



Lockheed Martin Management Association Retirees Newsletter

Looking Forward Towards A Wonderful Retiree Future!

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JUNE 2014

Needed: Staff Help

LMMAR needs volunteers to help keep LMMAR going. We particularly need a secretary and a newsletter editor.

If you think you can help please contact:

Norm Dhom, Membership Chair – (408) 732-2742

Jerry Vaughan, Treasurer – (408) 985-2708

Sad News

June 12, 1929—April 23, 2014 Nancy Powers Johnson passed away peacefully in her home on April 23. Born in Pennsylvania to Marie Hughes Powers and Francis Michael Powers, Nancy came to California in 1942. She was preceded in death by her first husband, William Matthew Horrigan; by her second husband, Clarence (Kelly) Johnson, and her daughter, Kathleen Winfield. Nancy is survived by her sister, Mary Jane Tronson (Charles), her brother, Paul Michael Powers (Helene), her sister, Jacqueline Powers Doud (Robert), and five children: Robert Powers Horrigan (Gail); Maureen Ganzel (Jerry); John Michael Horrigan (Leah); Pamela Horrigan; Michelle Horrigan; eight grandchildren, eight great grandchildren and many nieces and nephews. She was a member of the

Cabrini Literary Guild, the Cal Tech Associates, the Heritage Society of Mount St. Mary's College, and a benefactor of Holy Spirit Retreat Center and Providence St. Joseph Hospital in Burbank. Nancy was beloved by her countless friends and cherished by her loving family. A Mass celebrating her life will be held on Friday, May 2 at 10:30 A.M. at Holy Spirit Retreat Center, 4316 Lanai Rd., Encino 91436. In lieu of flowers, you may honor Nancy's memory with donations to Holy Spirit Retreat Center or Mount St. Mary's College.

May 2014 LMMAR Bridge Results

May 1 - Pairs Duplicate - 1st Place - Doug Gordon & Angie Schynert and 2nd Place - Gary Bea & Chuck Schmidt.

May 6 - Individual Duplicate - 1st Place - Alex Fucile and 2nd Place - (tie) Chuck Schmidt and Bob Vigeant.

May 8 - Pairs Duplicate - 1st Place - Dave Himmelblau & Dave Topak and 2nd Place - (tie) Doug Gordon & Angie Schynert and Ted Hinshaw & Bob Vigeant..

May 13 - Individual Duplicate - 1st Place - Bob Vigeant and 2nd Place - (tie) Doug Gordon, Dave Himmelblau, Ted Hinshaw, and Angie Schynert.

May 15 - Pairs Duplicate - 1st Place - Gary Bea & Chuck Schmidt and 2nd Place - Ted Hinshaw & Bob Vigeant.

May 20 - Individual Duplicate - 1st Place - (tie) Alex Fucile, Dave Himmelblau, and Angie Schynert.

May 22 - Pairs Duplicate - 1st Place - Doug Gordon & Angie Schynert and 2nd Place - (tie) Gary Bea & Chuck Schmidt and Dave Himmelblau & Dave Topak.

May 27 - No Game.

May 29 - Pairs Duplicate - 1st Place - Gary Bea & Chuck Schmidt and 2nd Place - Dave Himmelblau & Dave Topak.

SIXTY YEARS AGO: LOCKHEED ESTABLISHES A MISSILE SYSTEMS DIVISION

By Sherm Mullin

In 1954 Lockheed Chairman Robert E. Gross decided to establish a Missile Systems Division (LMSD), based on the advice of his key advisors and the technical success of some recent projects at the Lockheed California Division. The key advisor was L. Eugene "Gene" Root, the new Director of Corporate Planning, formerly of Douglas Aircraft and the new RAND Corporation

Urged by Robert Gross in 1947 to give some thought to pilotless vehicles, Willis Hawkins, a very creative preliminary design engineer, and his team responded to an Air Force request for a pilotless vehicle. They won the Air Force competition to develop a reusable flying test bed for ramjet engines operating in the range of Mach 1.7 to 3.0, at altitudes up to 80,000 feet. Ramjets are very simple, efficient engines, but they only operate when accelerated to their minimum operating speed by other systems. For the X-7 program they were accelerated by solid rocket boosters with over 100,000 lb thrust.

On April 28, 1951 the first X-7 was launched from a B-29 bomber. It came apart in flight. The first successful flight was completed on May 2, 1952, when it returned to earth as planned, undamaged. The X-7 was an exceptionally productive experimental program, providing new knowledge not just of ramjets, but also structures and materials, supersonic aerodynamics, instrumentation, and telemetry systems. The X-7 made its 130th and final flight in 1960. During the flight testing it had broken the speed record (Mach 4.3) and the altitude record (106,000 ft) for air breathing vehicles.

