

SPACE SYSTEMS SYMPOSIUM (D1)  
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SET, A SCENARIO EVALUATOR TOOL FOR SUPPORTING SPACE-EXPLORATION  
MISSION-ARCHITECTURE DESIGN

**Abstract**

The design of space-exploration missions begins with a mission statement that defines the ultimate goals of the mission itself. The mission-architecture defines, instead, how the mission will work in practice, and encompasses all the elements that will take part in it. It includes such issues as the synergies of manned and robotic resources, mission control, and the mission timeline. The mission-architecture design activity is an iterative process in general aimed at the maximization of the cost effectiveness (or value) of the mission and minimization of costs. This is performed by successive comparisons and evaluation of the alternative generated mission architectures. The Scenario Evaluator Tool (SET) is conceived to support the engineering team in the framework of the space mission design process. In particular, SET is a simulation software tool that allows building mission architectures with a significant reduction of development time and computational effort. The software allows the characterization, the comparison, and optimization of exploration scenarios and building blocks through a user friendly graphical interface. Each mission-architecture is characterized and evaluated on the basis of the mass budget of the building blocks, cost index and exploration capabilities. SET is general enough to allow the design of several space exploration scenarios for Gap-analysis studies (flexibility). Further, it allows the users to introduce new model libraries (expandability). This paper describes the main features and the potentialities of the simulation software. To show the working principle of SET, a hypothetical human space-exploration mission scenario has been developed and implemented. The results has been accomplished in the framework of STEPS (Systems and Technologies for the ExPLoration of Space), which is a research project co-financed by Piedmont Region (Italy), firms and universities of the Piedmont Aerospace District.