

The Application of the NASA Advanced Concepts Office, Launch Vehicle Team Design Process and Tools for Modeling Small Responsive Launch Vehicles

Abstract

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The Advanced Concepts Office (ACO) Launch Vehicle Team at the NASA Marshall Space Flight Center (MSFC) is recognized throughout NASA for launch vehicle conceptual definition and pre-phase A concept design evaluation. The Launch Vehicle Team has been instrumental in defining the vehicle trade space for many of NASA's high level launch system studies from the Exploration Systems Architecture Study (ESAS) through the Augustine Report, Constellation, and now Space Launch System (SLS). The Launch Vehicle Team's approach to rapid turn-around and comparative analysis of multiple launch vehicle architectures has played a large role in narrowing the design options for future vehicle development.

Recently the Launch Vehicle Team has been developing versions of their vetted tools used on large launch vehicles and repackaged the process and capability to apply to smaller more responsive launch vehicles. Along this development path the LV Team has evaluated trajectory tools and assumptions against sounding rocket trajectories and air launch systems, begun altering subsystem mass estimating relationships to handle smaller vehicle components, and as an additional development driver, have begun an in-house small launch vehicle study.

With the recent interest in small responsive launch systems and the known capability and response time of the ACO LV Team, ACO's launch vehicle assessment capability can be utilized to rapidly evaluate the vast and opportune trade space that small launch vehicles currently encompass. This would provide a great benefit to the customer in order to reduce that large trade space to a select few alternatives that should best fit the customer's payload needs.