

# NEWS & NOTES

NACA SPECIAL ISSUE

National Aeronautics and  
Space Administration



Volume 31, Number 4

Fourth Quarter 2014

## FROM THE CHIEF HISTORIAN



Do you notice something different? That's right, our incredible graphics folks from the Headquarters Communications Support Services Center (CSSC) have updated the design of *News & Notes*. It was about time to bring this newsletter up to current standards for readability, and we also asked them to reflect the National Advisory Committee for Aeronautics (NACA) centennial theme in the design. (Hence the black and yellow coloring used in the markings on so many classic NACA/NASA research craft.) I think they've done a great job. How about you? One aspect that I'm particularly pleased with is the History Program Office logo that they've also worked into the newsletter. By now, those of you who follow us on social media may recognize the logo as our new avatar. Again, the CSSC graphic designers developed the logo for us, and I like to think that it elegantly captures the aeronautics, space, technology, and science aspects of the NACA and NASA while subtly highlighting history as the launch pad for our future.

*continued on next page*

## CELEBRATING THE 100TH ANNIVERSARY OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

### THE SPIRIT OF THE NACA...BY AN OLD NACA GUY

By Jack Boyd

The spirit at the Ames Aeronautical Laboratory in the days of the National Advisory Committee for Aeronautics (NACA) was one of freedom and innovation. No reasonable idea was discouraged. There was a freedom to learn. Continuous learning, even when done unconventionally, kept curiosity strong. And curiosity led to innovation.

I felt intimidated when I started in 1947, as an engineer right out of college, but everyone encouraged me. If you had an idea and it had relevance to anything at all, they'd let you pursue it as far as you wanted to take it. It was a very open-minded society in those days. We also had

*continued on page 3*

### IN THIS ISSUE:

- 1** From the Chief Historian
- 1** Celebrating the 100th Anniversary of the National Advisory Committee for Aeronautics
- 1** *The Spirit of the NACA...by an Old NACA Guy*
- 3** *The Wind Tunnel District of the NACA Ames Aeronautical Laboratory*
- 6** *Lewis Research Center and the Post-War NACA Inspections*
- 13** *NASA Langley—The Beginning of It All*
- 19** *In the Words of Those Who Were There: Oral Histories from the NACA Days*
- 21** *The NACA's Influence on Stennis Space Center*
- 23** News from Headquarters and the Centers
- 29** Other Aerospace History News
- 32** Review: *The Enigma of an Aerofoil*
- 33** Recent Publications and Online Resources
- 38** Upcoming Meetings
- 39** Obituary: Noel Hinners (1935–2014)

NASA HISTORY PROGRAM OFFICE  
OFFICE OF COMMUNICATIONS



*From the Chief Historian (continued)*

Another great thing that I'm delighted to celebrate is the Headquarters Honor Award recognition of our team for their work managing the archive renovation here over the last year and a half. At the ceremony on 30 October, Chief Archivist Jane Odom accepted the Civil Service/Contractor Team Award from Administrator Charlie Bolden and Deputy Administrator Robert Lightfoot on behalf of the team. The citation commends the team "[f]or outstanding dedication, strategic planning, and teamwork in managing the Headquarters Historical Reference Collection renovation project." As those of you who have visited since we reopened this fall will agree, the results are stunning. What isn't so obvious is the meticulous planning and backbreaking work that went into making the renovation a success. Inside this issue, you'll find a picture of the whole group of honorees with the award plaque that now hangs in the archive. Congratulations, and thanks for a job extremely well done, to our renovation leader Jane, as well as Nadine, Colin, Steve, John, Yvette, and Liz!

As usual, we are dedicating our final issue of the calendar year to a theme—and this year that theme had to be the NACA centennial. The actual centennial of the day that the legislation creating the NACA became law is Tuesday, 3 March 2015. As mentioned in our last newsletter, we'll be cosponsoring a historical symposium on the contributions and legacy of the NACA at the National Air and Space Museum starting that day and running through 4 March 2015. We received a tremendous response to the call for papers for this symposium. Frankly, I'm really excited about the many extraordinary topics that will be covered and by the historical brain trust that is participating in the symposium. You won't want to miss this one, either. You can find out the latest on the symposium at <http://www.nasa.gov/naca100years>. In the meantime, though, I invite you to whet your appetite with the NACA-themed articles right here in News & Notes. As with the symposium, we were overwhelmed with great newsletter submissions on the NACA from our colleagues at the various NASA Centers. In fact, we weren't able to fit all of the articles in News & Notes. Rather than making you wait until the spring newsletter, we've taken the articles that didn't fit and turned them



Top: Chief Archivist Jane Odom holds the Civil Service/Contractor Team Award plaque, which she accepted on behalf of the team from Administrator Charlie Bolden (r) and Deputy Administrator Robert Lightfoot. The citation commends the team "[f]or outstanding dedication, strategic planning, and teamwork in managing the Headquarters Historical Reference Collection renovation project." Bottom: To Jane's left is John Hargenrader, and to her right is Liz Suckow. On the back row, from left to right, are Nadine Andreassen, Yvette Smith, Steve Garber, and Colin Fries.

into Web articles that you will find posted at <http://www.nasa.gov/topics/history/index.html>. So be sure to take a look there too. While you are there, you can also enjoy articles on some key NACA leaders (and [mostly former] Center namesakes) written this year by our interns. Joseph Ames, George Lewis, and Hugh Dryden had extraordinarily long and influential careers at, or involved with, the NACA. Those of us who follow in their footsteps would be well served, and perhaps inspired, to know a bit more about them. So, happy reading, and I hope to see you at the NACA centennial symposium in March.

