

## FROM THE CHIEF HISTORIAN

Let me give you an update on some of our office's many activities. As I mentioned last time, we have a number of publications in the works. The next book to be published will be the proceedings volume from the conference we held over a year ago to mark NASA's 50th anniversary. Steve Dick and Roger Launius are the editors for this volume, which should appear in early summer. Second, Bob Arrighi's book on NASA Glenn Research Center's (GRC's) Altitude Wind Tunnel should appear this summer, following up on his very successful CD-ROM on the same topic. Michael Meltzer's history of NASA's planetary protection efforts should be published in late summer. Then Douglas Vakoch's edited collection of essays regarding the psychology of spaceflight should be published in the fall. Trailing hopefully not far behind will be the eighth volume of our data books series, a volume of societal impact essays edited by Steve Dick, an exciting collection of oral histories of NASA's leadership, and the third volume of our *Wind and Beyond* aerodynamics documentary history series.

Our office also is involved in various ways with anniversaries of major historical events. Coming up this summer is the 35th anniversary of the Apollo-Soyuz Test Project. We have an informative Web site at <http://history.nasa.gov/astpl> online, where Colin Fries and Liz Suckow will be helping to add more interesting materials. Looming over the horizon in about a year is the 50th anniversary of human spaceflight (the first flights of Yuri Gagarin and Alan Shepard), as well as the 30th anniversary of the STS-1 flight. Nine years ago, we

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## NEWS FROM HEADQUARTERS AND THE CENTERS

### Headquarters

Jane Odom has taken on Contracting Officer's Technical Representative (COTR) duties directing a book project (Sunny Tsiao's biography of Thomas O. Paine), and she has on a number of occasions filled in at Office of Communications senior staff meetings. She continues to evaluate and acquire new material for the Historical Reference Collection (HRC). She appraises items for historical value, directs the subsequent processing of collections, and answers reference and Freedom of Information Act (FOIA) requests. Jane has handled several records management liaison actions recently as well as a mandatory declassification review. In addition, she continues to publish speeches of key officials in NASA's history online at <https://mira.hq.nasa.gov/history/>. It is expected that these speeches will be accessible to the public via a new Web page and links by late summer 2010. The press release collection on this Web site is now complete.

Collectively, Colin Fries, John Hargenrader, and Liz Suckow share reference duties, answer inquiries received by e-mail, assist walk-in researchers, and help Jane with FOIA requests. They are jointly appraising a large collection received from the Boston Museum of Science. The collection

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held a conference to mark these anniversaries and produced a conference proceedings volume (available online at <http://history.nasa.gov/sp4107.pdf>). We are starting to collect ideas about how best to mark these anniversaries next year, so stay tuned.

In terms of personnel, I am very pleased to have two excellent undergraduate interns aboard this semester. Thomas Simpson is a sophomore from American University, and Taylor Johnston is a senior at Georgetown University. They are doing great work on many different projects. Unfortunately, they will be unable to stay this summer, so we will likely have a new intern in a few months.

Thank you for all your interest in and support of NASA history.

Stephen Garber

Acting Director, NASA History Division

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*News from Headquarters and the Centers (continued)*

consists of subject files of the deputy director, Walter Webb. Together they are also working to further preserve our HRC hard-copy collection by photocopying deteriorating news clippings, replacing worn folders, and updating abstracts of folder contents. Their preservation work is currently focusing on Earth sciences, aeronautics, NASA Centers, and satellites and space probes. Finally, they recently reviewed the introduction for the reprint of *Lunar Impact: A History of Project Ranger*.

Colin is currently processing a collection of sources used in the Exploring the Unknown documentary series. He scanned and uploaded a collection of *SPACEWARN Bulletins*, 1970–90, to the HRC database. Colin and Liz continue to appraise a collection of Administrators' chronological correspondence files, ca. 1963–78, copying historically significant items to add to existing subject files in the HRC. Colin also continues to assist in maintaining the History Division Web pages.

Liz completed the appraisal of a 53-box collection borrowed from the Federal Records Center (FRC). The collection contained life sciences history sources, papers of Langley Research Center engineer/Headquarters official T. L. K. Smull, and chronological correspondence from a number of Headquarters offices. Her next project entails appraising a 66-box collection from the FRC containing Office of Manned Space Flight correspondence and the papers of Surveyor program manager Benjamin Milwitzky, as well as making copies of historically significant items. Liz continues to update the Headquarters oral history inventory available at <http://history.nasa.gov/oralhistory/ohcatalog.htm> and has entered descriptive information about our oral histories into the database.

John continues to verify photo dates in the GReat Images in NASA (GRIN) database to make sure they conform as closely as possible to the dates the photos were taken after some errors were discovered.

## Ames Research Center (ARC)

NASA Ames concluded its 70th anniversary celebration with a gala dinner on 23 January 2010. Bill Ballhaus, Nichelle Nichols of *Star Trek* fame, Center Director Pete Worden, Deputy Center Director Lew Braxton, and Jack Boyd all spoke on the



As part of the NASA Ames 70th anniversary celebration, Lew Braxton hosted a panel discussion of NASA Ames Center Directors—Pete Worden, Hans Mark, Dale Compton, and Bill Ballhaus—during which they reflected on how the Center has changed since Hans arrived in 1969.



At the NASA Ames 70th Anniversary Gala, keynote speaker and former Center Director Bill Ballhaus regaled the hundreds gathered with stories of Ames and offered thoughts on the future of innovation in the Agency.

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*News from Headquarters and the Centers (continued)*

Nichelle Nichols of *Star Trek* fame gave a rousing address at NASA Ames on the enduring value of space exploration and reflected on the experience of being a role model during the Apollo era and the tumult of the 1960s.

enduring qualities of NASA Ames. Other 70th anniversary events included “Turn Back the Clock Day” featuring an antique car parade and a dramatic performance about NASA history. Ed Schilling and Jesse Carpenter of the Ames video group updated *On the Shoulders of Giants*, a video history of the Center.

Archives interns Dorothy Leung and Laura Williams fully processed two collections and posted the encoded finding aids on the Online Archive of California. Dorothy processed the “Donald E. Wilson Earth Resources Survey Program Papers, 1972–83,” which document his efforts to establish Landsat data analysis capabilities throughout the Pacific Northwest. Laura processed the “Robert E. Slye Papers, 1961–2001,” which include materials related to NASA’s Mission Analysis Division.

Archivist April Gage prepared guidelines for capturing documents digitally and generating descriptive metadata. These guidelines will be road tested during the next few months by spring and summer archives interns Yelizaveta Zakharova and Ratana Ngaotheppitak from San Jose State University. They will help with digitizing records related to the Pioneer program, especially Pioneer Venus. The History Office has received numerous requests over the past few months for historical engineering information related to entry, descent, and landing.

## Dryden Flight Research Center (DFRC)

Christian Gelzer presented “Three Ejections and a Landing, or How I Came to Accept Fly-By-Wire” at the 3rd Annual Aviation History Symposium held by the American Institute of Aeronautics and Astronautics, Antelope Valley chapter.

Peter Merlin wrote a status report, which Dryden released as a News Feature on 10 July 2009 titled “Research Data From the X-15 Program Contributed to Apollo Lunar Missions,” is available online at [http://www.nasa.gov/centers/dryden/Features/X-15\\_Apollo.html](http://www.nasa.gov/centers/dryden/Features/X-15_Apollo.html).

His article titled “Milt Thompson’s Wild Ride,” which became another Dryden News Feature, is available online at [http://www.nasa.gov/centers/dryden/history/Features/Thompsons\\_Wild\\_Ride.html](http://www.nasa.gov/centers/dryden/history/Features/Thompsons_Wild_Ride.html) and was also carried by the local press (*Antelope Valley Press*, 6 January 2010). In addition, he traveled to Las Vegas, Nevada, to present “A History of Project OXCART From the Builder’s Perspective” at the Atomic Testing Museum on 7 October 2009.

Curtis Peebles finished the Hyper-X project history text, which has been approved by Export Control and submitted to a possible publisher. He has started a monograph dealing with the forgotten X-planes, such as the D-558-I, D-558-II, and X-3.

Betty Love continues sorting archival documents. Among the materials she recently sorted and recorded before returning them to the archives are papers from Gary Trippensee, an engineer at Dryden who oversaw projects such as the X-29 and the X-31.

Michael “Mike” Gorn retired from federal service on 26 February 2010. Here is a brief summary of his career:

Michael H. Gorn is an author and historian specializing in the field of aeronautics and spaceflight. He has published many books on the subject, including the critically acclaimed *NASA: The Complete Illustrated History* (Merrell Publishers, 2005, revised 2008) and *Expanding the Envelope: Flight Research at NACA and NASA* (The University Press of Kentucky, 2001). His most recent book is *Superstructures in Space: From Satellites to Space Stations, A Guide to What’s Out There* (Merrell Publishers, 2008).

Gorn grew up in Los Angeles, California, and attended the University of Southern California, where he earned a doctorate in history. He is presently a Smithsonian Institution research associate in the Aeronautics Division, National Air and Space Museum (NASM), Washington, DC.

