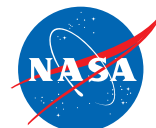


NEWS & NOTES

Volume 32, Number 1

First Quarter 2015

National Aeronautics and
Space Administration



FROM THE CHIEF HISTORIAN



From time to time, we get complaints about low-quality print versions of our NASA history books; whenever we do, it always turns out that the book is not one of ours, but a cheap knock-off. Some of you inveterate online shoppers may also have noticed copies of NASA history books with odd-looking covers for sale by your favorite electronic bookshop. Perhaps you've also wondered why there are copies of our free e-books for sale at rather ridiculous prices on these same sites. These odd "editions" exist because our books are not copyrighted—they are in the public domain. After all, you have already paid us to produce them with your taxes, so our publications are free of any charge beyond the Government Publishing Office's (formerly the Government Printing Office's) practice of recovering costs on printed books. They are also free to be reused or repurposed as people see fit.

The upside of the no-copyright policy is that you can still find hard copies of our books even if they are long out of print. For example,

continued on next page

WOMEN AND WORK: IN THE SHOES OF ROSIE THE RIVETER

By Mary Gainer, Historic Preservation Officer at NASA Langley Research Center

THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS WORK ENVIRONMENT

It was 1943, and the country was at war. This meant huge changes in life at the Langley Memorial Aeronautical Laboratory (LMAL), the premier theoretical research facility during World War II (WWII).¹

Numbering a mere 426 employees in 1938, the staff swelled to over 3,000 by 1945. It was also during this time of expansion that the National Advisory Committee for Aeronautics (NACA) began acquiring land in what is now known as the West Area.

¹ Marilyn M. Harper, *World War II and the American Home Front: A National Historic Landmarks Theme Study* (Washington, DC: National Park Service, 2007), available at <http://www.nps.gov/nbll/learn/themes/WWIIHomeFront.pdf>.

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NASA HISTORY PROGRAM OFFICE
OFFICE OF COMMUNICATIONS



From the Chief Historian (continued)

Dover Publications has worked with us in the past to produce reprints, with new introductions, of some of our most popular NASA histories. Other individuals and printers, seeing the demand, will offer our books for sale and, when they get an order, take our online PDF, slap a cover on it, and send it to a print-on-demand shop. These are usually the ones that we get the complaints about. I need to emphasize that this practice is perfectly legal, but the unfortunate result is that some readers get a book that is far below our exacting production standards.

While the occasional low-quality book is frustrating, to me the most significant downside of the no-copyright approach is what has been happening with our e-books. The marginal cost of producing an e-book version of a print book is tiny, and the distribution cost is nearly zero. This is why we make e-book versions of all of our new publications—and why we make them downloadable for free. Copies of our books now reach many times more people than was ever possible before. Unfortunately, some enterprising folks were downloading our e-book files and immediately uploading them to sites like Amazon.com and charging for them. While this too is perfectly legal, we were frustrated to see that people were actually paying for an e-book that they could get for free from the NASA Web site. We are still working to get our e-books onto those commercial sites, but doing so is a much more complicated issue than I ever imagined. In the meantime, we've added a prominent marking on the cover of our e-books featuring the phrase "FREE DOWNLOAD." At a minimum, either buyers will be aware that they are about to pay for something that they could get for no charge, or the uploaders will have to do a little graphic manipulation to earn their fees.

“
**WHILE THE OCCASIONAL
 LOW-QUALITY BOOK IS
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 E-BOOKS.**
 ”

As you probably already know, we have an electronic version of just about every NASA history book, plus a few other NASA publications of historical interest, available on our publications page: <http://history.nasa.gov/series95.html>. Many of these were

formatted by volunteers in the early days of the Internet as HTML pages. (If you were one of those volunteers—thanks!) To make all of that content more readily available, we are in the process of creating PDF versions of the books that currently are available only in HTML. This will probably cause some increase in the sales of low-quality knockoff print copies and e-books that should be free. The only reliable way to prevent the legal but, to my mind, reprehensible activity of a few is education. If people interested in NASA history

books knew they could get high-quality hard copies from the NASA Headquarters Information Center at a reasonable price or could download e-book versions for free from the NASA e-book site, there would be no market for low-quality, overpriced books. Want to help? Tell your friends who are interested in NASA history publications to go to <http://www.hq.nasa.gov/office/hqlibrary/ic/ic2.htm> for books and <http://www.nasa.gov/connect/ebooks/index.html#VOP2m969WMV> for e-books.

Happy Reading and Godspeed,



William P. Barry
 Chief Historian



Women and Work: In the Shoes of Rosie the Riveter (continued)

Virtually all military aircraft were tested in the wind tunnels at Langley. Business at the Center increased; women had been hired in the past but never numbered more than 100 at any given time. And they served in such stereotypical roles as secretaries, stenographers, typists, file clerks, and receptionists. But with the war, women were being sought for many nontraditional roles. An August 1943 *LMAL Bulletin*, the Center's newsletter, advertised:

Two HUNDRED new employees are being sought for work as Minor Laboratory Apprentices at LMAL, where they will perform duties similar to those of Mrs. X operating a planer in the West Area Machine Shop. A memorandum, issued to the staff, describes the need for additional non-draft[-]eligible personnel, especially women shop workers.

This was not the first time that rapidly expanding war industries dipped into the labor pool of women. During World War I, nearly three million women were employed in food, textile, and war industries. After that war, though, the majority of these women returned to their homes, where they have been referred to as an invisible workforce, relegated to the roles of housewives and stay-at-home mothers. Prior to WWII, most working women were single, deserted, or economically disadvantaged. A working wife was seen as a negative reflection on her husband's ability to provide. With the bombing of Pearl Harbor, though, the government reclassified 55 percent of its jobs to facilitate the hiring of women.

There was a social stigma associated with women who went to work—they were viewed as less feminine than those who stayed home. Propaganda rapidly dominated print, film, and the radio, glamorizing the role of female factory workers and encouraging women to take over jobs for the duration of the war. Rosie the Riveter (real-life Geraldine Hoff Doyle as painted



These women are at work at a planer. (LMAL 33031)

by Norman Rockwell)² is still a recognized icon, wearing her coveralls and bandanna and confidently proclaiming, “We Can Do It!” In the first great exodus of women from the home to the workplace, virtually all single women were employed and married women also were allowed to work.

The transition to the workplace was not always an easy one. Boeing worker Helen Nelson remembered that there was a lot of male chauvinism and that women were considered too stupid to know how to do much. Since organized labor did not have a place for women, working conditions were often inferior. In September 1943, Lenore Hulcher was hired as the first women's counselor at the Laboratory. Her duties were to handle the typical problems facing female employees:

2 Gwen Perkins, “Women's Roles: Who Was Rosie the Riveter?” *Women's Votes, Women's Voices* (Washington State Historical Society), available online at <http://washingtonhistoryonline.org/suffrage/Times/workers.aspx>.





The inscription on back of this 1948 Christmas party photo reads, “technical illustrating and reproduction departments with bosses and the ‘big chief’ Mr. Mixon” (head of department, in suit on the left). Lankes appears in the upper right. (Photo courtesy of Jean Lankes)

orienting them in their work, making work more pleasant, and assisting women in “assuming their place in the important war program under way here.”³

Well-known artist Julius Lankes was hired by the NACA in 1943 as the head of technical illustrating. The July issue of the *LMAL Bulletin* announced that he would be instructing college graduates to prepare figures for use in technical reports. The graduates were described as all women who majored in art, coming from a handful of schools.

3 “Mrs. Hulcher Is Women’s Counselor,” *LMAL Bulletin* 2, no. 21 (11–17 September 1943): 1, available online at <http://crgis.ndc.nasa.gov/crgis/images/1/19/Airscoop1943.pdf>.

New contracts continued to outpace the available employees. A new recruiting strategy was implemented early in 1944, when postcards were provided to employees to send to friends and acquaintances interested in employment. By April, 40 replies had been received; 23 of those applicants were women. Of those, one was seeking a professional rating—very uncommon at the time. The remainder included 12 clerks and 1 each as a woodworker, a draftsman, and a mechanic.

By September 1944, the lack of employees was deemed serious. The front of a special two-page *LMAL Bulletin* was a letter from director H. J. E. Reid pleading for names of potential workers “of either sex who would like to do more important work toward winning and shortening the war.” The backside was a combination of photos and employment opportunities. By the end of the year, 955 women were employed at LMAL, making up nearly a third

of the employees. They were almost equally divided between married and single women. Women filled the roles of typists, stenographers, computers (mathematicians), mail sorters, payroll clerks, telephone operators, machinists, sheet-metalsmiths, seamstresses, and woodworkers.

The “Computer Pool” started at Langley in 1935 with five women. The term “computer” was a title, designating a woman who performed mathematical equations and calculations by hand and then plotted the data. A 1942 report stated the computing sections relieved engineers of this essential but time-consuming work. While the engineers were free to devote their attention to research projects, the women received praise for calculating data “more rapidly and accurately” in half



the time of that taken by the engineers.⁴ By 1946, the ranks had swollen to about 400 women placed in sections across the Center. These women played an integral part in aeronautical and aerospace research into the 1970s. Although they were considered para-professionals (SP-3 through SP-8 in government position classifications), some of the women gained recognition in their fields. For example, Margaret Steiner was a coauthor on two publications on the ditching of B-25 aircraft.

