

Mission Success Bulletin

August 30, 2007

on-line

<http://www.lockheedmartin.com/michoud/>

Endeavour Touchdown!



Space Shuttle Endeavour lands smoothly at Kennedy Space Center on August 21 after a successful 13-day mission.

ET Project focuses on LO2 feedline bracket mods

Electrical, propulsion and structural systems perform nominally on ET-117

The 50 people inside the Mission Support Room in Building 101 thought the August 8th STS-118 launch and ET-117 separation had gone fairly well. Certainly, they had observed a few pieces of what appeared to be foam debris flash before the onboard cameras, but they weren't sure if any had impacted *Endeavour*.

Indeed, it would be two days before the imagery confirmed that some of the debris had contacted the Orbiter, and that at 58 seconds into flight one piece of foam, ice or both had unfortunately bounced off a thrust strut near the bottom of the ET and up against *Endeavour's* heat shield, creating a

small gash.

NASA studied the impact by conducting thermal analysis, computational fluid dynamics, and arc jet tests for several days while the astronauts carried out their mission on board the International Space Station. On August 16, nine days into their mission, the agency decided the damage wasn't a threat to crew safety during re-entry, and that *Endeavour* would land "as is." So a spacewalk to repair the slight gouge wasn't deemed necessary.

From Michoud's standpoint, with eight debris events, the tank performance had been pretty clean when looking at the metrics, according

to ET Program Manager **Wanda Sigur**. The piece that bounced into the Orbiter, like the other debris, was in-family, had been observed on multiple missions, was in the allowable specification range, and had been assessed by Shuttle Integration, she pointed out.

That piece of debris came off one of five liquid oxygen (LO2) feedline brackets that run down the Liquid Hydrogen Tank. Another similar piece of debris came off a different LO2 feedline bracket at 40 seconds into flight, but did not contact the Orbiter.

A redesign of the brackets is in sight on ET-128, slated to fly next April. The aluminum brackets now covered

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Bracket

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with foam ablator will be replaced with titanium brackets with reduced foam and ablator. Titanium is less of a conductor for cold or heat than aluminum. So less Super Light Ablator (SLA) will be needed around the new bracket area and will require less of a foam footprint.

Less foam should mean less debris, but the ET-128 redesign is still four launches away. What about bracket debris from the next launches? “We have looked at multiple options to address the LO2 feedline bracket support areas where we’ve seen foam loss previously,” Sigur explained. “Those changes range from very minor things to removal and replacement of complete sections of the foam. We’ve proposed an option to remove the

existing foam and SLA at the upper bracket areas where foam losses have been noted, and replace them with a reduced profile spray foam configuration. In addition, we are assessing whether we may be able to add water condensate diverters to avoid the volume of ice we get in that joint. The design change is proposed for the top three bracket stations.”

Those three highest brackets on the LH2 tank get special scrutiny because they move more than the bottom two. Drivers for the bracket foam loss include ice formation and motion of the LH2 tank at its top. “When significant ice freezes in the gap at these joints, on-pad pre-launch conditions can cause the ice to apply load to the foam and subsequently crack,” Sigur explained. “Steps to minimize the ice formation and subsequent loading of the foam will reduce the risk of debris.”

In order to gain access to the brackets, ET-120 mating operations to the Solid Rocket Boosters will be delayed.

Also, there were two other debris occasions from acreage foam at the top of the LH2 tank near the Intertank flange. One impacted the Orbiter; the other nicked the Orbiter tiles. Both occurred after the critical debris transport time – 135 seconds into flight. Kennedy Space Center personnel assisted by Michoud’s KSC Operations have done a hands-on inspection of the same area on ET-120.

“They have identified two areas that they think are suspect so we’re going to go forward with repairs,” Sigur reported. United Space Alliance technicians will remove the soft foam, sand it, and then repair it with foam pours if required. She said these repairs should not take long.

Sigur reminds the External Tank team that ET-117’s electrical, propulsion, and structural systems all performed nominally. “The team needs to recognize first that the good work they’ve been doing for RTF (Return to Flight) was also demonstrated on this vehicle. However, foam loss or any type of debris poses risk to the Orbiter. It’s a very delicate vehicle. So we need to look at these things that we’ve been trying to deal with and had put on the agenda to include on ET-128, and consider what we need to do to bring them in closer or do them faster.” ■



“We appreciate all the attention on the ding on the tile, but actually the Orbiter came back pretty clean.”

