LOCKHEED MARTIN MICHOUD SPACE SYSTEMS

MISSION SUCCESS® BULLETIN

June 2, 1999

MSFC, Lockheed Martin sign Space Act Agreement

Lockheed Martin Michoud Space Systems and NASA Marshall Space Flight Center have signed a Space Act Agreement to demonstrate a hybrid propulsion sounding rocket system.

The project goal is to qualify large-scale hybrid propulsion to meet NASA's sounding rocket mission requirement. A hybrid propulsion system consists of an inert, solid fuel grain and a separate oxidizer source.

"The hybrid sounding rocket will lower costs, provide safer operations and decrease the environmental impact of repeated flight operations," said **Pam Mitchell**, acting director of Program and Technology Development.

A comprehensive test program that includes ground motor and propulsion system tests will soon be conducted at NASA's Stennis Space Center along with a flight demonstration at NASA's Wallops Flight Facility in early 2000.

The hybrid flight vehicle will demonstrate hybrid combustion and ancillary systems based on hybrid technologies developed by Lockheed Martin over the past several years.

Marshall Space Flight Center will provide overall program management and coordinate participation at NASA sites. Lockheed Martin will provide the engineering design, manufacture, assembly and checkout of test articles and the flight vehicle, Mitchell said.

The hybrid vehicle is

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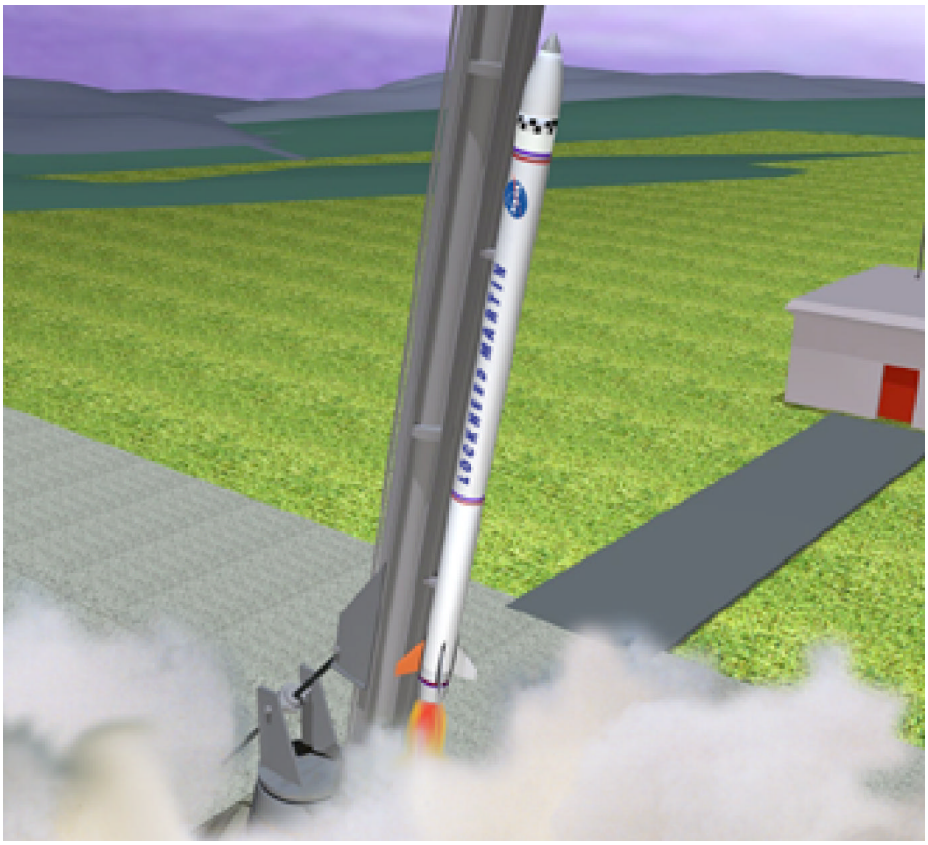

Digital art by Hugh Webb, Graphic Services, Michoud Space Systems

Artist's rendition of the proposed NASA hybrid sounding rocket.

