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The TFOME Safety, Health and Environmental Program continues to receive accolades from our customer. This past fall, the TFOME contract was honored to receive the 2006 NASA Glenn Safe Contractor of the Year Award. This award is given to only one nominee each year and was accepted by our TFOME Safety Manager, Glenn Owens, from the Chief of the NASA Glenn Safety Office and the GRC Deputy Center Director. In addition, our TFOME Safety Specialist, James Shultz, (Jacobs) was also honored with a NASA Glenn Individual Safety Award.

During the Summer of 2006, the Sierra Lobo R&D and Fabrication Facility in Milan, Ohio, entered into a partnership with the OSHA On-Site Consultation in pursuit of the highly-regarded OSHA Safety and Health Achievement Recognition Program (SHARP) certification. At an awards ceremony held on March 9, OSHA On-Site Consultation Program Manager, Greg Collins, presented us with the Award, making Sierra Lobo the seventh company in all of

Beyond Compliance - World Class Safety

OSHA’s Safety and Health Achievement Recognition Program (SHARP)

“The Safety and Health Achievement Recognition Program (SHARP) recognizes small employers who operate an exemplary safety and health management system.”

Continued on page 2
Ohio to achieve this safety designation. This is very impressive considering that they conduct nearly 900 consultation visits a year!

Also in attendance was Sierra Lobo’s OSHA On-Site Consultant, David Roll, who stated that no company in Ohio had achieved this award in such a short period. “Typically, this effort takes 18 months to three years; you guys accomplished this in six months with minimal improvements required.” Sierra Lobo was also the first Ohio Company to receive a two-year exemption from OSHA inspections, in contrast to the typical one-year exemption.

OSHA’s SHARP Program recognizes small employers who operate an exemplary Safety and Health Management Program. Requirements include exemplary safety performance as indicated by incident rates and inspection results, and a Safety Program driven by management commitment and employee involvement. The process includes a rigorous auditing process that evaluates all processes and procedures, air and noise monitoring surveys, thorough facility walk-through inspections, and employee interviews.

**Congratulations to all for an impressive team effort!**

Elements of World Class Safety . . .
- Management Leadership
- Employee Participation
- Hazard Anticipation and Detection
- Hazard Prevention and Control
- Planning and Evaluation
- Administration and Supervision

“Typically, this effort takes 18 months to three years; you guys accomplished this in six months with minimal improvements required.”

David Roll, SLI’s OSHA On-Site Consultant

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Sierra Lobo Milan Employees Displaying OSHA’s Safety and Health Achievement Recognition Program (SHARP) Award.
Sierra Lobo is currently working on the Mars Entry, Descent, and Landing Instrumentation Project (MEDLI) – a NASA multi-center project with participation from Langley Research Center, the Jet Propulsion Laboratory, and Ames Research Center (ARC). The MEDLI project will design, fabricate, qualify, and install advanced sensors and instrumentation systems for the heatshield of the upcoming Mars Science Laboratory (MSL) mission. The data gathered from the embedded sensors in-flight will be used to validate a variety of performance parameters related to atmospheric entry vehicles including heatshield performance, aerodynamics, and aeroheating. This project represents a unique opportunity for NASA to collect such data, something that has not been routinely performed since the early flights of the Space Shuttle.

Sierra Lobo’s extensive involvement with each of the sensors proposed for the MEDLI project has been the result of our development work performed at the Ames Research Center. In particular, Sierra Lobo has been heavily involved in the development of the ablation sensors that will be used to measure heatshield performance for MEDLI. The sensors, manufactured at ARC in part by Sierra Lobo technicians, have been integrated into a variety of heatshield materials to measure material performance during ground-based testing. Also, Sierra Lobo engineers are performing computational analyses of the MEDLI sensors to establish a theoretical model for their performance, which will be compared to test and flight results.

Recently, during the project approval review for MEDLI, the work performed by Sierra Lobo staff members was showcased to an audience comprised of several NASA Associate Administrators including the leads for the Exploration Systems, Aeronautics, and Science Directorates. The high quality of the development effort convinced NASA of the critical need to acquire material performance data and that inclusion of the MEDLI system was the best way to accomplish this mission.
Sierra Lobo has been selected to reproduce a 1/6 model of the Fuel Cracker that they built in 2004 for ISTAR hypersonic testing at NASA Plum Brook’s Hypersonic Test Facility. This system will be housed at NASA Glenn Research Center’s CE-5 Facility within the Engine Research Building. CE-5 is a high pressure/high temperature flamtube/sector combustion test facility with laser diagnostic and exhaust emission measurement capability. The system will be used to test different heated and cracked jet fuels with different injector and combustor configurations at conditions. This system will allow GRC to enter into a new arena of heated and cracked hypersonic fuels testing for near-term military applications and long-term commercial applications.

