Space Systems Company – Michoud Operations

Mission Success Bulletin

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March 16, 2005

Volume 24, No. 2

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

Byrd looks back after one year at Michoud

Expresses pride in accomplishments and optimism for the future

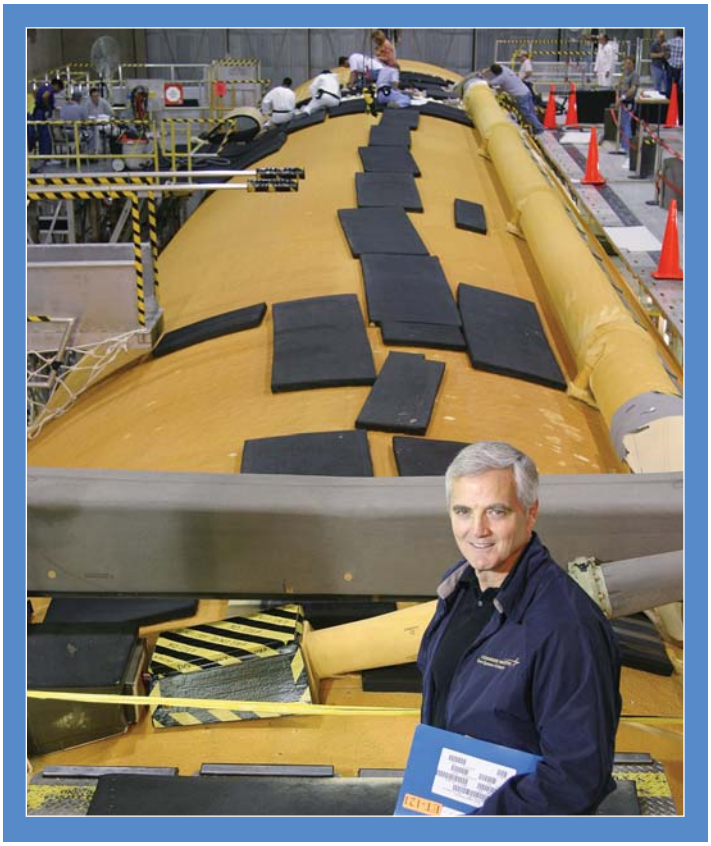
Editor's Note: In a recent interview with the Mission Success Bulletin, *Vice President & General Manager Marshall Byrd describes his first year at the helm of Michoud Operations, what the enterprise has accomplished in the past few months and opportunities for the future ahead.*

What have you learned about Michoud Operations in the year you have been here?

There were a lot of pleasant surprises for me when I got here. The whole team wants the right thing, and that is to give our customer the very best product we can in a timely fashion.

The challenges we have are centered around the collaboration that's required – between ourselves, our customers, our independent reviewers, our internal reviewers and on and on. Every action we take as we work through corrective actions demands intense reviews and acknowledgement between the working groups before it can be applied to the product.

I underestimated the impact of all that collaboration. But I think the fact that we've put together a structure and team that gets the product out the door in quality fashion while working with our reviewers and our customers in such a manner is pretty amazing.



In his first year Byrd has made it a priority to be visible and accessible at work sites. Here he stops by Building 420 to check on the final stages of work on ET-121 before rollout.

What did we need to accomplish when you arrived? What must we do today?

Our efforts last year were focused around the initial ET tank; the efforts required to redesign the vehicle, to qualify it and get it out the door on New Year's Eve. It was easy to focus on those things, but we also had to look at a broader field as well, other activities on campus that complemented the ET delivery.

The win on Falcon was not only a morale boost to all of us, but it was a technical achievement. In working with DARPA on Falcon, we get to continue development of the hybrid motor. That's a big deal!

I can't tell you how satisfied I am with those two major milestones – delivery of ET-120 and winning Falcon.

This year, we're far from done on Return to Flight. We've got to stay continually focused as we get back into flight; to fly this External Tank safely and to provide the shuttle team with everything it takes to complete the space station.

Around that, we must continue to build our enablers – our technologies. This year we'll have the opportunity to win the next phase of Falcon, and actually get to fly it. That is so complementary of what we do today in the ET area and what we want to do in the future – to be a provider of boosters of all flavors.

We also need to continually leverage the assets we have in the National Center for Advanced Manufacturing (NCAM) area to go off and do things like continuing the development of stir welding for our Crew Exploration Vehicle.