IFA team actions "Go" for flight test

The In-Flight Anomaly (IFA) investigation team has identified and is implementing a near-term corrective action to reduce Thermal Protection System (TPS) foam loss due to "popcorning" during Shuttle launches.

Questions about recurring foam loss from the ET and potential damage to the Orbiter prompted the launch of the intensive IFA investigation in December 1997. The team conducted tests at Marshall Space Flight Center to probe the reactions of TPS to the extreme heat and greatly reduced atmospheric pressure characteristic of launch environments.

The investigators noted a foam loss phenomenon they dubbed "popcorning" in which small chunks of foam pop off from the sprayed-on foam coating under extreme conditions. The team hypothesized that heating produces gases that are trapped in the foam's closed cell structure. With reduced atmospheric pressure, the gases burst through the foam.

To determine if popcorning occurs in the course of actual launches, the group mounted a video camera on one of the solid

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SECTOR NEWS

Corporation announces comprehensive review of Space and Strategic Missiles Sector

Lockheed Martin has named **A. Thomas Young**, former president and chief operating officer of Martin Marietta, to chair an independent panel of experts to conduct a comprehensive review of program management, engineering and manufacturing processes, and quality control procedures at Astronautics, Missiles & Space and Michoud Space Systems.

The panel will report its findings to the corporation's senior management not later than September 1, 1999.

"Although our Mission Success rate as a corporation has been in the range of 97 percent, it's also clear that recent launch vehicle missions have not met their objectives," said **Pete Teets**, Lockheed Martin president and chief operating officer. "This is unacceptable in a company that takes the concept of performance and quality as seriously as Lockheed Martin does. We and our customers expect Mission Success and we will deliver nothing less. The panel of highly qualified experts led by Tom Young will help us identify additional steps that Space & Strategic Missiles Sector president, **Tom Corcoran** and I can take to improve our launch vehicle operations as well as operations on other Space Sector programs."

The independent assessment panel is comprised of persons inside and outside Lockheed Martin who have a broad range of manufacturing, engineering, and program management expertise.

Ric Davis, former President of Martin Marietta Manned Space Systems, was named as a member of the panel.

New appointments announced

Space & Strategic Missiles Sector President **Tom Corcoran** announced the appointment of **Tom Marsh** as President of Lockheed Martin Astronautics. Marsh will succeed **Ray Colladay**, who retired from the company.

At the same time Corcoran announced the appointment of **Al Smith** as President of Lockheed Martin Missiles and Space in Sunnyvale, effective June 1. Smith succeeds **Mike Henshaw**, who has been appointed President and Chief Operating Officer of Lockheed Martin's Energy and Environment Sector, headquartered in Bethesda, MD.

"The success of the Space & Strategic Missiles Sector depends in large part on our ability to effectively manage and address near term issues while maintaining a focus on the future," said Corcoran. "These management changes will help provide the leadership and management expertise necessary to successfully address our challenges as well as preserve the commitment to Mission Success throughout the Sector."

Marsh most recently was Executive Vice President of Engineering and Technology at Missiles and Space in Sunnyvale. Concurrently, he was President of Special Programs.

Earlier, he served as President of Michoud Space Systems.

Smith joins the Sunnyvale team from Lockheed Martin Aerospace Electronics Systems, where he was President.

