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

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ARES I-X: THE FIRST TEST FLIGHT OF A NEW ERA

Abstract

Since 2005, NASA's Constellation Program has been designing, building, and testing the next generation of launch and space vehicles to carry humans beyond low-Earth orbit (LEO). On October 28, 2009, the Ares Projects successfully launched the first suborbital development flight test of the Ares I crew launch vehicle, Ares I-X, from Kennedy Space Center (KSC). Although the final Constellation Program architecture is under review, data and lessons obtained from Ares I-X can be applied to any launch vehicle. This presentation will discuss the mission background and future impacts of the flight.

Ares I is designed to carry up to four astronauts to the International Space Station (ISS). It also can be used with the Ares V cargo launch vehicle for a variety of missions beyond LEO. The Ares I-X development flight test was conceived in 2006 to acquire early engineering, operations, and environment data during liftoff, ascent, and first stage recovery. Engineers are using the test flight data to improve the Ares I design before its critical design review—the final review before manufacturing of the flight vehicle begins.

The Ares I-X flight test vehicle incorporated a mix of flight and mockup hardware, reflecting a similar length and mass to the operational vehicle. It was powered by a four-segment SRB from the Space Shuttle inventory, and was modified to include a fifth, spacer segment that made the booster approximately the same size as the five-segment SRB. The Ares I-X flight closely approximated flight conditions the Ares I will experience through Mach 4.5, performing a first stage separation at an altitude of 125,000 feet and reaching a maximum dynamic pressure ("Max Q") of approximately 850 pounds per square foot.

The Ares I-X Mission Management Office (MMO) was organized functionally to address all the major test elements, including: first stage, avionics, and roll control (Marshall Space Flight Center); upper stage simulator (Glenn Research Center); crew module/launch abort system simulator (Langley Research Center); and ground systems and operations (KSC). Interfaces between vehicle elements and vehicle-ground elements, as well as environment analyses were performed by a systems engineering and integration team at Langley. Experience and lessons learned from these integrated product teams area are already being integrated into the Ares Projects to support the next generation of exploration launch vehicles.