

Mission Success Bulletin

June 30, 2008

on-line

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

ET-128 part of near-perfect mission

May be best tank ever, Sigur says

When one looks at the ascent video and External Tank separation photographs, it's obvious that ET-128 performed like a champion when it flew with *Discovery*

Second, the first four of five Liquid Oxygen feedline support brackets are now made of titanium rather than aluminum. Titanium brackets that resemble L-shaped boomerangs provide lower thermal conductivity and are not as likely to form frost or ice. Engineers also redesigned the Thermal Protection System on the brackets with less foam so there's less debris potential.

ET-128 powered *Discovery* to orbit with the huge Japanese Pressurized Module, spare parts to fix the toilet, and astronaut **Greg Chamitoff** to live aboard the space station. The crew managed three spacewalks and further explored damage to one of the Solar Alpha Rotary Joints (SARJ) that turn the solar arrays to generate electricity for the station. NASA will likely address the SARJ problem on the November flight as the station will need extra electricity when it expands to a six-astronaut crew next year.

After *Discovery* undocked from the space station, analysts assessed the shuttle's heat shield and found the ship ready for entry. "*Discovery's* TPS system is all in very good shape, including all the Thermal Protection System tiles, all of the blankets, all of the reinforced carbon carbon on the wing leading edge and nose cap and all of the associated support systems," Cain concluded.

Upon *Discovery's* landing June 14, Launch Director **Mike Leinbach** walked underneath the shuttle to look at the tiles. "The orbiter looks to be in good shape, looks extremely clean."

Sigur agrees. "Our employees did a phenomenal job constructing this tank." ■

on May 31: rare foam divots, minimal debris, no Orbiter impacts during the critical time period – all good things from an ET perspective.

"It may very well be the best tank we've ever flown," suggested **Wanda Sigur**, ET program manager. "ET-128 was the first in-line tank since Return to Flight so we had time to focus on continuous improvement and debris issues, and it showed in the tank's performance."

NASA agreed as the Mission Management Team (MMT) decided not to require an on-orbit focused inspection early in the 14-day mission. **LeRoy Cain**, the head of the MMT, said, "We've asked a lot of our folks who work on the tank, and they did well."

Although more analysis will continue, a preliminary launch plus 5-day report concluded that all systems – electrical, propulsion, structural and Thermal Protection – performed nominally during launch and ascent.

ET-128 stood out for several reasons. First, the redesign of the Ice Frost Ramps on the Liquid Hydrogen Tank – on the surface the Ice Frost Ramps look the same, but underneath they're different. A new configuration applies foam differently that reduces voids in foam around brackets, rounds the base and isolators of the brackets to reduce stress, and seals shear pin holes to reduce potential leak paths.



Images of ET-128 post-separation on May 31

Success!

L02/Intertank flange spray close to 70-day goal

The mandate following the *Columbia* accident directed Michoud Operations to improve its Thermal Protection Systems (TPS) manual sprays so there would be less foam debris during shuttle launches. Michoud has accomplished that in such areas as the bipod, lower flange, Liquid Oxygen (LO2) feedline bellows, Protuberance Airloads (PAL) ramps, and more.

And last year as part of Return to Flight II, Michoud implemented a multi-part spray on the upper flange where the LO2 Tank and Intertank come together. While improving External Tank safety, the multi-part spray took a long time because of the many segments involved.

After reviewing the launch history of the LO2/Intertank closeout – which had little if any foam debris – and building on the knowledge gained during RTF on the cause of foam debris, engineers felt confident they could revert back to a one-pass spray, while still using proper controls and lessons learned.



As one of a three-sprayer team, technician James Duke applies foam to the ET-131 Liquid Oxygen / Intertank flange.

The goal – to reduce the time tanks spend in Cells G & H from around 100 days to 70 days.

Opposite the LO2/Intertank upper flange is the Liquid Hydrogen (LH2)/Intertank lower flange, which has a significant debris history.

Mission Success Director **Dan Callan** said the risk of pre-launch cryo-ingestion of pooled liquid nitrogen at the Intertank bottom or cryo-pumping of air into TPS defects is present on the LH2 flange, but not on the LO2 flange. Also, Callan pointed out that the LO2 flange stays cool during most of the flight because it's located at the bottom of the LO2

tank, covered by propellant. Just the opposite takes place with the LH2 flange where propellant drains away from the flange at the top of the LH2 tank.

Mike McBain, Materials Science senior manager, coordinated the multi-disciplined team that studied how to reduce the 12-segment spray to a 5-part spray, all the while watching sprayer fatigue closely. Manually spraying the flange, which is several feet wide and almost 28 feet in diameter, can be a tiring experience.