**NASA Glenn Amateur Radio Club Aides University High School in Contacting the International Space Station**

**Allen Tucholski,** Electronics Technician III, at Glenn Research Center was happy to be part of a very successful activity to help a local school, University, contact the space station, Expedition 14, on March 16. Each ISS crewmember is asked if there are a few schools they would like to contact via amateur radio while they are on the International Space Station (ISS), and Sunita Williams picked University School. Since the NASA Glenn Amateur Radio Club (NGARC) has had two previous successful contacts with the ISS last year with St. Albert and Cleveland Heights High School, the club was asked if they could support University School in Shaker Heights, Ohio.

This activity is sponsored by the American Radio Relay League (ARRL), the radio Amateur Satellite Corp (AMSAT), and NASA. Allen’s specific involvement was to offer the school the specific expertise and equipment to make this radio contact possible.

There were many conversations and e-mail correspondence after work, and Allen visited the school prior to the setup. (Site survey for antenna location, wiring, etc.) This included the special setup configuring of equipment on loan from NASA GRC that he had arranged beforehand. Allen helped to transport the equipment and assisted the school in the setup of the VHF radios, antennas, amplifiers, and transmitters to support ARISS contact between the International Space Station and University School.

Equipment checkout was performed, and the link was monitored during the transmission, paying particular attention to Doppler shift issues while tracking the ISS. (There is a software application that does this.)

The NASA Amateur Radio Club worked as a team, and each team member had a specific task, as this was a huge undertaking and required lots of planning by the school and NGARC.

The radio contact was telecasted on Friday evening at 6:00 p.m. on “Live on 5” and also on “TV3 News.”
NASA Kennedy Space Center

2006 NASA Honor Awards

The following University Spaceport Technology Development Contract Sierra Lobo team members were congratulated and recognized in groups and team awards at the NASA KSC Annual Awards Ceremony on July 25, 2006.

Kennedy Space Center Cryogenic Test Laboratory Team

- For the successful design and flight qualification of the ET LO₂ Feedline Bellows Aerogel Insulation System supporting STS-114: Phillip A. D’Andreamatteo, Barry J. Meneghelli, Zoltan F. Nagy, Douglas A. Rewinkel, and Gary L. Wall.

Liquid Hydrogen Vent Arm Special Instrumentation Group

- In recognition of outstanding achievement in support of the pre-pressurization anomaly for STS-114: Drew P. Schmidt.

Space Shuttle Microwave Scanning Beam Landing System (MSBLS) Signal Simulator Development Team

- For outstanding dedication, technical expertise and interagency teamwork needed to design, develop, and deploy the Microwave Scanning Beam Landing System Signal Simulators: William D. Haskell

Space Shuttle NAVIDS Flight Inspection System Development Team

- For outstanding dedication, technical expertise and interagency teamwork needed to plan, design, develop, verify, and install the enhanced NAVAIDS Flight Inspection system at all operational Space Shuttle landing sites: William D. Haskell

SLI Employee Helps Build Playground for Elementary Children in Mississippi

Barry Meneghelli, Engineer V, along with the members of the Rotary Club, went to Waveland, Mississippi, to help build a playground that will be shared by CB Murphy and Gulfview elementary schools. The children have been unable to play outside because their playground was destroyed by Hurricane Katrina.

Members of the Titusville Sunrise Rotary Club, along with clubs from the Stennis Space Center and the New Amsterdam Guyana Rotary Clubs raised more that $52,000 to build a new playground for these children.

Once the building started, more than 150 parents, teachers, staff, and volunteers worked tirelessly to turn the red clay into a beautiful playground. The look on the children’s faces was worth the effort spent, as it also implied that the area was on the road to recovery. This playground would make the children feel like they were getting back to a normal life by being able to play again. Jan White, Principal of the combined elementary schools, stated, “We built more than a playground on Saturday. We built relationships and a sense of community.”
Solar Water Cracker

Hydrogen ($H_2$) production by conventional means such as reformation is an energy-intensive process requiring large expensive energy infrastructure, while electrolysis $H_2$ production is not as energy intensive, but is very inefficient. These production methods are not desirable for lunar applications due to the very high energy usage or low production. Sierra Lobo personnel at the Cryogenics Test Laboratory (CTL) at Kennedy Space Center, (KSC) FL, have designed and fabricated a sun tracking Parabolic Mirror Solar Concentrator (PMSC), Thermal Receiver and Steam Heat Transfer Fluid System (SHTFS) to provide the energy for low-cost hydrogen ($H_2$) and oxygen ($O_2$) production by disassociation of water. A solar cell power system provides electrical power to drive the sun tracking system, as well as the SHTFS pump and instrumentation.