Until then, Godspeed,

**William P. Barry**  
Chief Historian



*Celebrating the 100th Anniversary of the National Advisory Committee for Aeronautics (continued)*

many free-flowing discussions with people outside the laboratory.

In the fifties, we at Ames began to think about space thanks to Harvey Allen. The air speeds at which we were working were Mach numbers of 0.2 to 2.0, twice the speed of sound. Allen told us to think beyond that. If we were really going to go into space, we'd be orbiting Earth, for example, at 17,000 miles an hour. He had an idea for the blunt-body shape to slow down a vehicle when it enters the atmosphere, and he had the freedom to explore that idea.

That reentry work got us thinking about other things. For example, if we went to Mars and Venus, where the atmospheric gases are different, the aerodynamics might be different, too. How would we enter one of those atmospheres? At the time, we at Ames were aerodynamicists; we knew nothing about planets. We invited to Ames a famous astronomer named Zdenek Kopal, who worked at an observatory in the Pyrenees Mountains in Spain. Kopal told us that carbon dioxide and nitrogen were probably prevalent gases on Mars and Venus. We had a facility here called a ballistic free-flight range. We thought we'd fill one of these ranges with a mixture of carbon dioxide and nitrogen and fly different shapes into them to see what the aerodynamics looked like. We just asked the chief at the range and he said, "Hey, that sounds like a great idea; go do it." There were interesting differences in the flight through the gases, not only in the aerodynamics, but also in the heating. That started a path toward planetary entry vehicles, which other people pursued later.

Had we not started doing this work at the NACA before 1958, because we were curious, we would never have gotten to the Moon when we did. We had a jump-start on the technology we were going to need. Before 1958, NACA people at Langley, Lewis, and Ames were looking beyond, to the next step into space, curious about the technology that would lead to the

lifting body. Not only were we curious, but we had the freedom to pursue that curiosity.

Simply starting somewhere and sharing what you learn encourages others to pick up the insight and expand on it. You never know where things can end up.

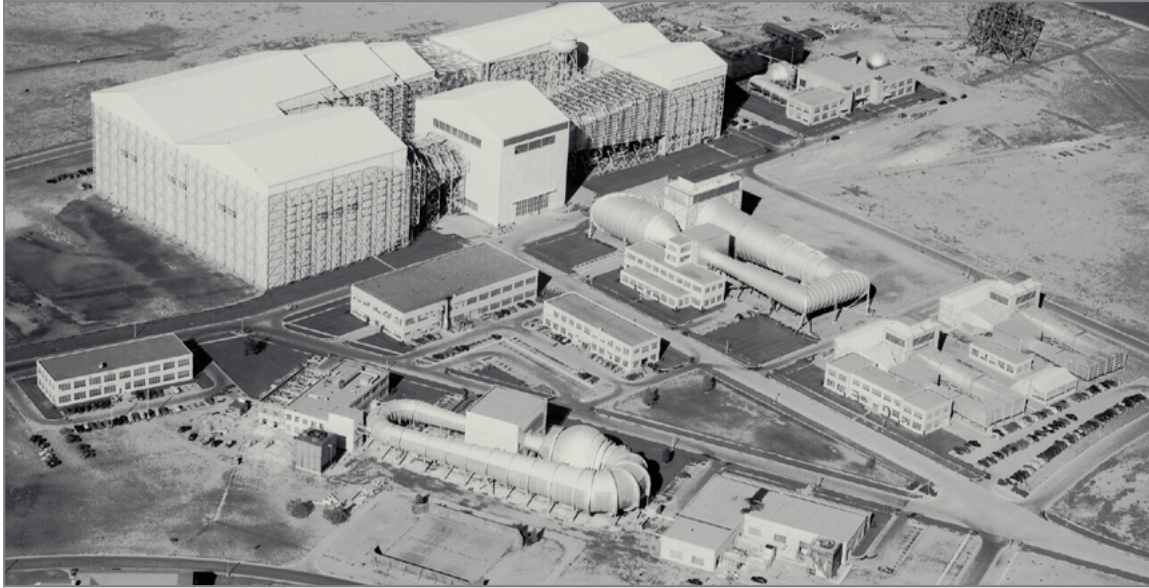
## THE WIND TUNNEL DISTRICT OF THE NACA AMES AERONAUTICAL LABORATORY

By Glenn Bugos

The Unitary Plan Wind Tunnel complex at NASA Ames was a pearl in the history of the NACA. Opened in 1955, its three test sections, powered by a single set of compressors, could take a single aircraft model through each regime of flight, from Mach 0.2 to Mach 2.5. In the Unitary, Ames engineers tested almost every American jet transport and supersonic military aircraft. Seen from an aircraft above, the Unitary Tunnels are visually linked, with the air returns and valves shaping a circuit among the three test sections. These connected tunnels at Ames also connected to a series of new tunnels built in the early 1950s on a "unitary plan" around America—at other NACA Centers, at military bases, and at universities. Jack Parsons, Deputy Director at Ames and manager of its construction, planned the tunnels for complementary capabilities so that models and testing data from them could move easily among the far-flung researchers who needed them.

