Space Systems Company – Michoud Operations

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Mission Success Bulletin

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

Michoud puts in huge RTF effort at KSC

It's been a colossal undertaking.

A crew of approximately 40 Michoud employees has been working around the clock every day for a month at Kennedy Space Center (KSC) on several urgent Return to Flight projects that involve replacing ET diffusers and installing bellows heaters.

Debris Verification Reviews where ice debris became a hot topic. With those issues outstanding, NASA decided to postpone *Discovery's* launch to July.

To respond to the diffuser and bellows heater concerns and to try and stay on schedule for a July launch, Michoud Operations quickly assembled

KSC the next day.

While that was happening, Mission Support Room (MSR)-led teams kicked into high gear assembling engineering requirements, drawings, Manufacturing Process Plans, Risk Assessments and logistics plans to support the aggressive work schedule.

Beginning with ET-121

The Michoud crew at KSC changes out a diffuser on ET-121's LO2 tank. Standing top left is Louis McCoy. Clockwise from lower left are Lance Mercier, Danny Winn, Mark Lockwood, Floyd Jolivette, Mike Cinquigranno and Jorge Chacon.

The work at KSC arose from the first Tanking Test in April when *Discovery* and ET-120 were on the launch pad and from two subsequent

a team of technicians, quality inspectors, technical support engineers and mechanical installers on Saturday, April 30 and flew them to

(the second RTF tank) in KSC's Vehicle Assembly Building (VAB), the team immediately tackled the Liquid Oxygen Tank (LO2)

diffuser – a complicated job that took two weeks to complete. To remove and replace the diffuser – which disperses and reduces the velocity of pressurant gases in the tank – technicians had to pull the nosecone, and then remove the ogive cover plate.

While the LO2 diffuser job was under way, other technicians began work to replace the Liquid Hydrogen Tank diffuser, an easier job that took four days.

A third group started prepping for the bellows heater installation, a tedious three-week task with multiple steps. Originally scheduled for implementation on the third RTF tank, a bellows heater will now fly on all tanks.

The heater is designed to keep ice from forming on the LO2 feedline bellows in the critical debris zone. The bellows, a circular metal ribbon around the feedline, allows the feedline to flex when propellant flows through it.

The team is working on ET-121 in a vertical position in KSC's massive 52-story VAB, unlike at Michoud where most of the work is done in the horizontal position.

"Working from a vertical perspective is not a big deal here," explains **Michael McGehee**, RTF manufactur-

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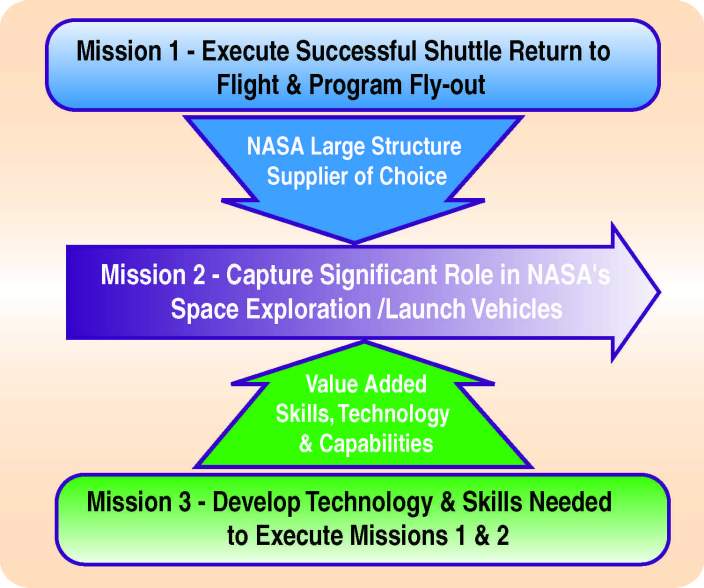
Michoud Operations hones Strategic Plan

The 2006 Strategic Plan maintains the three-prong strategy developed last year to accomplish existing External Tank goals and to position Michoud Operations to support future business opportunities in space exploration (see graphic).

"We've made progress on all three goals," said **Dan Ferrari**, director, Business Development. "The biggest accomplishment for Mission 1 is delivery of the first two Return to Flight External Tanks. That's a major change from a year ago. We're well on the path to returning to safe flight."



Michoud has partnered with Space Systems on two important future programs: providing structures design and build for the Crew Exploration Vehicle (CEV) for Mission 2 and technology development for the Thin Gauge Friction Stir Weld Development Program for Mission 3.