Initial testing and verification of the PMSC were successful, and the SHTFS is functional. Further testing is in work to fully characterize the PMSC and determine the total energy available for potential processes. Preliminary tests have been performed. The initial results indicate the energy production goal has been exceeded, and the energy available is greater than 37K BTU/Hr. This type of autonomous system may provide a low energy usage/low cost method for lunar applications or other applications requiring an energy source (i.e., Thermo-acoustic Cryocooler).

Cryogenic Gate Valve

Sierra Lobo personnel at the Cryogenics Test Laboratory (CTL) at Kennedy Space Center, (KSC) FL, have developed a highly reliable cryogenic isolation valve with excellent flow characteristics and throttling capability. The new cryogenic gate valve design utilizes a captured Kef-F® gate seal that is a harder material and more resistant to generating particulate material than the original virgin Teflon. The primary innovation in the new design are gates that retract away from the valve body seats prior to final closure or opening, thus eliminating the sliding motion on the sealing surface that was the weakness of the previous gate valve designs.

The initial prototype of the new gate valve design is a retrofit of a surplus 40-year old, two-inch valve body. Without refurbishing the valve body seats, the prototype valve has exceeded the original 1960’s specification requirements for non-cryogenic seat leakage, at one bubble per second per inch of valve diameter. Component testing of the prototype valve, including cryogenic shut-off capability, has also been completed with similar results. Additionally, as part of this test program, the inclusion of a Titanium Nitride (TiN3) coating on the moving parts of the valve will be evaluated for reducing particulate matter and providing a better, longer lasting, non-galling operating surface. New technology sealing materials are also being evaluated as replacements for the valve surface and valve seats. Further development will be completed to optimize the valve seating characteristics and to expand the retrofit design to other valve body sizes.

The new valve design is ideally suited to the tank isolation valve application, combining the required throttling capability, excellent flow characteristics, and robust sealing performance, all in one valve.
Once again, the past twelve months have seen Sierra Lobo employees recognized for their outstanding work on the ROME contract. John Stobierski, Robert Done, Jeremiah Barry, and Frank Beltnick all received spot awards for their continued exemplary support of activities at the National Transonic Facility (NTF). Mary Hackney, our local Human Resources representative and Administrative Assistant, was recognized by ROME management for her tireless and expert contributions to the HR activities of the contract. Joe Cooper, a Facility Service Representative in the Maintenance organization, was recognized for his fast response to a critical issue that developed with one of NASA LaRC’s important utility lines. Our riggers, Dean Burnett, Charles Cooke, Harry Edelstein, Billy and Bobby Hamilton, and Donnie Williams played a key role in winning another celebration luncheon for their section as a result of their continued excellent safe work practices. Congratulations to all of you for jobs well done!

AEROSPACE AS ART

One of our Mechanical Technicians, Stanley Slusarczyk, has been using his talents to support the art world, earning him a spot bonus in the process. Over the past three years, Stan has traveled to various museums across the country and installed an Aerospace Design Exhibit, which displays Langley wind tunnel models as works of art. Models as old as a 1920’s Boeing F4B-2 and as recent as a Mars Airplane concept are either mounted on the museum walls or placed in display cases. Stanley enjoys transforming an empty hall with bare walls into this unique exhibit, and museum curators have noted the positive comments the show has generated. Stanley has been from Seattle to Washington, DC, and points in between with this exhibit, and he always looks forward to the next opportunity to help the general public appreciate the aerospace industry in a new and different way.

Speaking of the next opportunity, it will be at the Experimental Aircraft Association’s Museum in Oshkosh, Wisconsin. It will be running from June through October 2007. For all you airplane enthusiasts who will be going there for the world’s largest fly-in, you can enjoy this exhibit as well.

Stanley Slusarczyk with his aerospace display at the Springfield Museum of Art in Springfield, Ohio.
Science Fair

The 56th Tidewater Science Fair was held at Old Dominion University this past March, showcasing the hard work of 242 high school and junior-high school students. Projects covered the gamut of scientific knowledge: biology, chemistry, physics, computer science, enviromental science, and many more.