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Return to Flight focus broadens

Ron Wetmore has almost a dozen Return to Flight milestones that he's trying to keep straight in his head. At least one occurs every week – either a Design Certification or a Certification of Flight Readiness milestone.

The RTF manager believes the focus has broadened, not narrowed, in recent weeks – from the design and delivery of flight hardware to the reviews necessary to certify the shuttle is ready for flight.

"There's a huge amount of work," Wetmore says "but while we're focusing on getting all the testing, analysis and presentation packages put together, we can't lose sight of processing those first three vehicles."

Each review generates new assignments for testing and analysis, but Wetmore hopes to get the majority of that work done and most of the outstanding items closed by mid-April so Michoud can focus on the Flight Readiness Review prior to the launch of STS-114. On top of that, a return to production is under way and there's a new proposal in work with NASA to re-baseline the ET through 2010.

The view from 50 feet high – ET-121 heads for Port Michoud past groups of applauding employees a day ahead of schedule on March 4.

"A lot of work to do in a short period of time," is the way he describes it.

The challenge is to keep working as a team as the new activities bring more people into the equation. Wetmore says he's impressed with the way all departments have come together to tackle the work and move forward as the Return to Flight effort has broadened.

"We believe that the changes we've made are appropriate to deal with the issues identified in the CAIB (Columbia Accident Investigation Board) report – that we've significantly improved the performance of the vehicle from a debris standpoint," he says.

In response to the CAIB, Michoud has put together a plan to continue to improve the tank. Phase 1 involved the redesign of areas known to be debris producers.

Phase 2 will involve improving process controls on additional closeouts, redesigning parts of the tank where appropriate and further developing non-destructive evaluation techniques.

Wetmore says he agrees with NASA Shuttle Manager **Bill Parsons** that this is going to be the safest shuttle to ever fly when the launch window opens on May 15. ■

Astronaut Michael Good presented Silver Snoopy awards to Terry Sherman (left), Production Operations, and Rusty Carpenter, Safety & Product Assurance. Good cited Sherman, a Thermal Protection Systems spray mechanic, for outstanding efforts in developing, verifying and validating the flange foam manual closeout; and Carpenter for inspection performance in delivering ET-120, with emphasis on the bipod and camera harness.

Falcon team prepares for follow-up testing

First firing of hybrid motor a roaring, flaming success

Those who witnessed the successful test fire of the Lockheed Martin hybrid motor in California on January 21 as part of the Falcon Small Launch Vehicle (SLV) program described it as a heart-pounding 60 seconds.

Paula Hartley whose responsibility includes the hybrid motor test firings remembers feeling good after hearing the test conductor announce the 30-second mark. Upon hearing "40 seconds...50 seconds" and then "shutdown" at 60 seconds, she said she was ecstatic and started hugging Falcon chief engineer **Joe Arves** while at the same time thinking back over the years to the many challenges that Michoud Operations has overcome to get to this point.

"We had a lot of firsts for this test," says Hartley. "The duration of the test fire was longer, our fuel was newly developed, and our port geometry was extremely complex. All eyes were on us."

The test firing is the first of a series of hybrid motor firings that Lockheed Martin will conduct this year at the Air Force Research Laboratory, Edwards Air Force Base.

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

DARPA and the Air Force awarded funding to Michoud Operations and three other competing companies to conduct a 10-month effort to refine their SLV design and to conduct risk reduction testing.

Detailed inspections of the motor itself and data analysis indicate that test objectives were met. The motor remained stable throughout the burn as indicated by chamber pressure. The nominal thrust was as expected, and the fuel regression was consistent throughout the ports.

"This test represents a major step in confirming the feasibility and benefits of the environmentally-friendly and operationally-simple hybrid motor that we believe is the key to achieving the responsive and low-cost launch vehicle that the Falcon program requires," says **Bob Simms**, Falcon SLV director and program manager at Michoud.

Design engineer Keith Joiner (left) documents findings while casting supervisor Nick Dolese and test engineer Jim Hesse measure the 43 ports for fuel regression following the successful test firing of the Falcon hybrid motor.

Michoud's Falcon hybrid motor fired for the full duration 60 seconds in its first test firing at Edwards Air Force Base, California on January 21.

The next test challenge for the Michoud team going forward is achieving a full duration burn.

"We need to demonstrate that we can burn as much fuel out of the motor as possible so we are not carrying extra weight during ascent of the launch vehicle," says Arves.

