Upper Stage Engine (USE) Powerpack Assembly 1A (PPA–1A) Test #6: The sixth test of PPA–1A was completed on April 3 at NASA Stennis Space Center (SSC) Test Facility A1. The planned duration was 550 seconds. The PPA–1A started at the 218K power level and then, after 10 seconds, transitioned to the 274K power level. At approximately 293 seconds, the test was terminated by a redline cut on the Liquid Oxygen (LOX) Annin valve position. The valve drifted open when the control cable came loose. No other anomalies were noted during the purge sequences or test. The flowmeter calibration objective and the first of 5 Q/N data points (flow/speed) were obtained during the test. The data review for this test was held on April 7. Plans for upcoming tests are being reviewed with the goal of getting the needed remaining data as efficiently as possible.

Recent activities specific to the Elements include:

- **Flight and Integration Test Office (FITO)**
  - ***Ares I–X Roll Control System (RoCS) Interface:*** The review of the interface between RoCS and Upper Stage/Interstage for transfer of loads and potential changes to fastener sizes is ongoing. The team received the modified loads analysis from the SE&I Structural Lead on April 9, and the Teledyne team is looking at modifying the design for minimal impact to both sides of the interface. Teledyne and Marshall Space Flight Center (MSFC) personnel are working on the Verification Requirements Definition Sheet template and the population of the Teledyne internal database as trial balloons, in preparation for going forward with the approach to the Ares I–X Control Board (XCB) later this month. The RoCS team supported a Vibro-Acoustics Technical Interchange Meeting (TIM) at ATK/Huntsville. The RoCS top-level assembly drawing was released per the Kennedy Space Center (KSC) operational test requirements development schedule.

- **First Stage (FS)**
  - ***FS Preliminary Design Review (PDR)***: The FS element is currently holding their PDR kick-off on April 7–11. All deliverables have been completed and documented. Documentation review and Review Item Discrepancy RID submittal will occur until April 25. The PDR Pre-Board is scheduled for May 22 and the Board is scheduled for June 5.
  - ***Ares FS/Shuttle Reusable Solid Rocket Booster (RSRB) Thrust Vector Control (TVC):*** The Ares FS/Shuttle RSRB TVC transition plan for refurbishment of the Shuttle-flown hardware was presented to the NASA Headquarters (HQ) Transition Control Board (TCB) on April 1.

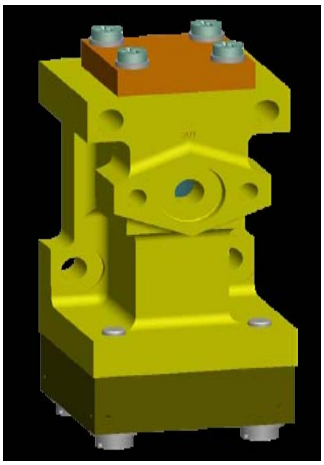
The Shuttle TVC system is the baselined system for Ares. The TVC components must be refurbished in a timely manner to protect the hardware from corrosion. Maintaining the TVC vendors through the end of Shuttle significantly reduces the cost risk to Shuttle by avoiding vendor shutdown costs. The Agency is currently determining how to provide funding for this effort.

Also, on April 1, Ares FS presented an action response to the NASA HQ TCB on the cost sensitivity to flying the Shuttle RSRB heritage Thrust Vector Control (TVC) system versus the payback period for developing a new Electro Hydrostatic Actuator (EHA) system. The decision was made to proceed with EHA development based on reducing processing time at KSC, and elimination of hydrazine. This effort is being funded by the Exploration Systems Mission Directorate (ESMD) and Ares.

