SPACE SYSTEMS SYMPOSIUM (D1)
System Engineering - Methods, Processes and Tools (2) (6)

Author: Mr. Andy Braukhane
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany

Mr. Antonio Martelo
Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Germany

SUPPORTING MODEL PAYLOAD SELECTION FOR SCIENCE MISSION FORMULATION

Abstract

When confronting the design of a new space science mission the ideal situation would be one where a team of scientists would set the scientific goals and define a model payload. Subsequently, an engineering team would define the constraints this payload imposes on the mission analysis, spacecraft design and ground segments. But this is much more complex since limitations imposed by system-related elements have also an impact on the payload design. Because of this, both the scientific and engineering teams must work together and be capable of redefining scientific requirements so as to obtain a feasible design that does not compromise the essential objectives of the mission. For this process to be seamless, members of the scientific team should have some understanding of the technical issues, and members of the technical team should have a knowledge base that allowed them to understand the critical science issues. In reality, the fact that in a (e.g. concurrent) design study, there are rarely payload developers present in either group tends to create a situation where the science team focuses on maximizing functionality, whereas the engineers target a robust system, and neither are quickly able to size and define the payload and its impact on the system in a rapid and realistic way. To aggravate the situation, there are presently no tools, nor any known rules or relations between objectives and instruments that can help in the preliminary modelling of multiple payload sets. A study at the DLR Institute of Space Systems is currently ongoing to unearth said relations if they exist, with a long term goal of developing system engineering tools which can help in the preliminary design process for scientific exploration missions. The present paper recalls the problems and processes during the preparing of a science mission, especially in the European environment. It outlines how information from past missions could lead to a more robust preliminary system design through the use of dedicated analyses tools which propose potential instrument combinations, and can increase mutual understanding between scientists and engineers. The paper describes the steps of DLR's attempt to better organize such activities, and presents some preliminary results about instrument evolutions, trends and relations, based on the initial historical data gathering phase. These constantly evolving results will be later used to create tools for e.g. model payload proposals and system requirement derivation.