Space Systems Company – Michoud Operations

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Mission Success Bulletin

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NASA to fly first day of window

NASA has scheduled the next Space Shuttle flight, STS-121/ET-119, on the very first day of the launch window – at 2:48 p.m. CDT Saturday, July 1.

Top level NASA managers made the final decision to go for launch in the Flight Readiness Review (FRR) on June 17.

External Tank-119 will help propel Orbiter *Discovery* into space and be the first to fly without Protuberance Airloads (PAL) ramps – a major design change to the vehicle.

A piece of foam from the PAL ramps came off during STS-114 last July, so NASA decided in December to remove the Liquid Oxygen Tank and Liquid Hydrogen Tank PAL ramps.

During the FRR, several NASA managers preferred to delay the launch in order to redesign the ice frost ramps.

But NASA Administrator **Michael Griffin** said that the possibility of foam loss at the ice frost ramps would not pose a significant risk to the safety of the crew. NASA and Lockheed Martin continue to explore options for redesigning the ice frost ramps in question.

"I don't want to get us into a situation where, by being more cautious than I think technically is necessary today, we wind up having to execute six flights in the last year," Griffin said.

NASA ET Program Manager **Wayne Hale** has said numerous times that the project should fly with only one major modification to the tank at a time.

"I think it is acceptable for a number of reasons to go fly for a limited number of flights until we come up with a new design," Hale said of the ice frost ramps.

STS-121 will fly a crew of seven to the space station where German astronaut **Thomas Reiter** will remain, thus increasing the station crew to three. Astronauts also will test new hardware and inspection techniques to improve shuttle safety, deliver supplies and make repairs to the station during the 12-day mission. ■

Final preparations are under way for STS-121/ET-119 to launch July 1.

Work continues on ET-118 at KSC

As weeks turn into days in advance of the STS-121 launch, the work pace quickens on the launch on- need tank, ET-118. Since arriving at Kennedy Space Center on June 9, ET-118 has become the center of attention for Michoud employees who are working to complete necessary activities in Florida.

According to **Ben Ferrell**, manager, Operations & Integration who is monitoring the work from Michoud, crews have four main tasks on ET-118:

1) remove and replace the engine cut-off (ECO) sensors, just as technicians did on ET-119
2) vent the Intertank foam
3) complete shakedown plan
4) complete Non Conformance Documents deferred to KSC.

"The work is going fairly well," Ferrell said. The schedule shows that crews need to be off the tank July 9. In fact, in the first week of work beginning June 12, crews completed the venting

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ET-118

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of the Intertank and started preparing for the ECO sensor removal, scheduled for week two.

Mike McGehee, senior manager, ET Recurring Build, estimated Michoud will have 75 people working on ET-118 at KSC. As employees rotate in and out, that number could grow to 90.

"They're doing well, staying on schedule," says McGehee who travels to and from KSC.

"I've got a real good feeling about this. Everybody's got a can-do attitude, and we're making good progress."

Besides serving as a back up tank for STS-121, ET-118 is scheduled to fly with *Atlantis* as part of the STS-115 mission with launch to take place in late August or September. ■

CEV enters final two-month stretch

Few steps remain on the schedule in the competition to design, develop, test and build the Crew Exploration Vehicle (CEV).

Teams from Lockheed Martin and from Northrop Grumman-Boeing are massaging their final proposals that are due next month. Then NASA is expected to announce the winner within ten weeks when Authority to Proceed is issued.

If Lockheed Martin wins the competition, much of the CEV structures work will come to Michoud. CEV work here would also include a Thermal Protections Systems design for a heat shield and back shell.

This week the Lockheed Martin team will meet with NASA officials to discuss the proposal and answer questions on Wednesday at Johnson Space Center. Part of that discussion will include Lockheed Martin's Best and Final Offer cost model, submitted earlier this month.