Gregory Ackerson, a SLI Systems Analyst with the ROME Group at NASA-Langley, was one of six judges for the physics and astronomy category. The hands-down winner was Easan Balakumar of York High School with his study of parabolic occlusions' effects on pressure within a simulated blood vessel. Easan went on to receive honorable mention at the Virginia State Science Fair.

Contract Performance

A major milestone for the ROME contract was achieved during September 2006. The National Transonic Facility was signed off by NASA as Government Owned, Contractor Operated (GOCO). This event transitioned the day-to-day operations of this critical national asset over to ROME, who staffs the facility with a majority of Sierra Lobo employees. A comprehensive, and to many, exhaustive series of certification programs and demonstration tests were successfully completed to achieve this noteworthy accomplishment. The transition of another key Langley wind tunnel, the 14’ x 22’ Subsonic Tunnel, is already underway and planned for a transition complete date later this year.

ROME Rated “Excellent”

The last two ROME performance period scores were both “Excellent.” This noteworthy achievement earned us another six months added to the contract as an award term, extending our contract to May of 2010. We still have the opportunity to continue this trend and ideally realize a ten-year contract to 2014.

SLI Picnic

Many of our employees were able to attend the first annual Sierra Lobo ROME picnic in Summer 2006. Through the great organizational skills of Mary Hackney, and the exceptional culinary talent of Carl Horne, we had a wonderful barbeque at a lakeside park. Big thanks to Mary and Carl; and to Daniel and Karen Lowe from corporate headquarters who came down to help celebrate.
Sierra Lobo Wins Contractor Excellence Award

Sierra Lobo, Inc. was recently awarded the MSFC Contractor Excellence Award for small business product category. Representatives from Sierra Lobo attended the MSFC Center Director’s Breakfast, where there were numerous MSFC and local dignitaries present. The Breakfast included addresses by both the Center Director, David King, and Exploration Launch Projects Office Manager, Stephen Cook, on the Aries I and other MSFC Managed Projects. The breakfast concluded with the presentation of the MSFC Contractor Excellence award with SLI President, George Satornino, and Program Manager, Hunter (Ed) Denson, accepting. Winning this award automatically nominates SLI for the prestigious NASA George M. Low award to be chosen later this year. Congratulations to all for this monumental achievement!

Witness to Launch of STS-116

SLI employee, Atteynas Mangruem, was witness to the launch of STS-116 on December 9, 2006, in support of a water delivery system launched aboard STS-116 or the International Space Station. She works in the Electrical Fabrication Shop at Marshall Space Flight Center and was recognized along with approximately ten other employees at MSFC for their work in the quick turnaround and delivery of this system. Her husband, Wilfred, accompanied her to watch the spectacular nighttime launch.

Environmental Management System Certification Audit

On November 16, 2006, the machine shop operated by Sierra Lobo at Marshall Space Flight Center was part of the Center's ISO 14001 Environmental Management System Certification Audit. Several employees were interviewed as to the purchasing, handling, and disposal of chemical wastes and our recycling efforts in support of the Center. Sierra Lobo has developed its own Chemical Management Program to comply with the Environmental Management System at MSFC. All chemical purchases, excluding office and housekeeping supplies, are tracked from their arrival until the chemicals are used. Each chemical container is bar coded to track use, shelf life, and link to electronically cataloged Material Safety Data Sheets by Environmental Engineering and Occupational Health Services. Unused chemicals are turned into the Environmental Engineering and Occupational Health Services for redistribution or disposal. Sierra Lobo's precision cleaning operations have already benefited from this program through the recovery of a cleaning agent from other operations at Marshall Space Flight Center.
Sierra Lobo Team Competes in FIRST Championship

A team of Sierra Lobo-sponsored high school students from Milan, Ohio, recently competed in the international-level final round of the FIRST Robotics Competition (FRC) in Atlanta, GA. The team was comprised of junior and senior students from the EHOVE Joint Vocational School, which is in close proximity to the SLI Milan facility. First-year Team #2252 - nicknamed the “Mavericks” - won the “Rookie All-Star Award” at the Buckeye Regional competition held in Cleveland, Ohio, and were thereby qualified for the national event. This marks the first year that the SLI Corporate Office has sponsored an individual team in the FIRST competition, although SLI and TFOME employees at NASA Glenn Research Center have been supporting the Buckeye Regional event for a number of years. These employees were recently featured in an article on the NASA Headquarters website. NASA is also a major national sponsor of the competition, which includes students from 37 countries.