Also in support of Mission 3, Michoud was selected for Phase 2A of the Falcon Small Launch Vehicle program and is busy test-firing hybrid rocket motors while preparing for the next down-select phase of the program.

Following the recent appointment of Michael Griffin as NASA Administrator, it is apparent that the CEV program will be accelerated. Michoud has sent a contingent to Denver to determine the Lockheed Martin response to the anticipated requirements. "This could mean even more work for Michoud, and be a better gap filler from ET to the future," Ferrari says.

NASA is leaning toward an earlier down-select to one design, potentially by 2006 as opposed to late 2008, with human flight to begin as early as 2010 rather than 2014. "This could translate into building additional test vehicles at Michoud so the company is confident humans can fly by 2010," clarifies Ferrari.

NASA is expected to evaluate proposals submitted by Lockheed Martin and the competition later this summer and then issue a Call For Improvement that may include the accelerated schedule and a new requirement for CEV to fly to the space station.

Because of the Friction Stir Weld technology developed here, Michoud also has a role in a $16 million NASA contract recently awarded to Space Systems. "Thin Gauge Friction Stir Welding will fulfill goals for Missions 2 and 3," states Ferrari.

This technology (see story at right) will support upper stage applications for future Heavy Lift Launch Vehicles, both EELV-derived and shuttle-derived, as well as in-space transportation stages that would move cargo from Low Earth Orbit to the moon or from lunar orbit back to Earth. Should NASA require space transportation lift of over 60 metric tons, Michoud will be in position to capture Shuttle Derived Vehicle work that could help satisfy that requirement.

Another project gaining momentum in the Department of Defense is the Operationally Responsive Space Program. This program requires a small launch vehicle like the one Michoud is currently working on in support of the Falcon project.

The National Center for Advanced Manufacturing (NCAM) continues to play a crucial role in future programs at Michoud. NCAM provides equipment to develop technologies critical for producing high-performance structures for space exploration and other customers such as the Joint Strike Fighter program, which also accomplishes goals for Missions 2 and 3.

Vice President & General Manager **Marshall Byrd** and Ferrari recently presented the Strategic Plan to Space Systems in Denver.

"The response was a positive one," says Byrd. "Space Systems recognizes the value of our contributions to the space program. But in order for us to receive work from them or the rest of the corporation, we have to compete and provide the best value or they will go elsewhere to meet their customers' needs."

Byrd repeats his now-familiar theme – performance, performance, performance. "How we perform today is going to play a crucial role in winning future work." ■

