



Ares I Preliminary Design Review (PDR) + 90-Day Status Review: An Ares I PDR + 90-Day Status Review was held on December 1–2 at Marshall Space Flight Center (MSFC) to address key technical integration issues coming out of the PDR. The review was well attended with participants representing nearly all NASA Centers, the Exploration Systems Mission Directorate (ESMD), the Constellation Program Office, the Projects with interfaces to Ares I, various engineering and Safety and Mission Assurance (S&MA) organizations, the Astronaut Office, and multiple industry partners. Key topics discussed included thrust oscillation design implementation, results from the centrifuge testing at Ames Research Center on crew performance during thrust oscillation conditions, results from the Operability Assessment Team studies, load relief, liftoff pad clearance, scale model liftoff acoustics testing, and possible acceleration of the First Stage nozzle extension.

Several key decisions were made at the review, including: baseline a passive mass absorber system in the first stage aft skirt based on an integrated risk assessment; down-select to the spring ring isolator module system in the frustum/interstage region; pursue development of the propellant mass absorber system to evaluate its viability by March 2009; finalized the integrated stack height; pursue in-flight load relief and day-of-launch i-loads updates; use open-loop control during liftoff similar to Saturn to steer away from the launch tower and eliminate the tower contact concern; begin development of a scale model liftoff acoustics test; and pursue three key studies as recommended by the Operability Assessment Team's evaluations, including early integration of the first stage forward and aft skirts and evaluation of eliminating one T-0 connection.



Upper Stage Engine (USE) Test Stand (TS) A-3 at Stennis Space Center (SSC): Tower construction is continuing on TS A-3. Three-fourths of the first 70-foot-high base is near completion as shown in Figure 1. Work on the propellant docks is also progressing. In the foreground of Figure 2, piles are being driven for the liquid hydrogen barge dock. In the background of Figure 2 to the right of the tower, concrete has been poured for the liquid oxygen barge dock.



Figure 1



Figure 2



Recent activities specific to the Elements include:

- **First Stage (FS)**

- **Deceleration Subsystem (DSS) Ares I Main Parachute Porosity Increase:** The first two main parachute drop tests exhibited a higher drag coefficient than predicted. Although the increased drag provides a lower water impact velocity, it also creates higher loads on the main chutes and their attachment fittings. Since the initial design porosity of the main chutes was lower than the Shuttle solid rocket booster (SRB) main chutes, the decision was made to increase the Ares I porosity closer to that of the SRBs. Seven ribbons have been selected for removal from the lower section of the main drop test parachutes, which will increase the porosity from 11.9 percent to 15.4 percent. Drag data from the follow-on drop tests using the higher porosity chutes will be used to determine the final porosity to incorporate into the Ares I flight design.

- **Upper Stage Engine (USE)**

- **Hardware In The Loop Lab:** The construction for the Hardware In The Loop (HWIL) Lab at MSFC is currently ongoing for the J-2X controller and software. The HWIL will be used to verify the software and Engine Controller Unit (ECU) for the J-2X. The foundation is finished, as shown in this photo.



- **Instrumentation Critical Design Review (CDR):** The Instrumentation CDR was held the week of November 18th. The instrumentation will be used to take measurements of the engine parameters prior to start and during mainstage. The instrumentation will be used for health and status of the J-2X and also for post-flight data analysis.

- **Flight and Integrated Test Office (FITO) and Ares I-X**

- **Ares I-X Roll Control System (RoCS) Element:** Activities specific to the RoCS Element include:
 - Final assembly and proof loading of the modified Inner Installation Tables was completed, with a ship date to Kennedy Space Center (KSC) set for November 24. The final data drop for the Constellation Safety and Engineering Review Panel Phase III review was made and the review was held December 3–4.



- The RoCS Acceptance Review Plan was presented to the Ares I-X Control Board and approved for pre-ship activities.
- Build-up of two engines (of four) was completed, and one was leak tested, as shown in the photo. Two bypass manifolds for the last two engines are still in precision cleaning. The first fuel-side trim orifice calibration runs were conducted.
- Inner Installation Table tipping discussions and analysis reviews were supported. The decision was made to bolt the inboard legs of the tables to the flooring of the Upper Stage Simulator (USS) dolly prior to the empty module fit checks.
- Welding flaws/problems have been noted in the Module B propellant lines. Extra tubing will have to be procured to complete the fabrication, and this will impact the schedule.
- The Project Office is looking at the option of sending modules to KSC without tubing installed and if that option is selected, that would require installation and leak testing.
- Three of four flight engines are now assembled, leak tested, and starting through functional tests. Three of four helium pressurant lines have been flow tested through check valves.
- The first iteration of the fuel-side orifice plate has been fabricated after the initial baseline trim run, and now is ready for the next set of pressure drop tests. The oxidizer side full-bore orifice plate and the blanks for the flight orifices have been fabricated.
- The Inner Installation Tables have been prepared for shipment to KSC.
- The module anti-tip trolley piece parts are all fabricated, awaiting Government Quality Assurance approval.
- The weld tests for the titanium fairing closures have been completed.
- The assembly of the pre-ship review data package has begun. The change in data drop and pre-ship review dates (December 15 and January 7, respectively) have been coordinated with the Mission Manager.



Engine leak testing at Teledyne

The Ares Projects looks forward to the US Element friction stir weld of the actual US dome gores in MSFC's Building 4755 in December. This will be a follow-up to the successful welding of two Shuttle External Tank dome gores in August.

...and as of this Ares Projects Weekly Summary, there are only 218 days until the first Ares I test flight, Ares I-X!!!