NASA Administrator Michael Griffin

“It was a bit ‘under’-whelming. To see it, it looked rather small.”

Commander Scott Kelly (below left)

First Friction Stir Weld tank completes major milestone

It was a long road, but ET-132 – the first Liquid Hydrogen Tank using Friction Stir Welding – endured and completed proof testing in Building 451 on August 14. Barrels 3 & 4 of the tank were Friction Stir Welded back in early 2003, but then a series of obstacles stopped the tank's progress.

First, the *Columbia* accident led to a suspension in production activities; later, Hurricane Katrina demolished the proof-test facility. When the facility re-opened earlier this year, equipment problems shut down the initial proof test.

But after a four-year wait for proof testing, all that is behind ET-132 now. It passed the critical proof test with loads and stresses applied that are similar to those the tank will encounter in flight. The test proves that the Friction Stir Welding application is acceptable for manned space flight. Up until ET-132, all previous hydrogen tanks had been joined using Variable Polarity Plasma Arc Welding or VPPA.

To improve the reliability of the External Tank, NASA and Lockheed Martin turned to Friction Stir Welding

— a solid-state process where a rotating tool with a shoulder and a projecting pin is plunged into the weld joint until the shoulder contacts the surface. Frictional heating caused by the rotating pin tool and applied pressure (approximately 10,000 lbs.) plasticizes the material. As a result, weld joints are more efficient, yielding 80 percent of base material strength. Fusion welding claims only 40 to 50 percent of base material strength.

Beginning with ET-132's LH2 tank, Lockheed Martin has now welded five tanks using Friction Stir Welding.

"I remember in 2003 when we fabricated the third and fourth barrels of ET-132's hydrogen tank using Friction Stir Welding," said **Bill McGee**, chief weld engineer. "Each barrel consisted of eight orthogrid panels and took about two weeks to assemble. Barrels three and four were constant thickness weld joints. This meant for the 20-foot length of the barrel panel, the thickness of the weld remained 320-thousandths of an inch."

Fast forward four years to the triumphant proof test in Building 451

two weeks ago. "Proof testing was the final acceptance test the hydrogen tank had to undergo to prove that the Friction Stir Weld configuration met performance requirements," according to **Dan Callan**, director, Mission Success.

During the four-hour test, the LH2 tank was pressurized to 38 pounds per square inch with gaseous nitrogen, and a sequence of jack loads were applied by eight hydraulic rams to the tank's aft interface points.

"This test was a major milestone for Friction Stir Welding, and demonstrated that the pressure vessel will perform the mission that it was designed for," added Callan.

Today, the LH2 tank is back in the factory, undergoing post-proof Non-Destructive Evaluation in the 7077 tool. The tank is on track to integrate with the Liquid Oxygen Tank/Intertank in the Vertical Assembly Building next spring to complete the ET-132 stack.

Then the waiting will be almost over, and the tank will fly its shuttle mission about a year later. ■



Systems test technicians (from left) Enrique Lacayo, Joseph Bordelon, Lawrence Meserve, and Peter Finger disconnect one of the eight rams that were used to successfully proof test ET-132's Liquid Hydrogen Tank in Building 451.

AALF conference focuses on career development

Beginning with a welcome from Vice President & Site Executive **Manny Zulueta**, the Southeast Region of the African American Leadership Forum (AALF) kicked off a Face-to-Face conference in New Orleans August 10 & 11.

Zulueta encouraged 175 Lockheed Martin participants to use the conference as an opportunity to learn more about the corporation, to talk with executives about managing one's career, and to

Regarding personal careers, Zulueta issued a challenge, "Whatever you're doing, think more globally about what it is the enterprise is asking you to do." He charged individuals to deliver results that go beyond job descriptions and to turn each assignment into a stretch assignment.

Along the same lines, **Mike Javery**, vice president, Operations, said, "The one single thing that will make or break

Wanda Sigur, vice president, External Tank Project, told attendees, "My general experience is that you are more empowered than you think."