Best and Final Offer is the corporation's final price for CEV based on the latest requirements, configuration, Concept of Operations, etc. Michoud's **Richard Harris**, deputy program manager for production on CEV, will participate in that discussion.

A conceptual image of the Crew Launch Vehicle, which will carry the Crew Exploration Vehicle atop the rocket

Meanwhile, the CEV team continues to update its proposal and will submit its Final Proposal Review (FPR) to NASA at the end of July.

Jules Schneider, Michoud's assistant CEV program manager, calls the FPR the last submittal as part of the Phase II procurement that incorporates all changes and updates to the CEV proposal. The Michoud team is busy working on its share of the inputs.

Once all this is done, it will be almost like having a negotiated contract in front of both parties, Schneider explains. "If selected, we'll be able to ramp up very quickly at Michoud."

In addition, the CEV baseline calls for final assembly and integration work to be done at Kennedy Space Center. "That's important to Michoud because we've been tasked to lead that effort at KSC," Schneider adds.

"It's exciting to work on CEV knowing that we will be involved in developing the next spacecraft that will put humans into space, on the moon and eventually on to Mars."

The new spacecraft is expected to carry up to six astronauts into Earth orbit soon after the Space Shuttle is retired in 2010 and then to the moon by 2018. ■

Big turnout for Safety & Health Fair

At Michoud's four-day Safety & Health Fair last week, employees took the opportunity to discuss safety tips with those in the industry and talk to a variety of health professionals. From blood pressure checks to eye screenings to press-point massages, the fair serves as a venue for those concerned about their health. For some employees, this was the first time they had seen a health professional since Hurricane Katrina. ■

IFA teams conclude foam loss probe

{NASA and Lockheed Martin jointly established five In-Flight Anomaly (IFA) teams to investigate foam loss from the Protuberance Airloads (PAL) ramp, bipod, ice frost ramps, flange and acreage areas after the STS-114 launch last July. ***Paula Hartley*** *led the effort for Lockheed Martin. The Mission Success Bulletin talked with her about the probe.}*

Where does the investigation stand now?
Hartley: The IFA investigation is virtually complete. The fault trees have been closed for all five teams. Four of the five teams have issued their test reports. The fifth team will report soon. We are on track to issue the final IFA report before the next flight.

What has come out of the investigation?
Hartley: Sixty-plus recommendations ranging in complexity from mandatory hardware redesign to enhancements in the build documentation. The project has reviewed each of the recommendations and established closure plans. The plans have been prioritized and will be brought to closure through a combination of test and analysis to ensure that our hardware fully benefits from the lessons learned from this investigation (see graphic for probable causes and corrective actions).

What are and will be the biggest changes?
Hartley: The most significant changes were associated with the PAL ramp and bipod areas resulting in hardware redesign for STS-121/ET-119. The ice frost ramps are the next components to be considered for redesign. A joint Lockheed Martin/NASA team has been established, and several design options are under consideration for near-term implementation. No specific actions will be implemented for Intertank flange or acreage. However, across all five teams we have simply put better processes in place – how we handle hardware, our enhanced inspections and our attention to detail. We remain committed to continuous process improvement after STS-121 and all subsequent flights to ensure the total health of the tank.

Did the PAL Ramp IFA team's work last fall contribute to NASA's decision to remove the ramps?
Hartley: Yes. The investigation team utilized ET-120 as a test bed to establish the most probable cause for the foam-loss event. As this tank had experienced two thermal cycles, we had a unique opportunity to test some theories. Ultimately, cracks were identified under the PAL ramps and were deemed to result from thermal conditioning. As this condition is inherent to the design, the team revisited a previous proposal to eliminate the PAL ramps. Analysis confirmed that elimination of

Bipod Fitting Closeout

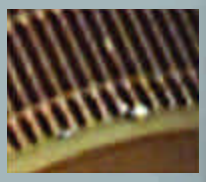
Most Probable Cause

Divot caused by cryoingestion through and into cable

Corrective Actions

- Sealed / filled bipod wires to stop cryoingestion leak path
- Enhanced / validated harness bonding process to eliminate void volume under harnesses

