14th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)
Innovative Concepts and Technologies (1)

Author: Ms. Sara Cresto Aleina
Politecnico di Torino, Italy

Dr. Nicole Viola
Politecnico di Torino, Italy
Ms. Roberta Fusaro
Politecnico di Torino, Italy
Mr. Giorgio Saccoccia
European Space Agency (ESA), The Netherlands

APPROACH TO TECHNOLOGY PRIORITIZATION IN SUPPORT OF MOON INITIATIVES IN THE FRAMEWORK OF ESA EXPLORATION TECHNOLOGY ROADMAPS

Abstract

Exploration technology roadmaps have been developed by ESA in the past few years and the latest edition has been released in 2015. Scope of these technology roadmaps, elaborated in consultation with the different ESA stakeholders (e.g. European Industries and Research Entities), is to provide a powerful tool for strategic, programmatic and technical decisions in support of the European role within an International Space Exploration context. In the context of preparation for possible future European Moon exploration initiatives, the technology roadmaps have been used to highlight the role of technology within Missions, Building Blocks and Operational Capabilities of relevance. In particular, as part of reference missions to the Moon that would fit in the time frame 2020 to 2030, ESA has addressed the definition of lunar surface exploration missions in line with its space exploration strategy, with the common mission goals of returning samples from the Moon and Mars and expanding human presence to these destinations in a step-wise approach. The roadmaps for the procurement of technologies required for the first mission elements of the above strategy have been elaborated through their main building blocks, i.e. Visual navigation, Hazard detection and avoidance; Sample acquisition, processing and containment system; Surface mobility elements; Tele-robotic and autonomous control systems; and Storable propulsion modules and equipment. Technology prioritization methodologies have been developed in support of the ESA Exploration Technology Roadmaps, in order to provide logical and quantitative instruments to verify choices of prioritization that can be carried out on the basis of important, but non-quantitative factors. These methodologies that are thoroughly described in the paper proceed through subsequent steps. First technology prioritization's criteria are selected; then decision trees are developed to highlight all feasible paths of combination of technology prioritization's criteria and to assess the final achievement of each path, i.e. the cost-effectiveness. The risk associated to each path is also evaluated. In the second part of the paper, these prioritization methodologies have been applied to some of the building blocks of relevance for the mission concepts under evaluation at ESA (such as Tele-robotic and autonomous control systems; Storable propulsion modules and equipment) and the results are presented to highlight the approach for an effective TRL increase. Eventually main conclusions are drawn.