The idea of building a series of complementary tunnels did not originate with the Unitary Plan. Indeed, this idea of complementarity drove the grand architecture of Ames. In 1938, the NACA Main Committee entrusted to Smith DeFrance, who became Ames's first Director, and Parsons, who served as his deputy during his entire tenure, with a blank sheet of paper and 101 acres of flat land on which to build the





The Ames wind tunnel district taking shape, about 1948.

laboratory of their dreams (within the limits of the NACA's sparse funding, of course). As World War II loomed, Ames would build the tunnels needed to serve aircraft makers on the West Coast and to give NACA engineers a place to do fundamental research to solve design problems that arose during the war. No single aircraft firm could build the specialized tunnels needed; the government built them for use by all.

The Ames Aeronautical Laboratory was one of only a few wind tunnel complexes built for that purpose from the beginning. The capabilities that made each tunnel unique were carefully planned, and, for efficiency's sake, they were located close together. In contrast, most other aerodynamic complexes accreted buildings over time.

More than 50 wind tunnels have been built at Ames over its history, most of them in the 1940s and 1950s. Some were big enough to test full-scale aircraft. Some were tiny, for testing preliminary models less than an inch wide. Some moved air slowly, at the speed at which aircraft land and helicopters hover. Some moved air at hypersonic speeds, like those at which guided missiles flew. Some were new test sections to

answer new questions with existing tunnels. Some were built to validate the design of larger and more complex wind tunnels. In later years, some were built to validate the computer codes now used to design all modern aircraft. It proved easier to build all these wind tunnels once Ames had built the infrastructure to support them.

In mapping the master plan for Ames, DeFrance and Parsons built the early Ames tunnels along a triangular set of roads, which also defined the shape of the infrastructure that included high-voltage wiring and transformers for massive bursts of electrical power. The design included intricate piping that carried compressed air, dry air, vacuum, steam for heat, or water for cooling between the buildings. It included a big, central machine shop—the second building undertaken at Ames—where craftsmen built iterations of aircraft models and invented new instruments to visualize minute variations in otherwise invisible air, visualizations then captured by the sophisticated camera of the central photography lab. It included sheds where the electrical branch kept their wires and the scale service branch kept the hydraulic lines that gathered data. It included the big rooms where the



computers calculated, attacking that data with mathematical skill to turn it into the smooth curves of visceral interest to the young aeronautical engineers. (In those days, “computers” were mostly young women with prodigious mathematical skills who performed complex calculations with pen, paper, and slide rules.) The engineers who ran the tests tended to identify with an individual tunnel. But the technical experts—the energetic, geeky, craft-skilled experts of the sort for which Silicon Valley has become famous and who at Ames built models, wired them for data, and computed the results—moved among all the tunnels and cross-pollinated each tunnel with their best practices. The infrastructure was as much human as technical.

A dozen tunnels were the size of buildings and thus today are prominent enough to be considered under the historic preservation laws. The initial build-out of Ames included two identical 7- by 10-foot workhorses, the 40- by 80-foot full-scale tunnel, the 12-foot pressurized tunnel, the 1- by 3-foot supersonic tunnel, and the 14-foot transonic tunnel. It also included a 6- by 6-foot supersonic tunnel that DeFrance and Parsons assumed would remain a dream until the Navy offered to fund its entire construction in 1945. In the mid-1950s, Ames continued to build new tunnels inside this district, including the Unitary Plan and the 3.5-foot hypersonic tunnels. In 1984, Ames made its last major addition to this wind tunnel district, attaching an 80- by 120-foot test section onto the 40- by 80-foot tunnel.

This sense of the term “district,” used to describe this concentration of buildings, derives from historic preservation laws. For example, Shenandoah Plaza, the series of Spanish revival architecture buildings around the parade ground of Moffett Field built in the early 1930s to support the dirigible the U.S.S. Macon, is significant as a historic district. For the early collection of wind tunnels, however, early Ames folks simply called them their “Laboratory.” There were only two other distinct areas of Ames. The headquarters building stood sentinel at the center of a circular road, guarding access from the outside world to the



Looking west along DeFrance Avenue in 1989. From top to bottom, the 3.5-foot hypersonic tunnel, the Unitary Plan, the model shop, the 16-foot tunnel, the 7- by 10-foot tunnel, the 12-foot tunnel, and the 1- by 3-foot tunnel.

tunnels, and the flight-test hangars stood closer to the runways of Moffett Field. Though physically distant, the hangars were intellectually close to the tunnels. The low-speed division ran both tunnels and hangars and expected tunnel data to be cross-checked with flight data. Beginning in the 1960s, though, Ames took on new tasks, in new disciplines, to support the broader missions of NASA and built facilities for space-life science, planetary science, spacecraft fabrication, simulation, and information technology. The Center expanded, and empty spots were filled in, though its heart remained the wind tunnel district.