By 1954 a small number of key people and some of the basic technology needed for the new Lockheed division were in place, with Willis Hawkins as Director of Engineering. After some

initial general management problems Gene Root became Vice President and General Manager, later becoming the first President of Lockheed Missiles and Space Company.

A decision was made to locate the main plant in Sunnyvale, California. 275 acres of farmland were purchased in 1955, where a large LMSC specialized primary facility was rapidly constructed. Later LMSC President Gene Root led the purchase of 400 additional acres, and a major plant expansion was implemented. Land was also purchased in Palo Alto in 1955 for the new research and development facilities. Only a very few people in Burbank transferred to the new division, so most of the key senior and middle management positions were filled by new hires.

Two newly won programs dominated the early years of the new division. The first big win was the Navy's pioneering submarine launched intermediate range ballistic missile (IRBM) program, which became the Polaris missile system. The Polaris was designed with all new technology: two stages, both with solid rocket, thrust vectored engines, a digital guidance computer, a unique light weight reentry vehicle, and many other innovations. The Polaris A1 configuration was 28.5 ft high, 54 inches in diameter, weighed 28,800 lb, and had a range of 1,000 miles.

After overcoming numerous development problems two missiles were successfully launched from the USS George Washington in July 1960. In December 1960 the George Washington deployed in the North Atlantic with 16 Polaris missiles on board.

The second LMSC big win was one of the most highly classified programs in U.S. history, code named CORONA. Most of what follows was not declassified until 1995.

CORONA, with strong support from President Dwight Eisenhower, was a program to create the first photo-reconnaissance satellite system, to gather intelligence on Russia.

The program objective was to put the satellite in orbit, gather extensive high resolution photographs, and then send the photographs back from orbit in a reentry vehicle. As it approached earth it deployed a parachute so it could be caught in the air by a specially equipped aircraft. All this, to put it mildly, was not easy! The first eight launches in 1959 and 1960 were not successful. Finally, on August 18, 1960 a successful mission was achieved. After seventeen orbits around the earth the photo package returned as planned and was snatched in the air by an Air Force C-119 aircraft crew. The photos were an intelligence revelation! A total of 145 CORONA launches were made, with the last launch on May 25, 1972. The information provided to President Eisenhower and his successors was of enormous importance to the United States.

Fortunately one major subsystem used in CORONA was not classified: the Agena spacecraft, a widely used second stage vehicle used to put an amazing variety of satellites into orbit. The AGENA D configuration was 23 feet long, 5 feet in diameter, and had a liquid rocket engine with up to 17,000 pounds thrust. First launched in 1959, 362 Agena vehicles were launched into space. More importantly, Agena was a major factor in establishing LMSC as a leading designer and producer of space systems.

In 1957 Lockheed sales revenue was \$879 million. Missiles, space, and propulsion contributed only \$73 million (8.3%). That same year Russia launched Sputnik I, the world's first satellite, into orbit on October 4, 1957, followed by Sputnik II on November 3, 1957. When Sputnik I started sending signals back to earth, CEO Bob Gross let Gene Root know by calling him in Sunnyvale, saying: "beep, beep, beep." The so-called space race was on. Lockheed would become a major participant in the U.S. space and missile effort throughout the remaining years of the Cold War.

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In 1961, the year Robert Gross died, Lockheed corporate sales were \$1.445 billion, with missiles and space contributing \$735 million (51%). Lockheed was no longer primarily an aircraft company. It is interesting that Lockheed Aircraft Corporation did not become simply Lockheed Corporation until 1977, after Robert Gross, Courtlandt Gross, and Dan Haughton were no longer in control.

LMSC produced more than missiles and space systems. It produced four Lockheed CEOs: Roy Anderson, 1977-1985, Larry Kitchen, 1986-1988, Dan Tellep, 1989-1995, and later, at Lockheed Martin, Vance Coffman, 1998-2005.

Personal Note: On loan from Lockheed Electronics, I worked as a field engineer on the Polaris program from June 1960 to February 1961. I was assigned to the third Polaris submarine, the USS Theodore Roosevelt, at Mare Island Naval Shipyard in Vallejo, CA. After months of 24/7 dockside testing effort, I was one of the two Lockheed engineers on board the Roosevelt during its first sea trials in December 1960.