An interesting job that some of the women had was in the Dynamics Tunnel Operation Shop, where they were busily engaged in making rag dolls. Four women were assigned to making 1/24-scale models of a 6-foot, 200-pound man. The dolls were dynamically balanced for use in determining where a pilot should bail out of a spinning airplane—toward the inside or outside of a spin.

Dress

The 1930s and the Depression following the Wall Street crash seemed to bring an end to the style of the flappers. There was a dramatic drop in hemlines. The stylish woman was seen in clothing with a more angular look. Padded shoulders, cork-wedged shoes, and hats worn at an angle were in vogue and emulated looks popularized by celebrities such as Joan Crawford, Carol Lombard, and Myrna Loy.

Longer, upswept hairdos and the Victory Roll became popular. This hairstyle has been linked to the pattern of the exhaust roll left in the sky after fighter plane maneuvers and to the fact that everyday life was all about victory at war. The rationing of metal bobby pins resulted in the use of pipe cleaners by resourceful women to achieve the style's effect. The style also worked well for women entering the workforce, who were often required to keep their hair off their faces.

⁴ R. H. Cramer to R. A. Darby, "Computing Groups Organization and Practice at NACA," 27 April 1942.

With the entrance of the United States into the war, and the resulting clothing rationing, women's fashion took on a more utilitarian look. Clothing had to be practical, last a long time, and serve for a variety of occasions. The withdrawal of the new nylon stockings led to the popular practice of painting seams on a friend's legs in preparation for a dance, while bobby socks were popular for day-to-day wear. Women's hats were often patterned after the men's trilby style featured in the hit movie *Casablanca*.

In February 1943, shoes made with leather or rubber soles were added to the list of rationed goods, which already included coffee, sugar, and gasoline. The ration allowed three pairs per person per year and outlawed any extravagant flourishes like colors, high heels, and decorative embellishments.

Perhaps the biggest change in fashion happened when women began working in coveralls and traditional male clothing. Women's work clothes were sometimes offered for sale through the NACA exchange. In 1944, women could purchase a uniform for \$4, available in sizes 14 through 44. Caps were available for \$1.10. The latest safety caps sported a "completely ventilated felt crown with large visor and porous rayon snood, all in dark blue, the cap is considered as not only



This photo from 1943 shows diversity in women's clothing. (LMAL L-35045)



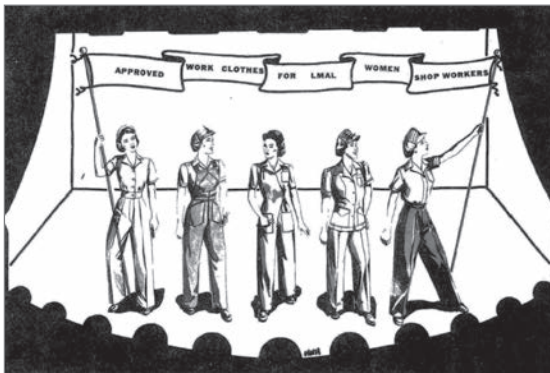
flattering to the wearer, but comfortable as well.”⁵ Women were instructed in proper attire promoted by the safety board with wording designed to highlight the visual appeal of the new clothing. A pamphlet was issued describing the approved apparel for female shop workers.

Special directions for wearing a turban were included in a 1944 edition of the *LMAL Bulletin*. Although it was stated that the safety cap, when worn properly, was recommended for women who worked on machinery, the turban was found to be satisfactory for most purposes. A review of photos of female workers at LMAL shows that the turban was more popular than the cap.

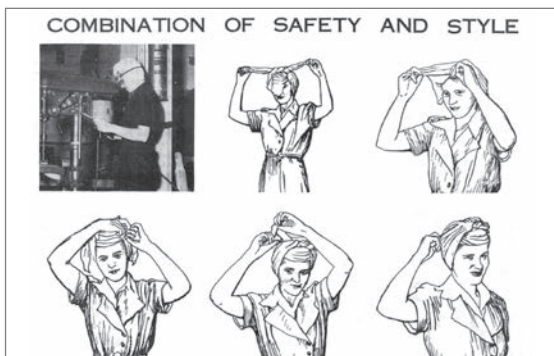


Women work while sporting their turbans. (LMAL 33026)

5 “Safety Cap: New LMAL Millinery Note,” *LMAL Bulletin* 2, no. 16 (7–13 August 1943): 6, available online at <http://crgis.ndc.nasa.gov/crgis/images/1/19/Airscoop1943.pdf>.



This illustration from a 1943 pamphlet shows approved apparel for shop workers. (“LMAL Fashion Show,” *LMAL Bulletin* 2, no. 17 [14–21 August 1943]: 4)



Five steps to properly securing a turban are illustrated. (“Combination of Safety and Style,” *LMAL Bulletin* 3, no. 41 [30 September–6 October 1944]: 5)



This woman is wearing a safety cap with snood. Note that the cap is pushed back on her head and not worn as prescribed. (L-33962)

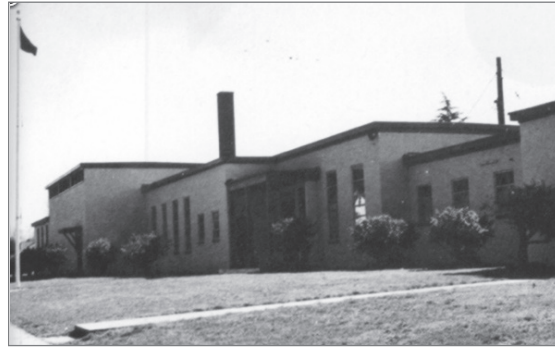


Housing and Services

The number of employees at the NACA grew rapidly during the time leading up to American involvement in the war. The 450 staff members in 1939 had swollen to 2,163 by June 1943. New engineers arrived from the Georgia Institute of Technology (Georgia Tech), the Indiana Institute of Technology (Indiana Tech), and Tri-State of Indiana. Many women came from such schools as the Women's College of the University of North Carolina, the College of William and Mary, Mary Washington College, and Randolph Macon Woman's College. The rapid increase in employees led to a housing shortage. During this period, several new developments sprang up, primarily to provide living arrangements for the families moving into the area. Cavalier Court in Fox Hill and Sussex in Hampton, Virginia, are two examples. The 128-unit development in Fox Hill promised the Laboratory's personnel first consideration, calling it an "ideal situation because it is possible to establish a new community made up entirely of NACA employees."⁶

As discussed previously, women were heavily recruited, and the need soon arose for a nursery for the young children of mothers working at the NACA. A former nurse from the Laboratory, along with her sister, purchased a home at 103 North King Street in Hampton and turned it into a 24-hour nursery. Two nurses were on duty during the day to supervise the children, and one was there during the night. This was needed not only due to the number to shifts running at that time, but also since mothers often opted to board their children there for \$10 a week.⁷

The new single-family homes did not help the many single women who were recruited. It was not unusual to see notices in the Laboratory's *LMAL Bulletin* requesting rooms. In June 1943, it was reported



Anne Wythe Hall was built at Bay Avenue and Lombard Street in Hampton. (Photo courtesy of Mary Caroline Boerner)

that the most challenging personnel job was finding housing for the large number of women being hired. Anne Wythe Hall was opened late that year to house 368 unmarried women engaged in defense work. The small community consisted of three dormitories, two of which had double rooms, a community building, an infirmary, and a cafeteria. Each dormitory boasted a large bath and laundry room on each floor, with a lounge on the first floor where dates could call on the residents.⁸ All this was available for \$3 per person per week for a double room or \$5 for a single.

Many of these women did not have their own transportation, so a special bus service was started. Those working the day shift left from the community building at 6:05 a.m. and then were picked up at the end of the shift at 4:50 p.m. by building 587. This allowed the "girls plenty of time to get to work in the West Area and give those in the East Area time to eat breakfast."⁹

Carpooling was another popular option at this time. The Laboratory Transportation Committee urged all to give their fellow workers a lift. A survey in 1943 showed an average number of 4.6 passengers in sedans and 3.7 in coupes. Even with those numbers, it was

6 "NACA Housing Project Started," *LMAL Bulletin* 1, no. 2 (11 December 1942): 1, available online at http://crgis.ndc.nasa.gov/historic/Scoops,_News,_and_Phonebooks.

7 "Nursery May Open Dec. 1," *LMAL Bulletin* 2, no. 31 (20–26 November 1943): 1, available online at <http://crgis.ndc.nasa.gov/historic/File:Nursery.jpg>.

8 "Anne Wythe Hall Will Open Soon," *LMAL Bulletin* 2, no. 28 (30 October–5 November 1943): 4, available online at <http://crgis.ndc.nasa.gov/historic/File:AnneWytheHall1.jpg>.

9 "Special Bus Accommodates Ann Wythe Hall Residents," *LMAL Bulletin* 3, no. 11 (4–10 March 1944): 4, available online at <http://crgis.ndc.nasa.gov/historic/File:BusService2.jpg>.

reported that rides were still desperately needed for the night shift. By 1944, the popularity of carpooling seems to have declined. On 27 June, women were posted at all gates to observe which cars had vacancies. Owners of vehicles discovered to have vacancies were requested to take on more passengers. Carpool rides were desperately needed in the Wythe neighborhood, where many female workers lived at Anne Wythe Hall.

Advancement

With the employee shortage, the NACA began offering training to women. In 1943, the high school apprentice program was under way for boys. The classes for the spring 1943 term were opened to female mechanical workers, if space permitted.