A federal historian for nearly 30 years, Gorn began his career in 1981 with the Department of the Air Force in Washington, DC. He held a variety of staff and management positions over 12 years, culminating in Deputy Chief Historian of the U.S. Air Force. He also served for three years as the first historian of the U.S. Environmental Protection Agency in Washington, DC. Gorn then worked for NASA for 13 years, eventually becoming the Chief Historian of NASA Dryden Flight Research Center, Edwards Air Force Base, California, the world’s leading facility for the study of flight dynamics.

Michael Gorn is the recipient of the prestigious Gardner-Lasser Aerospace History Literature Award for *Expanding the Envelope: Flight Research at NACA and NASA*, presented by the American Institute of Aeronautics and Astronautics for the best

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*News from Headquarters and the Centers (continued)*

original book published in the field during the previous five years. He has also received the Alfred V. Verville Fellowship from NASM and was selected for the Fellowship in Aerospace History by the American Historical Association.

Gorn has been featured in interviews appearing on the British Broadcasting Corporation (BBC), the History Channel, and the Discovery Channel. He lives with his wife, Christine, in Simi Valley, California.

We wish Mike a productive and rewarding retirement.

## Glenn Research Center (GRC)

*Revolutionary Atmosphere*, a new book about the historic Altitude Wind Tunnel written by Glenn archivist Bob Arrighi (WYLE), is through the editing process and will soon go to print. This 300+ page scholarly look at the Altitude Wind Tunnel covers the transformations the wind tunnel made in its long history—from a wind tunnel doing full-scale testing for wartime applications, to a vacuum chamber supporting the Vision for Space Exploration, and even a brief period as home to Mercury astronaut training. The book will also address the attempts to resurrect the facility and its eventual decommissioning and demolition.

Historian Mark Bowles (Belle History) has won the 2010 History Manuscript Award from the American Institute of Aeronautics and Astronautics for his book *The Apollo of Aeronautics*. The book covers the Aircraft Energy Efficiency (ACEE), consisting of six aeronautical projects born out of the energy crisis of the 1970s and divided between the Lewis and Langley Research Centers in Ohio and Virginia. After publication this spring, a book signing will be held at the Glenn Research Center library.

Glenn History Officer Anne Power presented a lecture at the Case Western Reserve Kelvin Smith Library as part of the “Feds in Cleveland” lecture series. The talk covered the origins of Glenn and how it came to be located in Cleveland, Ohio. The talk is also being converted into a virtual museum exhibit as part of Glenn’s new Second Life island “Glennopolis.”

## Marshall Space Flight Center (MSFC)

### **2010 Marks 50 Years for Marshall as a NASA Center**

MSFC is making plans to mark 50 years of service to NASA and the nation on 1 July 2010. The Center became operational on 1 July 1960, and it was dedicated on 8 September 1960. However, President Dwight Eisenhower set the process involving the creation of the Center in motion on 14 January 1960. On that day, the President officially informed Congress that he planned to transfer the Development Operations Division of the Army Ballistic Missile Agency in Huntsville, Alabama, to NASA.

In his message to Congress, Eisenhower said he had recently reviewed “the needs and requirements” of NASA and the Department of Defense, including the Agency’s “responsibility for the nation’s program of space exploration” and the Department of Defense’s responsibility for the “development and operation of space vehicles for defense purposes.” Eisenhower believed that both agencies needed launch vehicles. However, the question involved which agency would have responsibility for

“boosters for space vehicles greatly exceeding the thrust of any boosters now available.” Eisenhower favored NASA, since he saw “no clear Department of Defense requirement for such very large boosters.” As part of his message to Congress, the President added, “For this reason, I assigned sole responsibility for the development of space vehicle boosters of very high thrust to NASA last November.”

On 14 January, however, Eisenhower addressed what he called the “pertinent arrangements” for NASA to carry out its mission by saying, “This can be done by transferring to NASA the Development Operations Division of the Army Ballistic Missile Agency and certain supporting personnel.” Unless Congress objected, the transfer plan would become effective in 60 days.

On the local level, the *Huntsville Times* predicted the transfer plan would “provide jobs for Dr. Wernher von Braun [the Marshall Center’s first director] and more than 4,800 other Army employees” who would join NASA. In addition, the newspaper stated, “NASA would receive title to more than 86 million dollars['] worth of buildings, land and equipment at Redstone Arsenal, plus 14 million dollars['] worth to be shared with the Army at Cape Canaveral, Fla.” In the months that followed Eisenhower’s transfer plan, Congress held hearings. By mid-March, Congress had agreed to the plan and the new NASA Field Installation was officially named the George C. Marshall Space Flight Center.

In July, those Army employees who had decided to join NASA were officially sworn in as NASA employees. In September, the President traveled to Huntsville, where he officially dedicated the new NASA Center as the “George C. Marshall Space Flight Center” in honor of his fellow World War II military leader, General George C. Marshall. Von Braun would serve as Director of the new Field Center, providing the launch vehicle needed to launch the first human into space and the first humans to the lunar surface as well as launch vehicles and scientific expertise to NASA far into the future.

## Stennis Space Center (SSC)

Stennis’s History Office broadened its Oral History Collection with five employees who shared their experiences from the Apollo and Space Shuttle programs. With a combined total of 200 years of experience, Ronnie Bilbo, Samuel Brown, Jeanne Kellar, Roberto Van Peski, and Wanda Williams talked about their roles at America’s largest rocket engine test complex in the following excerpts:

Roberto Van Peski, senior associate mechanical engineer with Jacobs Technology, started at the test site in 1964 as an iron worker in construction on Dual Position Test Stand B. Van Peski described his first impression of the test site as “a big muddy mess. It was a big hole in the ground. If I’m not mistaken, it was 90 feet deep. It looked like it was deeper than that. One of the biggest challenges was keeping water out of the bottom of the pit while pile driving was in progress. Water pumps were operated around the clock. When I began, the last of the pilings were being driven into the ground. The foundation of the B Test Stand started out with the placement of re-enforcement [*sic*] steel on top of the pilings. Mats were formed with the steel rods, and stacked on one top of the other. While we were building ever upward with the steel rods, carpenters were building forms around the perimeter to receive the concrete pours. This process continued until the last of the concrete was poured.”

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*News from Headquarters and the Centers (continued)*

A laboratory metrologist with Applied Geo Technology (AGT), Samuel Brown began as an electrician/electronic technician in 1977 with General Electric during the Space Shuttle program. He recalls the first time an external fuel tank was tested at Stennis. “It was actually a flight tank, the only one, I think, [that] has been tested here. They were having problems with the insulation on the tank. We had to install instrumentation and TV cameras to view certain areas on the tank. During the process, we had two cameras that had to be online for that test the next day, so we worked from 10 o’clock that night to 1 or 2 o’clock in the morning trying to get the video cameras online. We worked long hours, but it was something that was needed for the space program, and we accomplished it.”

With 32 years on the job, AGT’s engineering technician Wanda Williams stressed the importance of safety and being a team player to produce top-quality work. “Our job has always been support of the test stands. As a matter of fact, in the early days in ’78 when I first started working, we fabricated cables, took them out to the stands and crawled around the floors of the stands hooking up the cables. We had a commitment to ourselves to always do top quality work and to do it safely. Every time something changed, our main priority was to have the best quality and do it safely. We were going to carry that top quality work and working safely from one program to another.”



Stennis employees Wanda Williams, left, Jeanne Kellar, Ronnie Bilbo, Samuel Brown, and Roberto Van Peski, kneeling, share their memories of the Apollo and Space Shuttle programs in the Center’s Oral History Collection. The group stands in front of the A-2 Test Stand at Stennis.

Jeanne Kellar began as a general clerk 44 years ago with General Electric in Central Engineering Files (CEF), where she continues today as a documentation coordinator with Erica Lane Enterprises, a subcontractor of Jacobs Technology. “In Central Engineering Files, we had what they called satellite files for the engineering groups on the designing construction. We had a copy machine and microfilm of the drawings of the site being constructed, and we would make the copies for the engineers. We were like engineering aides. You had to type 65 words a minute to get the job. GE had a lady who was in HR [who] had to wear high heels and dresses, even on the construction site. You had to dress appropriately. That was their dress code for the ladies who worked for them in the original days. Then in 1969, they allowed us to wear pantsuits. We could stop wearing dresses, but we still had to wear high heels. We had a counter in CEF, where the people would come in for service and ask for drawings. I’ve [been] barefoot a many a day, standing up with those high-heel shoes. For a little country girl to wear high heels all day long, I enjoyed every minute of it.”

Another AGT employee, Ronnie Bilbo, a calibration technician, remembers the first time an engine was tested at Stennis, before he began work in 1966. “I’ll never forget the first time they tested an engine out here. They told everybody—it’s going to make a lot of noise for a long ways off. This thing went off at 4 o’clock in the morning and the house was shaking and the ground was shaking and the windows were shaking.



So, everybody runs out on the porch to see what was going on. We had lived maybe 12 miles from here. Those were powerful engines. If they did it on a real cloudy day, the sound waves kept close to the ground, and they could burst windows out in Picayune, Bay St. Louis, and Waveland. So they had to wait on a clear day to do it. They did sound testing. The horn is still out there where they used to turn it on for testing. They had monitors way off-site to monitor that sound wave and to see if they could do anymore damage or rock anybody's house off the foundation."