Some of those tunnels have since been demolished, including one of the 7- by 10-foot workhorse tunnels and the guts of the 1- by 3-foot supersonic tunnel. The Ames “NACA Park” now stands at the geographic center of the district, where the 16-foot transonic tunnel stood until 2007. The hull of the 6- by 6-foot supersonic tunnel is now home to the Ames Aerospace Encounter, where members of the next generation of space explorers learn about the tools they will use. Much work needs to be done to modernize this infrastructure. These demolitions were not easy, neither emotionally nor technically, as facilities engineers worked to disentangle the pipes



and wiring between the buildings. Nor have these demolitions diminished the visual sense that all these tunnels are connected, physically and historically.

Of these tunnels, only the Unitary is currently a National Historic Landmark, designated as such in 1985. Ames is now making an effort to move more of the tunnels from the list of eligible facilities onto the actual historical registry. Keith Venter, the NASA Ames Historic Preservation Officer, leads this effort with support from the Architecture, Engineering, Construction, Operations and Management (AECOM) Technology Corporation and the Ames History Office. This is part of a comprehensive effort to update Ames historic preservation activities, which include the finalization of a new “Integrated Cultural Resources Management Plan and Programmatic Agreement.” All this activity will be published to the Web site at <http://historicproperties.arc.nasa.gov>.

The first step in this effort is to document the buildings determined to be eligible per the National Historic Preservation Act for review by the California State Historic Preservation Office (SHPO). These buildings can then be placed on the National Register of Historic Places. The list includes the administration building (N200), the 40- by 80-foot full-scale wind tunnel (N211), and the 6- by 6-foot supersonic wind tunnel (N226). The NASA/Army Aerodynamics 7- by 10-foot wind tunnel (N215) will also be reviewed for eligibility and nomination. The list also includes two NASA-era buildings eligible because of their significance in supporting the Space Shuttle program: the arc jet laboratory (N238) and the flight and guidance simulation laboratory (N243).

“  
**THE WIND TUNNELS  
 OF AMES REFLECT  
 THE SIGNIFICANCE  
 OF THE NACA  
 AND THE AMES  
 AERONAUTICAL  
 LABORATORY IN THE  
 LARGER CONTEXT OF  
 AMERICAN HISTORY.**  
 ”

Then, Ames staff will evaluate whether the tunnels are significant as individual structures or whether they compose a historic district, what their period of significance might be, and what buildings contribute to the district. They will submit their analysis to the California SHPO. A 2008 report titled “Understanding NASA’s Historic District” challenges us to consider it. The buildings are now not closely contiguous, but they are linked by aesthetics and by historical association. Part of the effort will be a review of the infrastructure that supported the tunnels as well as the buildings that supported the technicians who made them so productive.

The wind tunnels of Ames reflect the significance of the NACA and the Ames Aeronautical Laboratory in the larger context of American history. The tunnels are engineering marvels, massive steel hulls and fan blades tied to the most intricate of instruments. And, through the work done there by NACA engineers, the tunnels were key drivers in America’s conquest of our atmosphere and space.

## LEWIS RESEARCH CENTER AND THE POST-WAR NACA INSPECTIONS

By Bob Arrighi with assistance from Glenn Bugos

Young space power researcher Bill Brown stood under the lights on a makeshift stage in the Engine Research Building and began to run through his talk on power-conversion research at Lewis Research Center. He was stopped almost immediately by Center Director Abe Silverstein. Silverstein pointed to a full-scale model of a SNAP-8 reactor and barked, “I do not want to see that on the stage. I don’t want it. Get it off there.” The shaken Brown was participating in a dress



rehearsal for Lewis's upcoming 1966 inspection. The inspections, which were initiated under the NACA, allowed the Center to brief a handpicked legion of government officials, military leaders, and commercial manufacturers on its research activities and test facilities. The precisely organized and well-rehearsed inspections provided the NACA with an opportunity not only to showcase its capabilities, but also to solicit suggestions for further research and strengthen its case for continued federal funding. These were elaborate affairs. There was no tolerance for mistakes, either in the logistics or in the technical talks. Brown sighed with relief the following week, after his final practice run—sans the model—when Silverstein said, “Great job” and quickly went on to the next stop.<sup>1</sup>

The NACA management conceived these annual meetings, referred to as “industry conferences,” in the 1920s as a conduit between their research laboratory at Langley Field and the nation's aviation leaders.<sup>2</sup> The NACA could demonstrate its research efforts and test facilities at the conferences while receiving valuable feedback from guests regarding the issues that needed addressing and what facilities were most effective.