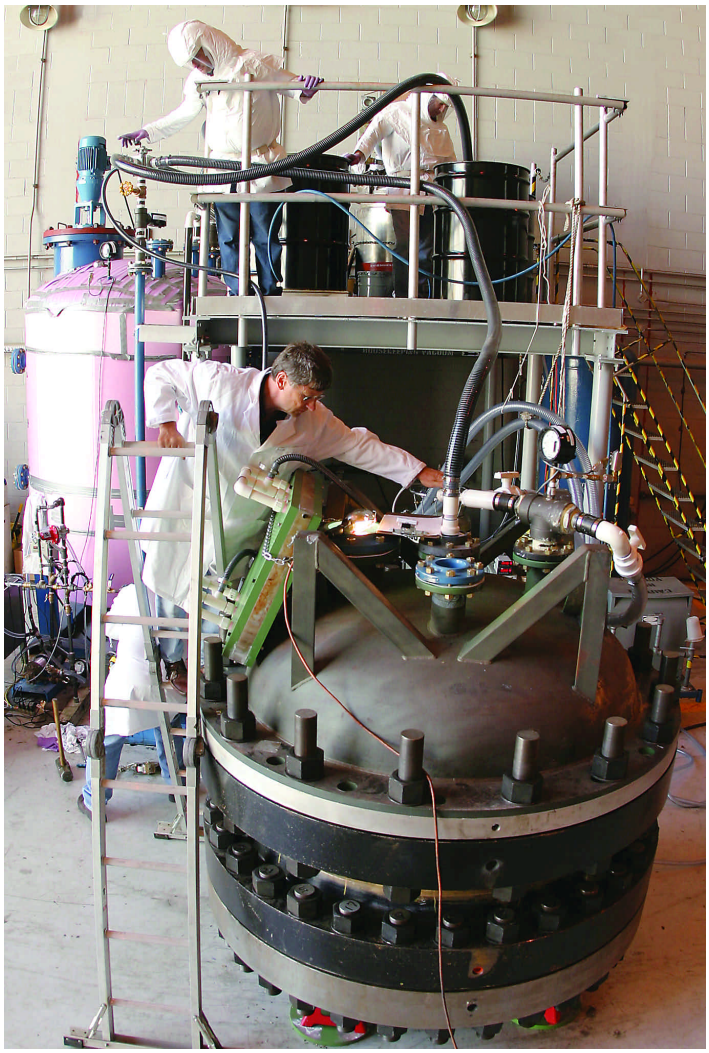
Technology for future launch vehicles

Michoud is combining its extensive Friction Stir Welding experience and the NCAM Universal Friction Stir Weld System to develop technologies with Lockheed Martin in Denver for assembling thin gauge structures. Funded through NASA's Human & Robotic Technology program, the goal is to provide ultra lightweight metallic cryogenic tanks for space exploration vehicles and storage systems.

As principal investigator, **Jennifer Takeshita** is the lead for the thin gauge structures effort. "This technology could reduce initial mass and associated costs to Low Earth Orbit by 50 percent, compared to existing systems," Takeshita says.

Space Systems completed contractual negotiations in November and recently held the kick-off meeting at Michoud with the NASA customer. ■

Falcon Small Launch Vehicle team prepares for second firing



In Cell M of the Vertical Assembly Building, propulsion engineer Victor Brown checks the fuel flow as the aft segment of the hybrid motor fills while casting supervisor Nick Dolese (above left) and mechanical technician Robert Cooksey monitor the A and B fuel components.

The Michoud Operations Falcon Small Launch Vehicle (SLV) team will soon conduct the second test firing of its hybrid motor design at the Air Force Research Laboratory at Edwards Air Force Base in California.

The team successfully test fired its first motor on January 21 for a duration of 60 seconds. The next test firing is scheduled for early to mid-June and will double its duration burn time.

"The Falcon SLV team incorporated design and process refinements and lessons learned from the January test and feels quite confident that the motor will perform as designed," says **Paula Hartley,** whose responsibility includes hybrid motor risk mitigation.

The second ground test motor is representative of Falcon's second stage motor geometry and fuel grain, and measures 11 feet in length and five feet in diameter.

Once the test is completed, the hybrid motor will be shipped back to Michoud where the team will weigh and disassemble the motor and perform extensive visual and dimensional inspections. Data results will be used to confirm motor performance and fuel regression.

"The objective of our second test is to substantiate the results of the first test firing, further validate our analysis techniques and confirm the predicted motor performance of the Falcon rocket system," Hartley explains.

"The Falcon SLV team incorporated design and process refinements and lessons learned from the January test and feels quite confident that the motor will perform as designed."

– Paula Hartley, manager, Risk Reduction Testing

The Falcon SLV program is a Defense Advanced Research Projects Agency (DARPA) and Air Force program to develop and demonstrate an affordable and responsive space lift capability. NASA has joined the program and is interested in the SLV's ability to launch small payloads.

Later this summer, DARPA and the Air Force will decide which contractor team or teams will move forward on detailed design, fabrication, and flight test of a demonstration vehicle in 2008. ■

To learn more about Falcon, go to *www.darpa.mil.*

RTF effort

Continued from Page 1

ing lead. "We're up on the twenty-third floor now. We have great access on a platform. Our folks are all operating at 110 percent, doing a quality job safely."

McGehee appreciates everyone for supporting the crew. "Many thanks to the KSC Operations group for being the MSR interface between our crew working in the VAB and Michoud. They set up ten computers for us in the VAB. Our lunch is brought in each day so we can stay up here. Also, **Bill Gilbert** has done a good job integrating the team's resource planning with United Space Alliance."

McGehee points to the daily delivery of tools, hardware and drawings from Michoud as vital. "That truck's been a lifeline for us," McGehee says. "We really appreciate all the people back home who support us."

Mark Lockwood, an electrical mechanical technician, says the project has been a team effort from the start, both at KSC and Michoud. "We're fortunate to have so many experienced technicians so some of us can be at KSC and the rest at Michoud handling the work there.

"I've enjoyed the opportunity to be here, but we realize we have to get it right and turn the corner on this," Lockwood says. "Our company, our program and our country need it."

As the team completes work on ET-121, more diffuser and bellows heater installation activities lie ahead at KSC. To say this Michoud team has gone beyond the call of duty might be an understatement.