In the contest, two teams of three student-built robots are pitted against each other in a sequence of two-minute qualification rounds. The objective of this year’s contest was to score the maximum possible number of points by placing inflatable tubes on the arms of a structure located in the center of the playing field, while opposing teams attempted the same task. Additional points could be scored by performing this task without human operator control and by raising the team robots off the ground at the end of the round. The Mavericks finished 39th out of 86 teams in the Curie Division.

Team mentor and SLI Mechanical Engineer, Alexander Yeckley, assisted the students with the design and development of the robot and supported the team during the Regional and Championship events. “It was a very rewarding experience working with a first-year team that was so successful.” Each robot is designed, fabricated, and operated by the student teams during a six-week “build season.” The design of all robots must comply with a 150-page rule book, and prior to the competition, each robot must pass both technical and safety inspections. During the process, the students are exposed to a variety of mechanical, electrical, and software engineering experiences.

FIRST (For Inspiration and Recognition of Science and Technology) was founded in 1989 with the stated purpose of inspiring an appreciation of science and technology in young people while building life skills. Since then, the FRC has grown to include over 1,300 teams and more than 32,000 students worldwide. Sierra Lobo’s Vice President, Daniel Lowe, stated, “The FIRST competitions are an ideal outreach effort for our company. We hope to increase our involvement in these types of programs in the future.”

For more information about the First Robotics Competition, or to get involved as a volunteer for next year’s events, go to www.usfirst.org.
For the third year in a row, the TFOME Team sponsored the annual FIRST Robotics competition (www.usfirst.org), which was held March 22 - 24 at Cleveland State’s Convocation Center in downtown Cleveland. TFOME provided the machine shop and staff for the entire three-day event. TFOME’s Resource Integration Specialist, Nicholas Iosue, organized the entire shop including painting all the tools for a professional appearance and transporting them to the competition with the help of Superior Mobility who donated their services. Nicholas led a team of technicians (Mark Jacko, Leonard Smith, William Magas, Richard Polak, Craig Rieker, Arnold Kuchenmeister, Timothy Schilens, and Joseph Lavelle) through hundreds of machining operations, which are free to the students. In addition, TFOME sponsored the Success Tech Academy Team, which is a member of the Cleveland City School District. TFOME provided a monetary donation for the construction of their robot and mentoring support to the students.
Sierra Lobo to Develop Advanced UUV Power System for Navy

The Sierra Lobo Research and Technology Directorate, in Milan, Ohio, will be developing an Unmanned Underwater Vehicle (UUV), liquid hydrogen, liquid oxygen, fuel cell based, power system for the Office of Naval Research (ONR). The module’s, compact, high-efficiency power system will be integrated into a 21” diameter hull section. The Advanced UUV Power System will increase the Navy’s 21” UUV mission endurance from eight hours to 24 hours. Sierra Lobo engineers, Thomas DePhillips, Thomas Montroy, and Chinh Nguyen will be working with UUV engineers at the Naval Undersea Warfare Center in Newport, Rhode Island, to integrate and test the new power system in the 21” UUV.

Development of the Advanced UUV Power System is being sponsored by the Honorable Marcy Kaptur, U.S. Representative of the 9th District of Ohio. Demonstration of the power system in a UUV is an important step in transitioning the technology into Department of Defense acquisition programs. Sierra Lobo’s Director of Research and Technology, Mark Haberbusch, has been working on UUV power systems for a number of years, and he stated the funding helps bridge the gap between research/bench testing and real world systems. “We are putting together a complete package for the Navy. We are bringing technology and Sierra Lobo’s expertise in cryogenic systems, operations, and safety.”

Embosed Systems

Thomas DePhillips, Engineer, attended the Embedded Systems Conference in Boston (September 25-28). The conference offered 74 classes to choose from, and he chose the following: Embedded Programming 101, C and C++ Gotchas, Implementing Embedded Speed Control for Brushless DC Motors, and Principles of Safety Critical System Design.

“Embedded Programming 101” introduced key concepts of embedded software and real-time systems. The main topics were hardware function and terminology and C and C++ programming tips, such as multitasking, reliability and real-time, and Cross Compiling and Debugging.