The conference attendees, composed of elites in the field of American aviation, actively participated in the discussions. Therefore, NACA Chairman Joseph Ames demanded perfect coordination and presentations at the conferences to put the NACA in the best possible light. Director of Research George Lewis worked with the Langley Memorial Aeronautical Laboratory (LMAL) staff on the content and staging of the talks and the facility tours, while Secretary John Victory handled the logistics and socialization.<sup>3</sup> Ames personally reviewed the presentations during rehearsals

and discussed the content, visuals, and oration directly with the speakers. Victory would assume this role following Ames's resignation in 1936.<sup>4</sup>

Several dozen guests attended the first conference in May 1926. By 1936, attendance had grown to over 600 and required the addition of a second day.<sup>5</sup> The NACA Headquarters invited hundreds of guests from the military, industry, universities, and government. Some invitations were sent to specific individuals, whereas others requested that organizations dispatch a representative.<sup>6</sup>

It became customary for the NACA officials and attendees to meet in Washington, DC, the day before and take an overnight cruise across the Chesapeake Bay to Langley. After a lavish breakfast in Hampton, Virginia, the visitors caravanned to the laboratory for a morning tour of the facilities. This was followed by lunch and the requisite group photograph. The afternoon was spent being briefed on the NACA's research and requesting ideas for future research. The group reboarded the steamship at the end of the day for the return journey. In those final hours, the leading lights of the nation's aviation field held relaxed conversations over drinks and dinner regarding the NACA and current aeronautical concerns.<sup>7</sup>

This annual NACA spring ritual was suspended during World War II (WWII) as the organization turned its attention to improving military aircraft. The final conference in 1939 was referred to as an “inspection”—a military term—for the first time. It was at this point that the NACA created its Moffett Field and Cleveland facilities. In lieu of the overarching

1 Bill Brown, interview by Bob Arrighi, 17 December 2003.

2 James Hansen, *Engineer in Charge: A History of the Langley Aeronautical Laboratory, 1917–1958* (Washington, DC: NASA SP-4305, 1987).

3 Alex Roland, *Model Research* (Washington, DC: NASA SP-4103, 1985).

4 Abe Silverstein, interview by Walter Bonney, 21 October 1972 and 20 September 1973, Glenn History Collection, Oral History Collection, Cleveland, OH.

5 Hansen, *Engineer in Charge*.

6 Mary Lou Gosney, “Invitations for 1954 Inspection,” memorandum, 1 April 1954, Glenn History Collection.

7 Roland, *Model Research*.



industry conferences, military and manufacturing representatives made frequent visits to the three NACA laboratories for classified technical conferences on specific topics.<sup>8</sup>

As the war began winding down, the new Cleveland lab began inviting large groups of visitors for “inspections” of its facilities. These included briefings, exhibits, and tours of the facilities, but the visits were on a much smaller scale than the fabled pre-war conferences at Langley. The Cleveland visitors included the National Aviation Writers, the Institute of Aeronautical Science, and groups of Army and Navy officers. Grandstands were erected beside the Altitude Wind Tunnel to facilitate group photographs of the visitors. During this period, the lab also used the “inspection” term for smaller visits by VIPs such as General Dwight Eisenhower.

Meanwhile, members of the aeronautical industry began voicing concerns during the war that the NACA was not responsive enough to their needs. They urged the NACA to share its research findings in a more timely and broad fashion. In response, George Lewis began appointing additional industry members to both the Executive Committee and the technical committees; and the power of the technical committees was elevated.<sup>9</sup> The NACA also instituted an Industry Consulting Committee in September 1945, which led to the addition of technical experts on airframes, engines, and aircraft operation to the Executive Committee. The dissemination of NACA reports was expedited, and the number of topical meetings increased. Perhaps the most palpable measure was the reinstatement of the NACA inspection conferences.<sup>10</sup>

The NACA and the field of aeronautics had changed dramatically in the mid-1940s. The former tripled in

size, incorporated a broader spectrum of research, and replaced the ailing George Lewis with Hugh Dryden. The aviation industry also expanded and was transitioning into new technologies such as jet aircraft and missiles. So there were concerns in March 1946 when new NACA Chairman Jerome Hunsaker suggested that each of the three research laboratories begin holding annual inspections.<sup>11</sup>

The growth of the aviation industry required close attention to the number of invitees and the addition of more inspection days.<sup>12</sup> The traditional exchange of information with the guests would be supplanted by even more polished presentations that would demonstrate the NACA’s capabilities, facilities, and effectiveness. Summaries of the talks with selected photographs were printed in 8- by 4-inch pamphlets and distributed to the guests. Langley Engineer-in-Charge Henry Reid suggested that photographs be taken of all the charts and exhibits for dissemination afterward and to serve as base material for budget requests.<sup>13</sup>

On 9 May 1946, the NACA opened its first inspection in seven years at Langley. Over the course of three days, guests heard about new technologies such as the helicopter, as well as traditional Langley research topics.<sup>14</sup> Two months later, on 16 July 1946, the Ames Aeronautical Laboratory held its very first inspection. The single-day event focused on the new research work necessitated by supersonic flight. In addition, aeronautical legend William Durand formally activated Ames’s new 12-Foot Low Turbulence Pressure Wind Tunnel.<sup>15</sup>

8 Ibid.

9 Ibid.

10 T. L. K. Smull, “Report to the Industry Consulting Committee,” 23 May 1947, Glenn History Collection.

11 NACA Executive Committee Meeting Minutes, 21 March 1946, Glenn History Collection.

12 Ibid.

13 Henry Reid to Edward Sharp, 15 October 1947, Glenn History Collection.

14 “Fifteenth Annual LMAL Inspection Huge Success,” *Wing Tips* (7 June 1946).