Classes directed specifically toward women continued to be offered. Computers in the Research Department were urged to attend a course in beginning and advanced mechanical drawing.¹⁰ There was also a special pre-engineering physics course offered to female computers.¹¹ The hopes were that women would be able to take over some of the work done by junior engineers. The Administrative Office usually held classes in typing and shorthand for women desiring employment advancement or more “congenial employment.” In 1945, a course in the fundamentals of aeronautics was added. It was designed to help secretaries and stenographers learn elementary aeronautical terms to assist them in taking dictation, preparing reports, and filing.¹²

Working as a computer, despite its paraprofessional status, paid much better than the majority of jobs available to women in the 1940s and 1950s. It also provided an entry for women into the field of aeronautical research at a time when most simply were not being hired as engineers, and it offered another career option besides teaching for those with degrees in the sciences. Teaching in North Carolina, Rowena Becker made \$550 a year before joining the LMAL computers in 1942. As a computer, she started at \$1,440 per year.¹³

During the 1940s, Langley began recruiting African American women with college degrees to work as computers. Initially grouped in a segregated section, the “West Area Computers” processed data sent to the pool and also joined sections on a temporary basis when additional help was needed. According to Beverly Golemba’s unpublished study of early computers at Langley, many women were not aware of the West Area Computers, although both the black and white women she interviewed reported that when computers from the different areas did do a project with each other, “everyone worked well together.”¹⁴ The first black computers did the same work as their white counterparts, but in a period when segregation was policy across the South and in the U.S. Armed Services, they also encountered segregated dining and bathroom facilities, along with barriers to other professional jobs.¹⁵

10 “School Days Are Here Again,” *LMAL Bulletin* 3, no. 2 (8–14 January 1944): 4, available online at <http://crgis.ndc.nasa.gov/crgis/images/7/7f/AirScoop1944.pdf>.

11 “Computers Attend Physics Classes,” *LMAL Bulletin* 2, no. 10 (28 June 1943), available online at <http://crgis.ndc.nasa.gov/crgis/images/1/19/AirScoop1943.pdf>.

12 “Here’s an Opportunity,” *Air Scoop* 4, no. 2 (12 January 1945): 2, available online at <http://crgis.ndc.nasa.gov/crgis/images/0/09/LARC1945.pdf>.

13 “Panel Discussion with Women Computers,” NASA Langley videotape, 13 December 1990; Marilyn Heyson, interview by Langley Research Center (LaRC) intern Sarah McLennan, 8 April 2011.

14 Beverly E. Golemba, “Human Computers: The Women in Aeronautical Research” (unpublished manuscript), pp. 42–44. Along with Golemba’s manuscript, a LaRC videotape entitled “Panel Discussion with Women Computers,” 13 December 1990, contains interviews with early African American computers.

15 President Truman issued Executive Order 9981 to desegregate the armed forces on 26 July 1948.



Social Expectations

It was said that the war effort asked a woman “to give up her jewels for motors, instruments, and bullets; her stockings and silk dresses for parachutes; her rouge for bombsights and her bobby pins for landing mats. Her girdle is wanted for life rafts and tires and her shoes and handbag for belts and flying suits.”

But even without those accessories, women were still often viewed as adornments. When several men were asked about the presence of women at LMAL, Melvin Butler, Head of Personnel Division, responded, “My only complaint is that there aren’t enough of them. As I sit here in my luxurious office watching the dear things flit about, I sometimes am conscience-stricken for accepting a salary for a job that is such a constant pleasure.”¹⁶

Further evidence of a concern at the Laboratory about female employees’ appearance and social graces—not just their ability to do their jobs—comes from an announcement in the November 1942 *LMAL Bulletin* that ran, “Girls, do you sit at home nights? Are you a wallflower? Do you lack that certain something? Would you like to be glamorous, alert and magnetic? If you would, your troubles are over. See Bill Thompson and let him explain all about our course on ‘From Droop to Debutante’ in ten easy lessons.”

The year 1944 saw the selection of the first Miss LMAL. She was to be selected by popular vote, with a caution that “[w]e all want our Miss LMAL to look really good on display and to make us feel proud that she belongs to us. Base your choice, therefore, on personality and posture as well as on good looks.” Pictures of the top 16 candidates would be sent to “some renowned judge of feminine beauty.” Their photos were published in the June issue of the newsletter. It was announced later that film director Cecil B. DeMille served as judge.

16 “What Is Your Candid Opinion of NACA Women?,” *Air Scoop* 3, no. 52 (15 December 1944): 5, available online at <http://crgis.ndc.nasa.gov/crgis/images/717f/AirScoop1944.pdf>.

There are many romantic stories involving women at the NACA during the war. Every issue of the *LMAL Bulletin* had wedding or engagement announcements. Elva May Nixon was a computer in the 1940s when she met Joe Boyle, a model maker. Hilda “Chick” Singleton worked in the sheet metal shop and met her future husband, David L. McCraw, at work. David had relocated to Hampton from Maryland. Afterward, the family moved to Houston, Texas, where David became the Assistant Chief of the Technical Services Division at the Manned Space Center (later to become Johnson Space Center).

Conclusion

Women working at LMAL found jobs that offered both challenges and opportunities. Starting out with limited options for promotion, many of the women proved that they could successfully do the work and sought out opportunities for advancement. Some ended up making a long-term career out of what they thought would be a temporary job, while others gradually moved into other careers at the Center. Often overlooked in histories of Langley Research Center, these women were at the forefront in challenging the status quo of women in the workforce.

Scholars disagree on whether the working women of WWII had any lasting impact on women’s roles in life. Some think that the war accelerated the movement of women into the labor force, while others take the stance that there was no lasting impact. All concede, though, that many forces worked against the retention of the changes that occurred during the war period. Living through the Depression and war produced a desire for stability and the reversion of Rosie the Riveter to Margaret Anderson in *Father Knows Best*. For the NACA/NASA, the real changes for women did not come until the 1970s.



NEWS FROM HEADQUARTERS AND THE CENTERS

NASA HEADQUARTERS

Washington, DC

History Program Office

By Bill Barry

Just after our last newsletter was published, we received the bad news that the contractor who provides our archival support staff had to reduce the staff from three to two. Although this possibility had loomed for some time, we were fortunate to have all three archivists through the renovation. But with the move completed, the contractor's plan to operate with two full-time archivists, supplemented by other staff on an as-needed basis, was implemented. As a result, John Hargenrader was let go at the start of the year. John has been a stalwart of the Headquarters archival program for over a dozen years. His depth of knowledge about so many aspects of space history, his good humor, and his focus on the practical (not to mention the mechanical skills he'd honed in his wood shop) were powerful assets. I know that many of you will miss him, just as we do. We'll be happy to forward any e-mails you might want to send with your thanks and well wishes to John.

Despite the hard start to 2015, we all took great pride in our accomplishments of 2014. Not only did we move back into our beautifully updated archival space late in the summer last year, but we also had a very productive year of publications. While we had only one full-size book go to print last year (the amazingly popular *Archaeology, Anthropology, and Interstellar Communication*), it was a good year for monographs and, most importantly, a banner year for the annual Aeronautics and Space Report of the President (a.k.a. President's Report). NASA is responsible for producing this Executive Branch report that is required by the Space Act. However, a variety of coordination problems led to a backlog. An incredible amount of work by Steve Garber and Giny Cheong

greatly reduced the backlog, which resulted in the release in 2014 of the President's Reports for FY 2009, FY 2010, and FY 2011. Not only will the FY 2012 and FY 2013 reports probably be in print by the time you read this, but the new processes Steve and Giny have instituted mean that the report for FY 2014 is also well advanced and will be in print in May. We've also been hard at work on several major book projects that will be released later this year. These include the third volume in our Societal Impact series, a centennial history of the National Advisory Committee for Aeronautics (NACA) and NASA, volume 3 of the *Wind and Beyond* series, and a major update to *Deep Space Chronicle*. This year promises to be a great one for reading NASA history.

Getting all of these books (and some more monographs) ready for publication this year meant a lot of work last year (and this) for our chief editor, Yvette Smith. Yvette has been working with us on detail for quite a while, but at the start of this year, we were able to get her position in the History Program Office formalized. In addition to serving as our editor and interface with the NASA Headquarters Communications Support Services Center (printing and design) folks, she has used her Web savvy to help improve our visibility on the NASA flagship Web site, www.nasa.gov. Yvette also serves as our "intern wrangler." She's a great (and now permanent) addition to the team.

Speaking of interns, we were really sad to see Amy Wallace and Nolan Lott leave us last December. Nolan is back at Nebraska Wesleyan University finishing up his senior year, playing some baseball, and getting ready for another year at school to complete his teaching credentials. (Based on the mail we've been getting, I think he misses us a bit too.) We are also happy to report that, after graduating from the University of Mary Washington this spring, Amy will be heading to the University of Glasgow to study in their digital archives program. If you have been appreciating our



social media output (and a number of other things) this spring, you can thank our spring interns, Shelby Jirikils (rhymes with “miracles,” as she says) and Rachael Kirschenmann. Shelby studies at the University of California, Irvine, where, unfortunately for us, they work on a quarter system. The good news was that she was able to start in early January, but the bad news is that she’ll be interning with us only until the winter quarter is over in the middle of March. Rachael is from the same school as Nolan Lott (Nebraska Wesleyan University); she started in February and will be with us until the middle of May. It is a busy spring, so we are happy to have such great help.