External Tank Progress Report

Selected Highlights as of June 1, 1999

HARDWARE	STATUS
ET-103	
100th Flight Tank	In Building 420. TPS closeouts, Intertank internal shakedowns are in work.
ET-104	
Tank	In Building 420. Tank is complete and staged for DD250 scheduled for 6/1.
ET-105	
Tank	In Final Assembly. GH2 vent tubing and LH2 Cable Tray installations under way. PAL Ramp trims, closeouts in work.
ET-106	
LO2 Tank	In High-Bay aisle. Starting Dome foam removal (20 inches of the lead-in spray area).
LH2 Tank	In Cell D. Completed primer touchups. Dome SOFI spray is next.
ET-107	
LO2 Tank	In Cell K. Completed acreage primer activities. Preparing for Dome paper spray for BX-250 application validation.
LH2 Tank	In Cell P. Completed external wash and acreage primer spray.
ET-108	
LO2 Tank	On 7023 Tool. All Lugs are tacked. Seal pass activities are underway.
LH2 Tank	On 5069 Tool. Completed X-ray and dye penetrant inspection. Plan to start mechanical installation 6/1.
ET-109	
LO2 Tank	On 5347 Tool. Dye penetrant inspection continues in work. One heat repair remains.
LH2 Tank	On 5019 Tool. Completed H-2 through H-3 welds. Barrel 3 loaded. Weld preps in work for H-4, H-5 welds.

Workplace safety demands integrity

Editor's Note: *Continuing the* Mission Success Bulletin's *series on* Safety *in this issue is Michoud Space Systems' Manager of Safety* ***Stephen Turner.***

- Follow procedures.
- If it isn't safe – stop the operation. Don't risk your personal safety!
- Encourage all employees to help design the fix.
- If a tool is unsuited for the job, don't use it.
- Don't put work/production schedule ahead of safety. Your safety comes first!
- Elevate problems to the level of management that can get them fixed correctly, permanently.

Do these sound familiar? Long-time employees have heard such statements on many occasions. Even our newest employees get the word right up front while attending new hire orientation: responsibility for safety lies directly with every employee working on our team.

When an accident (injury/illness), incident (flight hardware/property damage), or near miss (no injury or damage, but the potential was there) happens at the Michoud Assembly Facility, the Safety Department and the supervisor immediately investigate to discover the root cause of the event.

In 1997 and 1998 more than 95% of all our accidents and incidents were a result of "human error." Human error is a category that simply means that all safeguards were in place, but something within the control of an individual was not performed that caused the accident or incident.

As we each assess the potential for hazards in our work assignments, we have to take into consideration the full range of human errors — design flaws, stress and fatigue, and improper work techniques. Common causes for errors are: failure to follow procedures and/or drawings; unsafe working position or posture; improper use of equipment; failure to implement recurrence controls; design oversights; and design recommendation not implemented.

How often have undesirable events been attributed to "failed to follow procedure" in your work environment? We have to match the way we do business to the paperwork and follow existing procedures — as long as they do not jeopardize safe working conditions.

Constantly review these processes to be sure the latest revision is being used, and that all procedures are being followed accurately. Materials, tooling, designs, internal practices, laws, the way we do or need to do business are all constantly evolving.

YOU must take the initiative to implement changes when necessary.

Don't violate safety rules. Violating safety rules increases your risk of being injured. Why would anyone take that chance? Stop the operation when working conditions are not safe — this is a test both of good sense and personal integrity.

How often have you let down your guard and taken a chance while making the excuse: "This will only take a minute"? Then you stood on a chair, a tool box or other make shift ladder. Perhaps you used stairs without handrails to gain access to work areas; or used a tool not designed for the job; or didn't put on personal protective equipment; or left the guards off the tool; or you just rushed to perform the task "to get the job done." Any of these actions or omissions could have ended in disaster.

We all want to be cooperative, get the job done and keep on schedule. But we must never give in to using unsafe work practices.

For those in supervision and management positions, the challenge is never to communicate the impression to anyone that working in an unsafe manner is required or necessary to get the job done. On the contrary, supervisors must set the example that unsafe practices will not be tolerated.

Employees can help. Identify and report risks in day-to-day operations. Employees can and do provide critical information on potential hazards. Work together to correct the hazard. Every safety issue brought to supervision from employees must be treated seriously. When a problem is beyond the supervisor's ability to be corrected, the issue must be elevated to the level of management that is required to get the problem resolved permanently.

