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USING A MODEL BASED SYSTEM ENGINEERING APPROACH FOR THE DESIGN OF LUNAR
MISSIONS TO TEST AND VALIDATE KEY TECHNOLOGIES AND CAPABILITIES IN
PREPARATION FOR FUTURE HUMAN EXPLORATION OF MARS

Abstract

After establishing its presence on the Moon's surface, the next step in humanity's quest to explore space is the human exploration of Mars. Following the International Space Exploration Coordination Group roadmap, the transferability of validated key enabling technologies employed for lunar exploration will be fundamental to reduce the budget and development time of future Mars missions, as well as to increase safety and reliability. Recent studies already disclosed Design Reference Missions on the Moon to test and validate sets of technologies and capabilities for Mars exploration. Starting from this preliminary baseline, this paper aims at better defining the systems and the subsystems required to achieve their objectives. To conduct this work, which investigates possible technical solutions and optimizes the design through trade-off studies and analyses, a Model-Based Systems Engineering approach is pursued.

This study, together with the previous analysis, are carried out in the framework of II Level Master's programme SEEDS (SpacE Exploration and Development Systems), a project born from the collaboration between the Politecnico di Torino (PoliTo), the Institut Supérieur de l'Aéronautique et de l'Espace (ISAE) and the University of Leicester, with the participation of Agenzia Spaziale Italiana (ASI), Centre National D'Etudes Spatiales (CNES), European Space Agency (ESA), Thales Alenia Space and Altec.