Lockheed Martin-Built Lander to Study Interior of Mars

DENVER, May 19, 2014 – The team preparing NASA's next Mars lander mission gained a green light today to begin building the spacecraft, which will study how Earthlike planets form. Lockheed Martin [NYSE: LMT] will now begin building the InSight spacecraft.

The InSight mission will launch from California in March 2016 and touch down on Mars six months later. The stationary lander's robotic arm will then deploy surface and burrowing instruments from France and Germany to investigate the planet's interior.

InSight team leaders presented mission-design results this week to a NASA review board, and the board then gave approval for advancing to the next stage of preparation.

"The completion of the critical design review marks a major transition for the project," said InSight Project Manager Tom Hoffman of NASA's Jet Propulsion Laboratory. "We move from doing the design and analysis to building and testing the hardware and software that will get us to Mars and collect the science that we need to achieve mission success. Our partners across the globe have made significant progress in getting to this point and are fully prepared to deliver their hardware to system integration starting this November, which is the next major milestone for the project."



InSight adapts a Lockheed Martin spacecraft design from the successful NASA Phoenix Mars Lander, which examined ice and soil on far-northern Mars in 2008, but InSight will study a different aspect of planetary history with instruments never previously used on Mars. The mission will investigate how Earth and other rocky planets developed their layered inner structure of core, mantle and crust, and will gain information about those interior zones.

"We will incorporate many features from our Phoenix lander into InSight, but the differences between the missions require some modifications for the InSight spacecraft," said Stu Spath, InSight program manager for Lockheed Martin Space Systems. "For example, the InSight mission duration is 630 days longer than Phoenix, which means that the lander will have to endure a wider range of environmental conditions on the surface."

InSight's international science team is made up of researchers from Aus-

tria, Belgium, Canada, France, Germany, Japan, Poland, Spain, Switzerland, the United Kingdom and the United States. JPL, a division of the California Institute of Technology in Pasadena, manages InSight for NASA's Science Mission Directorate, Washington. InSight is part of NASA's Discovery Program of competitively selected missions. NASA's Marshall Space Flight Center in Huntsville, Alabama, manages the Discovery Program.

LMMAR Barbeque

Central Park, Santa Clara – August 15, 2014.

Join us for a fun-filled afternoon. This member favorite event will be catered by Andy's Bar-B-Que. Additional information and sign-up form will be in your newsletter. You don't want to miss this event, so mark your calendar today.

LOCKHEED OLD TIMERS' PICNIC

Washington Park – 25 June 2014

Time- 11:00 a.m. At Washington Park, Sunnyvale (located between Washington & McKinley). \$8.00 (if you do not bring a potluck item.) Main course is hamburgers, hot dogs, and hot links. Bring your own drinks, or lemonade will be provided. Suggested potluck dishes (to serve 8-10): pasta, any kind of salad, and desserts. For more information, call Lucille Wilson 408.225.9566 or Flo Fiance at 408.446.1873 or visit, www.lockheedoldtimers.org

LMMAR MEMBERSHIP DUES TIME

Let's welcome the New LMMAR Fiscal Year! The New LMMAR fiscal year 2014-2015 starts July 1, 2014. If you wish to maintain your membership, please complete and send in the form, "LMMAR MEMBERSHIP DUES" and include with your check for \$15 (or multiples thereof for additional years).

Send to address: Lockheed Martin SSC, LMMAR Membership B/163, P.O. Box 3504, Sunnyvale, CA 94088-3504. If we have not received your Membership Form and Check by end of November 2014, you will not be included in the

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Biennial LMMAR Membership Directory. Please include and note any changes on the form. If you decline to renew your membership, check box on form and return. Please enter your name on form.

We are sensitive to the unfortunate circumstance that some of our members have passed away. In such cases we continue to mail the Monthly Newsletter for the remainder of the paid fiscal year. If the addressee has passed away, please make note of the date on form and return it. In such cases the surviving spouse may maintain membership by continuing to pay annual dues.

How can you tell if you owe dues you ask? Look on the mailing label of the Newsletter. You will see an item above your name to the far right. E.g. P13/14 means "Paid for July 13 to June 14 and is now DUE. If you have paid for more than one year, you might see P14/15, which is paid through June 2015. We have received several "Thank You" notes during the past year, they are all appreciated.

Newsletter Sunshine information: Please send us information about retirees who have passed away.

Let's all look forward to another fun and exciting year!

Norman Dhom LMMAR Membership Chairman

Gravity Systems Provide Deep Insight for Earth Exploration

Look at the world around us, and it's easy to see the differences: The flat farm fields of the Midwest. The hills and valleys of rural Pennsylvania. The rugged peaks of the Rocky Mountains. Venture a bit farther and the differences show themselves through the lush rainforests in South America. Desert landscapes in Africa. Vast coniferous forests in Siberia. Glaciers in Greenland.