Using existing sprayers, the team reduced the spray to three parts. “But the work still took 77-78 days, and we weren't meeting the goal of 70 days or less,” McBain noted.

The ET Project advocated a 360-degree spray and associated work to meet the 70-day goal. So the team devised a plan using experienced sprayers with part-specific certifications and other technicians who had sprayed similar geometry. The team sprayed test panels, then dissected and inspected them. What once yielded several hundred voids

now resulted in only a few.

The game plan called for three technicians in rotating roles as sprayer, observer and helper. Only one spray gun would be used during the spray. After a technician sprayed an Intertank panel, he would hand the gun off to the next sprayer and rest. All the while, two Quality Control employees would be watching.

After several reviews and two dress rehearsals, the team put their spray plan into action on ET-131 in Cell G on June 11. Technicians carefully sprayed the upper flange, finishing the task in three hours in what is now the longest spray at Michoud. Three cameras recorded the action.

Afterward, McBain praised team members, “No one could ask for anything more. A very successful effort. No issues from sprayers. Quality had no issues. A good gun for three hours.”

At press time, the upper flange spray was to undergo plug pulls and dissection

testing. McBain estimated that 21 feet of foam would be removed toward the –x side of the tank, away from the Orbiter.

The entire team remained optimistic after the spray, knowing that their participation had greatly supported the goal of reducing the process to 70 days. “It went fine, went great,” smiled TPS mechanic **Andrew Williams**.

Because of the performance of the ET-131 spray team and the preparations that went into the spray, the initiative is expected to become an excellent way to improve tank delivery performance in the long run, Callan said. ■

Astronauts visit tank for Hubble mission



Four members of the STS-125/*Atlantis* crew visited Michoud on June 13 to hear technical updates and to see ET-127, the tank that will place them into orbit on their Hubble Space Telescope servicing mission, scheduled for October 8.

Visiting Michoud were Commander **Scott Altman** and mission specialists **John Grunsfeld**, **Andrew Feustel** and **Mike Good**.

This will be Grunsfeld's third trip to the Hubble Space Telescope and Altman's second. This fifth and final servicing mission should enable the telescope to continue uncovering

mysteries of the universe through 2013 or beyond. The Space Shuttle carried Hubble into orbit in 1990.

Lockheed Martin is striving to deliver the tank to NASA no later than July 11.

Following closely on the heels of ET-127 is ET-129, which should depart Michoud on or about August 9 for its STS-126 / *Endeavour* mission on November 10 to the International Space Station.

In an unusual move, *Endeavour* and ET-129 will be stacked and ready to launch from Pad 39B should there be a problem with *Atlantis* on orbit after its October 8th launch. No safe haven will exist for *Atlantis*, so *Endeavour* and ET-129 will serve as a rescue vehicle if needed. ■



