Paper ID: 15756
student

SPACE POWER SYMPOSIUM (C3)
Advanced Space Power Technologies and Concepts (3)

Author: Mr. Bryan Kaiser
University of New Mexico (UNM), United States, bryankais@gmail.com

ANALYSIS OF SPACECRAFT ELECTRICAL POWER SUBSYSTEM ARCHITECTURES TO ENHANCE SURVIVABILITY AND RELIABILITY

Abstract

Spacecrafts are costly to operate and difficult to repair once in use. The failure of elements of a spacecraft electric power subsystem can result in the failure of the entire electric power subsystem and subsequently the loss of the spacecraft. Due to the hostility of the space environment, failures in power system elements are common. Typical failures are short circuits, solar array failure, battery failure, and electromagnetic interference.

To ensure that failures in electrical power subsystem elements do not cause the entire subsystem to fail, the redundancy of subsystem elements and multiple connections between power sources and loads must be incorporated into the subsystem design. Multiple choices exist on how to connect the same number of sources and loads. It is intuitively clear that a choice of the configuration will affect the resilience of the subsystem. The ultimate goal of our research is the development of computational tools that allow the numerical evaluation of the ability of a given configuration of the electric power subsystem to withstand arbitrary number of faults in the subsystem elements.

A unique computational algorithm will be presented at the Congress. Efficiency of different design strategies will be evaluated in application to a notional satellite electric power subsystem.

The research is supported by the NASA-funded New Mexico Space Grant Consortium.