Ares Vehicle Integration (VI))

Ares Avionics and Software Integration: The Vehicle Integration Avionics System Simulation, Integration, and Support Team (ASSIST) (also known as the System Integration Laboratory (SIL) Team) successfully completed development and demonstration on September 30 of a core end-to-end integration and test capability. This capability included the integration of Upper Stage software development unit flight computers, Build 0 of the Upper Stage flight software, a single string of First Stage engineering avionics hardware, prototype First Stage rock and tilt thrust vector control (TVC) actuators, and a Kennedy Space Center-developed Ground System (GS) Launch Control System (LCS) interface emulator.

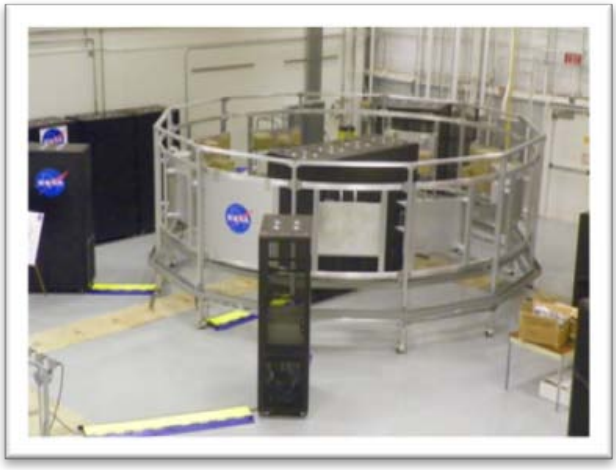

Figure 1 – Upper Stage Instrument Unit Integration Ring.

Figure 2 – First Stage Avionics Mounting Structure.

Figure 3 – First Stage Rock and Tilt TVC Actuators.

Figure 4 – Lab Displays and Controls.

The Ares Real-Time Environment for Modeling, Integration, and Simulation (ARTEMIS) system, developed by ASSIST, allowed the team to perform and demonstrate simplified prelaunch checkout and commanding, a complete closed-loop Ares vehicle ascent, and descent of the First Stage. Establishing this capability required close coordination with avionics and software team members from First Stage, Upper Stage, and Ground Systems. Also, it facilitated the early identification and correction of integration and interface issues. Work is continuing to integrate the Upper Stage Brassboard Development Unit (BDU) flight computers into the facility and to port Build 0 of the flight software to the BDUs.

61st International Astronautical Congress Presentation: At the 61st International Astronautical Congress held in Prague, Czech Republic, September 27 to October 1, the paper entitled "Ares I-X Flight Evaluation Tasks in Support of Ares I Development," by Lawrence D. Huebner, et al., was selected as one of two papers from the Future Space Transportation Systems Verification and In-Flight Experimentation Session as best paper. This honor could result in a peer-reviewed version of the paper being archived in the international journal *Acta Astronautica*.

Ares Upper Stage (US)

Test Subsystem: A joint Engineering development test activity was recently completed by the Test Laboratory (ET30) and Materials Laboratory (EM10) in the Hydrogen Test Facility (HTF), Building 4628 at Marshall Space Flight Center (MSFC). Three candidate cryogenic electrical feed-through connectors and several candidate instrumentation applications were subjected to repeated exposure to liquid hydrogen at a pressure of 100 pound-force per square inch gauge (psig). These connector and instrumentation attachment designs were candidates being considered for use with the Common Bulkhead Proof Test Fixture (CB-PTF) being planned for the Ares I Upper Stage. The photos below show the three test electrical connectors and the instrumentation mounting plate inside the test canister that were tested at the HTF.

Figure 5 – Test electrical connectors.

Figure 6 – Instrumentation mounting plate.

The desired goal of 100 pressurized liquid hydrogen exposure cycles was successfully obtained. Two 25-pin connectors and one 50-pin feed-through connector were tested. The connectors have a glass-ceramic insulation and had never been tested in liquid hydrogen conditions before. Several types of instrumentation adhesives were also tested on strain gages and temperature sensors that were bonded to a test panel. Electrical connectivity to the connectors and instrumentation was monitored during the testing. No connectors or adhesives failed during the 100 completed test cycles.

The Ares Projects look forward to the launch of STS-133, Space Shuttle Discovery, on November 1.