Intertank/LH2 Tank Flange, 2 locations



Most Probable Cause

Foam loss caused by voids in the close-out manual spray foam subjected to ascent thermal and pressure environments

Corrective Actions

- *Enhanced trim & inspection prior to flange closeout*
- *Performed thermal / vac tests for delta pressure void time-to-divot*

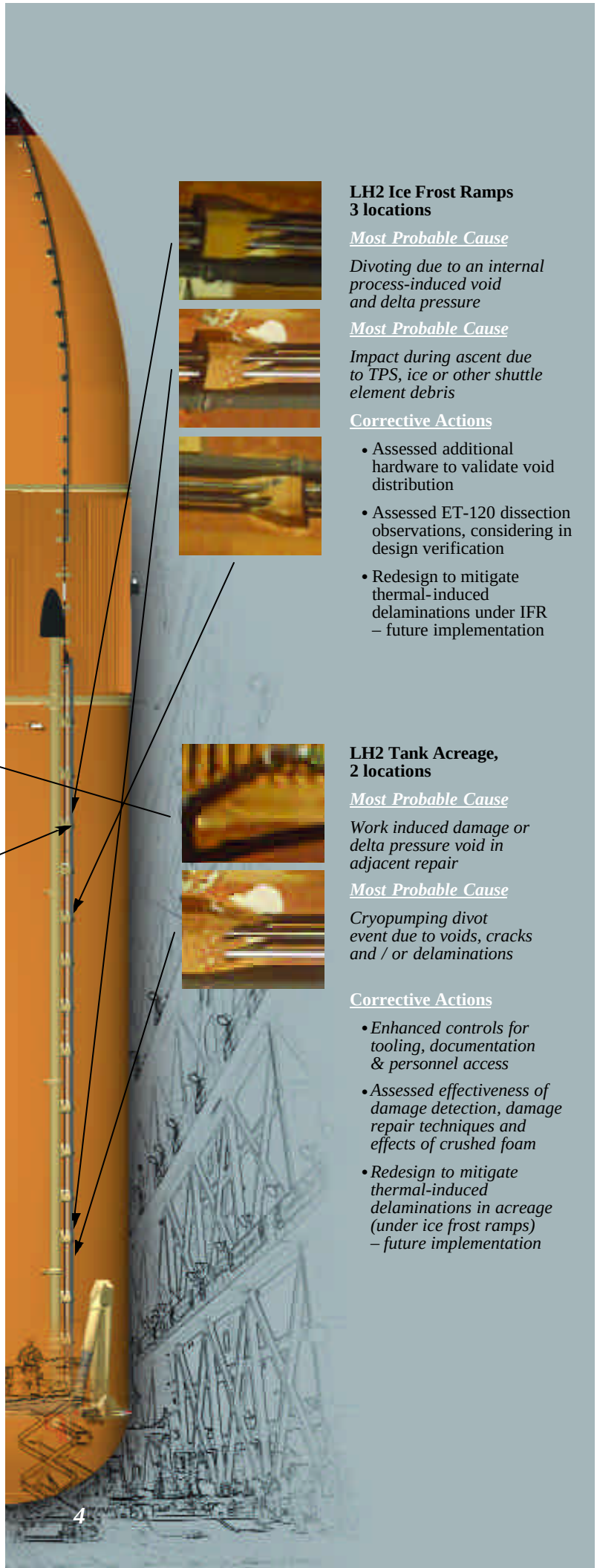
LH2 PAL Ramp

Most Probable Cause (combination of both)

- *Cryopumping of outside air through leak path connecting to atmosphere*
- *Defect(s) and / or damage to initiate failure or driving force to peel foam from tank*