Working together we can meet the mission, on time, within cost, and always safely.

Another project milestone in the making

ET-103, the Shuttle's 100th flight tank, nears completion as it is moved on May 21 from Final Assembly to Building 420 for Test & Check Out.

ISO 9001 gaining momentum

After five months of work, **Feltus Kennedy**, ISO Senior Management Representative, knows the ISO 9001 effort is now heading into a critical turn in the process. And it won't be long before the drive to ISO certification will be barreling down the home stretch.

The Management Leadership Team wants Michoud Space Systems to achieve ISO 9001 certification by September 30.

"I think we've made strides toward registration since we began this January," Kennedy said. "Certainly more employees are aware of and understand the push, but we've got a lot to do in the next four months."

Kennedy is referring to some of the major projects on the ISO 9001 Road Map (seen below) that are taking place this summer such as wrapping up the internal audit, conducting employee training and preparing for the pre-assessment by outside auditors from British Standards Institution (BSI).

"That last one is the dry run in July that will get us ready for the final assessment in September," Kennedy said. "That's what we're pointing to."

The team hasn't neglected Michoud employees at Marshall Space Flight Center and Kennedy Space Center. This month team members visited MSFC and KSC to check how those sites operate and to identify the ISO process discipline.

The team has also spent a lot of time polishing Michoud's Policies, Procedures and Practices so they will be ISO compliant. Verifying documentation is a huge part of the effort. Kennedy says the team has spent hours with internal customers reviewing written procedures as they relate to work processes.

"If the procedures are written well and we follow those procedures in our work, then the final step is to keep good records to prove we've done the work that way," said Kennedy. This is what ISO is all about – creating a standard and sticking to it so Michoud's products will continually be high quality, which the customer likes, he said.

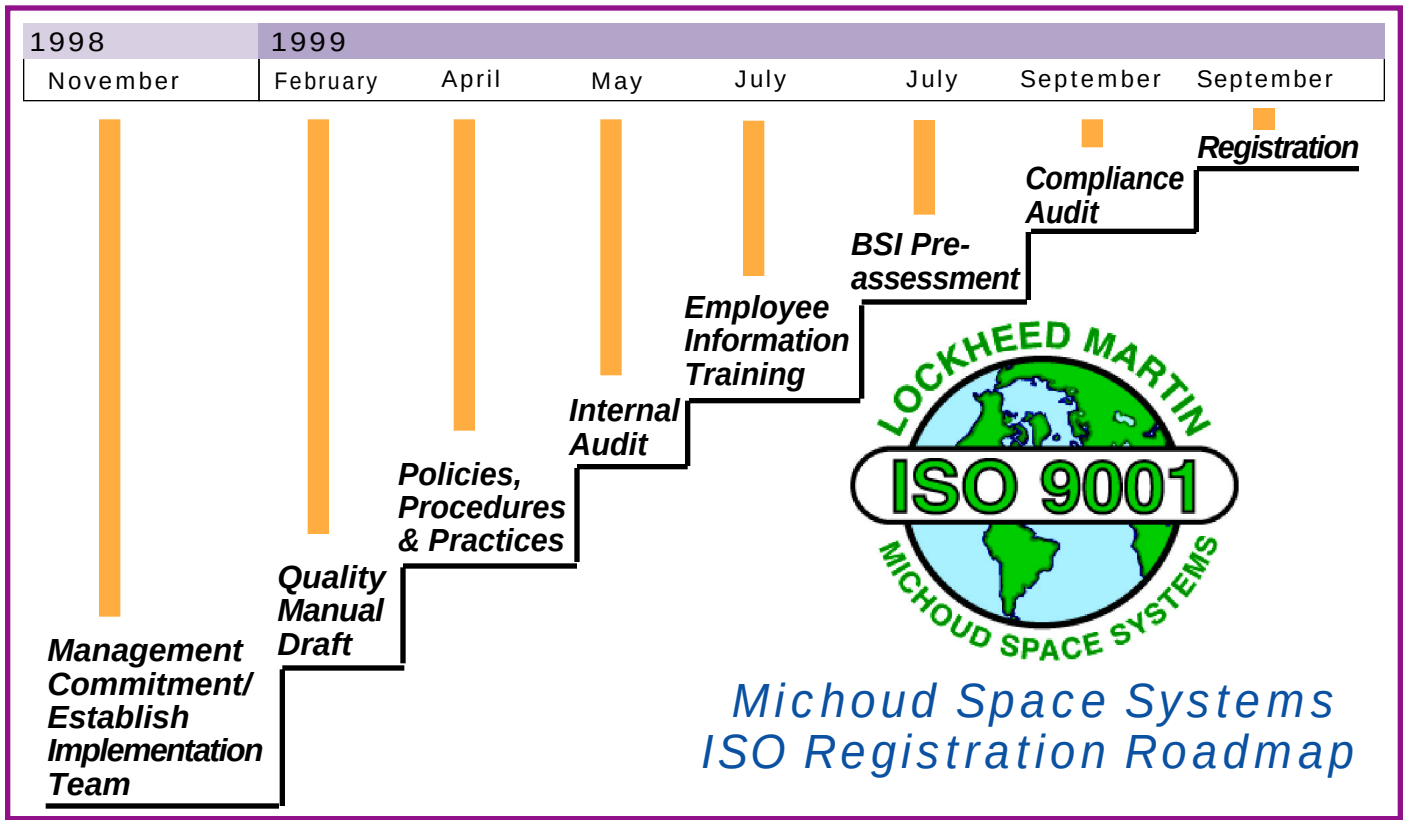
"Completing this will give us confidence that our third party assessor, BSI can come in and confirm our readiness for ISO registration," Kennedy said.