## RECENT PUBLICATIONS

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### NASA Publications

*Cosmos & Culture: Cultural Evolution in a Cosmic Context* (NASA SP-2009-4802), edited by Steven J. Dick and Mark L. Lupisella. This pathbreaking set of essays in the general category of astrobiology studies the relationship between cosmic and cultural evolution to further our understanding of the societal impact of space-flight. This volume can be purchased for \$25 from the NASA Center for AeroSpace Information (CASI) at <http://ntrs.nasa.gov/search.jsp>, the NASA Information Center, the Government Printing Office, or private vendors.

*Remembering the Giants: Apollo Rocket Propulsion Development*, Monographs in Aerospace History, No. 45 (NASA SP-2009-4545), edited by Steven C. Fisher and Shamim A. Rahman. This monograph is the proceedings from a series of lectures on Apollo propulsion development hosted by NASA's Stennis Space Center, held as part of the celebration to mark the 40th anniversary of the first rocket engine test conducted at the site then known as the Mississippi Test Facility. Members of the public may request a copy of this monograph by sending a self-addressed, stamped envelope to the NASA History Division, Room CO72, NASA Headquarters, 300 E Street SW, Washington, DC 20546. It is also available online at <http://history.nasa.gov/monograph45.pdf>.

*Astronautics and Aeronautics: A Chronology, 2001–2005* (NASA SP-2010-4031), compiled by Noel Ivey and Marieke Lewis. This very useful reference work contains summaries of news reports and government documents related to both domestic and international aeronautics and astronautics programs. This publication will only be available online at <http://history.nasa.gov/sp4031.pdf>.

### Commercially Published Works

#### Compiled by Chris Gamble

*Beyond UFOs: The Search for Extraterrestrial Life and Its Astonishing Implications for Our Future*, by Jeffrey Bennett (Princeton University Press, February 2008). This book describes the startling discoveries being made in the very real science of astrobiology, an intriguing new field that blends astronomy, biology, and geology to explore the possibility of life on other planets. Jeffrey Bennett takes readers beyond unidentified flying objects (UFOs) to discuss some of the tantalizing questions astrobiologists grapple with every day: What is life and how does it begin? What makes a planet or moon habitable? Is there life on Mars or elsewhere in the solar

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*Recent Publications (continued)*

system? How can life be recognized on distant worlds? Is it likely to be microbial, more biologically complex, or even intelligent? What would such a discovery mean for life here on Earth?

*Space Law*, by Francis Lyall and Paul B. Larsen (Ashgate, June 2009). Space law is an area of international law that has developed massively in the last 50 years. This book gathers together the authors' experience as professors in space law in readable form, and, with an extensive citation of the literature of space law, its discussion provides an excellent source for both students and practitioners. This title covers such topics as the Outer Space Treaty, 1967; astronauts; the air/space boundary question; the Moon and other celestial bodies; radio and the International Telecommunication Union; environmental regulation; telecommunication organizations; global navigation satellite systems; remote sensing; space activities; and international trade law.

*Paper Astronaut: The Paper Spacecraft Mission Manual*, by Juliette Cezzar (Universe, June 2009). From the creator of *Paper Pilot* and *Paper Captain*, *Paper Astronaut* is a beautifully illustrated voyage into deep space, combining stunning archival photographs and colorful technical drawings with expertly designed die-cut models that readers can actually cut out and assemble. Published for the 40th anniversary of the Moon landing in 1969—and introduced by Edwin “Buzz” Aldrin—the book includes histories of 20 feats of aeronautic engineering drawn from half a century of space programs around the world, from Apollo 11 to the Soviet space station *Mir* and China's Shenzhou 7 capsule, and featuring the most iconic designs of 50 years of space exploration. Each spacecraft is accompanied by amazing stories, fascinating facts and statistics about the universe around them, and mesmerizing photographs of the vessels in space.

*The Development of Outer Space Sovereignty and Property Rights in International Space Law*, by Thomas Gangale (Praeger Publishers, July 2009). In the United States, lobbies for the commercial development of space have become increasingly antagonistic toward the international legal regime of outer space, condemning the 1967 Outer Space Treaty and the unratified 1979 Moon Agreement as antibusiness. This book argues that the *res communis* principle enshrined in the Outer Space Treaty was misrepresented here, with essential help from corporate lobbyists whose real object was the defeat of the Law of the Sea Convention. Thomas Gangale builds the legal case for reviving the moribund Moon Agreement as a prelude to negotiating a second Moon treaty to establish a regulatory regime for the exploitation of extraterrestrial resources.

*The Earth's Plasmasphere: A CLUSTER and IMAGE Perspective*, edited by F. Darrouzet, J. De Keyser, and V. Pierrard (Springer, September 2009). Earth's plasmasphere, discovered at the beginning of the Space Age, has remained largely unexplored territory. Now, with the innovative observational techniques employed by the European Space Agency's (ESA's) Cluster and NASA's Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) spacecraft, new light is being shed on this key region of the magnetosphere. This book reviews the state of the art in plasmaspheric science based on these modern observations. It sketches the emerging overall picture of a highly structured plasma, sculpted by the ever-changing electromagnetic fields that result from the interaction of the solar wind with the magnetosphere.

*The Impact of HST on European Astronomy, Astrophysics and Space Science Proceedings*, edited by F. Duccio Macchetto (Springer, January 2010). This volume

offers a broad perspective of the advancements made possible by the Hubble Space Telescope (HST) over its almost two decades of operation and emphasizes their impact on European astronomical research. These proceedings of the 41st symposium in the ESLAB series of the European Space Agency collect the oral and poster papers that were presented and discussed during the meeting.

*Near-Earth Object Surveys and Hazard Mitigation Strategies: Interim Report*, by the Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies and the National Research Council (National Academies Press, December 2009). The United States is currently the only country with an active government-sponsored effort to detect and track potentially hazardous near-Earth objects (NEOs). Congress has more recently mandated that by 2020, NASA should detect and track 90 percent of NEOs that are 140 meters in diameter or larger, a category of objects that is generally recognized to represent a very significant threat to life on Earth if they strike in or near urban areas. This interim report addresses some of the issues associated with the survey and detection of NEOs. The final report will contain findings and recommendations for survey and detection, characterization, and mitigation of NEOs based on an integrated assessment of the problem.

*Rocket Propulsion Elements*, by George P. Sutton and Oscar Biblarz (Wiley, eighth edition, February 2010). For nearly 60 years, this seminal text has been regarded as the single most authoritative sourcebook on rocket-propulsion technology. Comprehensive and coherently organized, *Rocket Propulsion Elements* guides readers evenhandedly through basic principles, the various physical mechanisms and designs, and the application of propulsion to flying vehicles. The eighth edition has been updated with the latest advances in the field: changes in materials, systems design, analytical simulations, propellants, applications, and manufacturing technologies. At the same time, older system types, such as hybrid systems, are downplayed in favor of those in use today.

*Spaceflight: A Historical Encyclopedia*, by Patrick J. Walsh (Greenwood, December 2009). The 700 articles in *Spaceflight* cover every human space mission, as well as all significant robotic lunar and planetary space exploration programs, from the 1950s to the 2008 Space Shuttle and Soyuz flights. While most of the encyclopedia focuses on the United States and former Soviet Union, *Spaceflight* goes beyond other works of this type to explore the space-related initiatives of countries around the world, including longtime space powers such as France, the other member nations of the ESA, and the emerging space programs of China and India. Many of the entries are biographical, including portraits of NASA's first five groups of astronauts, Space Shuttle astronauts, Russian cosmonauts, and other non-U.S., non-Russian astronauts who have spent significant time in space.

*At the Edge of the Solar System: Icy New Worlds Unveiled*, by A. Doressoundiram and Emmanuel Lellouch (Springer Praxis, December 2009). On 24 August 2006, the solar system lost its ninth planet! The astronomers' decision at the International Astronomical Union General Assembly in Prague, Czech Republic, to demote Pluto had been precipitated by the discovery, beyond the orbit of Neptune, of a very rich population of Pluto-like objects. The study of the recently discovered remote celestial bodies grows ever more fascinating. Their great variety in color, shape, size, and orbit has astonished observers. What is more, studies of the composition of these newfound objects reveals that they are among the most primitive objects in the solar system. In their simple and lively style, the authors of *At the Edge of the Solar System*

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*Recent Publications (continued)*

alternate discussions on historical aspects and physical descriptions of the remote regions, as well as amazing findings from the cutting edge of research.

*Cosmic Noise: The History of Early Radio Astronomy*, by Woodruff Sullivan (Cambridge University Press, December 2009). The book provides a definitive history of the formative years of radio astronomy, beginning with the discoveries by Jansky and Reber of cosmic noise before World War II; through the wartime detections of solar noise, the discovery of radio stars, lunar and meteor radar experiments, and the detection of the hydrogen spectral line; to the discoveries of Hey, Ryle, Lovell, and Pawsey in the decade following the war, revealing an entirely different sky from that of visual astronomy. Using contemporary literature, correspondence, and photographs, the book tells the story of the people who shaped the intellectual, technical, and social aspects of the field now known as radio astronomy. The book features quotes from over a hundred interviews with pioneering radio astronomers, giving fascinating insights into the development of radio astronomy.