15 “Officials from AERL at Ames Inspection,” *Wing Tips* (2 August 1946). AERL stands for “Aircraft Engine Research Laboratory.”





From 1947 to 1953, Langley and Ames held inspections biennially.

The Cleveland facility held its first inspection 8–10 October 1947. The laboratory supplemented the Headquarters invitation list by requesting the presence of local manufacturers and officials. As a result, the inspection was expanded from two to three days. The VIPs and industry representatives attended on the first day, military officials on the second, and representatives from Cleveland-area industry and universities on the third.<sup>16</sup> The rosters of those who were invited and those who attended were carefully tracked. Chief of Public Affairs Walter Bonney invited specific members of the press corps to attend one of the days.<sup>17</sup>

The nearly 800 guests were briefed on full-scale engine testing, ramjets, axial-flow compressors, turbojets, fuels, icing research, and materials at eight different tour stops. The lab's altitude propulsion facilities—the Altitude Wind Tunnel, the Four Burner Area, and an altitude tank in the Engine Research Building—were highlighted.<sup>18</sup> Unlike its sister laboratories, Cleveland held inspections annually through 1951, with the exception of 1950. The 1948 inspection is notable for the rededication of the facility as the Lewis Flight Propulsion Laboratory in honor of the recently deceased George Lewis. The event also featured the nearly complete 8- by 6-Foot Supersonic Wind Tunnel.

The presentations, physical logistics, and scheduling for the inspections required a tremendous amount of planning and coordination, but the technical talks were the most important. Early on in the preparations, Silverstein, who then served as Chief of Research, decided which topics and facilities to highlight. The

division chiefs then selected individuals (and alternates) to develop and deliver the presentations. Even though many of the visitors possessed technical backgrounds, great efforts were made to convey complex subject matter in simple, easy-to-understand language. Speakers were encouraged to incorporate models, charts, photographs, and films into their presentations. There were several rounds of practice runs in the weeks leading up to the event, including the “semifinal” and “final” full dress rehearsals. The former was critiqued by Silverstein and the latter by John Victory.<sup>19</sup>

The physical preparations began weeks in advance. There was a general round of basic cleanup and repairs. The grounds were landscaped and buildings painted. Carpenters built stages and platforms; audio engineers installed public address systems and projectors; and mechanics fabricated exhibits and models. The publication branch created signs, slides, and pamphlets. Hundreds of comfortable chairs were borrowed and properly disseminated among the stops. The cafeteria scrambled to cater to hundreds of guests. An urgent call went out prior to the 1957 inspection requesting that staff return all of the plates, cups, and utensils that had wandered off to their offices.<sup>20</sup> The secretarial staff served as hostesses and servers at the luncheon and parties.

Unlike the early Langley inspections, it was impossible to sequester these large crowds on a single vessel. Instead, the NACA made arrangements with several major railway lines to transport guests to Cleveland from East Coast and Midwest cities, and the Cleveland Hopkins International Airport waived its landing fees for the dozens of transport aircraft bringing attendees in for the day.<sup>21</sup> Lewis set up an information desk

16 “NACA First Annual Inspection, Flight Propulsion Research Laboratory, Cleveland, Ohio,” 10 October 1947, Glenn History Collection.

17 “LMAL To Hold Inspection,” *Wing Tips* (16 May 1947).

18 “NACA First Annual Inspection, Flight Propulsion Research Laboratory, Cleveland, Ohio.”

19 Wilson Hunter, “Tentative Rehearsal Schedule for the 1954 Triennial Inspection,” memorandum, 20 May 1954, Glenn History Collection.

20 “Will You Please Send Them Home?” *Wing Tips* (14 August 1957).

21 Wilson Hunter, “1954 NACA Inspection,” memorandum, 25 May 1954, Glenn History Collection.



and lounge area at the airport for these guests.<sup>22</sup> Most of the visitors, however, were put up at the elegant Cleveland Hotel downtown on Public Square and bused out to the lab in the morning.