But try to peek beneath the Earth's amazing topography, and it becomes

nearly impossible to tell what's there. Is there water? Oil? Valuable minerals? Anything at all worth exploring?

That's where a unique technology available only from Lockheed Martin comes into play.



Lockheed Martin builds multiple versions of gravity gradiometer instruments, like those (top center) used in Full Tensor Gradiometer (FTG) systems. Other gradiometers (left and right) are used for partial-tensor systems, such as the CGG Falcon™ and the Land Gradiometer System, while smaller instruments (bottom center) are targeted for navigation applications.

For more than 20 years, gravity gradiometers have been commercially used to investigate small variations in the earth's density. The technology is based on the scientific principle that earth's gravity field varies with location, local topography and subsurface geologic features. Measuring the gravity variation caused by items beneath the earth's surface can help identify unique underground and undersea geologic structures – from natural resource deposits to potential national security threats.

"Gravity cannot be spoofed," explains Dan DiFrancesco, business development lead for gravity systems, Lockheed Martin Mission Systems and Training. "Think of it this way: A brick and a piece of wood have very different densities. Even if you put them side-by-side, they're not going to have the same gravity signature. We can tell the difference. That's what gravity gradiometers can do – show the differences in what's beneath the earth's surface by measuring the pull of gravi-

ty from the top and the sides, which greatly improves the ability to detect objects."

Originally created as a tool to help launch and direct ballistic missiles, Lockheed Martin transitioned gravity gradiometers to commercial surface ship and airborne applications in the 1990s. Today, the technology is gaining increasing interest as countries around the world look to identify new options for natural resources, energy supplies and mining.

"The days of stumbling upon an unknown lode of gold or a geyser of oil are over," says DiFrancesco. "Future deposits of natural resources lie deeper beneath the earth's surface, are likely smaller in size, and will be harder to find. But businesses don't have unlimited exploration budgets. They have to be smart about where they look."

Information from gravity gradiometers is used in conjunction with other measurements, like magnetic field intensity and seismic data, to provide a robust data set that helps identify areas that are good candidates for further exploration. For instance, gravity signals associated with mineral or hydrocarbon deposits are a key element of most resource exploration pursuits.

And while the fundamental physics behind today's gravity gradiometer technology aren't changing, how the technology is applied is continually evolving. Unconventional ways to deploy gravity gradiometers so customers can see smaller and deeper targets could range from autonomous underwater or aerial vehicles to fixed-wing aircraft or other airborne platforms that can provide advantageous survey conditions.

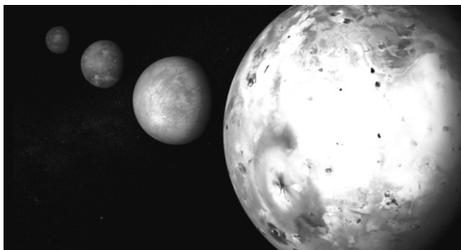
"The goal is to help customers get the information they need to have a great degree of confidence about where resources are and some initial indication of the amount of resource that might be down there," says DiFrancesco. "It's

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ironic, but gathering information to decide where NOT to proceed on a project may be the most valuable. It will save on limited budgets and focus efforts where they'll be most valuable."

Reaching Deeper



From space probes traversing deep into the solar system to powerful space telescopes looking back in time to capture dramatic images of celestial wonder, humanity has expressed a deep and abiding drive to understand the universe better.

By studying planets, asteroids and stars, scientists and researchers can glean clues and insights yielding greater understanding of the universe and sparking technological developments enhancing life on Earth.

While the past boasts a startling list of space exploration accomplishments, the future holds still greater promise.

Continuing its support of NASA's Mars Exploration Program, Lockheed Martin built the Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft, which launched aboard an Atlas V rocket Nov. 18, 2013.

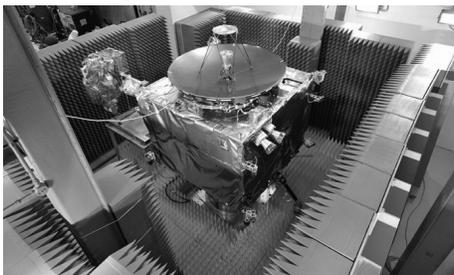
MAVEN is on its way to Mars, where it will arrive in September to begin its mission of studying the red planet's upper atmosphere and to gain clues as to what happened to earlier surface water.