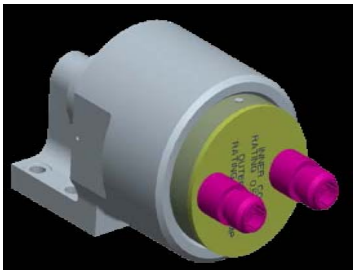
- ***Ares FS SE&I Team's Design Analysis Cycle 3 (DAC–3) Strategic Planning Meeting at ATK:*** The Ares FS SE&I team conducted a DAC–3 strategic planning meeting at ATK's Promontory facility during the week of April 1. Other participants included Vehicle Integration (VI) Integrated Design and Analysis (ID&A) personnel. Objectives of the meeting were to understand the delivery schedule for integrated vehicle data products and the dependencies of FS engineering design cycle on these products, leading to FS element Critical Design Review (CDR). Multiple schedule scenarios were developed and will be carried forward for consideration.

- **Upper Stage Engine (USE)**

  - ***Helium Spin Start Valve PDR:*** On April 3, a PDR was conducted for the J–2X Ancillary Valves (AVs). The AVs includes the three-way solenoid valve (SOV), four-way SOV, and the pressure actuated valve (PAV). These AVs are mounted on the J–2X Pneumatic Control Assembly (PCA) and regulate the flow of pneumatics to control valve positions and purges. The CDR is scheduled for July 24.



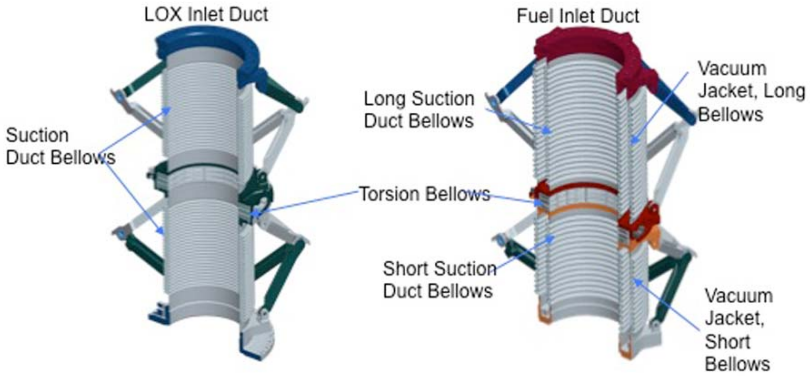
PAV



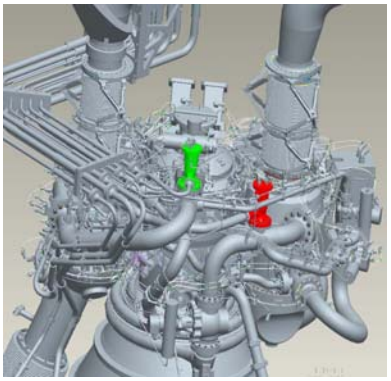
Three-Way SOV

Four-Way SOV

- ***Bellows Design Analysis Review:*** A drawing review of the LOX and fuel inlet bellows was successfully completed on April 8. The inlet bellows assembly is largely based on the design for the original J–2; however, to accommodate the greater loads anticipated on the J–2X, the bellows portion of the assembly has been redesigned. Strain gage data from recent PPA tests confirms redesign is required. Advantages of multiple ply bellows include: (1) Reduction in static and alternating stresses to improve low-cycle fatigue (LCF) capability and high-cycle fatigue (HCF) life; (2) provide additional damping capability to lower the flow-induced vibration stress amplitudes, and; (3) provide a robust design to guard against bellows surface defects due to handling and fracture control. The Bellows Design and Analysis Team recommended going forward with bellows redesigns for the inlet ducts.



- ***Oxygen Turbo Bleed Valve PDR:*** On April 2, a PDR was conducted for the J–2X Bleed Valves (BVs). The BV allows the recirculation of propellants to the main propulsion LOX and hydrogen tanks during tanking and J–2X engine chill. The CDR is scheduled for July 24.



J-2X Oxygen Turbo Bleed Valve

The Ares Project looks forward to the J–2X PPA–1A Test #7 (a 70-second test at 274K power level), which is currently scheduled for April 14.

…and as of this Ares Project Weekly Summary, there are only 369 days until the first Ares I test flight, Ares I–X!!!