*Mysteries of Galaxy Formation*, by Françoise Combes (Springer Praxis, December 2009). The mystery of how the galaxies formed is a complex and intriguing subject, involving several different theories and an understanding of many different phenomena. Françoise Combes outlines the context in which the Big Bang and the expansion of the universe occurred and the first “inhomogeneities” from which arose the early structures of the universe. Having outlined the evolution and structure of galaxies, the author introduces black holes. What do we know about their origins and growth at the centers of galaxies? Scenarios of both “top down” and “bottom up” galaxy formation are discussed, together with the relationship between red and blue galaxies and dwarf, elliptical, and spheroidal galaxies. The problem of dark matter is then addressed, including its relationship to visible matter and to the structure of the universe on the grand scale, focusing on the success of the Cold Dark Matter model. The author concludes by reviewing problems that remain to be solved and the techniques that might begin to be used to solve them.

*By Any Means Necessary! An Entrepreneur's Journey into Space*, by Gregory H. Olsen (GHO Ventures, LLC, December 2009). On 1 October 2005, Greg Olsen, a successful high-tech entrepreneur, climbed aboard a Russian Soyuz rocket and blasted off for the International Space Station. He was only the third private citizen to make that trip. In this inspiring and entertaining book, we learn how a self-described “average guy” went from underachieving juvenile delinquent who almost did not get into college to a Ph.D. scientist with 12 patents in electronics. We witness the entrepreneurial spirit, hard work, and occasional strokes of luck (or “grace,” as he calls them) that propelled him to start and sell two companies, one of them for \$600 million in stock. And we accompany him as he overcomes health issues, a bout of debilitating despair, and the Russian medical bureaucracy to achieve his dream of becoming a space traveler. Along the way, Olsen reflects on the mental outlook and work habits that made his success possible.

*Space Manifold Dynamics: Novel Spaceways for Science and Exploration*, edited by Ettore Perozzi and Sylvio Ferraz-Mello (Springer, December 2009). The term “Space Manifold Dynamics” (SMD) was proposed during the workshop “Novel Spaceways for Scientific and Exploration Missions” for describing new types of spacecraft trajectories that could revolutionize how space missions are designed. Obtained by applying the dynamical system approach to mission design, these trajectories represent a fascinating alternative to elliptic motion and provide a deeper understanding

of the classical three and N-body problems in celestial mechanics. This book gives a state-of-the-art overview of this new field of study together with applications of an interdisciplinary nature involving planetary science, astrophysics, and the piloted exploration of the solar system.

*An Assessment of NASA's National Aviation Operations Monitoring Service*, by the Committee on NASA's National Aviation Operations Monitoring Service (NAOMS) Project (National Academies Press, December 2009). The National Research Council of the National Academies was requested by NASA to perform an independent assessment of NASA's NAOMS project, which was a survey administered to pilots from April 2001 through December 2004. The National Research Council reviewed various aspects of the NAOMS project, including the survey methodology, and conducted a limited analysis of the publicly available survey data. *An Assessment of NASA's National Aviation Operations Monitoring Service* presents the resulting analyses and findings.

*Selling Peace: Inside the Soviet Conspiracy that Transformed the US Space Program*, by Jeffrey Manber (Collector's Guide Publishing, Inc./Apogee Books Space Series, January 2010). How the door to Russia's long-hidden space program was opened during the era of Soviet *perestroika*, the political struggle on the signing of the first contract between the Russians and NASA, the push to change space station *Freedom* into a cooperative venture, the willingness of the Russians to use free markets against the wishes of NASA, and how the Russian space station *Mir* became a commercial platform are all told in a relaxed and engaging style by the author, who is the only American ever to work within the Russian space program. The book chronicles the author's 14-year journey to use Russian assets to strengthen the American space program.

*The Scientific Exploration of Mars*, by Fredric W. Taylor (Cambridge University Press, January 2010). The dream of exploring Mars has been around since the early days of human civilization and still forms part of our vision of the future for the human race. Today, we send unpowered spacecraft to explore this neighboring world to examine its climate, search for evidence of past or present life, and learn how conditions there relate to those on Earth. Plans are now being prepared for a piloted mission to Mars, set against an uncertain background of political, practical, technical, and financial considerations. This unique book provides a complete description of the past, present, and future of Mars exploration. Written by a scientist intimately involved with missions to Mars, it provides a personal first-hand account.

*NASA Apollo 11 Owners' Workshop Manual: 1969 (including Saturn V, CM-107, SM-107, LM-5)*, by Chris Riley and Philip Dolling (Haynes Publishing, January 2010). This is the story of the Apollo 11 mission and the "space hardware" that made it all possible. Author Chris Riley looks at the evolution and design of the mighty Saturn V rocket, the Command and Service Modules, and the Lunar Module. He also describes the spacesuits worn by the crew, with their special life-support systems. Launch procedures are described, as well as "flying" the Saturn V, navigation, course-correction "burns," orbital rendezvous techniques, flying the Lunar Excursion Module, landing and walking on the Moon, taking off from the Moon, and Earth reentry procedure. The manual includes performance data; information on fuels; and biographies of Neil Armstrong, Buzz Aldrin, Michael Collins, Gene Kranz, and Werner von Braun. Detailed appendices cover all of the Apollo

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*Recent Publications (continued)*

missions, with full details of crews, spacecraft names and logos, mission priorities, Moon landing sites, and the Lunar Rover.

*The New Space Race: China vs. the United States*, by Erik Seedhouse (Springer Praxis, February 2010). The world's most populous nation views space as an asset, not only from a technological and commercial perspective, but also from a political one. The repercussions of this ideology already extend far beyond Washington, DC. *China vs. the United States* offers a glimpse of future Chinese aspirations in space and the wide-ranging implications of a looming space race. The author also explains how an interplanetary spaceship called the *Tsien Hsue Shen* might one day travel to the outer planets.

*Choice, Not Fate: Shaping a Sustainable Future in the Space Age*, by James A. Vedda (Xlibris Corporation, December 2009). *Choice, Not Fate* challenges the traditional paradigm in which space goals are equated with destinations. It suggests that space-flight programs should target advanced capabilities that bring direct benefits to Earth and enable exploration and development of the solar system. Vedda examines space activities in the context of today's globalized world while paying homage to the work of noted space futurists. Historical examples and current political processes illustrate the forces that perpetuate short-term thinking and highlight the need for incentives to promote long-term thinking. The book presents a revised rationale for spaceflight directly tied to societal needs and ambitions, with a greater role for the commercial sector.

*American Flying Boats and Amphibious Aircraft: An Illustrated History*, by E. R. Johnson (McFarland, December 2009). This work is a comprehensive, heavily illustrated history of the many flying boats and amphibious aircraft designed and built in the United States. It is divided into three chronological sections: the early era (1912–28), the golden era (1928–45), and the postwar era (1945–present), with historical overviews of each period. Within each section, individual aircraft types are listed in alphabetical order by manufacturer or builder, with historical background, technical specifications, drawings, and one or more photographs. Appendices cover lesser-known flying boat and amphibian types as well as various design concepts that never achieved the flying stage.

*North American X-15 Rocket Plane Pilot's Flight Operating Instructions*, by North American Aviation (Periscope Film LLC, January 2010). North American Aviation's X-15 rocket plane flew at Mach 6.72 and at altitudes above 67 miles—at the threshold of space. The men who piloted this amazing plane became the U.S. Air Force's first astronauts. Powered by an XLR-99 engine capable of producing 70,000 pounds of thrust at peak altitude, the X-15 pushed the flight envelope for piloted aircraft past the post office. Notably, both Apollo astronaut Neil Armstrong and Space Shuttle commander Joe Engle piloted the X-15. Originally published by North American Aviation for the Air Force and later NASA, this flight operating handbook represents a 1963 update of the original version first printed in 1961. Just recently declassified, it provides a revealing look into one of history's great planes. Also included in this edition is a rare X-15 rescue manual made for the plane's ground crew.

*Lockheed SR-71 Blackbird Pilot's Flight Operating Instructions*, by United States Air Force and Lockheed Aircraft (Periscope Film LLC, January 2010). Created by Lockheed's brilliant designer Kelly Johnson, the SR-71 Blackbird is one of the most legendary aircraft to emerge from the famous "Skunk Works." Capable of Mach

3 flight, the SR-71 could survey 100,000 miles of Earth's surface from an altitude of 80,000 feet. The SR-71 holds a coast-to-coast speed record of 64 minutes flown at over 2,100 miles per hour (mph). The SR-71 flew from 1964 to 1998 for the Air Force (with a brief retirement from 1989 to 1995) and completed over 17,000 sorties and over 11,500 hours at Mach 3. The Blackbird also flew as a NASA research aircraft from 1992 to 1999. Originally created for the elite group of pilots who drove "the sled," this flight operating handbook provides a revealing look into the cockpit of one of history's great planes. Just recently declassified, this book contains all the basic instructions for the SR-71A and twin-cockpit SR-71B training model.

