

SPACE SYSTEMS SYMPOSIUM (D1)
Interactive Presentations (IP)

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AUTOMATED INTEGRATED SPACECRAFT FEASIBILITY TOOL TO RESPOND TO EARLY
UNCERTAINTIES IN CUSTOMER NEEDS

Abstract

Customer objectives and requirements are the foundation to developing systems requirements, and therefore an essential step toward design solutions, on which feasibility studies in early stages of project are based. Without clearly defined customer requirements, it is difficult to successfully move forward to the next phases in system design, as any changes in the next phases costs more. But for several reasons, the customer may not clearly know what he exactly needs. This is usually the case in newly formed organizations, in the early steps of developing a space program. Our experience with the small satellite projects in an emerging space community demonstrates the negative effect of frequent changes in customer needs and the ambiguities in defining the mission requirements.

These uncertainties are an impediment for contractual purposes. The customer may take a vast amount of time for finalizing the requirements, and several changes, even as significant as changes in payloads, are not impossible. These changes negatively affects the time required for early feasibility studies.

To respond to the uncertainties in the customer needs, the authors have developed a tool to aid in feasibility studies. The tool integrates several modules and parametric studies previously developed to facilitate, and mostly automate, the process, creating responses to customer in a very short time. Notable innovations are on how to rapidly study the configuration of the spacecraft, and the thermal considerations. Specific solutions are developed for each aspect of the spacecraft design, some of which are based on statistical studies.

The paper explains the architecture of the tool, the detailed design approaches in constituent parametric modules, and the outputs. The flexibility in outputs and inputs are considered as not all the feasibility problems start at one specific initial points. These variables all can be tailored to the needs of each specific project. A GUI is developed for the tool, and explained in the paper. The GUI allows the user to not only run the study with specific inputs, but he can change many parameters to tailor the modules through the GUI.