The next test will be conducted in May and activities are under way at Michoud to design and build the motor. The plan is to incorporate design refinements and lessons learned from the January test. The motor case segments are currently being fabricated and will be delivered to Michoud in March. The three segments will then be cast, using the hybrid fuel casting facility located in Cell M, assembled, and shipped to the Air Force Research Laboratory for final assembly and testing. Test duration will be 120 seconds – twice the length of the previous test.

In parallel with the risk reduction testing, the Michoud Falcon SLV team is working toward the Preliminary Design Review (PDR) of the entire two-stage rocket and ground systems. The PDR is planned for June and will be the final milestone in the current effort.

Following the review, DARPA and the Air Force will decide which of the teams will be selected to move forward on detailed design, fabrication and flight test of a demonstration vehicle in 2007. ■

As Troy Smith (foreground) practices his manual technique prior to a vertical strut cable tray cover spray, Cedric Garrett explains the complete process to Byrd.

One year

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What did we learn from the RTF effort?

If you recall, we put together 10 disciplined, integrated product teams to focus on the risks of the ET system and how to reduce that risk. It's probably that simple.

At the same time, we put a program structure around it to make sure those teams were integrated. We went back to a development organization. We loaded integrated product teams with all the right disciplines to accomplish their tasks.

Then we empowered these teams to come up with solutions, to take these solutions through the approval cycle, to coordinate the solutions with each other and to finally integrate them on the product.

We changed our behavior as well. We had people get out of their office and participate on the floor. We generated a drive, an energy that got everybody to the table together to solve a problem versus the serial activity that we normally went through. The behavior was how do we help each other, respect each other and support each other.

Without that kind of a structure, without those behaviors, without that kind of a focus, it would have taken us much longer to get where we've gotten to today. The truth is that type of activity and those behaviors work in a recurring environment. So we've got to take the best of the best that we've learned from Return to Flight, formalize it, and integrate it into our structure as we go forward.

The change we've made here in the last two years is to understand that we can relearn some of the things that we thought we already knew how to do. That will assist us very well as we evolve into new product lines in support of space exploration opportunities.

> ***"I think our future looks great because of the president's vision. The reality is that we now have a long-term vision that will put the opportunity in place for our kids and our grandchildren to work here."***

Has customer perception changed from last year to the present?

There is no question that our lack of schedule performance in the early fall timeframe resulted in a loss of customer confidence. We were struggling to convert from our engineered solutions to our application on the product.

We finally put together some process and schedule disciplines that gave us the ability to not only perform to the work but to overcome real-time problems. We weren't necessarily accomplishing what we had planned each day, but when the week was over, we had accomplished enough work that we were still on schedule. We built a lot of self-confidence in that time, and it was reflected in our customer.

When it got to New Year's Eve, **Bill Readdy** and **Gen. Mike Kostelnik** joined us, and both voiced extreme confidence and admiration for the team and the execution we accomplished in the final few months. We've been able to continue with excellent performance on the follow-on vehicles as well. So customer confidence is definitely up; it started with our own self-confidence.

How will the efforts on RTF help us succeed in the future?

What we've gone through last year will make the development of a new vehicle a piece of cake, in my mind. Now, that's easily said but not so easily done. But the fact of the matter is that we worked our way through recertification processes that would normally have taken years.

We've actually broken through numerous cumbersome activities and turned them into real-time, executable processes. The adversity that we've overcome will give us the confidence to take anything on, and not only the confidence but the empowerment to execute.

> ***"Look at what we did in the last three months of the year 2004. Then imagine if we go off and take that kind of energy and that kind of collaboration and put it against the development cycle of a new vehicle. We could reduce that development cycle by over 50 percent and be in play a lot quicker than any of our competitors. That's something we can take to our customer."***

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What is the role of management in making that happen?

Leadership responsibility is unchanged. Clearly we have to stay focused on enabling

the total enterprise to, in our case, get back to flight and fly out the ET safely. But as we posture ourselves to be competitive in the future, so we can participate in things like space exploration, we need to make some changes. Some structural changes, possibly some organizational changes, that will align us to be the most efficient we can.

What else must we do to win new business like Crew Exploration Vehicle?

Cleon Lacefield has been chosen as the program manager for CEV. He has confidence in our ability to support the program, and we want to maintain his confidence.

Both to Cleon and to our customers, deliverables are what represent our performance. Deliverables come in many forms but the ones our customers remember are the ones that come in hardware form – ETs, Falcon test motors, X-33 tanks or early JSF development. Those are things our customers remember.