Historical Reference Collection (HRC)

By Jane H. Odom

In the Headquarters Archives, the staff continues to stay busy providing reference services and processing projects. During the last quarter, we hosted visitors from NASA Headquarters, the History of Science Society, the Planetary Society, the Advisory Council on Historic Preservation, the Georgia Institute of Technology (Georgia Tech), Auburn University, and the Free University of Berlin.

Recently, we completed a number of archive projects that researchers will find of interest. The processing (arrangement, description, and preservation) of the John Naugle Collection is complete. Naugle was Associate Administrator for the Office of Space Science and the Agency’s Chief Scientist before his retirement in 1981. The collection consists of 19 cubic feet dating from ca. 1950 to 2002. It includes seven series or broad types of material: journals, diaries, and appointment books; chronological correspondence files; subject files; biography files; trip files; articles and books; and microfiche of 1970s correspondence.

We completed a review of more than 70 boxes—on loan to us from the Federal Records Center—that contain files pertaining to NASA-congressional relations regarding the Space Shuttle–Mir and International Space Station (ISS) programs. After an appraisal,

hundreds of documents were copied and added to existing subject files in the Historical Reference Collection (HRC), making our human spaceflight collection that much richer.

Additionally, a two-year effort to capture born-digital aerospace congressional testimony and to digitize existing hard-copy congressional statements in our reference collection is complete. The result: just over 950 PDFs have been uploaded to our internal database, where they will be used in answering reference questions. Eventually, this collection will be made available externally for research use at <https://historydms.bq.nasa.gov/>. Stay tuned for details.

If you are interested in visiting the HRC to conduct research in these or other areas of interest, please contact us at 202-358-0384 or at <http://history.nasa.gov/contact.html> to schedule an appointment.

AMES RESEARCH CENTER (ARC)

Moffett Field, California

By Glenn Bugos

NASA Ames capped its 75th anniversary celebration with an open house on 18 October 2014. It was the first time since 1997 that Ames had opened its gates to the public, and more than 120,000 of

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NASA AMES CAPPED ITS 75TH ANNIVERSARY CELEBRATION WITH AN OPEN HOUSE ON 18 OCTOBER 2014. IT WAS THE FIRST TIME SINCE 1997 THAT AMES HAD OPENED ITS GATES TO THE PUBLIC....

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Pictured are scenes from the 75th anniversary open house at Ames.

our closest friends showed up. Center Director Pete Worden and Congresswoman Anna Eshoo opened the event with reflections on the long history of Ames and how Silicon Valley has grown up around it. The open

house featured a 2-mile-long, self-guided walking tour past Ames's key facilities, along roads ringed with exhibits highlighting the many Ames aeronautical and space missions, both past and present. A few facilities,



like the Unitary Plan Wind Tunnels and Sustainability Base, opened their doors for special “backstage” tours. Attendees could visit with hundreds of Ames engineers and scientists proud to explain their work and could hear family-focused talks by Ames researchers about the latest in space science and exploration. Our industry and education partners in the NASA Research Park also opened their doors, and the California Air National Guard positioned airplanes for visitors to see up close. For most, it was the first time they could gaze up from inside the enormous expanse of historic Hangar One. Kay Twitchell of the Director’s Office organized the open house, with support from everyone at Ames. From there, we moved right into planning celebrations for the centenary of the NACA.

In archive news, the finding aid has been posted online for the Vernon L. Rogallo Papers, 1948 to 1992 (PP14.02). The collection features technical publications, memoirs, photographs, and artifacts related to Rogallo’s employment as an engineer at Ames. He started in the 40- by 80-Foot Wind Tunnel and then transitioned to the instrumentation division, where he invented a ballistocardiograph to measure ballistic forces on the heart. The collection also features materials on his family’s aerobatic kite-flying team, the Rockets, which was a vehicle to publicize the Flexikite. The Flexikite was based on a design by Vernon’s brother Francis, famous for the Rogallo Wing.

We bid farewell to Laura Langford, an archives intern from the San Jose State University School of Library and Information Sciences. Laura completed a project of scanning and developing finding aids for a series of transcripts and documents related to the Cosmos Bion program, as well as other projects related to Ames artwork.

We also bid farewell to Lewis S. Braxton III, who is retiring as Ames’s second longest-serving Deputy Center Director. Lew began his career with NASA in 1975 as a co-op student and rose steadily through the ranks in finance and Center operations. He knew the history of Ames, he knew the value of that history, and he knew the value of a diverse and motivated workforce imbued with the cultural legacy of Ames.

ARMSTRONG FLIGHT RESEARCH CENTER (AFRC)

Edwards Air Force Base, California

By Christian Gelzer

As a member of the Technical Advisory Panel for the California Science Center’s (CSC’s) Samuel Oschin Air and Space Center, Christian Gelzer attended a meeting in October to test hands-on exhibits and provide feedback to CSC employees and directors. CSC senior executives have visited almost every science center and aviation museum in the nation to see what exhibits and interactive displays there are in order to develop ones for the new Air and Space Center, and this was an initial trial run of what they’ve developed. He also continues to serve as a subject matter expert to Evergreen Exhibitions as they develop their three-part traveling exhibition on flight that opens at the Smithsonian’s Air and Space Museum on the Mall in 2015. Meanwhile, he continues juggling four book projects, of which the closest to completion is the *Flight Loads Lab* monograph.

This spring, the Aeronautics Research Mission Directorate’s Office of Education and Communication will publish Peter Merlin’s *Unlimited Horizons: Design and Development of the U-2* (NASA SP-2014-620). This was Peter’s last book done as a historian for the Center before he moved to the Public Affairs Office. The study documents the design and development history of the Lockheed U-2, initially proposed as a stopgap measure to provide reconnaissance capability during the early years of the Cold War. While other books have documented the airplane’s operational history, few have made more than a cursory examination of its technical aspects or its role as a NASA research platform. This volume includes an overview of the entire Lockheed U-2 family, construction and materials challenges faced by the builders, the aircraft’s performance and capabilities, its checkered early history with the NACA and NASA, the eventual use of several U-2 and ER-2 airplanes as research platforms, and technical and programmatic lessons learned. The book will also be available as an e-book from NASA.



GLENN RESEARCH CENTER (GRC)

Cleveland, Ohio

By Anne Mills

This year, the Glenn History Office and Imaging Technology Center will release an updated version of its iPad app entitled “NASA Glenn Research Center: The Early Years—a Pictorial History.” The user interface has been overhauled to work with iOS 8, and a slideshow capability has been added, as well as options for sharing images through social media. More images have been included, along with expanded overview information to provide more context about the history of GRC, as well as the history of scientific and technical photography at the Center.

The app includes over 300 photos spanning 1941–79. They are divided into six sections, each covering an era of research at the Center. Each photo is accompanied by in-depth historic information. “GRC: The Early Years” is like a virtual coffee-table book, offering a detailed history of the Center through a carefully curated collection of extraordinary photography. The app will be available for the iPad free of charge through the iTunes store. Don’t have an iPad? A Web-accessible version of the original content can be viewed online at <http://www.grc.nasa.gov/WWW/portal/gallery/>.

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‘GRC: THE EARLY YEARS’ IS LIKE A VIRTUAL COFFEE-TABLE BOOK, OFFERING A DETAILED HISTORY OF THE CENTER THROUGH A CAREFULLY CURATED COLLECTION OF EXTRAORDINARY PHOTOGRAPHY.

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JOHNSON SPACE CENTER (JSC)

Houston, Texas

By Rebecca Wright

A recently released book, *Texas Women: Their Histories, Their Lives*, includes a chapter written by JSC Historian Jennifer Ross-Nazzal. Her featured topic was Dr. Mae Jemison, the first woman of color to be selected to fly as an astronaut for the nation. (You can read about the book at http://www.ugapress.org/index.php/books/index/texas_women.) Jennifer was also featured as a subject matter expert/commentator during a nationally televised documentary, *Makers: Women in Space*. Produced by PBS, the segment used many of the oral history transcripts from the JSC History Office as background research. Also during the past months, a significant amount of materials from the JSC Oral History Project were used in other broadcast presentations and/or publications.



“First Man on the Moon: Neil Armstrong” aired on the PBS program *NOVA* and featured audio from the Neil Armstrong interview conducted for the JSC Oral History Project in 2001. Darlow Smithson Productions, Ltd., which produced the show, included the name of the JSC History Office’s Production Coordinator, Sandra Johnson, in its closing credits to thank her for the assistance. Specific audio clips had been identified by the producers after they read the transcript online at the JSC History Portal.

Hector Tobar, author of *Deep Down Dark: The Untold Stories of 33 Men Buried in a Chilean Mine and the Miracle That Set Them Free*, drew upon the accounts found in the oral history transcripts from the NASA experts who traveled to Chile for the chapter on the rescue. The book was chosen by NPR Radio as one of the Best Reads in 2014 and as its first book for the new program, *Morning Edition Reads*. (See <http://www.npr.org/2014/12/11/369409338/join-the-morning-edition-book-club-were-reading-deep-down-dark>.)



An article included on the NASA Knowledge Management Web site uses a quotation from the book *NASA at 50: Interviews with NASA's Senior Leadership* to illustrate the importance of sharing information to prevent repeating mistakes. The article's writer, Dr. Ed Hoffman, who is NASA's Chief Knowledge Officer, states: "It is only through the repetition of these stories, by keeping them in the forefront of our minds, that we will mitigate or even cease making the same mistakes. That's why history and stories are important." The *NASA at 50* book includes edited transcripts from oral history interviews conducted by the JSC History Office, whose staff also edited the book's contents for its publication. Hoffman's full article is found online at <http://km.nasa.gov/tale-of-the-saber-toothed-tiger/>.