*Balls Eight: History of the Boeing NB-52B Stratofortress Mothership*, by Brian Lockett (Brian Lockett, July 2009). It has been asserted that the Boeing NB-52B Stratofortress, carrying Air Force serial number 52-0008, can lay claim to being the airplane that has seen and participated in more history than any other single airplane. For 45 years, the NB-52B was a fixture at Edwards Air Force Base. While the NB-52B is most famous for launching the three North American X-15 rocket planes, it continued to serve in the role of launch platform for a multitude of programs until its final mission on 16 November 2004. It was the oldest flying B-52 by nearly 10 years.

*The Farthest Shore: A 21st Century Guide to Space*, edited by Joseph N. Pelton and Angelia P. Buckley (Collector's Guide Publishing, Inc./Apogee Books Space Series, February 2010). *The Farthest Shore* is a comprehensive new guide to space systems and exploration as we reach anew into space in the 21st century. Inside, everyone from a questing student to a sci-fi fan can find out about all aspects of space, from how we use space to deal with global warming to the latest in space tourism. Experts assembled from around the world, from astronauts and astrophysicists to space zoologists, will tell us about the different ways we can use space to survive on Earth, explore the unknown cosmos, or create totally new industries. This book, largely written in narrative form, contains a series of interesting stories about how we use space in dozens of ways that continue to expand wider and wider every year.

*New Spaces of Exploration: Geographies of Discovery in the Twentieth Century*, edited by Simon Naylor and James R. Ryan (I. B. Tauris, February 2010). For many, the dawn of the 20th century ushered in an era when the world map had few, if any, blank spaces left to discover. The age of exploration was supposedly dead. *New Spaces of Exploration* challenges this assumption. Focusing specifically on exploration in the 20th century, the authors demonstrate how new technologies and changing geopolitical configurations have ensured that exploration has remained a key feature of our rapidly globalizing world. Ranging widely in their geographical focus—from Europe and Asia to Australia and from the polar regions to outer space—they demonstrate the increasing diversity of modern exploration and reveal the continuing political, military, industrial, and cultural motivations at play. The result is a major contribution to our understanding of the significance of exploration in the 20th century.

*Planetary Landers and Entry Probes*, by Andrew Ball, James Garry, Ralph Lorenz, and Viktor Kerzhanovich (Cambridge University Press, paperback edition, February 2010). This book provides a concise but broad overview of the engineering, science, and flight history of planetary landers and atmospheric entry probes designed to explore the atmospheres and surfaces of other planets. Examples are drawn from over 30 different lander and entry probe designs that have been used for lunar and planetary missions since the early 1960s. The authors provide detailed illustrations of many vehicle designs from different international space programs, and they give

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*Recent Publications (continued)*

basic information on their missions and payloads, irrespective of the missions' success or failure. Several missions are discussed in more detail to demonstrate the broad range of the challenges involved and the solutions implemented.

## ONLINE RESOURCES

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### NASA History

<http://history.nasa.gov/sp4031.pdf>

*Astronautics and Aeronautics: A Chronology, 2001–2005* (NASA SP-2010-4031), compiled by William Noel Ivey and Marieke Lewis. This very useful reference work contains summaries of news reports and government documents related to both domestic and international aeronautics and astronautics programs. This publication will only be available online.

### Other Sites of Interest

<http://dora.uah.edu>

“Dora and the V-2: Slave Labor in the Space Age” is an exhibit and Web site sponsored by the Salmon Library at the University of Alabama, Huntsville. The exhibit features the history of forced labor in the construction of the V-2 missiles at the Dora concentration camp and Mittelwerk underground factory near Nordhausen, Germany, during World War II.

[http://collectspace.com/resources/books\\_2009astronautical.html](http://collectspace.com/resources/books_2009astronautical.html)

collectSPACE, a Web site devoted to space history and artifacts and moderated by Robert Pearlman, has posted the list, compiled by the American Astronautical Society History Committee, of astronautics books published from 2006 to 2009.

## CHERTOK PRESENTATION BY DR. JESCO VON PUTTKAMER

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*The Russian space community celebrates the memory of Academician S. P. Korolev and other prominent space pioneers during their annual Academic Reading on Cosmonautics. The 34th Academic Reading on Cosmonautics took place on 26–28 January 2010, hosted by the Bauman Moscow Technical University in Moscow, Russia. Dr. Jesco von Puttkamer (NASA Headquarters) gave a presentation on Rockets and People, volumes 2 and 3, by Boris Chertok.*

*The following is an abridged version of the NASA presentation of Rockets and People, volumes 2 and 3, by Boris Chertok, given by Dr. Jesco von Puttkamer:*

Much has been written in the West on the history of the Soviet space program, but few Westerners have read direct firsthand accounts of the men and women who



were behind the many Russian accomplishments in exploring space. The memoirs of Academician Boris Chertok in English fill that gap. Chertok's storytelling skills confront us with real people with real dreams who achieved extraordinary successes under very difficult conditions but also suffered stunning setbacks and losses.

We knew very little about the Soviet space program during the 1960s, when I worked under Wernher von Braun in Huntsville, Alabama, on the Apollo Moon landing program. In 1957, we were shocked by Sputnik I, and in 1961, we were tremendously excited by Yuri Gagarin's heroic flight in Vostok 1. Again and again, we engineers and managers were amazed about the many Soviet firsts in space. And yes, we certainly did welcome them—because they represented strong incentives and stimulants for our own actions, deadlines, and accomplishments of human space travel. They made us work harder because engineers like to compete. Thus developed what media called “The Race in Space.”

But what we knew about our opposition, about the people behind these tremendous accomplishments and tragic setbacks in Russia, was next to zero. We knew practically nothing about Sergey Pavlovich Korolev and his deputies, among them Boris Yefseyevich. With *glasnost* and *perestroika*, little by little the curtain began to lift.



Panel with Academician Viktor Legostayev, Professor Demikhov (Vice Rector of Bauman Moscow Technical University), Boris Chertok, and Alla K. Medvedeva.

The first time I heard about Chertok was from some Germans from the former East Germany. I learned that starting in 1946, at the end of the Great War, a “Major Tschertok,” who later worked closely with Korolev, had been instrumental in pulling together former German rocket engineers and scientists plus lots of equipment. They all spoke very well of Boris Chertok. Soon thereafter I discovered the German translation of his four-volume memoirs, *Rakety i Liudi*.

I was very much impressed by this incredible tale of bygone years in the Soviet Union and what went on behind the scenes of its space program, which I, like all of us, had seen only from the outside and from across the ocean. It has always been and still

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*Chertok Presentation by Dr. Jesco von Puttkamer (continued)*



Left: Dr. Jesco von Puttkamer gives his presentation on *Rockets and People*, volumes 2 and 3, at the 34th Academic Reading on Cosmonautics. Right: The audience at the 34th Academic Reading on Cosmonautics.



Boris Chertok at his book signing.



Boris Chertok and Dr. Jesco von Puttkamer toasting to friendship.

is close to a mystery to me how the Soviet Union, which lost more than 20 million people during World War II and sustained incredibly vast material damage, overcame truly extraordinary economic difficulties; how this country in a time period of just two decades, from 1956 through 1976, accomplished three tremendous technical breakthroughs—radar technology, nuclear technology, and, the most amazing breakthrough of all, spaceflight technology with Sputnik I and Yuri Gagarin. How could it achieve so rapidly strategic parity with the U.S.A., stimulating our own space efforts in the process and forever leaving its mark on world history and in the annals of the 20th century?

It took Boris Chertok's milestone-setting memoirs to explain the mystery, to help to bring me some understanding of this puzzle. His four monumental volumes tell an incredible tale of the hard-to-imagine scale of the operations of the two superpowers in those years and of the truly heroic efforts of Russian people to accomplish what today many people take for granted. Sergey Korolev's accomplishments now became visible as what they really were: gigantic steps echoing down in history.

Chertok's narration, comprising four volumes and well over 2,000 pages, provides a breathtaking account of the march of time toward the promise of a great cosmic future for all participating countries.

A long time ago, we were on opposite sides, both engaged in a great competition between the two superpowers. It has brought forth huge achievements on both sides, but the cost to the people of these countries has been tremendous. What was originally only a concept of science fiction has meanwhile become reality, replacing the "race in space" mentality: partnership and cooperation instead of competition. The International Space Station, which has been in space now for over 10 years, is the incontrovertible proof that cooperation is better for everyone involved—and cheaper. That will become ever more important as we look toward the future.

## FORTY YEARS IN SEARCH OF SNOOPY

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By Peter R. Bendel

Story forwarded by the Charles M. Schulz Museum and JSC History Office.

In the late 1960s, NASA was poised to land an astronaut on the Moon with help from the people at Grumman Aircraft on Long Island, New York, and a cartoon character named Snoopy. In order to get the public more involved, NASA, working with Charles Schulz, came up with the idea to call the Apollo 10 Command Module (CM) *Charlie Brown* and the Grumman-built Lunar Module (LM) *Snoopy*. Several members of my family worked for Grumman at the time. Vincent Buffalino, my uncle, worked on the LM's landing gear.

At the time, I was a 10-year-old boy in awe of space travel and never imagined I could participate. One day my uncle told me that management was looking for someone to draw Snoopy. He knew I loved to draw cartoons, and he thought of me. He asked me to draw Snoopy with his leather helmet, goggles, and scarf for the guys back at the shop. I remember working on the color drawing in my grandmother's kitchen. The picture was small—about the size of an 8 1/2 x 11 inch piece of paper. I drew Snoopy facing to the right side of the page, standing at attention and wearing his leather

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*Forty Years in Search of Snoopy (continued)*

helmet and goggles. His scarf was sticking straight back from the wind blowing in his face. When I was finished, I gave the picture to my uncle and lost track of it.