Corrective Action

- *Eliminated LO2 and LH2 PAL ramps*



LH2 Ice Frost Ramps
3 locations

Most Probable Cause

Divoting due to an internal process-induced void and delta pressure

Most Probable Cause

Impact during ascent due to TPS, ice or other shuttle element debris

Corrective Actions

- Assessed additional hardware to validate void distribution
- Assessed ET-120 dissection observations, considering in design verification
- Redesign to mitigate thermal-induced delaminations under IFR – future implementation

LH2 Tank Acreage,
2 locations

Most Probable Cause

Work induced damage or delta pressure void in adjacent repair

Most Probable Cause

Cryopumping divot event due to voids, cracks and / or delaminations

Corrective Actions

- *Enhanced controls for tooling, documentation & personnel access*
- *Assessed effectiveness of damage detection, damage repair techniques and effects of crushed foam*
- *Redesign to mitigate thermal-induced delaminations in acreage (under ice frost ramps) – future implementation*

the ramps posed no safety of flight issues. Subsequently, the liquid hydrogen and liquid oxygen PAL ramps have been eliminated.

Did the decision to remove the PAL ramps affect the ice frost ramps?
Hartley: This drove a slight modification to the ice frost ramps that were in conjunction with the PAL ramps. The current design includes what we call ice frost ramp extensions on each of the affected ice frost ramps – six where the LH2 PAL ramp was located and three where the LO2 PAL ramp was located.

How big are the ice frost ramp extensions?
Hartley: They're relatively small – approximately 20 inches by 4 inches and extend outboard three inches onto the acreage. As a point of interest, it's the same configuration that we have on all the other ice frost ramps. Essentially, it's not new.

So ET-119 has only PAL ramp and bipod changes?
Hartley: That's correct; the redesigns are limited to these regions. However, process improvements – such as the placement and control of mats used on top of the tank while processing in the horizontal orientation – have been implemented, all in an effort to protect the hardware.

When will the ice frost ramps be redesigned?
Hartley: The Lockheed Martin/NASA team that I referenced earlier is committed to implementing the changes as quickly as possible, potentially as early as STS-116/ET-123, which is scheduled to fly in December of this year. Although anxious to improve upon the current design in a timely manner, we will not compromise our rigorous verification and validation processes.

What was the toughest thing about the investigation?
Hartley: The sheer volume of work and technical issues coupled with the impacts of the hurricane offered significant challenges. Through December, most of our team was located at Marshall Space Flight Center, resulting in tremendous personal sacrifices. Technically, the elimination of the PAL ramp was a very emotional decision. Determination of the most probable cause, which led to the decision, was a result of hundred of hours of work including tedious dissections on ET-120 and high-fidelity mock-ups, hardware test and analysis, and lots of interchange meetings.

Roughly 100 people served on these five IFA teams across all organizations – did they also work on getting ET-119 and ET-118 out the door?
Hartley: These folks did it all. They fully supported IFA activities and didn't miss a beat on their daily activities with production processing.

What did we learn from this investigation?
Hartley: We learned that we're actually doing a good job on the processing of foam on our tank. The dissections that we did beyond the cracks that surprised us showed that we had good process controls in place. We had minimum voids, minimum void distribution. We learned that our models for the most part were verified by what we were seeing on the hardware, which always makes people feel good. But we also recognized that we could do things better. ■

Baham appointed to Ethics position

Lockheed Martin has named **Lillian Baham** as Ethics manager, effective July 3. She will report to Marshall Byrd and succeeds **Feltus Kennedy** who is retiring.

In the new full-time position, she will oversee all matters relating to ethics and business conduct at Michoud Operations. "I want to be a source of information for anyone who has questions about ethics or a particular situation," Baham said. "My door will be open to employees."

Baham joined Lockheed Martin in 1977 as a stenographer in Systems Engineering. Later, she became an administrative secretary. Going to school at night, she earned a degree in business administration from Southern University in New Orleans in 1981.

The following year she moved to Materiel Sourcing where she worked in Status & Expediting. Subsequently, she became a buyer, then a contract administrator and was promoted to purchasing manager in 2001.