Quartz online magazine featured a lengthy article that extensively used information from the Commercial Orbital Transportation System (COTS) oral history project. The article was titled "The Right Stuff: What It Took for Elon Musk's SpaceX To Disrupt Boeing, Leapfrog NASA, and Become a Serious Space Company." At the end, the editor included a note: "We're grateful for the oral history project at NASA's Johnson Space Center, which provided much useful background material and several quotes for this article." The COTS project and report can be found online at http://www.jsc.nasa.gov/history/oral_histories/c3po.htm.

Also, earlier this year, NASA Chief Historian Bill Barry asked the JSC History Office to gather as much oral

history as possible from surviving NACA members in preparation for the centennial of the organization's creation. The NACA Oral History Project transcripts are now posted online and reflect a significant contribution to the historical record for generations to come. The collection features those gathered this past year from individuals associated with the Langley, Glenn (Lewis), and Ames Research Centers, along with the memories captured in previous years. Currently, interviews are being conducted with some of the erstwhile NACAers who worked at the former High-Speed Flight Research Station (now named Armstrong Flight Research Center). To access the collection, visit http://www.jsc.nasa.gov/history/oral_histories/naca.htm.

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THE NACA ORAL HISTORY PROJECT TRANSCRIPTS ARE NOW POSTED ONLINE AND REFLECT A SIGNIFICANT CONTRIBUTION TO THE HISTORICAL RECORD FOR GENERATIONS TO COME. THE COLLECTION FEATURES THOSE GATHERED THIS PAST YEAR FROM INDIVIDUALS ASSOCIATED WITH THE LANGLEY, GLENN (LEWIS), AND AMES RESEARCH CENTERS, ALONG WITH THE MEMORIES CAPTURED IN PREVIOUS YEARS.

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On the JSC History Portal, readers will find historical information provided by the U.S. Spacesuit Knowledge Capture Project. Cinda Chullen, manager of the project and manager of the JSC Portable Life Support System area, requested assistance from the JSC History Office in releasing the archived U.S. Spacesuit Knowledge Capture events via the JSC History Portal. Sandra Johnson from the JSC History Office prepared the information for uploading and created an accessible Web page with links to 14 video recordings of subject matter experts, transcripts of the recordings, and PDF files containing the participants' presentations or prepared information, all of which can be found online at <http://www.jsc.nasa.gov/history/spacesuits/index.htm>.



LANGLEY RESEARCH CENTER (LARC)

Hampton, Virginia

By Mary Gainer

We welcomed a new team member in December 2014. Mark A. Chambers has worked as a contractor, in various capacities, for the NASA Langley Research Center for over 22 years. During his career, Mark has worked as a writer-editor for the NASA Langley Office of External



Mark A. Chambers

Affairs, writer-editor for the Langley General Aviation Program Office, technical writer-editor for the NASA Engineering and Safety Center (NESC), and technical writer for the NESC Academy. Over the past seven years, Mark has worked as a technical editor both for the Langley Ares I-X Systems Engineering and Integration Office and for the Langley Aeronautics Research Directorate and Flight Projects Directorate. On 3 December 2014, Mark began work as a contract Cultural Resource Specialist (Straughan Environmental, Inc.) for the Langley Center Operations Directorate.

Over the years, Mark has been fascinated by Langley's rich aerospace history and has authored or coauthored (with his father, Joseph R. Chambers) seven books, some published by NASA and others published by commercial publishers.

In his current job, Mark is assisting with the inventory and organization of the Langley Archives Collection as we make the move to more of an electronic format. An example of the type of collections being reviewed is the Robert L. Trimpi Collection, a vast archive of papers, notes, reports, and books dealing primarily with hypersonic research and Apollo 13 documentation. (See Trimpi's obituary here: http://ergis.ndc.nasa.gov/historic/Robert_L._Trimpi.)

MARSHALL SPACE FLIGHT CENTER (MSFC)

Huntsville, Alabama

By Michael Wright

The Marshall History Office has initiated two major archival projects: the digitization of the papers of David H. Newby and the cataloging of 16-millimeter films located at the Michoud Assembly Facility in New Orleans, Louisiana. Newby was sworn in as Marshall's first official employee when the Center opened in 1960. He was instrumental in the transfer of the core of the Army Ballistic Missile team from the Army to NASA in July 1960. After the transfer, Newby continued on in the Administration and Technical Services Office, serving for many years as director of that office. The bulk of the papers consist of penciled notes that he recorded during meetings with Dr. Wernher von Braun and other Marshall leaders concerning Saturn program management and organizational structure. The papers are currently on loan to Marshall from the University of Alabama in Huntsville Archives and Special Collections Department, headed by Anne Coleman. At the conclusion of the project, we will make the digitized papers available to researchers. A digital copy will be archived at Marshall. Another digital copy will be provided to the university archives, along with the original paper copies.

Another new project involves assessing and describing more than 350 16-millimeter films currently housed at the Michoud Assembly Facility. Brian Odom, the Marshall archivist, traveled to Michoud in December to assess the condition of the collection. It consists primarily of films from the Gemini, Saturn, and early Space Shuttle eras. A few of the films even predate the acquisition of Michoud by NASA in 1961. The films will be transferred to Marshall, where they will be archived and eventually digitized.

A long-time employee, Dieter Grau (1913–2014), passed away on 17 December at the age of 101. Grau was a Peenemünde veteran and an original member of the German Rocket Team who joined Dr. Wernher von Braun at Fort Bliss in 1946. After transferring



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DIETER GRAU (1913–2014)... WAS A PEENEMÜNDE VETERAN AND AN ORIGINAL MEMBER OF THE GERMAN ROCKET TEAM WHO JOINED DR. WERNHER VON BRAUN AT FORT BLISS IN 1946.

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to Huntsville with the “Rocket Team” in June 1950, Grau worked in the Guidance and Control Laboratory. After the group transferred from the Army to NASA in 1960, he was named director of the Quality and Reliability Assurance Laboratory and served in this position throughout the Apollo program. Grau retired in December 1973.

STENNIS SPACE CENTER (SSC)

Stennis Space Center, Mississippi

By Daphne Alford

Stennis Space Center hosted its first-ever NASA Social with more than two dozen social media enthusiasts from around the country. A team of representatives from NASA Headquarters, Marshall Space Flight Center, and Stennis selected the 26 final participants, who traveled from 15 states—as nearby as Alabama and Tennessee and as far away as California, New Jersey, and Wisconsin. More than 300 people from across the country applied to participate.

On 12 September 2014, participants began with a morning visit to NASA’s Michoud Assembly Facility in New Orleans, then spent the afternoon touring Stennis facilities and learning about the rocket engine test work conducted at the site. They were joined by local media for a press conference with NASA Administrator Charles Bolden, who provided updates



NASA Administrator Charles Bolden (center, top photo) stands with social media enthusiasts from around the country who gathered at Stennis Space Center for the site’s first-ever NASA Social. During the event, the social media visitors attended a press conference, at which Bolden provided an update on NASA’s deep space exploration efforts.

about the B-2 Test Stand and NASA’s “Journey to Mars.” They also visited the A-1 Test Stand.

Participants learned about renovations to the Apollo-era B-2 Test Stand from Rick Rauch, manager of the renovation project, with assistance from Tim Pierce, deputy of the Facility Services and Utilization Division of the Stennis Center of Operations Directorate. Both the A-1 and B-2 test stands are being prepared to test engines and rocket stages for NASA’s new Space Launch System, which will carry humans deeper into space.



The B-2 Test Stand was among the Stennis facilities the group toured.



ARMSTRONG'S FLIGHT LOADS LABORATORY'S 50TH ANNIVERSARY

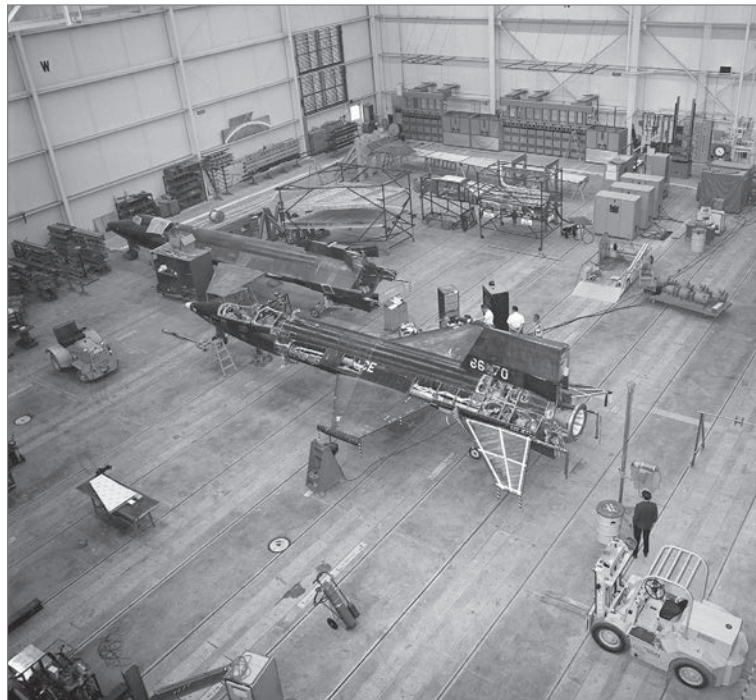
By Christian Gelzer

NASA's Armstrong Flight Loads Laboratory celebrated its 50th anniversary in October 2014. This extraordinary facility was built to test and validate materials on and in the X-15, specifically to answer questions no one had anticipated when that aircraft was launched. At its opening, there were few laboratories like it in the world; the only peer in this country was the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio. The Flight Loads Lab initially performed aero-thermo-structural testing related to hypersonic flight. It was not just that the testing temperatures were staggering; it was that the test articles were frequently subjected to flight loads at the same time as these remarkable thermal loads. Adding to the complexity, sometimes an entire wing of the X-15 was subjected to thermo-structural loads simultaneously.