Summarizing many of the points made during the discussion, **Marshall Byrd**, vice president & general manager, Commercial Space, asked the following question. "If you're not going to take charge of your career, who is?"

Byrd offered the following advice,



build relationships with those who can guide and mentor a career.

Michoud Operations hosted the conference with the theme, "Shaping the Future – Managing Your Career Growth thru Performance +." Guest speakers provided tools for career development, and focused on talent retention and Full Spectrum Leadership.

In keeping with the theme and the goal of improving inclusion and diversity throughout Lockheed Martin, **Sonya Stewart**, corporate vice president, Diversity & Equal Opportunity Programs, told participants, "It will come from a collective effort of everybody working collaboratively to make this a better corporation."

Emphasizing that change is interactive, Stewart called upon the audience, "Don't just sit back — sit up, look forward, and engage!"

you is effort. Everybody's capable at the end of the day. The people who get the good assignments, top evaluations, and promotions will be the individuals who set themselves apart from others."

Javery emphasized four aspects in developing one's career:

1. Intellectual aspect, a curiosity about the business, – ask questions, do research, find out about the business
2. Social aspect – have the ability to self-promote, build relationships with peers and managers, develop personal networks
3. Influential aspect, similar to executive charisma – being able to energize a team and to get others to work with you
4. Planning aspect – set career goals, develop a plan for reaching them, shape your future

"Get focused on where you want to be, how many routes you're going to take to get there, and always have a plan."

The AALF – Southeast Region consists of Lockheed Martin business participants from South Carolina to Louisiana.

"AALF is a self-help forum aimed at improving the performance of Lockheed Martin by leveraging the power of diversity and the development of personal mastery," according to **Matt Milligan**, Southeast Regional leader and program director, Aircraft Survivability Programs, Missiles & Fire Control in Orlando.

Participation in the AALF is voluntary. For more information about AALF at Lockheed Martin, go to <http://aalf.global.lmco.com> on EVPN or LMPassage. ■



Snoopy Award winners honored

During their visit to Michoud August 1, crew members from the June STS-117 mission presented Silver Snoopy Awards to **Jon Street** of NASA along with **Warren Ussery**, **Geneva Robertson**, **Tim Murphy**, and **Doug Powell** of Lockheed Martin.



STS-117 Pilot Lee Archambault presents Silver Snoopy to Doug Powell of KSC Operations.

Street, a NASA Michoud resident engineer, received the award for engineering leadership of production support and technical risk assessment for non-conformances on ET flight hardware. Robertson, a senior electrical fabricator, accepted a Snoopy for her dedication and efficiency in building electrical harness assemblies.

For performing as the ET Engineering Change Manager and for coordinating design integration across

all directorates, Murphy, a senior staff systems engineer, achieved his Snoopy. Ussery, a staff research engineer, was recognized for his involvement in the redesign of ET-120's Ice Frost Ramps.

NASA awarded Powell (pictured left), a TPS/mechanical engineer, with a Snoopy for outstanding dedication and support of Return to Flight activities and hail damage recovery efforts.

Congratulations to the winners. Their outstanding dedication and commitment reflect NASA and Lockheed Martin's goal of Mission Success. ■



Snoopy winners (front row from left): Jon Street (NASA), Geneva Robertson, Tim Murphy, and Warren Ussery. Astronauts from left: Mission Specialist Patrick Forrester, Commander Rick Sturckow, Pilot Lee Archambault, and Mission Specialist Steve Swanson.

NASA Administrator tours Orion facility

On August 9, the day following the STS-118 ET-117 launch, NASA Administrator Michael Griffin walked the Operations & Checkout (O&C) Building, which will serve as Lockheed Martin's final assembly and integration site for the Orion capsule at Kennedy Space Center.

Demolition of obsolete systems has begun in the O&C factory and design of critical systems including HVAC, electrical, and bridge cranes has reached 30 percent. Other work packages are in design at the historic KSC structure.