"An extraordinary effort by extraordinary people," McGehee sums up. ■

Ethics Corner

Training applies to real-life situations

by Feltus Kennedy, Ethics Officer

The annual Lockheed Martin Ethics Awareness training runs through July 15 at Michoud Operations. As ethical situations may face each one of us, all employees including new hires and contract personnel are required to take the training.

Kennedy

This year, employee teams are discussing sample cases during training and then rating the case responses as "Highly Ethical," "Ethically Sound," "Gray Area," "Unethical" or "Highly Unethical."

These sample cases reflect real-life ethical situations that could occur at Lockheed Martin. In this training we try to get across that it is unacceptable to ignore unethical behavior or misconduct, while it is "highly ethical" to inform management about such behavior or misconduct.

Disciplinary Actions
January – April 2005

ACTION	HOURLY	SALARIED
Counseling/Verbal	0	2
Written	10	4
Suspension	8	0
Discharge	1	0
No Action	0	3
Open	0	7
Total	19	16

This chart shows disciplinary actions through April.

An employee who sees or suspects wrongdoing might seek assistance from someone who can correct the misconduct – Safety, Timekeeping, Security or Human Resources, for example. This is the "ethically sound" thing to do. Informing management of the misconduct, however, allows for possible corrective action to take place and is the "highly ethical" approach.

If you observe unethical behavior or misconduct and don't report it, a minor issue could grow into something much worse. Unreported misconduct could jeopardize the company's reputation and affect customer relations and employee job security.

Management encourages employees to raise issues. That way, managers can be sure the proper people are involved in resolving the issue, and that appropriate disclosures are made to the customer and other authorities.

Reporting the concern to your management is always the best approach. However, if you are not comfortable doing that, seek out a higher member of management, HR, Legal or the Ethics Officer. Lockheed Martin prohibits retaliation against anyone who reports misconduct or unethical behavior.

If any manager or fellow employee retaliates against another because he/she reported misconduct, the retaliating employee will be disciplined and possibly terminated.

Remember, when it comes to ethical concerns, nothing good comes from doing nothing. ■

Ten more employees receive baseballs

Return to Flight Manager Ron Wetmore recently presented baseballs to these happy employees for their RTF performance and for keeping their eye on the ball. Front row from left: Lynn Servay, Chi Tran and Stephanie Zulauf. Back row: Wetmore, Michael McGehee, Richard Harris, James Moffett, Hal Simoneaux, Troy Smith, Dave Buras and Vincent Morales. ■

Thoughts on Diversity

One Company, one team, all inclusive, where diversity contributes to 100% Mission Success

by Karen Weldon,
Diversity Council Chair

At Lockheed Martin, we believe diversity includes everyone, and we're committed to being inclusive and supportive to each employee as a must in achieving Mission Success.

We value each employee's individuality by eliminating barriers to inclusiveness and creating an environment where people want to work and where they are afforded opportunities to grow and develop.

As such, Lockheed Martin is composed of many inclusive teams that value and leverage each person's individuality. Let's look at a characteristic of people on these teams.

Something as simple as a smile may affect the contributions that a person can make to a team. Lack of a smile may be interpreted as hostility, "I don't like you" or "I don't want to be here."

Americans primarily associate smiling with friendliness, and consequently the lack of a smile may lead a team to ignore what a person has to offer or to leave him/her out of team activities.

In some Asian cultures, smiling signals shallowness and thoughtlessness. One proverb says "the man who smiles a lot is not a real man."[1]

For other Asians, smiling can mean disagreement, anger, frustration, confusion or a substitute for "I'm sorry" or "thank you."

In the Caribbean, the interpretation may depend on eye expression and forehead movements. Smiling may mean "please," "thank you," "May I see you for a moment?" "What can I do for you?" or "You're welcome."

The lack of a smile may also be the result of a bad or hurtful work or life experience. Because of this, the person may find it difficult if not impossible to trust others or to open up to others. Valuable contributions are therefore suppressed.

In the inclusive environment at Lockheed Martin, each person should be aware of team differences. Persons shouldn't just chalk up differences to personality, but try to understand all the dimensions that go into diversity.

Based on that awareness, each person should accept and respect the differences of others so that every team can operate efficiently and effectively with improved interpersonal skills.

Anyone who has ideas to encourage inclusiveness and to promote the understanding and acceptance of the differences among Michoud employees should contact a member of the Diversity Council shown at left.