The facility was necessarily large: 150 feet by 120 feet by 40 feet, with trenches in the floor to carry compressed air or water, as well as tie-down slots with a maximum load uplift capability of 15,000 pounds. This capability shone like never before in the 1970s, when an entire Lockheed YF-12 (at a size of 102 feet by 56 feet) was heated for hours on end (multiple times), some areas to 600°F, to reproduce Mach 2.7 temperatures—while the aircraft was subjected to flight loads.

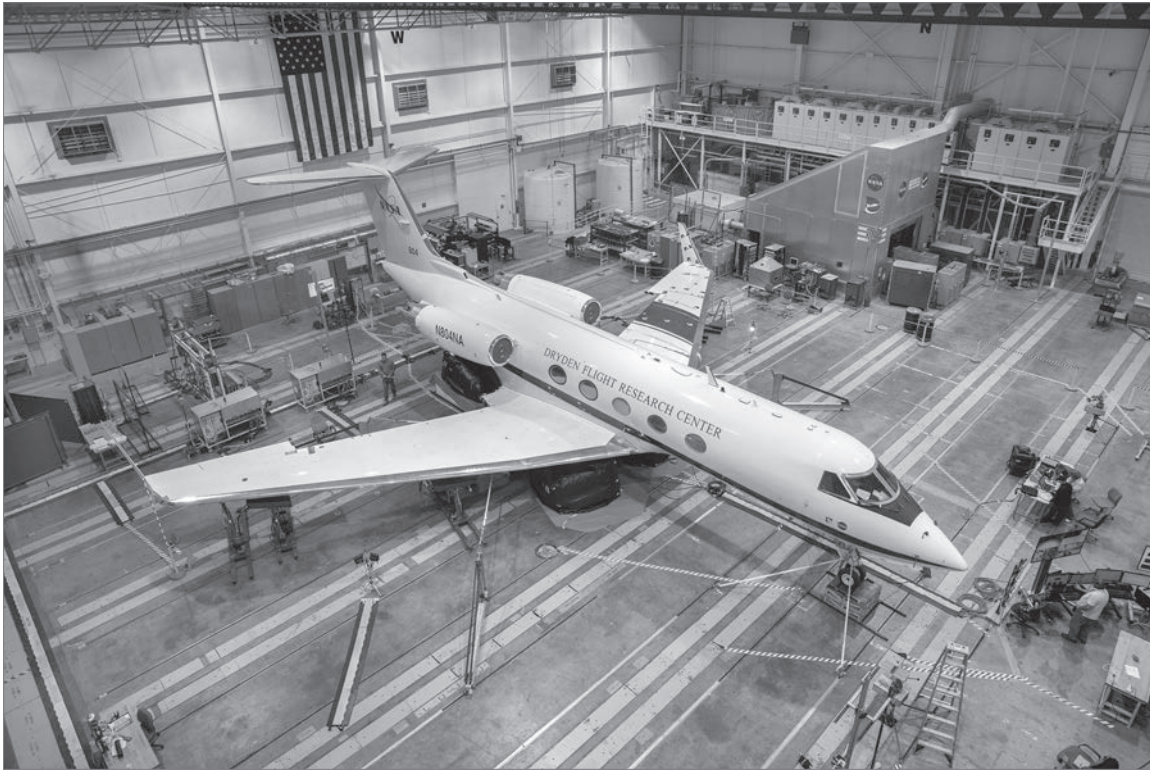
The Laboratory's experience with hypersonic and supersonic test and calibration transferred easily to the

Space Shuttle Program. Starting in 1979 and continuing almost through the end of the program, the Lab performed various thermal and loads studies. The Lab also performed critical work on materials and thermal properties related to the National Aero-Space Plane (NASP) program in the 1980s. It performed the first combined heating and loading tests of titanium matrix composites (TMC) structural panels for the X-30, work with relevance even though neither vehicle flew.



This 1968 photo shows the interior of the Flight Loads Lab with two X-15s and engineers/technicians working near the closest aircraft (66670). The farthest X-15—lacking a vertical stabilizer or engine—has a rack of sorts beyond it. In that rack, lying horizontally, are two flat surfaces that look like wings. They are, in fact, two sets of heating elements, an array of quartz lamps that the engineers will roll up to and over the aircraft's wings (above and below to envelop the wing). After closing off the ends and turning on the lamps, the engineers will be able to raise the temperature over the wing so that it reflects that of the aircraft on reentry and to do so in discrete sections of the wing so that the leading edge will be approximately 1,000°F because those lamps are on full blast. The next row of lamps will be on a lower setting and will raise the area further aft to only 800°F, and so on going aft over the wing. (NASA)





This photo, taken from almost the exact same spot as the first one (note the W for west and N for north in both images on the walls) shows one of the Center's Gulfstream Gills, this one the test bed for the Active Compliant Trailing Edge (ACTE) program. The aircraft rests on three air bags (pneumatic bags) in preparation for a loads test. Before an aircraft is modified from its factory configuration, the engineers bring the aircraft into the Loads Lab to establish a benchmark of the aircraft and its various parameters. After it has been modified, they return it to the Lab to test it again to see how it reacts to the same loads tests—how does it bend, what are the resonances and frequencies, and so on. At the time of the test in the photo, the landing gear was retracted and the aircraft floated only on those three air bags, a first as far as anyone knows when it comes to testing. It was important to separate the loads placed on the aircraft from those on the landing gear since the gear—when in contact with the ground—would distort the results of the test. Placing the aircraft on the air bags kept this from happening.

Running across the floor are the trenches that can carry water, power, or tie-downs. Near the north wall is a chamber with a slanted roof. This chamber protects the oven inside with further insulation and allows the Lab to purge the oven and surrounding area with an inert gas for a variety of reasons. It is necessary to do so when testing things at 1,500 to 2,500°F. If you have any amount of oxygen in the chamber at that temperature, the item you are testing corrodes in a second—not to mention other weird things that can happen. (NASA)

In recent years, the Lab has worked closely with Langley Research Center to take fiber-optic strain sensing (FOSS) technology out of the laboratory and into practical applications by optimizing algorithms. The technology was permanently embedded in the composite wings of Armstrong's Ikhana, a science platform that has since flown on rockets and is being licensed for commercial applications. Additionally, in partnership with Glenn Research Center, the Lab is now working to develop flight applications

for shape memory alloys. The Lab retains its long-standing connection to thermal testing, boosting its high-temperature oven capability to beyond 2,500°F.

The Flight Loads Laboratory is perhaps better known outside Armstrong than it is within the Center, likely because its remarkable capabilities have drawn so many customers from industry, government, and academia over the decades. The Lab melds research with aerospace testing and validation.

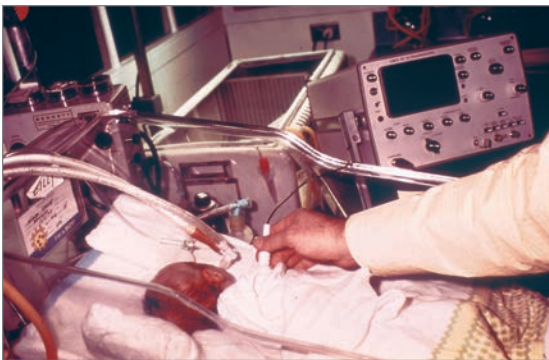


AN ONLINE PICTORIAL HISTORY OF TECH TRANSFER: THE NASA AMES TECHNOLOGY TRANSFER HISTORICAL IMAGE GALLERY, 1976–2012

By Lois Rosson

While looking at images curated online might not have the same impact for viewers as strolling through an actual gallery, the expedience of digital platforms has unique advantages for those seeking to share historical materials with a wide audience. The example discussed here, Ames Research Center's Technology Transfer Historical Image Gallery, was created by the Center's New Media team, led by Yvonne Clearwater, to commemorate our Center's 75th anniversary. The gallery can be found online at <http://www.nasa.gov/content/nasa-ames-tech-transfer-gallery/>. It is composed of photographs shot for NASA's *Spinoff* magazine and features images of 50 technologies from the publication's history as a celebration of technology partnerships at Ames.

The online gallery allows viewers to scroll through images either individually or by decade. Each photograph—a digitized scan of the original negative—is paired with a short excerpt from the original *Spinoff* article and information about the partnership and products that evolved from it. Since no resources were expended on the archival preservation or treatment of the featured images, the costs of executing the project remained remarkably low. Equally symptomatic of curatorship in the “digital age,” the only physical



This image of an echocardioscope in 1976 comes from the NASA Ames Technology Transfer Historical Image Gallery, 1976–2012.

contact made with the photographs was to plug in the thumb drive sent from the magazine's editor.