That includes maintaining our technical expertise and our everyday performance on our core product – the ET.

Behind that performance, we have all kinds of activities – maintaining an infrastructure with its support – the production environment, the office environment and test labs on-line at all times. We have a huge infrastructure to maintain on this campus and a fantastic team that does that. We've got to go off and structure ourselves so those individuals clearly enable the folks that have deliverables.

What is that structure?

We have two basic lines of business: **Ron Wetmore** responsible for ET and **Randy Tassin** responsible for advanced programs. We must be structured to support those two lines of business. It's very important to make sure that we have the right enabling resources focused on a product-centered organization.

Ernie Jarreau discusses new manufacturing process procedures with Byrd as Cheryl Armand inspects ET-121 in the background.

It requires a very similar effort to what we had for Return to Flight – a focused, integrated team of all flavors, of all disciplines, focused on delivery of the right hardware at the right time.

I want to leverage the structure of bringing all the right resources to a project that we've used repeatedly with success on RTF, on the Super Lightweight Tank, X-33 and other programs. Through this structure, we do things more efficiently and please our customer. So I hope to spend the next few months to formalize an organizational structure that emulates what we did for Return to Flight.

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Teams identify keys to success for ET-120, future projects

Factors critical to the delivery of ET-120 on New Year's Eve will remain critical to the continued success of Michoud Operations on projects going forward. Through interviews with team leads and other personnel, **Pat Powell**, director, Business Transformation & Best Practices, identified three key elements that led to the success.

- *There was a clear and meaningful goal shared by all.*
- *Individuals overcame perceived obstacles to focus attention on outcomes.*
- *Attitudes shifted from "Will we make it?" to "We will make it!"*

To **Hal Simoneaux**, RTF manufacturing operations lead, the goal was clear. "We knew people were depending on us. There was strong sense of mission. I gave the team a compelling reason for change – the potential International Space Station deorbit. I communicated to them '...this is why it is important to you – you are saving the program.'"

Dan Callan, RTF design and development lead, identified a basic change in personal accountability from management on down through the organization. "There was a greater sense of ownership," Callan said. "Day to day management changed. Production went from a wait mode to a pull mode. They (Production) realized Engineering did not have to tell them to build the tank – they could build it if they had the engineering – so they created pull."

Mike Smiles, NASA team lead for Safety & Mission Assurance on RTF, observed the attitude change by mid-December. "At two weeks before New Year's Eve we knew there was a glimmer of hope that we could actually make it – that inspired us – there was a chance to make it. Everyone was pitching in for the common good. DCMA, NASA and LM dropped the barriers, and people took on responsibilities outside of their traditional functional requirements."

Finally, on New Year's Eve, all the work and cooperation paid off as Michoud Operations delivered ET-120. "It was my best day ever at NASA... the proudest day of my NASA career," said Smiles. ■

One year

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So how does our future look?

The reality of it is that we have a significant backlog. The backlog is the completion and delivery of about 28 more tanks, and that is not insignificant. We've got proposal activities to continue Falcon and Hybrid programs. We have some technology efforts that support the CEV and that proposal.

As we look at our future, you look to the short term, it is nose to the grindstone to perform, perform, perform on our ET products and continue to develop a better and better product on each delivery. That will position us to go off and to play in this new game called space exploration. That exploration activity encompasses large mass to orbit, and that's our business!

I think our future looks great because of the president's vision. The reality is that we now have a long-term vision that will put the opportunity in place for our kids and our grandchildren to work here.

What one thing can we work on to become more successful?

The source of most inefficiency is poor communications. If we could spend every day working a little harder to improve the way we communicate amongst ourselves here at work, at home or anywhere else, we're going to make the next day better. I don't think we can over emphasize how much benefit clean, crisp two-way communication provides, and it's more than Town Halls, and it's more than walking around the factory.

It's also making sure that what you hear in the environment is a basis for decision-making.

Communications is, by definition, two-way – a 50/50 proposition or 40/60, 60/40, depending on how it goes. That's one of the things we struggle with in management because we've been accustomed to 90/10, a broadcast from the leadership organization hopefully received and executed. We know we've got to do better than that. That responsibility falls on everyone.

One of **Pat Powell's** key responsibilities as director of Transformation is to help us leverage two-way communication across the enterprise. We've got two-way communication activities already under way. I fully expect that we will continue with the momentum we have begun to generate.

How secure is our future at Michoud?