She is a member of the Michoud Diversity Council and active in the Mentor/ Mentee Program. ■

Michoud welcomes Coast Guard Command

The United States Coast Guard Integrated Support Command New Orleans will soon call the Michoud Assembly Facility home.

Hurricane Katrina severely damaged the Coast Guard facility along the Industrial Canal at the locks, and the government deemed the site "beyond economical repair."

Assembly of the Coast Guard's interim, modular facility at Michoud will be completed in August on a 16½-acre site near the intersection of Mercury Drive and Saturn Boulevard.

"The Coast Guard has entertained the thought of moving to Michoud for about ten years," says **Ernest Graham**, NASA project engineer. "The Corps of Engineers has plans to expand the locks at the Industrial Canal, and the Coast Guard's facility is in the middle of that expansion area."

The interim facility at Michoud will include administrative office space, housing, industrial support, facilities engineering, a galley and medical and dental care for 200 personnel.

The Coast Guard plans to build a permanent facility located just west of the interim complex by 2009.

According to Long Range Planning Manager **Elliot Perret**, Facilities & Environmental Operations is coordinating dig permits and tie-in points for utilities as well as assisting NASA with negotiating support services for the interim facility.

Michoud will also become the home port for the Coast Guard Cutter, *Pamlico*, a 160-foot construction tender whose crew builds and maintains aids to navigation in the bayous and waterways of south Louisiana. Future plans for the Coast Guard include a military exchange and a lounge/recreational facility.

"I look at this as a win-win situation, having the Coast Guard on site. They will bring in a lot of support and added security, especially during hurricane season," Graham exclaims. ■

Construction crews begin the final phase of the Coast Guard's interim facility where 200 people will work on the west end of the Michoud Assembly Facility.

Tom Marsh retires after 37 years

Steve Fredrick (from left), Marty Hrovat and Jeff Blaum extend their best wishes to Tom Marsh who retires as Space Systems Executive Vice President at the end of this week. Marsh's deputy, Joanne Maguire, will succeed him. Marsh served as head of Michoud Operations from September 1994 to February 1997.

Milestones *Employees celebrating anniversaries with Lockheed Martin in July 2006*

30 years
Raymond Clark
Brian Guggenheimer
Jessie Huggins
Harold Hurst
Lucius Ledet
Everett Mitchell
Terry Roche
Gerald Wesley

25 years
John Anderson
Paul Ball
Darryl Brown
Laron Calhoun
Charles Culver
George Davis
Rose DeSilvey
Dan Ferrari
Raymond Guidry
Deborah Liebel
Richard Little
Thomas Melchionne
John Morton
Jonas Motes
Robert Pratt
Michael Ripoll
James Rollo
Reginald Salloum
Linda Savage-Regan
Allen Surla
David Taylor
Guerrino Verzier

20 years
Royal Holland
Timothy Livengood

15 years
Craig Dooley
Buddy Paul
George Taylor
Gary White

10 years
Walter Loop
David McCrary
Keith McGuire

Graduates interview for positions at College Day

Tom Conrad interviews Alissa Johnson, a recent graduate from the University of Alabama, for a position in Production Operations.

Lockheed Martin hosted 70 recent graduates for College Day on June 9. Human Resources reports 31 of the applicants have accepted jobs with Michoud Operations, and more offers are pending.

Fall Fest

Mark your calendars. Fall Fest is Saturday, November 4 at Fontainebleau State Park., 9 a.m. to 7 p.m.

The day will feature fun for the family, including inflatables for the kids, music by two employee bands, softball, volleyball, horse shoes, a 50/50 raffle, an employee jail, ice cream, karaoke, robots that walk the Earth, a silent auction, an employee cookbook, bingo, crafts and food. Sorry, no carnival rides, but wait until you see the inflatables! ■

*Call **Russell Arthur** at 7-1054 or **Debbie Berkman** at 7-1056 to volunteer for Fall Fest.*

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