

Space Flight Systems Directorate
Activities Report
March 23 - April 3, 2009

ADVANCED FLIGHT PROJECTS OFFICE

ISS and Human Research Project Office

ISS Research Program

Bench Review for FIR (Fluids Integrated Rack) and Light Microscopy Module (LMM) Completed at KSC. The first Hardware Bench Review for the Fluids and Combustion Facility's (FCF) Fluids Integrated Rack (FIR) stowed hardware and its first payload, Light Microscopy Module (LMM), was successfully completed on March 25, 2009, with the STS-128 crew members. The review examines the packing of the hardware in their stowage bags and is now ready for installation into the Transportation Racks of the Multi-Purpose Logistics Module (MPLM).

The FIR rack was officially turned over to Kennedy Space Center (KSC) to prepare the rack for final installation into the MPLM for STS-128 (17A). Installation is currently scheduled for April 7, 2009. Contact: MAH/Robert Corban, (216) 433-6642

2009-2010 DIME Student Competition Funded by Teaching from Space. The Dropping in a Microgravity Environment (DIME) student competition was selected for FY09 and FY10 funding by the Teaching from Space (TFS) program managed at Johnson Space Center (JSC). The DIME program is open to students from across the USA and provides an end-to-end experience where students propose, design, build, and test their own experiments in the 2.2 Second Drop Tower, after which they report on the results. This is a natural fit for the TFS program that provides educational opportunities using spaceflight and other environments unique to NASA. The DIME program, which ran for six years before cancellation in 2006, will be expanded from a high school program to include experiment opportunities for middle school students. In the latter case, the students will not travel with their experiments to GRC to participate in the drop testing. Educator workshop(s), distance learning, and an expanded internet will be instituted to further inspire, recruit, and support participants. NASA retiree Richard DeLombard, who initiated and directed the DIME program, was tapped to provide support. Contact: MAH/Nancy R. Hall, (216) 433-5643

Science Project Office

In-Space Propulsion Technology (ISPT) Project Office

ISPT Holds Mars Ascent Vehicle Technologies Interim Review with MSFC and JPL.

The ISPT Project held an interim review at the Aerospace Corporation in Pasadena, California, on March 31, 2009, with the NASA Marshall Space Center (MSFC) and Jet Propulsion Laboratory (JPL) regarding Department of Defense technologies applicable for the Mars Ascent Vehicles. Contact: MAS/Gray Research/John Dankanich, (216) 433-5356

NASA's Evolutionary Xenon Thruster (NEXT) Ion Thruster Wear Test Passes 750 Hours of Operation. On March 31, 2009, the NEXT Prototype Model (PM) ion thruster passed the halfway point of 750 hours of operation in Vacuum Facility (VF) 5 of Building 301. The goal of this wear test is to demonstrate that the PM thruster performance is

comparable to the Engineering Model (EM) thruster that currently operated over 21,000 hours in the Long-Duration Test (LDT). The PM thruster wear test uses the flight-like propellant management system for the duration of the test. Portions of the testing also include the flight-like power processing unit. To date, the PM thruster operates in kind to the EM LDT thruster and supports a propellant throughput capability of 750+ kg of xenon. This work is supported by the Science Mission Directorate under the direction of the In-Space Propulsion Technology Program. Contact: RPP/Jonathan Van Noord, (216) 433-5310

Advanced Capabilities Project Office

Energy Storage Project

Successfully Demonstrated a Key Technology Critical for Non-flow-through Fuel Cell Technology. An 18-layer assembly was fabricated to integrate hydrogen, oxygen, product water and coolant chambers into a single part, then built into a four-cell fuel cell stack. Testing shows that the high-precision manufacture of each layer created a highly conductive interatomic bond able to withstand high gas pressures. The system is running well and producing a respectable 0.8 volts per cell, even before platinum plating which will significantly boost performance. Successful development of non-flow-through fuel cell technology should lead to the minimization of balance-of-plant components, increasing reliability and reducing mass for Constellation's Altair and Lunar Surface Systems projects. Contact: MAC/Carolyn Mercer, (216) 433-3411