Also, any employee who wants to support council activities such as a diversity booth at the Employee Open House or a diversity day in the fall is encouraged to volunteer.

Remember, inclusion is not an option at Michoud or anywhere else in Lockheed Martin. ■

Do you know your Diversity Council representative? First row from left: Domingo Reyes, Facilities & Environmental Operations; Lillian Baham, Materiel Sourcing; Zuyapa Jackson, Human Resources; and Michael McGehee, Production Operations. Back row: Yvonne Vielle, Materiel; Cheryl Alexander, advisor, HR; Karen Weldon, chair, Information Technology Systems; Alfred Donaldson, F&EO; Cassandra Roy, ITS; and Wendy McQueen, Program Management & Technical Operations. Not pictured are Judy Atilano, Prod Ops; Susan Foozer, Business Operations; Jessica Nolan, Safety & Product Assurance; Chu H. Pak, S&PA; and Twanda Vaughn, HR.

[1] *Multicultural Manners, New Rules of Etiquette for a Changing Society*; Norine Dresser; John Wiley & Sons, Inc.; 1996

Upcoming summer events at Michoud Assembly Facility

Safety & Health Fair
June 14-16
11 a.m. to 1 p.m.
Showcasing a safety rodeo, health screenings and educational booths

Tech Days
June 21-23
11 a.m. to 12:30 p.m.
Building 103 NCAM area
Cutting-edge technologies – ensuring Michoud's role in space exploration

Employee Open House
Saturday, August 6
Buildings 103, 110 & 114
A day of family fun, Return to Flight tours, music and food

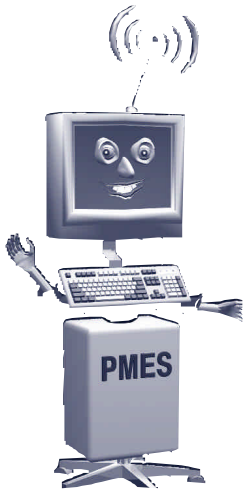
PMES continuously reduces paper at Michoud

In a successful cutover two months ago, the Paperless Manufacturing Execution System (PMES) team successfully turned off three legacy computer systems and, in effect, moved thousands of work documents and data records to PMES.

So now that PMES is "live" and living in the production environment, how is the new system progressing?

"The goal of PMES is to gradually introduce more electronic shop orders into the work flow so that less paper will be used in building and processing External Tanks," says **John Welborn**, project manager.

"Some paper will always be used in tank fabrication, but I think we are making steady progress in reducing the amount of paper."



Basically, PMES reduces paper in these ways:

- Work documents are created and approved electronically
- Shop orders are electronically released to in-line production, tooling, transportation and receiving inspection work centers
- Employees access shop orders on factory computers
- Data such as tool numbers, temperature/humidity, serial/lot numbers, shop notes and buyoffs are electronically recorded into shop orders
- Non-conformance records (NCRs) are initiated and routed for disposition and closure electronically
- Digital photos and scanned images are electronically attached to NCRs
- Closed orders and NCRs are electronically archived

Using PMES, approximately 130 types of shop orders have been completed and archived electronically, and another 350 are in-work in the tooling, transportation and receiving inspection areas.

Also, about 30 in-line build shop orders have been released for work, mainly in the weld and mechanical assembly areas.

Although PMES is not directly used in the Return to Flight Mod Centers and supporting commodity areas, teams in these areas execute abridged PMES orders on paper and work NCRs and Reject Tags on paper. They are then manually entered into PMES modules to capture the as-built traceability, Critical Items List accountability data, and track and status flight hardware and tooling discrepancies.

"I want to thank all who participated in making PMES an operational success," Welborn says. ■

To learn more about PMES, go to *http://maflm503.maf.nasa.gov/34xx/PMES/*

Get ready to batten down the hatches

Hurricane season begins today, and experts predict an active season. Hurricane forecaster **William Gray** predicts 13 named tropical storms in the Atlantic, with seven developing into hurricanes and three becoming major storms with top winds of 111 mph or more.

Emergency Coordinator **Steve Turner** encourages employees to prepare now for this season's eventual adverse weather. "Knowing what to do before the emergency strikes can minimize damage and hardship. Employees should help their families minimize the impact of an emergency by developing their own plans."

Whether you're a native or new to the area, employees should familiarize themselves with the MAF Status page at http://www.mafstatus.com

Not only does the site give Michoud's status, but also provides links to weather sites and other emergency information to guide employees in developing a plan. From "Related Emergency" links, employees can see what's happening at the City of New Orleans Office of Emergency Preparedness.