When I was in my teens, I asked my uncle what happened to the drawing I did. He recalled that it disappeared when the Apollo 10 LM was sent to the Kennedy Space Center (Cape Canaveral). He believed it went into space and was left in the LM when it was placed in permanent orbit around the Sun. This thought made me very happy because it fed my romantic ideas, but I always wondered and had doubts.

In the mid-1980s, I began thinking about Snoopy and space again when the *Challenger* disaster happened. I decided to contact NASA. It was 17 years later, and I had little hope that anyone would remember or even know about the whereabouts of an insignificant child's drawing. I started with the Kennedy Space Center. People there told me to contact the Johnson Space Center in Houston, Texas. A very helpful woman got on the phone and said she would do some research for me. To my surprise, she called back a week later and said she did not find my drawing but found a photo of the drawing taken from a color telecast when Apollo 10 was about halfway to the Moon. She told me she was going to take the negative off the back of the original print and send me the print. I was elated to know my uncle was correct. Here was evidence that my Snoopy actually went to the Moon. This fact enhanced my romantic notion of Snoopy orbiting in the solar system forever, but there was still some doubt.



Astronaut John W. Young, Apollo 10 Command Module pilot, displays the drawing of Snoopy in this color reproduction taken from the fourth telecast made by the color television camera aboard the Apollo 10 spacecraft.

Another two decades have passed, and thanks to the evolution of the Internet my doubts have ended. I was searching the Web and came across the NASA image Web site (<http://images.jsc.nasa.gov/>) and was delighted to see a published photo of the Snoopy NASA sent me years earlier. I began to wonder what else was out there. In January 2010, I came across an article titled "Apollo 10 and Color TV" by Ray Katz on his blog (<http://www.thespacebuff.com/>). In the article was another more colorful and detailed photo of my Snoopy. The author had mentioned that he had tried to buy the drawing at an auction but failed. Further research revealed that my Snoopy was also displayed at the Charles Schulz Museum in California (<http://www.schulzmuseum.org/>) in early 2009. I contacted the museum curator, Jane O'Cain, for information. She told me the drawing was on loan to the museum from a collector who purchased it at auction some time earlier.

Imagine that, my drawing has actually been back on Earth all this time. I am saddened by this revelation because my romantic idea of Astronaut Snoopy forever in space has been shattered. However, the more exciting and good news is that my drawing has taken on a life of its own and evolved into a piece of American space-flight history. Few people have ever had their work go into space and even fewer to

the Moon. In fact, I believe more men have walked on the Moon than artists have had their work travel to it. Through all this, I even have the chance of being reunited with the Snoopy I drew so long ago. Snoopy has been found alive and well, forever an inspiration.

## NASA'S NATIONAL HISTORIC LANDMARKS

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*The National Park Service manages the National Register of Historic Places (NRHP). The NRHP contains approximately 2,900 National Historic Landmarks (NHLs): the buildings, districts, structures, and objects that are significant to America's history nationally. While NASA's historic accomplishments in aeronautical research, science, and space exploration are well documented, less is known about the buildings and structures that supported and enabled these accomplishments. This series provides an overview of NASA's 20 NHLs. This issue features NASA's Full Scale Tunnel located at Langley Research Center, Hampton, Virginia.*

### Farewell to the Cave of Winds Langley's Full Scale Tunnel, an Aeronautical Hallmark

**By Mary Gainer (LaRC) and Caroline Diehl (Cultural Resources Management)**

The historical significance of NASA's Full Scale Tunnel (FST) and its many contributions to aerospace technology were recognized when it was designated an NHL in 1985 as part of the Man in Space NHL Theme Study performed by the National Park Service. The theme study resulted in 20 NASA properties being named NHLs, with the FST being one of five located at LaRC in Hampton, Virginia. Once the largest wind tunnel in the world, the 79-year-old tunnel ran its last test on 4 September 2009, as NASA has made the difficult decision to demolish the facility. This will be the second NASA NHL to be lost. In 2000, the Rocket Engine Test Facility at GRC was demolished to make way for an expansion of the Cleveland Hopkins International Airport adjacent to GRC. Much has been written to document the significant research and people associated with the FST. This article focuses on the physical characteristics of tunnel, its impact on the U.S. aerospace industry, NASA's decision to say farewell to it, and the activities under way to preserve its memory.

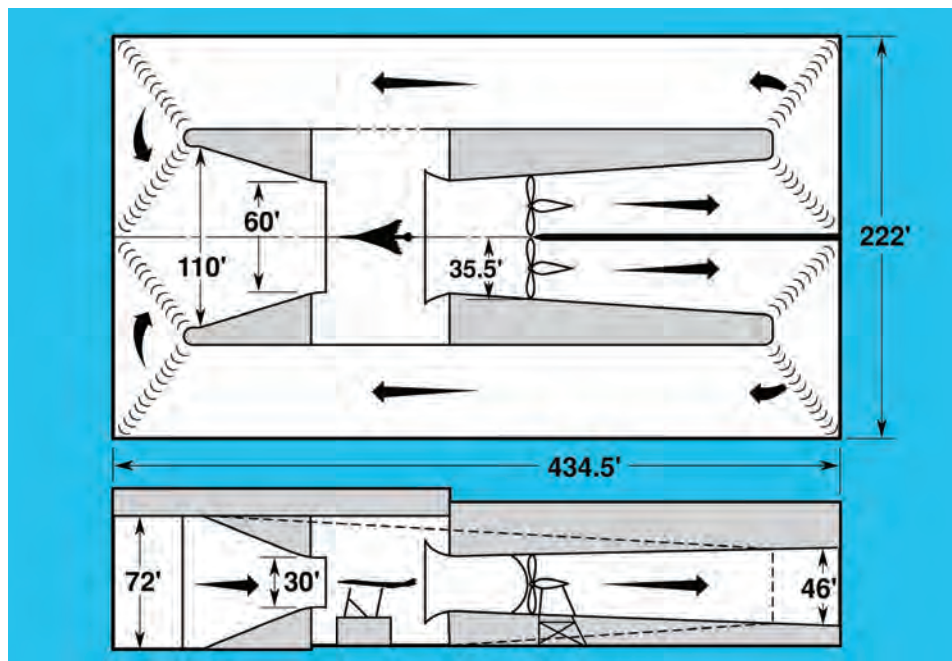
As part of the original site of the NACA, the FST was built adjacent to the Back River on land leased from the Army Air Service on property known as Langley Field (now Langley Air Force Base). The tunnel was designed by Smith J. DeFrance of the NACA staff and was completed in 1931 for \$900,000. The tunnel building is 434 feet by 222 feet. The exterior shell was covered with sheets of Careystone Corrugated Asbestos/Concrete Roofing and Siding material, a highly specialized building material for industrial applications. The Philip Carey Company of Ohio was so pleased with the government's use of its material that it ran a full-page advertisement in the June 1930 *Saturday Evening Post* that stated, "They wanted a building material to hold 110-mile hurricanes—*Daily*." According to Deborah G. Douglas, Visiting Historian at LaRC during the late 1990s, "The advertisement offered a foretaste of

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*NASA's National Historic Landmarks (continued)*

the kind of hyperbole and emotional rhetoric that would become commonplace for descriptions of the NACA's Full Scale Tunnel.”

The test section of the FST is 60 by 30 feet, and 56 feet in length. It has a continuous, double-return flow circuit with an open throat with airspeeds to 110 mph. It was the world's first double-return tunnel and required testing of a model of the tunnel circuit to tune its flow quality. Built to test full-scale aircraft of the day, the tunnel can accommodate test articles with wingspans of up to 50 feet and weights of up to 15,000 pounds. The tunnel's drive propellers initially consisted of four cast aluminum alloy blades screwed into a cast steel hub, but the blades did not withstand the stress of operation and were replaced in 1938 with wooden blades constructed in a Langley shop. These blades proved to be more than satisfactory and remained in operation until the final closure of the tunnel in 2009. In the roof of the test chamber are two skylights, each approximately 30 by 40 feet. These were built to provide lighting conditions for daytime operation. There were eight 1,000-watt floodlights for night operation. Also around the perimeter of the building were smaller windows. During World War II, these windows were painted black, and some still retain the black paint. The aerial image shown below clearly shows the skylights and the perimeter windows.



1965 plan view cutaway of the tunnel.

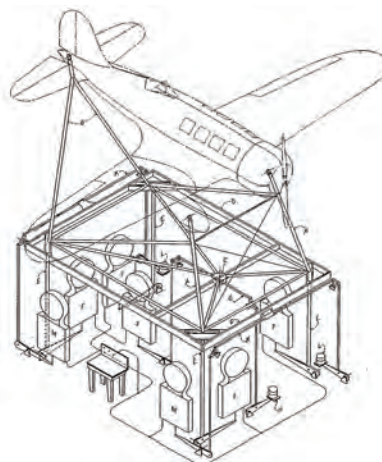
Aircraft were mounted on a floating frame, which rested on struts and transmitted the lift, drag, and crosswind forces to a series of scales. This setup facilitated the measurement of forces in three directions; and by combining the forces and proper lever arms, the pitching, rolling, and yawing moments of the aircraft could be computed. The entire floating frame scales were enclosed in a room for protection from air currents. The original dial-type Toledo scales were later replaced by electronic scales.