Perhaps the most difficult task was scheduling the activities. Every minute of the day was scripted. The visitors arrived at the laboratory around 8:30 a.m. They registered in the lobby of the Administration Building, then proceeded down the hall to the auditorium. At 9:30 a.m., Jerome Hunsaker or Victory greeted the guests and provided an overview of the NACA's history. This was followed by Hugh Dryden's description of the NACA's research methodology. The Lewis contingent, led by Director Ray Sharp and Silverstein, briefed the group regarding the tour stops and Lewis's overall research efforts. Executive Engineer Carlton Kemper then highlighted the lab's primary test facilities.<sup>23</sup> The introduction concluded with a group photograph of the guests.<sup>24</sup>

At 10 a.m., the hundreds of visitors were then separated into color-coded groups of about 40 to begin the tour. At Lewis, there were customarily eight tour stops—each with 30-minute sessions featuring several speakers. The guides and support staff were pressured to maintain a tight schedule that included short breaks for coffee and cigarettes and lunch. The breaks were as stringently planned as the talks. For example, hostesses were instructed to provide 10 percent more coffee than was needed at each stop.<sup>25</sup> The day concluded around 4 p.m. with a reception at the picnic

grounds or hangar. The guests were then bused back downtown for dinner at the hotel.

Traditionally, Lewis held a private inspection for the staff on the Friday afternoon following the event. Afterward, a party was thrown at the picnic grounds to celebrate the event's success.<sup>26</sup> Employees were then invited to bring their families in on Sunday for an open house. The technical presentations were or were not held for them, depending on the security levels at the time. Either way, almost all of the laboratory buildings were open to the families. These open houses regularly drew 3,000 or 4,000 people on a single afternoon.<sup>27</sup>

The enthusiastic letters of appreciation from the guests and NACA management began rolling in almost immediately afterward. Meanwhile, the Lewis planners began assessing the event—including the evaluation of the speakers and a lighthearted review of how they utilized their pointers.<sup>28</sup> The staff contributed suggestions regarding displays, talks, and planning.<sup>29</sup> The inspection planning materials—including invitation lists, schedules, correspondence, transcripts of the talks, and photographs of the exhibits and charts—were then collected and bound in a single volume that was permanently stored in the Lewis library.

In June 1949, Langley veteran Ira Abbott drafted guidelines for the new NACA inspections. His primary concern was that the content of the inspections was overly technical. "The visitors can be expected to carry away only a general impression. The inspections should be conducted so that this impression is not one of bewilderment, but rather one of confidence that the Committee knows its business and is making

22 William Gough to Wilson Hunter, "1954 Triennial Inspection at the Lewis Laboratory," 28 June 1954, Glenn History Collection.

23 "NACA First Annual Inspection, Flight Propulsion Research Laboratory, Cleveland, Ohio," 10 October 1947, Glenn History Collection.

24 Ibid.

25 Wilson Hunter to William Dey, "Refreshments To Be Served During the 1954 Inspection," 5 April 1954, Glenn History Collection.

26 "Lab To Observe Open House Sunday Sept. 25," *Wing Tips* (16 September 1949).

27 "Pre-Inspection Hustle-Bustle," *Wing Tips* (25 June 1954).

28 Carlton Kemper, "1954 Inspection—NACA—Lewis Flight Propulsion Laboratory," memorandum, 8 June 1954, Glenn History Collection.

29 John Hopkins to Wilson Hunter, 17 October 1957, Glenn History Collection.



substantial progress through the orderly but vigorous conduct of research in well-planned facilities,” he said. Abbott instructed presenters to briefly contextualize their topic and its history, note the current concerns, and describe the NACA’s steps toward remedying the issue. The scope of post-war NACA research was much broader than in earlier times. The visitors could not be expected to be versed in all topics. Abbott stressed the streamlining of information so that guests could grasp the general concepts in each field without becoming awash in details, technical language, or mathematical symbols. He encouraged the use of simple charts, models, and equipment.<sup>30</sup>

In March 1953, the NACA announced that its three laboratories would rotate the duties of hosting the inspections. These new Triennial Inspections would highlight the work of the host site but would also include a stop from each of the other two laboratories.

(The new Muroc Flight Test Unit was not included.)<sup>31</sup> Traditionally, Lewis held its inspections over three consecutive days in late September or early October; Langley over three alternating days in mid-May; and Ames during two days in mid-July. Lewis hosted events in 1954 and 1957 under this system. In addition, Lewis conducted a one-day inspection on 22 May 1956 to showcase its new 10- by 10-Foot Supersonic Wind Tunnel.

Lewis’s most famous inspection was the 7–10 October 1957 event held literally at the onset of the Space Age. Lewis had been working on propulsion and

aerodynamic issues regarding missiles and rockets since the mid-1940s and was starting to pursue electric propulsion. By the mid-1950s, the efforts toward developing high-energy propellants, particularly liquid hydrogen, were producing real results. Although Lewis was also unveiling its new Rocket Engine Test Facility (RETF), the NACA was wary of overstepping its aeronautical mandate. On Thursday, 3 October, John Victory led a group from Headquarters through the final dress rehearsals. During at least two stops, Victory interjected when references to spaceflight were mentioned. The RETF stop even included a display of stars and satellites in its exhibit.<sup>32</sup> Victory ordered the frustrated researchers to strike those lines from their talks. The next evening, the Soviet Union launched Sputnik. When the inspection began on Monday morning, the original talks were in place, and Lewis was praised by the nearly 1,600 attendees for its readiness for the space race.<sup>33</sup>

Over the next year, the National Aeronautics and Space Administration (NASA) was created, with the NACA serving as its core. In January 1959, NASA announced that the new agency would continue the Triennial Inspections, beginning with an event at Langley in October 1959 featuring Project Mercury.<sup>34</sup> The inspections, however, would slowly fade away as NASA evolved. Langley held another in May 1964, but there were no further inspections at Ames.

