ABSTRACT FOR PAPER

APPLICATIONS FOR A SPACECRAFT AVIONICS FUNCTIONAL MODEL

By Joseph F. Smith
Jet Propulsion Laboratory
Pasadena, CA 91109

Over the last few years, the author has developed a basis for a spacecraft avionics functional model that takes a functional approach to issues that are addressed by generic spacecraft avionics. The purpose will be to create a model that can be used to analyze the resources, characteristics, and cost of the spacecraft avionics, even at an early stage in the spacecraft development. This model will also allow the spacecraft architect to analyze a number of avionics architectures, and to determine which architecture best meets the mission requirements with minimum cost and resources.

At the present time, there are five identified applications for this model. These applications are:

- Education/Training: The breakdown of the functions will make it easier to provide training on the functionality and activities that occur onboard of a typical spacecraft.

- Systems Engineering: The breakdown from Functions implies an outline that could be used to document the functional requirements of the spacecraft avionics. This approach would bring a standard outline to the documentation of requirements, which would increase efficiency, and may enhance the utility of standard requirements tools; while still having sufficient flexibility that it can actually be used for a number of different projects.

- Modeling Applications: If it were possible to create an estimate of the resources required by all of the possible Roles, then once the requirements of the Roles were documented it would be a "simple" matter to estimate the resources for each Role, and to add up all of these resources in order to determine the resources of each Function. Once Functions were assigned to subsystems, it should then be possible to determine the resources required by each subsystem. It should then be possible to use an as yet undefined algorithm to cost the implementation of the avionics requirements.

- Analysis/Trade/Cost Applications: If the modeling approach as discussed above were to be implemented with an automated or semi-automated tool, it would be possible for the system architect to model a number of different architectures and functional breakdowns in order to determine which one best meets the mission requirements, which is most flexible, and which is most cost effective.

- Functional Standardization & Commonality: In using this model, the Roles within a Subfunction always have the same relationship between each other. This implies that it may be possible to reuse software modules that implement Roles from one spacecraft/mission to another. If this approach were to be used for a few missions, a library of software modules would be built up, allowing the next project to only code those modules that were new, that had significantly different requirements, or that had grown antiquated.

This paper will first provide a quick background on the proposed SAFM, and the will provide more detail on the applications that are identified above. As much as possible, actual examples and results will be used to further define each of the proposed model applications.