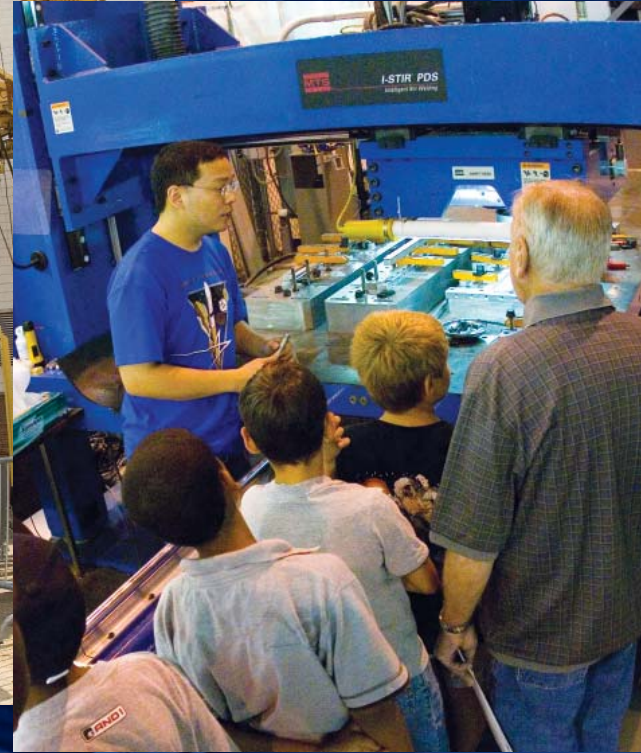
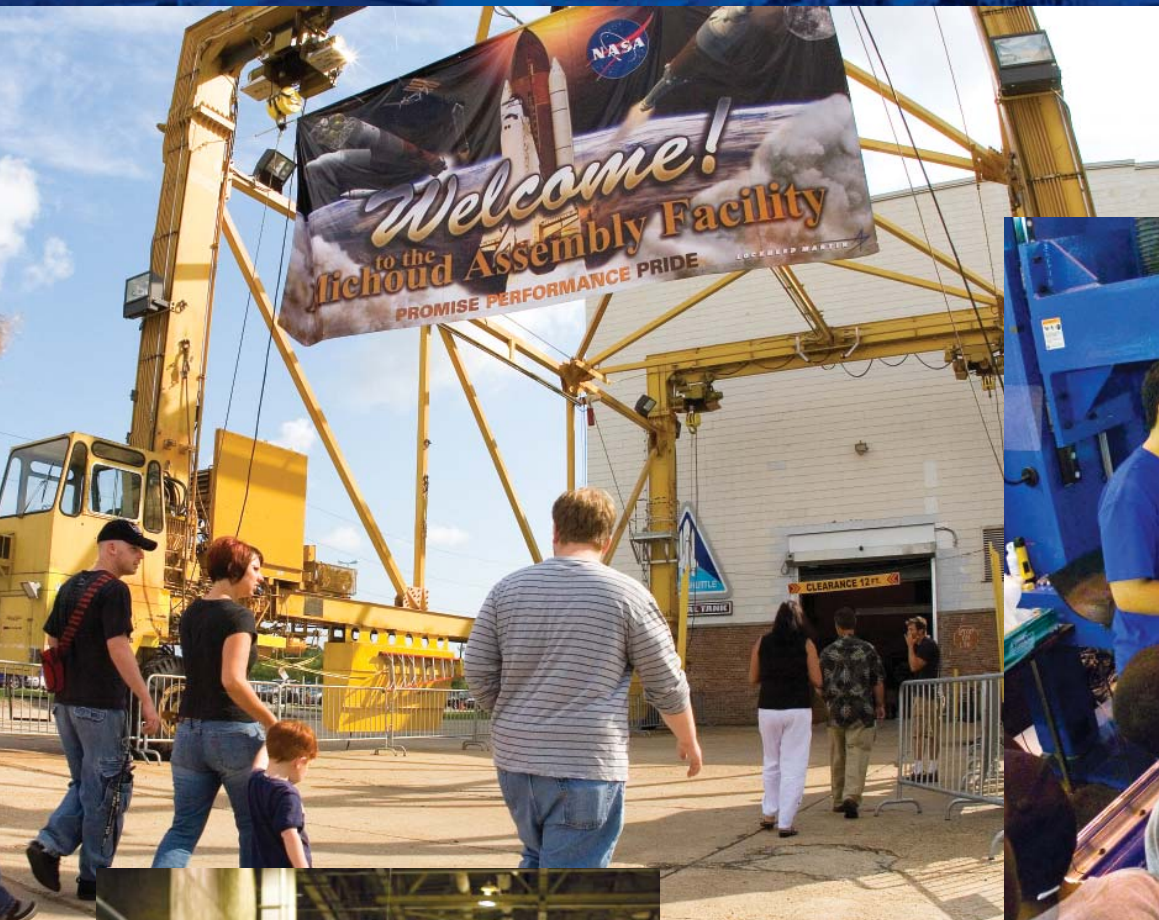
Inset - NASA ET Chief Engineer Ken Welzyn (crouching) discusses ET-127 with astronaut John Grunsfeld, a Hubble expert, and Commander Scott Altman. Mission Specialist Mike Good scans ET-127, the tank that will take the STS-125 crew to orbit.

Gerstenmaier meets with employees



NASA Associate Administrator of Space Operations Bill Gerstenmaier expresses his appreciation to Production Operations employees for continuing ET production efforts. Sharing information about NASA's transition plan from shuttle to the Constellation Program, Gerstenmaier spoke to several employee groups during a visit June 6.

Lockheed Martin Celebrates 35 Years at Michoud





Flying out with Pride, Passion and Integrity



Space Systems Company Awards Night

May 31, Santa Clara, California

Michoud Operations Recipients

Exceptional Service



Jeff Best

For outstanding performance in leading manufacturing engineering and planning activities in support of External Tank production. He leads the detail fabrication, weld, mechanical assembly, and transportation and handling areas.



Gary Collins

For his contributions in developing 1 certification plan for assembly, integration, and production operations for the Orion program at Kennedy Space Center. He identified key stakeholders and created partnering alliances with teammates and our NASA customer.