In “C and C++ Gotchas,” this session explains the different types of gotchas (errors) and why they are an inherent part of C and C++. A gotcha occurs when your program compiles and links without diagnostics. This can then cause the program to produce erroneous results, terminate abnormally, run very slowly, or run out of memory. A gotcha also occurs when you import seemingly correct code from one environment to another and then the program no longer compiles, or links, or the program misbehaves. It presents several C and C++ programming examples containing gotchas and recommends ways to avoid them. Some of the recommendations were static checking in C, which catches many potential errors at translation time, such as constructs that compile and link without diagnostics, yet produce unintended and often disastrous, run-time results. It also helps to prevent portability problems, when a program runs properly in one environment, yet fails in another.

“Implementing Embedded Speed Control for Brushless DC Motors” taught about BLDC motor fundamentals. The main topics were BLDC motor construction, 120-degree modulation and commutation, trapezoidal control with Hall sensors, and sensorless operation with Back EMF.

The class “Principles of Safety Critical System Design” taught safety versus fault tolerance, design issues for safety, hazard analysis, fault and event tree analysis, shutdown design patterns, single-channel patterns, dual-channel patterns, dual-dual pattern, and monitor-actuator pattern. “I was fascinated by the number of presenters and their experience with embedded systems programming,” Thomas reported. “It was a very good training experience.”
Advanced SINDA/FEMAP CFdesign Training

Chinh Nguyen, Engineer, attended and completed a three-day training course on advanced SINDA/FEMAP at the Network Analysis facility located in Chandler, Arizona. In general, the training was very informative and applicable to SLI’s needs. The training agenda included advanced techniques in using FEMAP as a thermal modeler and in using SINDA for computing and post processing in different thermal analysis systems and applications. The training agenda included the items listed below:

- Advanced Geometry Manipulation — Complicated CAD models imported into the FEMAP requires to manipulate or clean-up to convert into the simpler model for thermal analysis.
- Advanced Mesh Generation Techniques — Meshing control methods to generate the uniform meshing (if possible) for more accuracy in term of computing.
- Material Properties as Function of Temperature — Introduce the technique to model the material properties as function of temperature in the tabular (table) form or function. Import material data base into SINDA environment.
- Contact Surface (segment) Modeling — Techniques to model the contact resistance between two surfaces, or fluid and surface, or nodes and surface, and others. An example of this technique in thermal modeling is a model of a cryogenic storage tank using a cooling loop. This technique is very useful in thermal modeling, such as determining cooling requirements for an electronics box.
- Data Processing in Post Process in SINDA and FEMAP — Provide techniques to generate data such as temperature distribution and heat flow report in SINDA and FEMAP.
- Using Skeleton File in SINDA — Techniques to develop FORTRAN statements in SINDA without going back to FEMAP.
- Other Tricks — Many other tricks in using SINDA and FEMAP.

Chinh also attended a Computational Fluid Dynamics (CFD) CFdesign training seminar on April 17-18 at Park One Center, in Independence, Ohio, to learn about a new software package just recently purchased for Milan. The training covered the introduction of flow theory, modeling capability, exploration of the entire CFdesign user interface, and effective use of simulation results. With the CFdesign software in-house, the completion of CFdesign training adds to Sierra Lobo’s capabilities for computing and modeling fluid dynamics and heat transfer, which are essential as the company strengthens its analytical capabilities. The CFdesign tool will be used for several on-going projects at Sierra Lobo’s, Milan, Ohio, facility.

NASA Plum Brook B2 Facility Study

Sierra Lobo’s Milan Test Facility is working with a large team of GRC, Plum Brook, and Private Industry engineers to determine the Feasibility and Cost to perform J2-X testing at the Space Craft Propulsion Facility (B2-complex). The J2-X is a current engine to power the upper stage of NASA’s new Constellation Vehicle. The multimillion dollar enhancement of the B2 facility will allow it to perform full-stage-firing tests of the J2-X upper stage engine at thermal vacuum conditions.
SLI was recently awarded a new contract with Jefferson Laboratory (J-Lab) in Newport News, Virginia. J-Lab is located several miles away from Langley, so you could almost say it is in the eastern technology belt.

J-Lab has been tasked by the Department of Energy (DOE) to implement a Worker Health and Safety Program as stipulated in the publication of a new DOE Regulation. The section that J-Lab is most concerned with is the application of ASME Code rules on piping systems and the safety of workers who are exposed to these systems. All DOE managing and operating contractors must be compliant with the requirements set forth by these documents by May 2007. As it stands now, J-Lab has an extensive and varied assortment of pressurized process systems that were fabricated, procured, and installed under an evolving set of engineering standards with very little consistency or application of ASME Codes to validate the systems properly before they were operated.