Meanwhile, the team wants to make sure all employees are aware of the ISO 9001 effort. So team members will soon kick off an ISO incentive campaign with important ISO information flyers being posted weekly on bulletin boards.

Then departmental leads will randomly ask employees questions relating to ISO information in the flyers. Employees who answer correctly will receive a modest prize as a token of the team's appreciation for their ISO awareness.

No pressure; this is all rehearsal for the big show in September, said **Mike Schaefer**, Team Lead. "We're just trying to make it fun with incentives for employees while they learn about ISO. Actually, some of the prizes are pretty nice.

"This summer we plan to provide employees with ISO information, from banners to training to answering individual questions," said Schaefer. "It's all part of getting over the hump and becoming certified by the end of September. Then, we will face the challenge of continuously improving our processes in preparation for follow-on BSI audits every six months."



Dilbert and Co. launch Ethics Challenge again

In a return engagement, the popular cartoon characters Dilbert, Dogbert, Cathy and Wally and others are featured in this year's annual Ethics Challenge training.

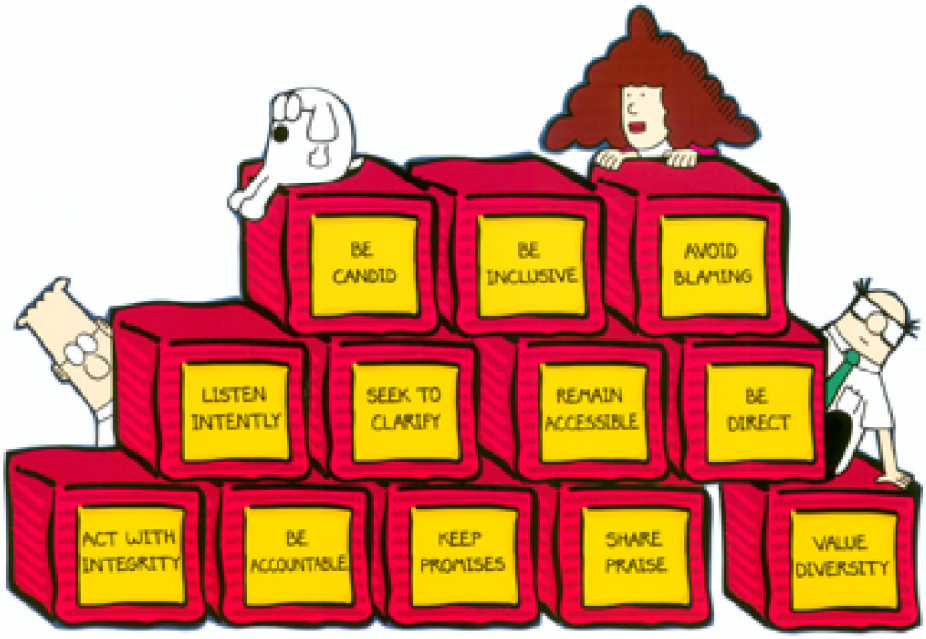
On May 14, company President **Dennis Deel** kicked off ethics training for Michoud Space Systems when he introduced senior management to the format and focus of this year's training. In subsequent sessions, these senior managers trained their own personnel, and this "cascade" pattern is being repeated until all employees have the opportunity to participate in a training session.

Training for the company is due to be completed by July 31.

For 1999, the Ethics Challenge focuses on building trust and open communication as prerequisites for an ethical work environment. "Trust and communication are the focus of this year's program because of the importance given to these values by employees during the Corporation's recent ethics survey," said **Stuart Stine**, Michoud Space Systems ethics officer.

This year's Ethics Challenge takes the form of a team-based game. The employee teams are given a series of workplace situations to analyze. The object is to try to determine which three of a set of 12 proven trust building and communication techniques ought to and banish fear and mistrust from each situation.