Touring the factory from left are Tom Pentrack, deputy director, NASA KSC ISS & Spacecraft Processing; Matt Carol, NASA O&C facility activation lead; Lloyd Gregg, USA Orion program manager; Richard Harris, LM Orion deputy program manager, Production; Griffin; Russell Romanella, director, NASA KSC ISS & Spacecraft Processing; Jules Schneider, LM Orion Assembly, Integration & Production senior manager; Scott Wilson, NASA Orion Production Operations lead; Cheryl McPhillips; NASA KSC Constellation lead; and Tom Mott, LM Orion O&C facility activation manager.



EVO plans its fall calendar

After a successful construction project in St. Bernard Parish where volunteers helped build two homes this past month, the Employee Volunteer Organization is organizing its end of summer and fall schedule of service projects.

Beach Sweep 2007

Saturday, September 15

Litter clean-up: 9 a.m. – Noon

Picnic: Noon – 2 p.m.

Volunteers to clean streets and roads as part of the Ocean Conservancy's International Coastal Clean-Up and storm drains and ditches around Lake Pontchartrain both Northshore and Southshore

Contact: **Tyler Spalding** at 7-1517 or email tyler.r.spalding@maf.nasa.gov

Friends of the Jefferson Animal Shelter

8:30 a.m. – 2 p.m. Saturday, October 20

This event is a Pet Adoption Day for dogs and cats. The EVO is looking for ten volunteers to meet at 8:30 a.m. at the Jefferson Parish Animal Shelter at

#1 Humane Way in Harahan to help bathe and walk the dogs. The shelter staff then transports the animals to the adoption site. The pet adoption event begins at 10 a.m. and ends at 2 p.m.

In addition to bathing and walking the dogs, volunteer responsibilities include screening potential adoptive parents, caring for the animals during the event, and set-up and clean-up.

Contact: **Tyler Spalding** at 7-1517 or email tyler.r.spalding@maf.nasa.gov

The City Park Event

October-November timeframe

The EVO is making arrangements at City Park to work at the Botanical Gardens or amusements area or to help paint Pan American Stadium. The EVO is looking for 10-20 volunteers for this event.



USO Stuffing Party

October timeframe

The EVO wants to help the USO stuff packages of goodies to be sent overseas to our troops. Approximately 125 volunteers will be needed for this activity. Remember several years ago when we stuffed care packages for our soldiers overseas, we had the largest turnout of volunteers ever for a single project.

Please check the EVO website for details at <http://maf509.maf.nasa.gov/303x/evo/index.htm> ■

Meetings with foreign persons – be mindful

Issues stemming from the June 1 visit to Michoud of the STS-120 astronaut crew, which included Italian citizen and astronaut **Paolo Nespoli**, demonstrate that it is critical when conducting a meeting or participating in a telephone conference call with non-Lockheed Martin personnel – that all understand the “rules” for dealing with foreign persons.

First, determine in advance if export-controlled technical data will be discussed, and whether foreign persons are expected to participate. If “yes” to both, check with the Michoud Operations export control staff — **Judy Russell** at 7-1337 or **Tom Rau** at 7-4111. A license or other authorization may permit the discussions.

Second, if Lockheed Martin is sponsoring the meeting, the host must

fill out the Foreign Travel/Meeting/Visitor Notification form and submit it in advance of the meeting to the Michoud export control staff for approval. See Standard Procedure 6-13, Export Requirements. It is required for such meetings, when technical data may be exchanged or when general public domain capability-type data will be discussed. It is also required for telephone conference calls, if technical data may be discussed.

Third, just prior to the meeting or telephone conference call, the Lockheed Martin meeting lead (or if NASA is sponsoring the meeting, the most senior Lockheed Martin person present) should “set the level” of the meeting. That is, the lead should inquire as to the presence of foreign persons and announce whether export control

technical data will be disclosed.

Failure to observe these rules, when technical data is to be discussed, may result in an export control violation — which can result in criminal and civil penalties, denial of the privilege of doing business with the U.S. Government, and substantial negative publicity for Lockheed Martin.

The Michoud export control staff has developed a “setting the level” chart that may be used in making this announcement. Observing this third rule may help avoid an unintentional export control violation, especially when Lockheed Martin is not the meeting lead or sponsor.