In one of his recent trips, Daniel Lowe had the opportunity to meet with representatives of J-Lab and show them our company profile. Needless to say, they were very impressed; especially in the dilemma that they are currently in with their existing piping systems. As we know, SLI has significant experience in the area of design, fabrication, testing, validation of pressure systems, operation, and the application of systems safety rules defined by the ASME Boiler and Pressure Vessel Code. The purpose of the new contract, therefore, was to provide a Pressure System Safety Program for J-Lab. The program provides J-Lab with the necessary programmatic tools to meet the requirements published in recently released DOE Regulations that apply to verification and validation of new pressure systems and, thereby, ensure safety of personnel at the Lab.

Martin Offineer, Antony Skaff, and Thomas DePhillips of the Milan Office and Jack Schlank and Michael Hudson of the Langley Office are collaborating on developing the program. Martin, Michael, and Jack toured J-Lab in September 2006. One of J-Lab’s main efforts centers around a neutron accelerator that is about a mile long and is buried underground. The system utilizes many gallons of liquid helium and has thousands of miles of instrumentation cables. Martin, Michael, and Jack were amazed by the facility. “I have seen a lot of facilities ranging from those at Plum Brook Station, Glenn Research Center, AEDC, and Stennis,” Martin says, “But I have never seen anything as complicated and as large as this facility!” The program was completed by the middle of January 2007 and was very well received. In fact, additional work with J-Lab is under discussion.

**Milan Engineers Receive Systems Engineering Training**

Alexander Yeckley and Martin Offineer of the Milan Office recently attended separate training courses on the concept of Systems Engineering to see how it can be applied by SLI. In today’s exciting space exploration market, SLI is competing with many different companies. Many of these organizations, especially the ones that regularly deal with flight hardware, follow the principles of systems engineering. Company Vice-President, Daniel Lowe, has stated, “I believe Systems Engineering is an important element in our maturation as an engineering and product commercialization company. It will also be valuable as we expand our engineering services work.” The benefits of systems engineering are that it minimizes the possibility of degradation of product quality over the life of the product; minimizes cost overruns during the product’s entire life cycle including its development, use, and final close out; minimizes the risk of schedule slippage by performing a very thorough task breakdown and definition; ensures customer satisfaction by meeting all customer requirements; and minimizes setbacks of the product due to development failures caused by poor planning. With these benefits, one can easily see why the Systems Engineering approach is heavily used in the flight hardware business.

Alexander attended a week-long course in Tullahoma sponsored by the University of Kansas Department of Aerospace Engineering. “I was a little surprised to learn that there are at least eleven different definitions of what “Systems Engineering” is. It means different things in different situations,” he reported. “It’s important that we implement Systems Engineering in a way that is tailored to the specific needs of a project, and our company. There is no single “right” way of doing it,” he concluded.

The course Martin attended was in San Jose, California, and was in conjunction with the AIAA Space Conference. It was an abbreviated two-day course and covered many applications and approaches for Systems Engineering. Emphasis was made on requirements analysis and development, designs based on requirements, risk management, schedule development to define all elements of product development, technical performance measurement, tracking and validating design criteria, and interfacing with customers. “Many of the discussions were on items SLI practices in one form or another, but plans are to incorporate some of the features to improve SLI’s process even better,” Martin reported.
Sierra Lobo Integrates Alternative Fuels Lab

Sierra Lobo, Inc. has recently been selected to integrate the NASA Glenn Research Center Alternative Fuels Lab. Located in the newly-refurbished Building 109, the centerpiece of the lab will be three laboratory-sized Fischer-Tropsch stirred tank reactors. The Fischer-Tropsch process creates “green,” synthetic versions of common hydrocarbon fuels such as kerosene and diesel.

Since the fuels are synthesized from relatively pure gases, the sulfur content of the product is substantially lower than in fuels produced by traditional petroleum refining processes. The Air Force is currently flight-testing a blend of the synthetic fuel with traditional JP-8 in two of eight engines aboard a B-52 Stratofortress, with promising results. SLI is assisting GRC personnel in the detailed design, procurement, data acquisition system programming, operating procedure development, safety review, hardware installation, system checkout and many other related activities. The project will continue through September 30, 2007.

Martin Offineer Talks to Students at Amherst High School

Martin Offineer recently came home from work one day and found his daughter, a freshman at Amherst High School, at the kitchen table buried in blown up balloons and egg crates. She was busy working on a project involving the infamous “egg drop test.” She had the idea of tying four large balloons together and using the connection area in the middle of the structure to provide an area for a weight on the under side and the egg on the top side. After several tests, the test apparatus was tweaked and refined. The structure passed all “flight tests” at school during its demonstration by surviving drops of 10, 20, 30, and the final height of 40 feet.