Another Mars mission will be the Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) spacecraft. Targeted for a 2016 launch, InSight will take the first-ever interior measurements of Mars to offer researchers insight to the evolution of terrestrial planets.

Along with Mars, scientists and researcher will have a new opportunity to gain greater clues about Jupiter when the Juno spacecraft arrives at the planet in July 2016.

Launched Aug. 5, 2011, Juno is on a five-year voyage and will provide information to help enhance understanding of Jupiter's origins and development.

"Studying planets like Mars and Jupiter benefits humanity in so many ways," said Crocker. "By gathering data on atmosphere, climate, composition and formation, we can learn about processes at work over time that help us better understand phenomena affecting life on Earth."



The Mars Atmosphere and Volatile Evolution (MAVEN) mission will be the first spacecraft mission dedicated to surveying the upper atmosphere of Mars.

Solar system exploration isn't confined to planets. It includes asteroids, too.

The Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) spacecraft will launch in 2016 and rendezvous with the asteroid Bennu in 2018. It will spend a year collecting samples, then will launch a capsule returning the samples to Earth in 2023.

"OSIRIS-REx is a mission to unravel the earliest stages of solar system history," said Dante Lauretta, principal investigator for OSIRIS-REx with the University of Arizona. "Sample return from asteroid Bennu promises insight into the origin of life and habitable environments on the early Earth. In addition, OSIRIS-REx is a forward-looking mission that supports future asteroid exploration and impact-hazard-mitigation missions."

Scheduled for launch in 2016, OSIRIS-REx will return the first samples ever taken from a special type of asteroid that scientists believe holds clues to the origin of the solar system.

Since launching in 1990, the Lockheed Martin-built Hubble Space Telescope has delivered breathtaking space imagery of the solar system and distant stars and galaxies while dramatically expanding scientific knowledge.

Lockheed Martin has been working with the University of Arizona to develop the Near-Infrared Camera, or NIRCcam, which will serve as the primary imaging instrument for the James Webb Space Telescope. With NIRCcam, Webb will peer even deeper into space and further back into time.

To better understand the solar system requires better understanding the sun. By studying the sun, scientists can gather data leading to insights about solar activity and how it affects life on Earth.

Lockheed Martin designed and built the Interface Region Spectrograph, or IRIS, spacecraft, which launched in June 2013. IRIS is operational and will continue to gather images that will help researchers understand the genesis of solar storms.

Note: Where did you go recently? What interesting things have you done? Send us your story. It probably will be of interest to your fellow LMMAR members. If you have something interesting email it to:

Jerry_vaughan@yahoo.com

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JUNE 2014

Activity Calendar

- **LMMAR Executive Board Meeting.** First Monday of each month unless holiday conflict, then second Monday. 9:30 a.m. Bldg. 157-Satellite Room (off the cafeteria).
- **LMMAR Newsletter Mailing Session.** Volunteers needed. Second Thursday of each month. 9:30 a.m. Bldg. 157-Litrium. Contact Norm Dhom (408) 732-2742.
- **LMMAR Barbeque in Central Park August 15.**
- **LOCKHEED OLD TIMERS' PICNIC in Washington Park - 25 June 2014**
- **LMMAR Luncheon.** October 31, 2014 at Michael's at Shoreline in Mt. View. Contact Lucille Wilson at 408.225.9566
- **LMMAR Luncheon.** December 5, 2014 at Michael's at Shoreline in Mt. View. Contact Lucille Wilson at 408.225.9566
- **LMMAR Bridge Card Players.** Join the fun! Every Tuesday and Thursday, 12:00 noon at the Willow Park Condominiums located at the NE corner of Moffet Blvd. and Middlefield Road in Mountain View. Entrance is from Moffet Blvd. Contact Dave Himmelblau, 'phone No. 650 968-1121.
- **Lockheed Martin Blood Bank Drive.** Second Wednesday of each month. 8:00 a.m.- 3:00 p.m. Bldg. 163. LMMAR Contact Norm Dhom (408) 732-2742.
- **Lockheed Martin Retirees Investment Group (LMRIG).** Meets last Thursday of each month, 1:00-2:00 p.m. in B163 at the corner of J Street and 1st Ave. (Employee Connection Building). Dues are \$2. Contact Don Kinell (650) 948-1520 or Martin Abelow (408) 253-6924. Join us for lunch in the B-157 cafeteria prior to the meeting between 11:40-12:40.

For your financial needs, please contact Star One Credit Union at www.starone.org or (866) 543-5202 toll free.

LMMAR NEWSLETTER

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