Larry Cox

For exceptional contributions and support for the weld operations department of the ET program. As a repair welder, he works closely with weld engineering in product restoration and acceptance.

Alfred Donaldson

For contributions to the design, project management, and construction of the West Master Substation that provides power to Michoud production and site operations. He coordinated construction logistics with subcontractors, in-house construction crews, and the utility company.



Guillermo Ladut

For exceptional support of on-the-job training activities and certification of weld tool and rotation fixture operators at Michoud Operations. Through his efforts, the number of certified welders increased by 62 percent.



Roger Reinmuller

For fracture-based safe-life assessments of External Tank structures and propulsion system hardware. Armed with extensive knowledge of fracture mechanics and solid practical experience, he demonstrated the structural adequacy of discrepant ET-119 and ET-120 propulsion lines. Utilizing this hardware resulted in on-time deliveries and cost savings.



Eric Roché

For planning and implementing the migration of Michoud Operations to a common disclosure statement within Space Systems. He mapped out the accounting changes required for the initiative and ensured that key personnel understood the impacts of the new business model.



Linda Savage-Regan

For sustained performance and commitment to the development and support of the Orion Integrated Master Schedule. This schedule gives program management the knowledge to manage all aspects of schedule, cost, earned value, task integration, and risk associated with Michoud Operations work scopes.



Brian Sollberger

For sustained leadership and a commitment to safety in leading the materiel receiving group in the Human Space Flight line of business. He manages receipt, distribution, and accountability for critical ET and other program material. His group handled more than 23,000 items in 2007 and has worked incident 1 accident-free for 17 months.

Leadership

Ricky Hinson

For exceptional quality control leadership, ensuring that the External Tank inspection team is trained, certified, deployed, and supported to meet all program requirements. Responsible for a diverse group of more than 115 inspectors, he has championed and enabled the delivery of more than 120 tanks.



Brian Magendie

For exceptional leadership in the integration and planning of production operations for the External Tank. As the principal industrial engineer, he has accomplished numerous critical activities, ranging from ensuring contractual coverage and engineering availability to resolution of production issues that could compromise on-time delivery.



Mike McBain

For his commitment to the Space Shuttle Return to Flight effort. As the focal point for re-certification and re-qualification of processes for the External Tank Thermal Protection Systems, he has established a reputation of trust and honesty with his NASA counterparts and worked with Lockheed Martin production personnel to implement enhancements. (Could not attend due to medical reasons)



Jimmy Blevins
 For conducting a complex impact analysis to support risk reduction of damage to the Space Shuttle due to debris liberated from the External Tank. He provided timely data for a Thermal Protection Systems redesign that flew successfully on the next mission.



Charles Kirch
 For conducting critical tests related to redesigns of the External Tank and for resolving on-pad anomalies. In addition to serving as test conductor, he coordinated requirements between NASA and Lockheed Martin engineers and the test facility.



Dr. Carlos Pizaña
 For timely delivery of the first flight component of Orion flight hardware, meeting a crucial program milestone. He developed the manufacturing instructions while overseeing the procurement process.

John Variello

For diligence in determining the cause of the helium injection test failure on External Tank-120 and implementing corrective actions to prevent recurrence of the problem. As the failure analysis team lead, he directed testing of the helium inject box, ultimately identifying the cause to be contamination of seals. (Could not attend due to illness)

Ed Taft

Diversity Leadership Award

Marshall Byrd
 2007

For his engaging leadership style and successes in building an inclusive work environment during his tenure as vice president of Michoud Operations, especially in the aftermath of Hurricane Katrina.



For contributing to the successful on-time delivery of External Tank-125. The team proof-loaded equipment and inspected critical welds in response to a NASA request to certify Pegasus for transporting the tank to Kennedy Space Center.

Jim Angel, Steve Boudreaux, James Cenance, Mark Dauth, Perry Degelos, Barry Erminger, Billy Hale, William Hall, Christi Houghton, Gene Lassus, Tim McCaffery, Mike Murphy, Anthony Murray, Bruce Rushing, Vickie Schmersahl, Damien Smith, Darrel Smith, Lisa Spiers, Dale St. Romain, Frederick Walker



Jimmy Doll, Team Lead

External Tank-120 Restoration

For extraordinary efforts in ET-120 restoration to successfully meet NASA's flight manifest.