The legendary contributions of the FST and its staff to the nation's military and civil aerospace programs began in the 1930s with critical data on the effects of aircraft components such as landing gear, propellers, and wing designs on aerodynamic behavior. Such tests could not be accomplished in smaller tunnels with subscale models. Later, in World War II, enhancements to emerging military aircraft through drag-reduction testing helped contribute to the superiority of U.S. aircraft. After the war, large-scale aircraft testing shifted to the more capable 40- by 80-foot wind tunnel at the Ames laboratory, while the mission of the FST became focused on free-flying model tests, which were in high demand for tests of unconventional subjects such as vertical takeoff and landing aircraft, parawing vehicles, supersonic transport designs, and reentry configurations. In addition, the tunnel became a unique national facility for evaluating the characteristics of high-performance fighter aircraft at high angles of attack, including every fighter from the F-4 to the F-22.

In 1995, NASA declared the FST excess to mission needs, and the tunnel was retired. Tunnel operations were subsequently taken over through lease by Old Dominion University, which attracted a new clientele from the auto sport communities, including NASCAR. The final tests, beginning in 2006, were to test the prototype of a new, more fuel-efficient aircraft design. The Boeing Company, in partnership with the U.S. Air Force Research Laboratory and Old Dominion University, explored the blended wing concept. The last test on the on the Boeing X-48C ran on 4 September 2009. A formal ceremony in recognition of the contributions of the FST was held at LaRC on 14 October 2009, with over 300 active and retired attendees. In addition to a presentation on the history and contributions of the facility, tours of the building were held for the participants and former staff members of the FST.

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*NASA's National Historic Landmarks (continued)*

LaRC's decision to demolish the tunnel was not one that was reached easily. As Cheryl Allen, LaRC Construction of Facilities (CoF) Program Manager in charge of the demolition, states, "We realize the tremendous history associated with this tunnel. However, due to the age and declining condition of the tunnel, it no longer meets NASA's mission needs and comparable capabilities exist here at the Center and within the Agency." Additional factors in the decision include the fact that the integrity of the asbestos concrete roofing and siding is severely compromised, the facility's close proximity to the Back River and issues of flooding, as well as the fact that the property is owned by Langley Air Force Base. The original land use agreement between NASA and the Air Force stipulates that NASA may use the property "for the purpose of constructing, using, operating, and maintaining thereon buildings, structures and utilities necessary in scientific research and experiments in the problems of flight . . ." Since NASA no longer needs or uses the tunnel for flight research and testing, the property is to be returned to the Air Force as open land. Additionally, the nation has redundant capability in the Ames National Full-Scale Aerodynamics Complex (NFAC), which was closed by NASA in 2003 and has been operated by the U.S. Air Force since 2007 under the direction of the Arnold Engineering Development Center (AEDC). The NFAC can test airplanes with wingspans of up to 100 feet and has two test sections measuring 40 by 80 feet and 80 by 100 feet, respectively.

In accordance with the National Historic Preservation Act (NHPA), LaRC initiated formal consultation regarding demolition of the FST with the Virginia State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP) beginning in the summer of 2001. LaRC hosted a regulatory consultation meeting with the SHPO, the ACHP, the National Park Service, and local stakeholders in February of 2002, to include a tour of the tunnel. The meeting extended discussions of alternatives including suggestions of turning the facility into a museum or heritage tourism site. LaRC also held a public meeting in 2005 to solicit views from the local community and retired researchers. Following recommendations from the regulatory community as well as concerns from public feedback, LaRC performed an analysis of alternatives to demolition to include turning the tunnel into a heritage tourism site, performing adaptive reuse, and mothballing. The analysis concluded that demolition was the only practicable alternative because of the tunnel's location on a secure Air Force base and the compromised condition of the tunnel, including safety issues related to flooding and roof and asbestos siding integrity.



In order to mitigate the adverse impacts of the demolition of an NHL and to capture the engineering and architectural uniqueness of the tunnel, LaRC completed Level I Historic American Engineering Record (HAER) documentation of the tunnel in 2006. The record is currently with the National Park Service for submission to the HAER collection at the Library of Congress. LaRC is also exploring options with interested parties to



Current view of fan blades.

preserve portions of the facility. Regarding the original Toledo Scales, Cheryl Allen states, “There would be no way to utilize the original scales that contribute to the historic context of the property. The scales have not operated since the 1970s and our hope is that there will be interest by a museum to put them on display.” There has been a definite interest in the wooden fan blades and the 1/15 scale model of the tunnel built to test the concept before constructing the actual building. NASA hopes to incorporate mementos from the FST in a permanent display at the Center.

LaRC has also developed a multimedia Web site as part of its mitigation efforts for the tunnel. The LaRC Geographic Information Systems (GIS) team, under guidance from the LaRC Historic Preservation Officer, developed a Web site that tells the story of the FST to include the history, photographs, virtual tours of both the interior and exterior of the tunnel, scanned documents, test videos, and interviews with retired researchers. Student GIS team interns have been instrumental in scanning documents, editing and uploading videos, and assisting with the Web page development. Interns have also been heavily involved in creating the virtual tours, which enable a person to “walk” through the tunnel without leaving his or her chair. More archived material is currently being digitized to include versions of the FST’s test log and almost every photograph taken and movie made during the history of the facility.

The history of the FST, which spans nearly 80 years, is available at <http://gis.larc.nasa.gov/historicllarc>. The tremendous contributions that the FST has made to the aerospace industry require that



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*NASA's National Historic Landmarks (continued)*

LaRC make every effort to preserve artifacts from the tunnel as well as preserve the memory of the tunnel by providing as much information as possible to the public about this unique and historic property. Joseph Chambers, retired NASA aeronautical engineer and former head of the tunnel, presented a historical review of the contributions of its research and closing remarks at the 14 October 2009 ceremony marking the official closing of the FST. As he stated, “Even after the tunnel is physically demolished, the revolutionary research conducted in the ‘Cave of the Winds’ will live on in current and future civil and military aerospace vehicles. The impact of this unique facility and its staff has helped ensure the continued leadership of the nation’s critical programs with giant leaps in economic effectiveness, safety, and national defense.”

*For more information on this property, contact Mary Gainer, LaRC Historic Preservation Officer, at [mary.e.gainer@nasa.gov](mailto:mary.e.gainer@nasa.gov), or Caroline Diehl, CRM Support Contractor, Science Applications International Corporation (SAIC) at [caroline.a.diehl@nasa.gov](mailto:caroline.a.diehl@nasa.gov).*

## OTHER AEROSPACE HISTORY NEWS

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### NASA Aeronautics Research Mission Directorate

By Tony Springer

#### Aeronautics E-Books

With the advent of the latest batch of e-book readers, a new craze has hit the mainstream, the e-book. Why bother reading from a hard copy when you can have a handy electronic book at your bedside? In order to meet a broader audience for its educational and outreach materials, the NASA Aeronautics Research Mission Directorate has started publishing its books in both the classic hard-copy book format and the new e-book formats. NASA’s first e-book offering is *X-15: Extending the Frontiers of Flight* (NASA SP-2007-562) by Dennis R. Jenkins. The book is available in formats suitable for the main e-book readers and in PDF format for download from the NASA Aeronautics Web site at <http://www.aeronautics.nasa.gov/ebooks/index.htm>. As an interesting side note, when *Wired* magazine picked up the story, the Center for Aerospace Information, which distributes the book for NASA, experienced a surge in sales of the classic hard-copy version.

#### Award-Winning Future Aeronautics Volume

Mark D. Bowles won the prestigious American Institute of Aeronautics and Astronautics History Manuscript Award for 2010 for his work *The Apollo of Aeronautics: NASA’s Aircraft Energy Efficiency Program, 1973–1987*. This work is part of an ongoing series of case studies sponsored by the Aeronautics Research Mission Directorate to promote lessons learned from past programs applicable to the current and future aerospace workforce. The book will be available early this spring as NASA SP-2009-574 in both the classic hard-copy book and e-book formats. The book covers the ups and downs of the Aircraft Energy Efficiency project. The project resulted in a number of advanced technologies including the advanced turboprop (winner of the Collier Trophy), advanced composite structures, and winglets.

## National Air and Space Museum (NASM)

**By Michael Neufeld**

James David of Space History published “The Intelligence Agencies Help Find Whales: Civilian Use of Classified Overhead Photography under Project Argo” in *Quest: The History of Spaceflight Quarterly* 16, no. 4 (2009): 27–36.

On 25 February 2010, Michael Neufeld, Chair of the Division of Space History, gave a lecture entitled “Mittelbau-Dora in History and Memory” at the University of Alabama, Huntsville. This lecture was held in conjunction with an exhibit at the university called “Dora and the V-2: Slave Labor in the Space Age,” which was open from 21 February to 12 March 2010. The online exhibit will remain available at <http://www.dora.uah.edu>.