In hindsight, one of the Tech Transfer Image Gallery's most successful elements is its historical parallel with the magazine's initial goals. Like the publication, the ultimate purpose of the image gallery is to attract new viewers unfamiliar with NASA technology transfer and *Spinoff* magazine. When Congress formed NASA in 1958, it mandated that the administration and its contractors report to industry any new, commercially significant technologies discovered in the course of its research and development. “Spinoff” products quickly sprouted from space technologies and into private industry, heightening NASA's need for an annual report to make a cogent presentation of all this activity at congressional budget hearings.

By 1973, this requirement resulted in the creation of a *Technology Utilization Program Report*, a publication that soon caught the public's attention. It stirred interest in the idea of tech transfer and was soon reworked into a nontechnical magazine. In 1976, the first four-color *Spinoff* was published.

The ubiquitous accessibility of the Internet was a motivating factor in the project's conception, and the high production quality of *Spinoff*'s photographs made it an attractive candidate for the gallery's focus. The magazine's 38-year history provides a rich archive of material documenting the technology transfer process, and the publication's establishment as a bridge between technological innovation and public knowledge makes it inviting to audiences beyond the scientific community.

Lois Rosson is an intern with the Ames Technology Transfer Outreach team and a graduate of the University of California at Santa Cruz with degrees in history and art practice.



OTHER AEROSPACE HISTORY NEWS

NATIONAL AIR AND SPACE MUSEUM (NASM)

By Michael Neufeld

In preparation for the summer 2016 reopening of the renovated Boeing Milestones of Flight Hall, curated by Margaret Weitekamp and Paul Ceruzzi (Space History) and Bob van der Linden and Alex Spencer (Aeronautics), the museum has already begun moving artifacts. Because the exhibit is part of the main hall and entrance, it will remain open throughout the transformation, allowing the public to watch staff working on the artifacts and preparing the new displays. With a few exceptions, most of the artifacts in the hall will remain on display, although some of them will have to be moved or removed temporarily during the renovation.

Two artifacts found new display locations in the last months of 2014. The Breitling Orbiter, the pressurized balloon gondola that allowed Bertrand Piccard and Brian Jones to complete the first nonstop flight around the world with a free balloon in 1999, was moved to the Steven F. Udvar-Hazy Center, where it became the anchor of the lighter-than-air display. In addition, the Stardust return system that collected samples from Comet Wild 2 as well as interstellar dust before returning to Earth in 2006 was moved to its new display location in the museum's "Exploring the Planets" exhibit.

Other artifacts have been removed or relocated to create the space needed to work on the new displays. The touchable Moon rock, on loan from NASA's Johnson Space Center, will return to the Boeing Milestones of Flight Hall for the opening in 2016 but for now has been moved upstairs to the "Apollo to the Moon" exhibit on the museum's second floor so that visitors can continue to touch the Moon even as the new setting for this valuable rock is being prepared.

The display of a group of Goddard rockets has been removed for conservation; the May 1926 rocket, the oldest extant liquid-fueled rocket engine, will return to display in Milestones for the new configuration. Likewise, Gemini IV, from which Ed White made the first American spacewalk in 1965, has been removed from its plinth and is being displayed on a stand while it waits for its new custom case. John Glenn's Friendship 7 Mercury spacecraft will follow. Finally and most notably, the Ryan New York–Paris Spirit of St. Louis was lowered to the floor so that conservation, cleaning, and inspection could be conducted before it was returned to its original position in the Milestones Hall. If you visit in the next few months, you'll see how much work has been done.

During calendar year 2014, curators and scientists at NASM published seven books:

- Valerie Neal (Space History): *Discovery: Champion of the Space Shuttle Fleet* (Zenith Press).
- Ralph D. Lorenz and James R. Zimbelman (Center for Earth and Planetary Studies): *Dune Worlds: How Windblown Sand Shapes Planetary Landscapes* (Springer Praxis).
- Roger D. Launius (Associate Director and Space History): *Historical Analogs for the Stimulation of Space Commerce* (NASA SP-2014-4554).
- Roger D. Launius and David H. DeVorkin (Space History), editors: *Hubble's Legacy: Reflections by Those Who Dreamed It, Built It, and Observed the Universe with It* (Smithsonian Institution Scholarly Press).
- Michael J. Neufeld (Space History), editor: *Milestones of Space: Eleven Iconic Objects of NASM* (Zenith Press).



- John D. Anderson (Aeronautics) and Richard Passman: *X-15: The World's Fastest Rocket Plane and the Pilots Who Ushered in the Space Age* (Zenith Press).
- Paul D. Ceruzzi (Space History): *A History of Modern Computing* (MIT Press, Japanese edition).

Also during the calendar year, seven exhibitions either opened or closed at NASM:

- “Views of Africa,” 15 October 2013–16 February 2014: A collaboration with the National Museum of African Art that presents an exploration of diverse perspectives of Earth, focusing on the dynamic landscapes of Africa.
- “Spirit and Opportunity: 10 Years Roving Across Mars,” 9 January–14 September 2014: A celebration of the amazing images and achievements of the two Mars Exploration Rovers on the 10th anniversary of their landings on the Red Planet.
- “Red Bull Stratos: Mission to the Edge of Space,” 2 April–26 May 2014: An exhibition of the pressurized balloon gondola in which Felix Baumgartner ascended to an altitude of 127,852 feet—the edge of space—over Roswell, New Mexico, on 14 October 2012, along with the pressure suit that he wore on a flight to 97,145 feet on 25 July 2012.
- “Repairing Hubble,” 23 April 2014–present: A display in the Space Race Hall that included the Hubble Wide-Field Planetary Camera and other artifacts from the servicing missions to the telescope.
- “The Great Picture,” 26 April 2014–present: A 3,375-square-foot photograph, taken by the largest pinhole camera in the world, of an abandoned Marine Corps air station in Southern California.
- “Hawaii by Air,” 25 July 2014–present: An exhibit that recounts how traveling to Hawaii has changed over time, how that experience evolved along

with the airplane, and how air travel changed Hawaii itself.

- “Spying from Space,” 21 November–present: An expanded section of the “Space Race” exhibit on orbital reconnaissance.

NASM Archives has acquired the Arthur C. Clarke Papers from his estate in Sri Lanka. This is a major acquisition, and all involved deserve our thanks, notably Martin Collins (Space History) and Patricia Williams (Archives). The collection is currently being processed and should become available for researchers at the main Archives reading room at the Udvar-Hazy Center before the end of 2015.

To commemorate the 50th anniversary of the first two extravehicular activities (EVAs) in 1965, the National Air and Space Museum opened “Outside the Spacecraft: 50 Years of Extra-Vehicular Activity” on 8 January. Running through 8 June, the exhibit features many rarely seen artifacts. It focuses on the spacesuits and tools required to perform EVA tasks, which are set against the backdrop of spacewalk photography and artwork. Highlights include Aleksei Leonov’s military uniform, Ed White’s Gemini IV EVA equipment, Gene Cernan’s Apollo 17 boots, Neil Armstrong’s Apollo 11 “Snoopy” cap, and an artistic display of gloves and tools used in Hubble servicing. The exhibit was curated by Jennifer Levasseur (Space History). Numerous programs will occur throughout the run of the exhibit, all of which can be found on the exhibit’s Web site, <http://airandspace.si.edu/EVA>. Twitter users are encouraged to respond using #spacewalk50.

Hunter Hollins (Space History) has published “Science and Military Influences on the Ascent of Aerospace Development in Southern California,” *Southern California Quarterly* 96, no. 4 (December 2014): 373–404. It includes a discussion of the early development of the Jet Propulsion Laboratory.



RECENT PUBLICATIONS AND ONLINE RESOURCES

COMMERCIALY PUBLISHED WORKS

Astronautics Publications: 2014

By Michael Ciancone, *American Astronautical Society (AAS) History Committee Chair*

This list comprises English-language books published on various aspects of spaceflight in assorted disciplines and ranging from juvenile and popular literature to texts intended for academia or practicing scientists and engineers. In addition to obvious topics of human spaceflight and uncrewed interplanetary explorations, this list also includes the occasional nonastronautics title that has a space “flavor.” Titles that are published solely in electronic format are not included. Books marked with a ✨ are for young readers.

Ruwantissa Abeyratne. *Regulation of Commercial Space Transport: The Astrocizing of ICAO*. Springer [SpringerBriefs in Law Series].

Charles Adler. *Wizards, Aliens, and Starships: Physics and Math in Fantasy and Science Fiction*. Princeton University Press.

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The History Program Office gives sincere thanks to Michael Ciancone. Please note that this list includes only astronautics publications, not aeronautics or astronomy, and does not represent an endorsement by NASA.

UPCOMING MEETINGS

The annual meeting of Oral History in the Mid-Atlantic Region will be held **9–10 April 2015** in Camden, New Jersey. Visit <http://ohmar.org> for more details.

The 31st National Space Symposium will be held **13–16 April 2015** in Colorado Springs, Colorado. Visit <http://www.nationalspacesymposium.org/> for more details.

The annual meeting of the National Council on Public History will be held **15–18 April 2015** in Nashville, Tennessee. Visit <http://ncph.org/cms/conferences/2015-annual-meeting/> for more details.

The annual meeting for the Organization of American Historians will be held **16–19 April 2015** in St. Louis, Missouri. Visit <http://www.oah.org/meetings-events/> for more details.

The annual meeting for the Society for History in the Federal Government will be held **24–25 April 2015** in Shepherdstown, West Virginia. Visit <http://shfg.org/shfg/events/annual-meeting/> for more details.

