into account both the Italian industrial and institutional base concerned with human spaceflight activities. Conclusions are drawn by mapping said capabilities to reference Moon and Mars human exploration scenarios as proposed by the international community. The proposed mapping exercise is performed by identifying figures of merit for the evaluation of Italian technological capabilities in terms of technological benefits, expected cost, reliability, level of maturity potentially reachable in the future, technology risk, compliance to national and international stakeholder needs and potential contribution impact to reference scenarios. This study surveys key Italian technologies as initial case studies, which selection is based on existing Italian industrial heritage, and ranks them according to proposed metrics. Future work will include the extension of the analysis to other potential Italian contributions, with the final goal to identify key drivers in a comprehensive approach to support future Italian strategies in human spaceflight.