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

Mr. Luca Levrino
Politecnico di Torino, Italy

Dr. Nicole Viola
Politecnico di Torino, Italy

Mr. Giorgio Saccoccia
European Space Agency (ESA), The Netherlands

Ms. Roberta Fusaro
Politecnico di Torino, Italy

EFFECTIVE METHODOLOGIES TO DERIVE STRATEGIC DECISIONS FROM ESA
TECHNOLOGY ROADMAPS

Abstract

Top priorities in future international space exploration missions regard the achievement of the necessary maturation of enabling technologies, thereby allowing Europe to play a role commensurate with its industrial, operational and scientific capabilities. As part of the actions derived from this commitment, ESA Technology Roadmaps for Exploration represent a powerful tool to prioritise R&D activities in technologies for space exploration and support the preparation of a consistent procurement plan for space exploration technologies in Europe. The roadmaps illustrate not only the technology procurement (to TRL-8) paths for specific missions in the C-Min 2012 timeframe, but also the achievement for Europe of technological milestones enabling operational capabilities, essential for current and future Exploration missions. Coordination of requirements and funding sources among all European stakeholders (ESA, EU, National, Industry) is one of the objectives of these roadmaps, that show also possible application of the technologies beyond space exploration, both at ESA and outside.

The present paper describes the activity that supports the work on-going at ESA on the elaboration and update of these roadmaps and related tools, in order to criticise the followed approach and to suggest methodologies of assessment of the Roadmaps, and to derive strategic decision for the advancement of Space Exploration in Europe. After a review of Technology Areas, Missions/Programmes and related building blocks (architectures) and operational capabilities, technology applicability analyses are presented. The aim is to identify if a specific technology is required, applicable or potentially a demonstrator in the building blocks of the proposed mission concepts. In this way, for each technology it is possible to outline one or more specific plans to increase TRL up to the required level. In practice, this translates into two possible solutions: on the one hand, existing mission concepts will be complemented with the required technologies if the latter can be considered as applicable or demo; on the other, if they are neither applicable nor demo, new missions, i.e. technology demonstrators based on multidisciplinary grouping of key technologies, shall be evaluated, so as to proceed through incremental steps. Finally, techniques to determine priorities in technology procurement are identified, and methodologies to rank the required technologies are proposed. In addition, a flexible tool that estimates the percentage of technologies required for the final destination that are implementable in each intermediate destination of the incremental approach is presented.