Thermal Wadi Article in Popular Mechanics. An online article in Popular Mechanics has appeared summarizing concepts discussed at the recent Lunar Surface Systems Workshop sponsored by the Washington, D.C. Chamber of Commerce. The article, posted at: http://www.popularmechanics.com/science/air_space/4307340.html describes some features of thermal wadis that have been developed by Robert Wegeng of Battelle Memorial Institute, Kurt Sacksteder (NASA GRC), Suleyman Gokoglu (NASA GRC), Ramswamy Balasubramaniam (NCSER), and James Fincannon (NASA GRC), and Nantel Suzuki of NASA Headquarters. The article was informed by an interview with Wegeng, a presentation by Sacksteder, Wegeng and Suzuki on thermal wadis at the Chamber of Commerce Workshop, and a paper presented at the AIAA Aerospace Sciences Meeting in Orlando, Florida, in January 2009. Thermal Wadis are engineered sources of thermal energy and electrical power using the solar flux stored during periods of solar illumination to sustain lunar surface assets during cold periods of lunar darkness. The thermal wadi concept is linked to a concept of standardized lunar exploration rovers built with common chassis, communications, avionics, power and thermal wadi interfaces which amortize development costs across a fleet of rovers, and which are individually more productive by the ability to survive periods of lunar darkness for months or years. Contact: REC/Kurt Sacksteder, (216) 433-2857

Cryogenic Fluid Management (CFM) Project

CFM Project Management Customer Coordination Review at JSC. On March 23-25, 2009, the CFM Project Management (Susan Motil/GRC and Terri Tramel/MSFC) held a series of customer coordination reviews at Johnson Space Center (JSC) to discuss results of the CFM Content Meeting held earlier in March. Key participants in the meetings were Al Conde (CxP Technology Manager) to discuss CFM content going forward; Lauri Hansen (CxP SEI Manager) to discuss Orion CFM needs, the need for a CFM flight test to get within comfort zones for LCH₄, and general CFM technology needs in block upgrades; Lunar Surface System's Technology Lead, Jonette Stecklein; and Kathy Laurini (Altair PM) and

Leslie Alexander (Altair Technology Lead). The reviews helped to gain insight into customer priorities, schedule and concerns that helped to pre-coordinate our final PPBE submittal to the ETDP Office. Contact: MAC/Susan Motil, (216) 433-8589

Advanced Composites Technologies Project (ACT) Selects Materials Systems.

The ACT project completed its first major Ares V milestone with the selection of material systems for Ares V payload shroud and intertank/interstage structures. After evaluating approximately ten candidate systems, four candidate resin/fiber systems were found to be the most promising based on performance, available databases, and resin out-time. Two of these systems were selected: an autoclavable 350° F toughened epoxy and an out-of-autoclave toughened epoxy were selected for further study. Significance: The selection of candidate material systems allows structural concepts to be evaluated with a common set of material properties. Planned activities over the next year will enable selection of candidate structural concepts and a final material recommendation. These efforts are necessary first steps towards higher technology readiness levels of composite structures for insertion into Ares V. Contacts: Project: MAC/Bob Draper, (216) 433-6779 and LaRC/Mark Shuart, (757) 864-2898; Technical: RXP/James Sutter, (216) 433-3226 and MSFC/Larry Pelham, (256) 544-9111

SPACE OPERATIONS PROJECT OFFICE

Space Shuttle Support (Project Manager - Carol A. Quinn):

Purge, Vent and Drain (PV&D) Sub-System STS-119 PV&D Landing Report. PV&D noted no anomalies during entry and landing. Vent door positioning for de-orbit, Entry Interface (EI), post EI and post landing was nominal. Purge was initiated 24 minutes after the upper aft safety assessments were completed so a waiver will not be required. Purge was initiated 57 minutes after touchdown, exceeding the 45 minute limit, so a Data Trend Notice (DTN) will be written by KSC United Space Alliance PV&D engineering. Contact: DEF/Diana Centeno-Gomez

SCaN (Project Manager - Robert D. Corrigan, Acting):

10 Watt Ka-band Solid State Power Amplifier: The performance of a Ka-band solid state power amplifier (SSPA), manufactured by Advanced Communications Research and Development (Spain) for GRC, was verified. After initial start-up problems and an unusually long “warm-up” period, an output power of approximately 10 W at a corresponding gain of 40 dB from 30.0 to 31.0 GHz was realized. Efficiency was 10 %. This work is conducted under the Advanced Antenna Technology Task of GRC’s Space, Communication, and Navigation (SCaN) project. Contacts: RHA/Dr. Robert Romanofsky, 3-3507, RHA/Doug Hoder, 3-3438