Having spent many hours on the ultimate “egg drop test,” i.e., the Development and Testing of the Mars Pathfinder Airbag Landing System at the Space Power Facility at NASA’s Plum Brook Station in 1995 – 1996, and hearing the frustration in his daughter about why she needed to do this homework, Marty made arrangements with his daughter’s Science Instructor to talk to the Amherst students. “I wanted to talk to them about the similarity of their test concepts with the real projects and their work as engineers,” Marty reported.

Although it seems like just a short time ago to us, i.e., “the early 90’s,” most of these students were not even born when the technical concepts and challenges of the Mars Pathfinder Program were being discussed. Marty tried to convey to the students that the development and thinking they had to do for their egg drop structure is the same effort that engineers and scientists go through in the development of any new concept or project. Many of them came up with ingenious ideas and found great satisfaction, much like engineers, in seeing their project get tested and survive.

Marty conveyed to them the challenging meetings held with groups of people at NASA brainstorming how we were going to accelerate essentially an 18-foot wide air bag to speeds over 75 mph, or how we would catch the bag after it rebounded off the sloped landing platform, let alone figure out how we would sever the cable that was used to accelerate the airbag before it hit the platform. Martin laid out the whole final configuration, or test setup, discussing all of the inputs into the design requirements and how they were met. Once the test setup was discussed, the students saw 2D and 3D pictures from Mars, the videos of the build-up, the animated video from JPL that showed the whole project, and last but not least, the video that was made after the test program that showed many of the airbag drop tests set to music by the artist Yanni.

One student commented that I must have been pretty happy when it landed safely. “That is an understatement,” I said. “I was so happy, I cried!”

The 3D pictures got the biggest reviews by the students. The expression of “Wow” could be heard several times. Hopefully, a seed was planted and some new “engineers” were born.
Back in January of 2006, SLI received notice that our proposal to demonstrate the use of SLI’s No-Vent Liquid Hydrogen Storage and Delivery System™ in a liquid hydrogen fueled truck was included in the signed Department of Defense 2006 Appropriations Budget. SLI will receive $1.14M for the project, and the funding will be split with one portion routed through our contract with Kirtland Air Force Research Laboratory (funding already in place) and the other part through the Army Tank Automotive Research, Development, and Engineering Center (TARDEC) near Detroit, Michigan. Work on the Liquid Hydrogen storage system has begun with the design of the storage tank while reviewing concepts on how to optimize the shape of the tank and the operation of our pulse tube cryocooler.

The final goal of this project will be to implement our patented No-Vent Liquid Hydrogen Storage and Delivery System™ into a truck that has already been modified to operate with gaseous hydrogen. Sierra Lobo is working with a company that will convert the normal gasoline burning engine to a gaseous hydrogen burning engine. The picture to the left shows SLI’s new truck before it gets converted. It is a 2007 GMAC Sierra, 1500HD Crew Cab, four-speed automatic with overdrive. The truck has all the whistles and bells including all power options and, of course, a CD Stereo Package. Driving down the road in a one-of-a-kind liquid hydrogen powered vehicle just won’t be enough for SLI; we have to drive in style!

SLI is working with NASA AMES Research Center (NASA ARC) to build a ground-test simulator called the Descent Module Test Simulator (DMTS) that is going to best resemble the Descent Power and Analog Module (DPAM) that the Jet Propulsion Laboratory (JPL) is currently designing that will be part of the Mars Science Laboratory (MSL). Like the Mars Pathfinder rovers before it, the MSL is a roving, six-wheeled robot which will explore the surface of Mars. In comparison to previous rovers, it has a greater range capability and will carry the most advanced payload of scientific gear ever used on Mars’ surface - a payload more than ten times as massive as those of earlier designs. The SLI staff in Milan will be designing and fabricating a similar electronics and software simulation package called the Thermal Protection Simulator (TPS) that will be more customized to NASA ARC laboratory and other test needs.

The TPS is being designed to simulate five heat recession sensors, twelve thermocouples, eight pressure transducers, and four thermal sensors. This instrumentation will help simulate Mars and possibly other planets’ atmospheres because it will be interfacing with the Thermal Protection System sensor array developed at NASA ARC. The electronics will be designed to log this valuable data for post analysis and the software will enable the data to be viewable on a local personal computer during testing. Our SLI staff at NASA ARC will be using the TPS at their test facility.

NEW ADDITIONS TO THE PACK

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