Dilbert and crew provide their own unique perspective on business ethics, balancing the serious message of the ethics training with a touch of humor. The process for creating the Ethics Challenge began originally with feedback from employees that the most useful part of ethics training was the discussion of real world ethical scenarios.



In-Flight Anomaly

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rocket boosters for STS-95 to view one of the suspected areas of foam loss — the Intertank Thrust Panels — during flight. The launch went off as planned on October 29, 1998, and the dramatic video footage showed that popcorning did occur.

As a result of the data gathered from ground tests and the STS-95 launch, the team recommended a solution to the problem — venting. Venting is a technique of driving holes in the foam in affected areas of the tank to relieve pressure that builds up within the foam. This method has been rigorously investigated by Michoud Space Systems and NASA, and has been certified for implementation.

Michoud deployed a specialized crew to KSC to perform the modifications on External Tanks 100 and 99, scheduled for upcoming launches.

Six highly trained and certified technicians, led by **Eugene Sweet,** Technical Operations, were given a very short window to carry out this procedure. Without impacting the ET/Orbiter mate schedule, the team worked diligently for 12 hours to complete the task.

Sweet praised the group's dedication: "The crew was fantastic. They worked straight through without any breaks. There were no complaints, not even when hotel rooms weren't available because of Spring break."

Once data from the launch of ET-100 on the STS-96 mission indicates a reduction in Orbiter tile damage, the IFA team will recommend implementing venting on subsequent ETs.

According to **Kevin Montelepre**, Technical Operations, the benefit of the proposed "near term" modification is that the recurring cost is significantly less than implementation of a new foam.

Data on the success of the venting technique will be derived from a review of videotapes from the two cameras that were mounted on the solid rocket boosters for the launch of STS-96.

Hybrid agreement

Continued from front page

environmentally benign, safe to transport by commercial carrier and has a zero TNT equivalence rating when loaded on the launch rail. The spin-stabilized vehicle is designed to produce a sea level thrust in excess of 50,000 pounds (222 kN**)** and to lift a 1,200-pound (544 kg) payload to an altitude of greater than 175 miles (281 km). Mitchell said because the hybrid propulsion system is capable of being throttled, trajectories can be tailored for numerous atmospheric and exo-atmospheric scientific missions.