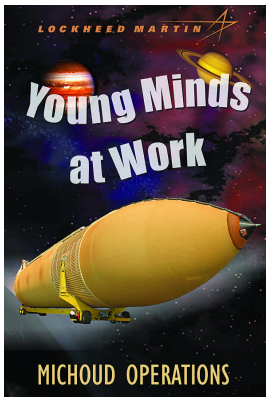
There, employees can get information on evacuation

routes, developing a family disaster plan and what to do after the emergency. In addition to the website, employees can dial 257-1MAF for the work status.

Check out "Hurricane Awareness" under Safety on Michoud's Gumbo site. Once Safety notifies the Emergency Operations Advisory Committee of potential threats and condition changes to the facility, the group convenes to apprise leadership on potential work status changes.

"When the facility goes to Condition IV (winds 58 mph or greater expected in 72 hours), employees who feel their family and/or property is at risk from adverse weather can request liberal leave from their management without concern that consent will be denied," Human Resources Director **Cheryl Alexander** points out.

The time to plan is now. Map out your evacuation route, identify hotels (including ones that allow animals) and gather your important documents. What you do today may keep your family safe if a storm comes our way. ■



Young Minds at Work

Employees brought their kids to work on April 28 as Michoud Operations orchestrated its first-ever Young Minds at Work. All the planning paid off as 361 Young Minds explored Michoud in New Orleans and Huntsville and gave the event a grade of 94 on the exit survey. Who knows – some of them may follow in their parents' footsteps and decide to work in aerospace. ■

"The best part of the day was the robots because my brother likes robots, and I can tell him what I learned." – Brooke, 11

Students were treated to several presentations – one of them being Battle Bots as Troy Alexander looks on.

The Model Room was a hit for students. Here, Anthony Palestina points out how the External Tank fits into the Space Shuttle stack on the launch pad.

"I liked the model room; it was cool to see everything miniature." – Bradley, 12

"I want to be an astronaut or a rocket scientist." – Avery, 10

Even "Morgus the Magnificent" showed up in the person of welder Noris "Bro" Silcio.

Former astronaut Digger Carey, a well-known face at Michoud, returned to talk to the kids. After answering dozens of questions, he posed with some of the students and Lockheed Martin's Jan Tingle.

Milestones

Employees celebrating anniversaries with Lockheed Martin in May and June 2005

35 years
Donald Wrobel

30 years
Morgan Ballard
Lawrence Brignac
Samuel Ducksworth
Lettie Pichon

25 years
Judy Atilano
Timothy Barkley
Michael Berger
David Brickner
Rodney Broussard
Thomas Conrad
Timothy Daggett
James Duke
Merlin Foley
Timothy Harper
David Hartley
Kenneth Hilton
Emory Hodges
Gordon Jarrell
Connie B. Johnson
James Kerr
Brian Knipfing
Andrea Labat-Henderson
Timothy McCaffery
Jeffery McFarland
Grace Millaudon
Hollis Monroe
Christopher Morah
Frank O'Conner
Cornel Peters
Cort Phillips
Patricia Powell
Felix Rosiere
Mark Ryan
Babette Staunton
Billy Thomas
Kathleen Wakefield
Kenneth Waller
Walter Whitfield
Joseph Wilbert

20 years
David Achary
Wilbur Dudley
Allen Fleming
Miriam Fleming
William Gilbert
Leslie Jennings
Philip Kopfinger
Edward Lott
Judy Martin
Jamie McKeough
David Myers
Jimmy Rainwater
Patrick Shea
Daniel Walkowski
Douglas Webb

15 years
Michael Campbell
Kenneth Leveque
Don Pollitz
Thanh Tran
Richard Treat

10 years
Joseph Bernhardt
Colin Lusk

5 years
Dwight Cox
Sonya Johnson

Robotics gets real for high school students

Michoud Operations engineer Curtis Craig is pictured with Ryan Powell (left), Brenton Clemens and Gerell West of O. Perry Walker High School next to their robot, "Max XL." Craig assisted the students in building the robot to compete in the FIRST (For Inspiration & Recognition of Science & Technology) Robotics meet in Atlanta. Michoud engineers Riki Takeshita, Scot Marshall and Travis Smith also helped students at Kennedy High, Abramson High and the New Orleans School of Science & Math in building robots. ■

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