The 34th International Space Development Conference (ISDC 2014) will be held **20–24 May 2015** in Toronto, Canada. Visit <http://isdc.nss.org/2015> for more details.

The joint meeting of the Council of State Archivists and the National Association of Government Archives and Records Administrators will be held **22–25 July 2015** in Austin, Texas. Visit <http://www.statearchivists.org> for more details.

The annual meeting of the Society of American Archivists will be held **16–22 August 2015** in Cleveland, Ohio. Visit <http://www2.archivists.org/conference> for more details.



OBITUARIES

MILTON W. ROSEN¹

Milton Rosen, a rocket engineer and early NASA executive who led the United States' first satellite venture, Project Vanguard, died 30 December 2014 at a retirement community in Bethesda, Maryland. He was 99.

Rosen began his career at the dawn of Space Age, conducting research on the development of radar and missiles at the Naval Research Laboratory (NRL) in Washington, DC. At the end of 1945, he teamed with nuclear physicist Ernst H. Krause to establish NRL's first rocket-development program. Until then, the United States was limited in its high-altitude experiments, using only a finite supply of captured German V-2 missiles to conduct research. Rosen believed that NRL's experience developing and researching missiles during World War II would be the ideal foundation for studying the utility, functionality, and design of rockets.

Within months, he, Krause, and other colleagues began to design and develop the multistage Viking rockets. The high-altitude rockets, which were launched between 1949 and 1955, helped demonstrate the potential of space exploration.

"I feel it's inevitable that our youngsters will see a lot more [of space] than we have," Rosen said in an interview on the early 1950s CBS television show *Longines Chronoscope*. Rosen oversaw the success of Vanguard 1, the first solar-powered satellite and the second artificial satellite placed in Earth's orbit. It remains the oldest humanmade satellite in orbit.

¹ Information taken from the *Washington Post's* Web site: Megan McDonough, "Milton Rosen, Rocket Engineer and NASA Executive, Dies at 99," *Washington Post* (24 January 2015), available online at http://www.washingtonpost.com/local/obituaries/milton-rosen-rocket-engineer-and-nasa-executive-dies-at-99/2015/01/24/5bda7524-a1a3-11e4-b146-577832eafcb4_story.html.

Rosen moved to NASA Headquarters in Washington at its inception in 1958 and served as the Agency's launch-vehicle director. He became a senior scientist in NASA's Office of the Deputy Associate Administrator for Defense Affairs and Deputy Associate Administrator for what is now the Science Mission Directorate.

He retired from NASA in 1974 and later served at the National Academy of Sciences as executive director of its Space Applications Board. He was a fellow of the American Rocket Society and wrote a book titled *The Viking Rocket Story* (1955). Reviewing the book in the *New York Times*, science writer and editor Jonathan N. Leonard wrote, "Mr. Rosen has the literary touch, rare among engineers, to build up sympathy for both men and machines."

BONNIE HOLMES

Wernher von Braun once called her "the lady I work for." Von Braun, the first Director of NASA's Marshall Space Flight Center (MSFC), was humorously referring to his devoted longtime executive assistant, Bonnie Holmes, who passed away on 5 December 2014.

For Holmes and von Braun, it was an 18-year-long working relationship that began in 1952 at Redstone Arsenal and ended in 1970, when von Braun moved to NASA Headquarters not long after he and his team at Marshall had developed the Saturn V rocket that landed the first humans on the Moon in 1969. The relationship between Holmes and von Braun was based on trust from beginning to end.

One day in 1952, von Braun, then working for the U.S. Army as leader of the pioneering rocket team, rushed to the hospital for his daughter's birth. It was



also the day he was supposed to interview the person he might select to permanently work as his new executive assistant. So Holmes was waiting just outside his door as he left.

That meant someone else had to select the new assistant. Although Holmes never got her interview with von Braun, she got the job and continued in the position when von Braun and his team transferred to the newly formed Marshall Space Flight Center. In a 2013 interview, Holmes remembered the dedication ceremony of MSFC in 1960: “I got to escort President Dwight Eisenhower to the stage where he officially named the George C. Marshall Space Flight Center.”

As von Braun prepared to leave Huntsville, Alabama, for NASA Headquarters in 1970, Holmes was invited to continue her job for von Braun at NASA Headquarters. However, she chose to decline the opportunity because of close ties to her family and friends in Eva, Alabama. Still, von Braun convinced her to at least travel to Washington and interview her potential successors.

By the time Holmes retired in 1978, she had served as an executive assistant for four Marshall Directors: von Braun, Eberhard Rees, Rocco Petrone, and William Lucas.

After leaving NASA, she worked at the U.S. Space & Rocket Center; after her retirement from there, she became active in civic duties in Eva. She served a term as Eva’s town clerk and helped find funding for a park, senior center, and library, where she also worked for years as volunteer head librarian.



Former MSFC Director William Lucas shakes hands with executive assistant Bonnie Holmes at her retirement party in 1978. (NASA)

JERRY ROSENBERG

Jerome “Jerry” Rosenberg, who had served NASA in a variety of capacities over the course of his career, passed away on 21 November 2014 at the age of 94.

He received his undergraduate degree in physics from the City College of New York, worked as a supervisory physicist for instrumentation at the National Bureau of Standards and as the project engineer (later administrator) for the pulsed nuclear reactor at Harry Diamond Laboratories before arriving at NASA in 1962. Rosenberg served as Chief of the Operations Group in the Office of Technology Utilization; program manager of the National Geodetic Satellite Program and project manager of NASA’s Geodetic Explorer satellites, GEOS-1 and -2; Deputy Director of Communications Programs in the Office of Applications; and Director of Technology Applications Programs. He also served as longtime executive director of the NASA Alumni League.

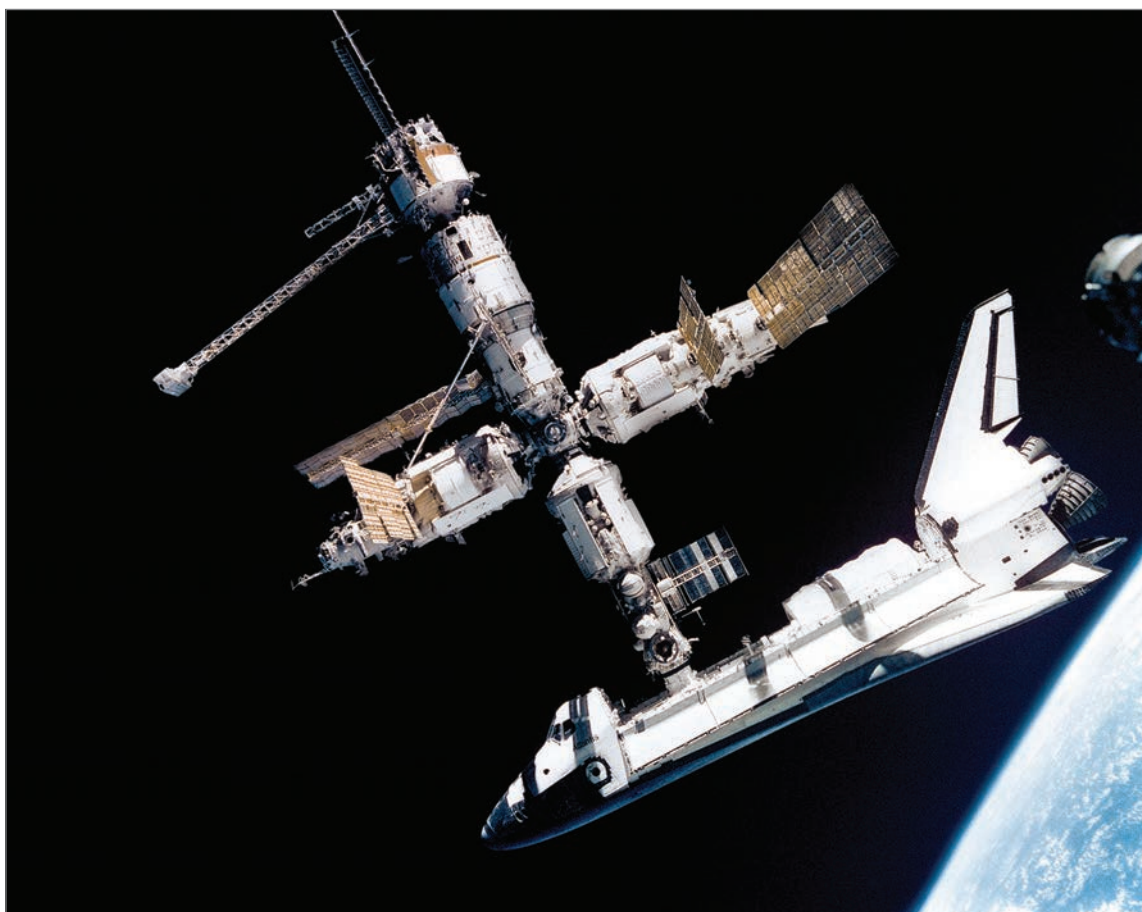


IMAGES IN NASA HISTORY

On 14 March 1995, as a member of the Soyuz TM-21 crew, Norman Thagard became the first American to be launched on a Russian rocket and the first American to stay aboard the Mir space station during the Shuttle-Mir Program.



Space Shuttle Atlantis (during mission STS-71) has its payload bay open as it prepares to dock with the Mir space station.





Norm Thagard exercises on the bicycle ergometer in the Mir Core Module.

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