A successful flight demonstration will benefit NASA, the Air Force, other government agencies and academic and scientific customers of NASA's sounding rocket program.

MILESTONES

Employees celebrating milestone anniversaries with Lockheed Martin in April include:

30 years
Alan Listemaa
Gibson Van Alstyne

25 years
Viola Balancier
Fred Breland
David Buras
William Cochran
Darryl Derbigny
Howard Faciane
Denese Lloyd
Karen Sanchez
Bonnie Strong

20 years
Rose Duvernay
Nicholas Dolese
Jack Garrard
William Hanrahan
Paula Hudson
Chris Jackson
Earl Kerne
Robin Legaux
Robert Lyons
Don Offner
Leonard Paige
Arnold Ranson
Rory Reese
Calvin Martin
Mark Myers
Kenis Tobias
Vivian Tolliver
Jay Weir

15 years
Carl Bouvier
Vincent Fazzio
Donald Gandolfo
Mario Hall
Larry Jackson
Jeffrey Miller
William Oponick
James Sholtz
Elmo Smith
Linda Thomas
Netsy Wheeler
Jacquelyn White
Jeanetta Wilson

10 years
David Berman
Constance Britt
Edward Highfield
Janet Jones
Joseph Le Beau
Kennety Maddox
Laurie McGoey
Lance Spiers
Farooque Sunka

5 years
Donald Bond
William Dickson
David Legnon
Darrell Lincoln
Brent Trosclair

MSFC decal check

On June 1, 1999, Redstone Arsenal will begin a decal check of all vehicles entering the Arsenal. All employees are advised to check their vehicle decal to make sure it is properly displayed and current.

If a new decal is required, it must be obtained at Building 4312, between 7:00 a.m. and 4:00 p.m., weekdays.

For more information, call (256) 544-4758 or 544-2090.

Decals must be affixed to the window on the lower left corner driver's side. Decals cannot be affixed to a piece of plexiglass or other object that allows it to be removed from the vehicle.

Contractors must affix the small piece containing the year of expiration on the side opposite the NASA logo.

Great Ideas Special

Michoud Space Systems is running a Great Ideas Special during the entire month of June. Each employee will receive an auto sun screen for the first Great Idea they submit during the month.

Great ideas should be submitted on the Great Ideas form (MAF/MMA 30-20-027) directly to your departmental Space Flight Awareness representative. No other approval is necessary.

For more information, call **Debbi Berkman**, 7-1056 or **Russell Arthur**, 7-1054.

Questions on ethics?

To obtain clarification on ethical matters or to report possible wrongdoing, contact the Michoud Space Systems ethics officer, **Stuart Stine**, at 7-3842, or call the Corporate Office of Ethics and Business Conduct, 1-800-563-8442.

Michoud Work Status

To find out the status of work at MAF, call 257-1MAF or 1-800-611-3116; check the EWS; listen to WWL-870 radio or WWL-TV; or access the MAF Site Status web site at www.mafstatus.com

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Michoud Space Systems

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TECH TIPS

An employee writes:

"I received a telephone call last evening from an individual identifying himself as an ATT Service technician who was conducting a test on our telephone lines.

"He stated that to complete the test I should touch Nine (9), zero (0), the pound sign (#) and then hang up. Luckily, I was suspicious and refused. Upon contacting the telephone company, I was informed that by pushing 90#, you give the requesting individual full access to your telephone line, which allows them to place long distance telephone calls billed to your home phone number. I was further informed that this scam has been originating from many of the local jails/prisons.

I have also verified this information with UCB telecomm, Pacific Bell, MCI, Bell Atlantic, GTE and NYNEX. Please beware. *Do not press 90# for anyone.*

"The GTE Security Department requested that I share this information with everyone I know. If you have mailing lists and/or newsletters from organizations you are connected with, I encourage you to pass on this information to them."