If we were to predict the next two or three years, we would have ourselves back to flight this summer, have the opportunity to fly two or three missions yet this year, and then continue bringing the factory back on-line, refurbishing the rest of our completed product and very methodically getting back into a recurring build of ET.

That's going to take an amazing amount of focus, because not only are we going to be refurbishing tanks, but we're flying missions and then we'll going to bring production back on-line. The next two or three years is going to take a massive amount of 'keeping our eye on the ball' to make it happen.

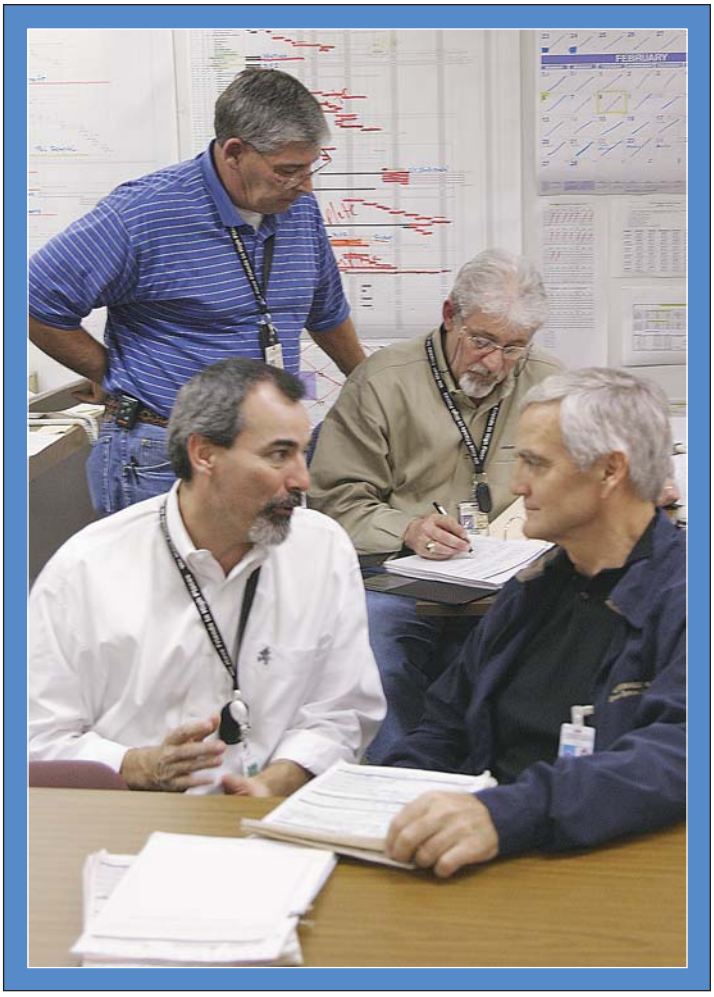
> ***"As aerospace facilities go, I think we've got a pretty secure future here. And much of that is in our control."***

And in parallel with that, we still would remain focused on our technologies, hot pursuit of things like Falcon, Kistler, and all those other activities that complement our ET build processes here.

The fact of the matter is that the headcount that we have on campus here today will be very close to the headcount we'll require in the next three to four years. I think there's a potential on the upside, if anything, as long as we get back in the air and shuttle flies per plan, I think we have a pretty secure immediate future.

As we go out and look out a little farther and look at where we'll be coming down the production line on ET, our future will be very dependent on where the development is for new launch vehicles, for the assets that will fly our space exploration missions.

It's hard to predict when you get out to 2010, 2011, 2012 – that's a long way out. As we get closer, we'll also have a better fidelity on what we'll look like in those time periods. As aerospace facilities go, I think we've got a pretty secure future here. And much of that is in our control. ■



In the Building 420 Command Center prior to the delivery of ET-121, Michael McGehee (lower left) explains the schedule planning activities to Byrd as Rick Nelson (upper left) and Mike Holcomb update retrofit work status.

Ethics Corner

Anderson-Behrens receives top corporate Ethics award

She could have let it go, but she didn't.

When teaching a training class, **Pam Anderson-Behrens**, a senior technical trainer at Michoud Operations, began fielding employee questions that made her wonder if engineering specifications were being properly followed.

"The students were coming in from another area, and I wanted to ensure their knowledge of procedure was in line with certification requirements at Michoud," she said. "I wanted to challenge them, and let them demonstrate how they were following a certain process or how they were conducting a specific test."

But the employees did not appear to be familiar with the procedures and told Anderson-Behrens that they were following their supervisor's directions, and that the supervisor was intimidating.

