

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS (D2)
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

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ARES I-X FLIGHT EVALUATION TASKS IN SUPPORT OF ARES I DEVELOPMENT

Abstract

NASA's Constellation Program successfully launched the Ares I-X Flight Test Vehicle on October 28, 2009. The Ares I-X flight was an ascent development flight test that offered a unique opportunity for early engineering data to impact the design and development of the Ares I crew launch vehicle.

As the primary customer for flight data from the Ares I-X mission, the Ares Projects Office established a set of 33 flight evaluation tasks that impact design and development of the Ares I crew launch vehicle. Six of those tasks supported the Ares First Stage element, while the remaining 27 were performed in support of the Ares Vehicle Integration Office. These engineering flight evaluation tasks were implemented in order to partially validate design tools and to partially validate scaling methodologies used to translate ground test data for flight vehicle design application. Task topics included Validation of Thrust Oscillation Modeling; Updated Ares I Rollout, Ground Wind, and Liftoff Loads Using Ares I-X Flight Data; Validation of Vibroacoustic Prediction Methodology and Empirical Scaling Techniques; Aerodynamic Database Generation Process Validation; Validation of Thermal Environments Models; Validation of Liftoff and Ascent Acoustic Environments; Flight Control System Tools Validation; and Validation of First Stage/Upper Stage Separation Dynamics Modeling. Included within many of these tasks were direct comparisons of flight data with pre-test predictions generated by tools and processes being used to design and develop Ares I, discussions of the similarities and differences in those comparisons, and whether the tools and processes required updates based upon those comparisons.

Following a brief overview of the flight test that will include a discussion of the background on flight instrumentation and flight evaluation planning, this paper will provide insight and observations based on results from those flight evaluation tasks that can directly support Ares I development and indirectly support other future launch vehicle development activities.