Again, if you need clarification on executing these rules or have an export control question, call Judy Russell or Tom Rau. ■

Hurricane Preparedness: Michoud is prepared; are you?

The most dangerous part of hurricane season is upon us again. Meanwhile, recovery is an ongoing process that continues with Katrina's second anniversary milestone this week. Remember the Boy Scout adage — Be Prepared. Are you ready? Take a moment now to update your data and personal information on:

- LM People
- Check out maffamily.com at <http://www.lockheedmartin.com/wms/findPage.do?dsp=fec&ci=17260&rsbci=15260&fti=0&ti=0&sc=400> for updates; and,
- Here's a checklist of hurricane preparedness tips from the National Oceanic & Atmospheric Administration (NOAA) for you and your family:

Family Disaster Plan

- ✓ Discuss the type of hazards that could affect your family. Know your home's vulnerability to storm surge, flooding and wind
- ✓ Determine escape routes from your home and places to meet. These should be measured in tens of miles rather than hundreds of miles
- ✓ Have an out-of-state friend as a family contact, so all your family members have a single point of contact
- ✓ Make a plan now for what to do with your pets if you need to evacuate
- ✓ Post emergency telephone numbers by your phones and make sure your children know how and when to call 911
- ✓ Check your insurance coverage - flood damage is not usually covered by homeowners insurance
- ✓ Stock non-perishable emergency supplies and a Disaster Supply Kit
- ✓ Use a NOAA weather radio. Remember to replace its battery every 6 months, as you do with your smoke detectors
- ✓ Take First Aid, CPR and disaster preparedness classes

Disaster Supply Kit

- Water — at least 1 gallon daily per person for 3 to 7 days
- Food — at least enough for 3 to 7 days
 - non-perishable packaged or canned food / juices
 - foods for infants or the elderly
 - snack foods
 - non-electric can opener
 - cooking tools / fuel
 - paper plates / plastic utensils
- Blankets / pillows, etc.
- Clothing — seasonal / rain gear/ sturdy shoes
- First Aid kit / medicines / prescription drugs
- Special Items — for babies and the elderly
- Toiletries / hygiene items / Moisture wipes
- Flashlight / batteries
- Radio — battery operated and NOAA weather radio
- Telephones — fully-charged cell phone with extra battery and a traditional (not cordless) telephone set
- Cash (with some small bills) and credit cards — banks and ATMs may not be available for extended periods
- Keys
- Toys, books and games
- Important documents — in a waterproof container or watertight re-sealable plastic bag
 - insurance, medical records, bank account numbers, Social Security card, school records, etc.
- Tools — keep a set with you during the storm
- Vehicle fuel tanks filled
- Pet care items
 - proper identification / immunization records / medications
 - food and water
 - carrier or cage
 - muzzle and leash



Emergency Information

To find out work status during hurricane season at Michoud, go to www.mafstatus.com or call 257-1MAF or 1-800-611-3116, check ETV or listen to WWL-870 radio or visit wwl.com or watch WWL-TV, Channel 4 or visit wwltv.com

Road trip to KSC

No, they're not beach bums. They're Lockheed Martin employees and their guests who took vacation time and rode a chartered bus from New Orleans to the "Space Coast" to watch the STS-118 launch near Kennedy Space Center on August 8. The LMents organization sponsored the bus trip that was open to all employees.



Milestones *Employees celebrating anniversaries with Lockheed Martin in September 2007*

30 Years

Eric Atlow
Joseph Bruno
Gregory Cucinella
Calvin Madison
Lawrence Meserve
Randy Strahan

Beuron Cannon
Lori Cantrell
Dana Dreyfus
Erick Engelhardt
Metrovon Fomich
Boris Goufman
Jeffrey Hinds
Marty Hrovat
Antonio Johnson
Robert Johnson

Barry Matherne
Gary Perniciaro
Curt Smith
Richard Welch

20 Years
Roy Charbonnet
John Lagaite
Sandra Petkosh

15 Years
Richard Silvers
Allen Sorrell

10 Years
Adam Baran
Miroslav Cutura
Troy Dupuis
Jeremy Luke
Sean Lusk

Paul Newton
Alan Truitt
Jonathan Zullo

5 Years
Michael Clogher
Dean Noel

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