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BEYOND-LEO ARCHITECTURE SIZING TOOL (BLAST)

Abstract

Up to this point, the space industry has been in need of a continuum to bridge rapid parametric analysis with extensive bottom-up engineering design. Modeling a system with uncertain variability within its input parameters is often polarizing, with emphasis placed on data collection, or simulation requiring complex software packages. With such high dependency upon the developer, deciphering the underlying algorithms can be difficult. Zero Point Frontiers Corp. has recently partnered with the NASA Johnson Space Center to develop a new approach to high level space architecture design and analysis. The Beyond-Low Earth Orbit (LEO) Architecture Sizing Tool (BLAST) was designed to offer an integrated balance between parametric analysis and engineering design. BLAST couples extensive Mass Estimating Relationship (MER) research with the capability to instantly assess changes to a mission via simultaneous sensitivity sweeps of several parameters. The program was conceived to generate data for human-rated vehicles rapidly, by providing a shareable, re-creatable, and rigorous end-to-end multi-element framework for developing beyond-LEO space architectures.

BLAST performs high-level human mission architecture study analysis with focus on two key features: a comprehensive MER-based model and a customizable experiments platform. Anchored in historical data, the existing MERs have been re-designed to incorporate present-day technologies and space assets. All metadata used to formulate the subsystem MERs is easily accessible within BLAST, allowing capture of assumptions. Recognizing a need to assess sensitivities in real time, BLAST was purposed to present solution spaces for combinatorial experiments of any set of mission parameters instead of focusing on individual point designs. This novel approach to modeling demonstrates how legacy models may be revised into an enhanced, user-friendly framework, enabling development of clearly defined system architectures.