John Blevins, Dan Boudreaux, Dave Buras, Craig Capdepon, Eric Champagne, Ron Ellzey, Mike Gallegos, Bill Gilbert, Michelle Guillot, Allan Hayes, Tyra Hebert, Brian Jeansonne, Kermit Lawrence, Bryce Martin, Charmorge Miller, Robert Mills, Marc Moody, Vincent Morales, Augie Panks, Don Pittman, Dave Rodrigue, Phil Terranova, Quoc Vo, Dave Windham

External Tank-124 Hail Damage Repair

For outstanding teamwork on inspection, assessment, analysis, and repair of hailstorm damage to External Tank-124. Post-flight analysis and review revealed that the repaired areas performed flawlessly.

Dr. Jed Aucoin, Jeff Beale, Mike Berger, Dave Buras, Ryan Dardar, Kevin Davis, Steven DeBlasio, Fred Eastman, Megan Fontenot, Robert Fowlkes, Ronnie Grice, Michelle Guillot, Tim Harper, Brian Jeansonne, Glenn LaPeyronnie, Ryan Martin, Jamie McKeough, Vincent Morales, Toan Nguyen, Leonard Paige, Ken Phillips, Troy Smith, Roy Steinbock, Eugene Sweet



Shan McEvoy, Team Lead



Jim Feeley, Team Lead

External Tank Product Support – Kennedy Space Center Operations

For sustained performance of a wide variety of post-delivery work and modifications for ET-117, ET-120, ET-124, ET-125 and ET-126.

Don Baxter, Bill Brandow, Marcy Dunn, Carl Exline, David Harris, Brian Knipping, Fred Lockhart, Scott Otto, Jean Paille, Sandy Petkosh, Doug Powell, Juan Ramirez, Ken Reaume, Marlene Seymour, Paul Sierpinski

(Consistent with the fact that STS-124 launched just prior to the Awards Night ceremonies, the entire team was on station at KSC and unable to attend.)

Community Service

Don Clark

For more than 20 years of dedicated service to his community. While working as an engineer with Huntsville Technical Operations, he has donated over 10,000 hours by giving blood platelets every 56 days to the Red Cross, serving as technology guru and computer database mentor for the United Way, organizing volunteers for the Salvation Army's mobile kitchen, working in the community garden, weatherizing homes for elderly, and building wheelchair ramps. In June 2007, President Bush presented Don with the Lifetime Volunteer Service Award.



LM21

Bob Bruce

For leading, championing, and executing LM21 principles and tools. Under his leadership, Michoud Operations certified 36 green and black belts and completed 75 structured improvement activities in 2007. Bob also developed and led the training of 82 first-line supervisors in the use of "safety huddles" to improve two-way communications.



Launch Honorees watch ET-128 perform brilliantly

Recognized for outstanding performance, the Launch Honorees stand before the massive 52-story Vehicle Assembly Building at Kennedy Space Center. From left: Dave Kinchen, Mike Balch (Huntsville Technical Operations), Al Arthur, Mike Berger, Johnny Vitrano, Judy Hill, Cora Arcement-Buffone, Paula Mones, Dilip Dudgaonkar, Craig Capdepon, Glen Wadge, Mark Steadman, Herman Lockhart, Tim Livingston and Mike Murphy.



Milestones *Employees celebrating anniversaries with Lockheed Martin in July 2008*

30 Years

Bernard Caruso
Rudolph Casimier
Walter Chin
Don Clark
Debbie Dauth
John Ellis
Ricky Hinson
Cheryl Iwanczyk

Leo Jarrell
Joseph Johnson
Shannon Maheia
Lance Mercier
John Riley
Maxson Roche
Barry Roussev
Molen Ursin
Richard Walker

Tony Winn
Al Young

25 Years

Belinda Chaplain
Dewey Crosby
Rebecca Jordan
Yolanda Miller
Henry Phillips

Earl Pratz
William Walsten
Ray Zibilich

20 Years
Danny Huffman

15 Years
Mark Heinsz
Rose LaLanne

10 Years
Glenn Lapeyronnie
Karen Laurant
Brian McGraw

Mission Success **Bulletin on-line**



Lockheed Martin Space Systems Company – Michoud Operations Volume 27, Number 6 • June 30, 2008

Director of Communications: Marion LaNasa

Editor: Harry Wadsworth

Graphics/Photographers: Eric Bordelon, André Bourdier, Jim Dowdall, Chip Howat, Jon Irving, Shannon Jurado, Kurt Kline, Ryan Martin, Brian Peterson, Kyle Ryan, Steve Seipel

Contributors: Dan Callan, Mary Edwards

Mission Success Bulletin is published by the Communications Department.