She could have ignored these red flags as a situation not within her job responsibilities. Rather, she accepted the responsibility to raise her concerns to the Ethics Office.

An investigation confirmed there were problems with the supervisor's style and directives not to follow the engineering specifications. During the investigation, other violations attributed to the supervisor surfaced; the supervisor subsequently resigned.

"Now, the technical specifications are being properly adhered to, the work environment is better and employee morale is improved," Anderson-Behrens said.

For her actions, Anderson-Behrens received the Chairman's Award for ethical business conduct at this year's Corporate Senior Management Meeting. ■

Lockheed Martin President & CEO Bob Stevens poses with Pam Anderson-Behrens, Training & Development, who received the 2005 Chairman's Award for ethical business conduct.

Michoud returns to Six Flags in '05

Responding to a survey conducted after Family Day in November, a majority of Michoud Operations employees said they enjoyed the motivational event at Six Flags New Orleans and wanted to return there this year.

"So it's official," said **Russell Arthur**, Space Flight Awareness. "Family Day will once again be at Six Flags."

Mark the date – Saturday, November 5.

"The 2004 Family Day at Six Flags was an overwhelming success with 76 percent of respondents indicating they had attended the event," Arthur said.

Of the 1,150 employees responding to the survey, 75 percent expressed a desire to continue the Family Day activity, 15 percent preferred a holiday party and six percent suggested individual departmental events. ■

Supporting our troops in Afghanistan and Iraq

Approximately 200 employees and family members turned out March 5 to stuff 5,000 bags to go to our troops overseas as part of Operation USO Care Package. Volunteers filled the care packages with telephone calling cards, CDs, snacks like beef jerky and playing cards. ■

Milestones

Employees celebrating anniversaries with Lockheed Martin in March and April 2005

30 years
Ken Cowie
Shirlene Cunningham
Barbara Robinson
Susan Smith

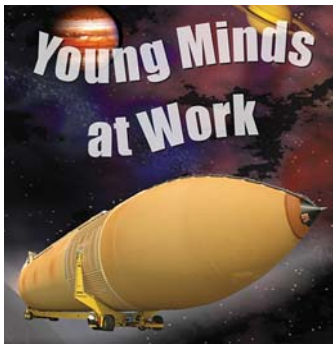
25 years
Lisa Blaum
Arthur Boudreaux
Gregory Broussard
Edmond Ceasar
George Cureau
Roger Deleson
Frederick Eastman
Kevin Ely
Faye Exnicious
Clifton James
David Jenkins
Daniel Jocks
Gregory Jones
Janis Kidder
Al Labat
James Louis
John Moore
Michael Nye
James Ordone
John Pericone
Kenneth Phillips
Steven Ruple
Willie Scott
Carol Simmons
Herbert Sires
Dale Stiller
Wayne Venus
Trudy Wigginton
Delores Willick

20 years
Larry Boudreaux
Mark Bryant
Steve Franklin
Paula Hartley
Carl Hedden
Sheila Hill
Joyce Hunnicutt
Randy McCullen
Paul McDaniel
John Pennino
Deadra Rayford
Richard Schneider
Ernest Stephens
Henry Stewart
Girod Tillman
Patricia Turegano
John Vitrano
Frank Williams

15 years
Robert Biggs
Barry Cantin
Robert Gravolet
Paul Jordan
Chris Packwood
Lynn Servay
Sandy Sollberger

10 years
Willie Henderson
Alfred McCrea
Dennis Necaise

5 years
Kim Price
John Varriello



Michoud will sponsor its first-ever Young Minds at Work on April 28 for employees' children and grandchildren to spend a day here from 7:30 a.m. to 4 p.m. and learn about space and the work we do. Children ages 10 to 18 are eligible. ■

Volunteers lead 2005 EVO board

This year's Employee Volunteer Organization board will participate in a number of community projects – from helping students in a mathematics competition to supporting telethons for Children's Hospital and public television. Front row from left: Dina Michel, Treasurer; Netsy Wheeler, President; Sonya Johnson, Vice President; and Delores Willick, Secretary. Back row: Board members Steve Garner (Past President) Yvonne Vielle, Bill Burtch, Barbara Keezell and Cedric Riley. Not pictured is Board member Barry Keegan.

Mission Success
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Michoud Operations, Volume 24, Number 2
March 16, 2005

Editor: Harry Wadsworth

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Mission Success Bulletin is published by the Communications Department.

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