Roger Launius presented an invited paper entitled “Space Museums as a Tool for Education” at the Fifth Ilan Ramon Annual International Space Conference in Tel Aviv, Israel, on 27–28 January 2010.

## American Astronomical Society (AAS) History Committee

**By Michael Ciancone**

### **Newsletter and Distribution List**

*Explorer*, the periodic newsletter of the AAS History Committee, is available on the AAS Web site at <http://www.astronautical.org/committees/history>. Issue no. 9 was published in November 2009 and includes book reviews, snippets of information of possible interest, and a summary of History Committee member activities with a “spotlight” on Oti Liepack. The next issue is tentatively planned for March 2010. If you would like to receive each issue, as well as an occasional bit of information related to spaceflight history, send an e-mail with your request to the Chair of the History Committee, Michael Ciancone, at [michael.l.ciancone@nasa.gov](mailto:michael.l.ciancone@nasa.gov).

### **Annual Meeting**

The AAS History Committee held its annual meeting on 2 December 2009 in conjunction with the AAS National Conference at the NASA JSC Gilruth Center in Houston, Texas.

## Emme Award for Astronautical Literature

### **2008 Emme Award Recipient Announced**

AAS has announced the recipient of the 2008 Emme Award for Astronautical Literature as David Mindell for *Digital Apollo—Human and Machine in Spaceflight* (MIT Press, May 2008). This announcement, as well as a complete list of 2008 finalists and past recipients, is available on the AAS Emme Web site at <http://astronautical.org/awardsleugene-m-emme-award/>.

### **2009 Emme Award Process Has Begun**

AAS is inviting folks to identify titles for consideration for the 2009 Emme Award for Astronautical Literature. The Emme selection process and timeline are defined on the Emme Award Web site, as noted above.

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*Other Aerospace History News (continued)***Member News**

The History Committee is pleased to welcome its newest members, Robert Pearlman and Dr. Asif Siddiqi.

**2010 Issue of *Federal History***

Editors Terrance Rucker and Benjamin Guterman are pleased to announce the online publication of the 2010 issue of *Federal History*, the scholarly journal of the Society for History in the Federal Government available online at <http://www.shfg.org/SHFGv3JournalIssues.html>.

Articles for this issue include the following:

- Felicia Wivchar, “The House Indian Affairs Commission—Seth Eastman’s American Indian Paintings in Context”
- Anders Walker, “‘Powers Unusual’: Brown v. Board of Education and the Modernization of Law Enforcement in Florida”
- Thomas Faith, “‘As Is Proper in Republican Form of Government’: Selling Chemical Warfare to Americans in the 1920s”
- Judson MacLaury, “President Kennedy’s E. O. 10925: Seedbed of Affirmative Action”
- Review Article: Gavin Wright, “The New Deal and the Modernization of the South”
- Roger R. Trask Lecture: Roger Launius, “Federal History and National Identity: Reflections from the Trenches”

All article submissions for future editions can be sent to [editor-shfg-journal@shfg.org](mailto:editor-shfg-journal@shfg.org).

## UPCOMING MEETINGS

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SpaceOps 2010 will be held **25–30 April 2010** at the Von Braun Center in Huntsville, Alabama. Please see <http://www.spaceops2010.org> for more details.

The 216th meeting for the American Astronomical Society will be held **23–27 May 2010** in Miami, Florida. Please see [http://www.aas.org/meetings/meeting\\_dates.html](http://www.aas.org/meetings/meeting_dates.html) for more details.

The 29th Annual International Space Development Conference (ISDC) will be held **27–31 May 2010** in Chicago, Illinois. Please see <http://isdc.nss.org/2010> for more details.

The annual conference for the Special Libraries Association will be held **13–16 June 2010** in New Orleans, Louisiana. Please see <http://www.sla.org/content/events/index.cfm> for more details.

The annual conference for the American Libraries Association will be held **24–30 June 2010** in Washington, DC. Please see <http://www.ala.org/lalal/confservices/upcoming/upcomingconferences.cfm> for more details.

The annual meeting for the Society for the History of Technology will be held **29 September–3 October 2010** in Tacoma, Washington. Please see [http://www.historyoftechnology.org/annual\\_meeting.html#future\\_mtgs](http://www.historyoftechnology.org/annual_meeting.html#future_mtgs) for more details.

The annual meeting for the History of Science Society will be held **4–7 November 2010** in Montreal, Quebec. Please see <http://www.hssonline.org/Meeting/2010HSSMeeting/index.html> for more details.

## OBITUARIES

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### Lew Allen, Jr.

Former JPL Director Lew Allen, Jr., passed away on 4 January 2010. General Allen graduated from West Point and served in the Air Force. In 1973, President Nixon appointed him as director of the National Security Agency, and the debate over domestic wiretapping began during his four-year tenure. He became the 10th chief of staff of the Air Force from 1978 to 1982, overseeing the establishment of Air Force Space Command. After retiring from the military, General Allen served as the Director of JPL from 1982 to 1990. He presided over the Galileo mission to Jupiter and the Voyager 2 flybys of Uranus and Neptune. He also led the investigation of the Hubble Space Telescope's faulty mirror. In 2007, General Allen became a member of the Air Force Space and Missile Pioneers Hall of Fame. He also received the Defense Distinguished Service Medal, the Air Force Distinguished Service Medal, and the Legion of Merit during his career.

### Aaron Cohen

Aaron Cohen, former Director of Johnson Space Center, died on 25 February 2010. Over his long and distinguished career, he served in various leadership roles including as manager for the Apollo Command and Service Modules, manager of NASA's Space Shuttle Orbiter Project Office, Director of Engineering at Johnson Space Center, and finally Center Director from 1986 to 1993. As Director, Mr. Cohen guided the Center during the *Challenger* accident and the return of the Space Shuttle to flight. He was awarded the presidential rank of Distinguished Executive in 1982 and 1988, and he also received NASA's Distinguished Service Medal three times.

### Dr. Herbert Grosch

Dr. Herbert Grosch was born on 13 September 1918 and passed away on 25 January 2010. He received his B.S. and Ph.D. in astronomy from the University of Michigan. During his distinguished career, Dr. Grosch worked for the U.S. Naval Observatory, Watson Scientific Computing Laboratory at Columbia University, Project Whirlwind at the Massachusetts Institute of Technology, and the National Bureau of Standards Center for Computer Sciences and Technology, and he became the first manager of IBM's space program. He served as the president of the American Rocket Society (1951), president of the Association for Computing Machinery (1976–78), and editor for *Computerworld* magazine (1973–76). He perhaps became best known for Grosch's Law, which says that computing power increases as a square of the cost.

*continued on next page*

*Obituaries (continued)*

## S. Neil Hosenball

S. Neil Hosenball died on 23 December 2009 after a long illness. He served as NASA's General Counsel from 1975 to 1985, becoming a pioneer in space law in issues such as Moon exploration, the peaceful uses of outer space, and space junk. From 1970 to 1979, Hosenball served as a member of the U.S. delegation to the UN Committee on the Peaceful Uses of Outer Space that resulted in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies. He also helped negotiate an international agreement on the remote sensing of Earth from outer space. After retiring from NASA, he helped establish the Center for Space Law and Policy at the University of Colorado and served as the center's first director.

## Stan Lebar

Stan Lebar, who led the team that developed the lunar camera used on Apollo 11 and other television cameras on later missions, died on 23 December 2009. Mr. Lebar served in the Pacific Theater of Operations as an Air Force B-24 ball turret gunner during World War II. After the war, he attended the University of Missouri and received a B.S. in electrical engineering in 1950. He joined Westinghouse Electric Corporation in 1953 and worked in the Aerospace Division until his retirement in 1986. During his long career, Mr. Lebar managed the camera programs for Apollo color television cameras, the Skylab series of cameras, and cameras for the Apollo-Soyuz Test Project.

## Robert McCall

Robert McCall became a space visionary in his paintings that first appeared in *LIFE* magazine in the 1960s and the movie posters for Stanley Kubrick's *2001: A Space Odyssey* (1968). His best-known work, *The Space Mural—A Cosmic View*, is a permanent exhibit at the National Air and Space Museum in Washington, DC. Mr. McCall also designed stamps to celebrate STS-1, the first Space Shuttle flight, and several mission patches. He died on 26 February 2010, at the age of 90.

## William Taub

Photographer William "Bill" Taub died on 20 February 2010. He began his career at the National Advisory Committee for Aeronautics (NACA) as an aircraft model maker in 1942. Although Mr. Taub went from being an amateur photographer to being the NASA photographer by accident, he covered the Mercury and Gemini astronauts, as well as events such as the Apollo 11 Presidential Goodwill Tour.

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Do you have more questions about NASA history in general? Please check out our NASA History Division Home Page at <http://history.nasa.gov> on the Web. For information about doing research in the NASA History Division, please e-mail us at [histinfo@hq.nasa.gov](mailto:histinfo@hq.nasa.gov) or call 202-358-0384.

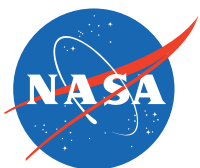
We also welcome comments about the content and format of this newsletter. Please send comments to Giny Cheong, newsletter editor, at [giny.cheong@nasa.gov](mailto:giny.cheong@nasa.gov).

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