“

**BY THE MID-1950S,  
THE EFFORTS  
TOWARD DEVELOPING  
HIGH-ENERGY  
PROPELLANTS,  
PARTICULARLY  
LIQUID HYDROGEN,  
WERE PRODUCING  
REAL RESULTS.**

”

”

30 Ira Abbott, “Improvement of Laboratory Inspections,” memorandum, 14 June 1949, Glenn History Collection.

31 “Change Schedule for Inspections,” *Wing Tips* (20 March 1953).

32 Robert Graham, interview by Sandra Johnson, 30 September 2005.

33 Virginia Dawson, *Engines and Innovation: Lewis Laboratory and American Propulsion Technology* (Washington, DC: NASA SP-4306, 1991).

34 “Info from Headquarters,” *Wing Tips* (30 January 1959).



Lewis, which was preoccupied with several new development programs, did not host another inspection until October 1966. The event was part of a yearlong celebration of the Center’s 25th anniversary. The three-day inspection, Lewis’s first since 1957, drew 2,000 invited guests.<sup>35</sup> The visitors witnessed the presentations at the major facilities; viewed the Gemini VII spacecraft, a Centaur rocket, and other displays in the hangar; and saw demonstrations of the new 500-foot-deep Zero Gravity Research Facility.<sup>36</sup> For the first time, the guests were hosted in the Development Engineering Building’s auditorium instead of the Administration Building. In his opening comments, Deputy Director Eugene Manganiello remarked on the dramatic accomplishments made since the last inspection nine years earlier and noted the controversy over the references to space leading up to the 1957 inspection.<sup>37</sup>

Langley held another inspection in October 1968 as the Apollo program was gaining momentum. The circumstances were much different five years later, when NASA decided to revive the inspections at its three Field Centers, starting with Lewis. The Apollo program was completed, and NASA’s budget was plunging. Lewis was hit particularly hard. The termination of the nuclear propulsion and power programs and the lack of involvement in the Space Shuttle design led to the loss of hundreds of jobs at the Center in the early 1970s. In response, Center management attempted to transition into new fields of research, such as terrestrial energy and energy-efficient engines. The September 1973 inspection, named “Technology in the Service of Man,” was an effort to sell Lewis’s capabilities to a host of industry, government, and military groups. The nine stops featured cleaner, quieter aircraft engines;

solar power research; and the Centaur rocket. Nearly 900 invited guests attended the event over the three days. The staff and their families heard the talks the following weekend, and the public was invited the weekend after that. In total, approximately 22,000 people attended the 1973 inspection talks.<sup>38</sup>

Although post-inspection comments were exceptionally positive, John P. Donnelly, Assistant Administrator for Public Affairs, questioned whether “[w]e got our money’s worth.” The positive impact of the inspection on the Center was undeniable, but Donnelly felt that “the people who count”—members of Congress—were not present in sufficient numbers.<sup>39</sup> The nature of the inspections had changed dramatically since the end of the NACA, and the target audience shifted from the aerospace elites to Washington power brokers. Although a subsequent inspection was planned for Langley and a future event at Ames, the 1973 Lewis event appears to have been the Agency’s final inspection.

In 1977, Lewis began issuing annual research and technology reports that comprehensively described the Center’s accomplishments during the past year. Although a bit briefer, the descriptions were similar in nature to the talks given at the inspections and included a large quantity of images. These reports are disseminated widely throughout industry, universities, and government institutions, but they cannot replace the interaction with and among the aerospace leaders that took place while attending the inspections.

#### NACA Biennial Inspections

1946	Langley [5/9,13,15/1946]	Ames [7/16/1946]
1947	Lewis [10/8–10/1947]	Langley [5/20–28/1947]

35 “Thousands To View Lewis Work at Inspection, Family Day,” *Lewis News* (30 September 1966).

36 Lynn Manley, Lewis Research Center Press Release 66-54, 16 September 1966.

37 Eugene Manganiello, “Lewis’ Role in Support of NASA Missions,” 4 October 1966, Glenn History Collection.

38 Walter Olson, “Technology Utilization and Public Affairs,” *Lewis News* (11 January 1974).

39 John Donnelly to Deputy Administrator, 20 December 1973, Glenn History Collection.



1948	Lewis [9/28–30/1948]	Ames [7/12–13/1948]
1949	Lewis [9/20–22/1949]	Langley [5/18–24/1949]
1950	Ames [7/10–12/1950]	
1951	Lewis [10/9–11/1951]	Langley [5/18–25/1951]
1952	Ames [7/14–15/1952]	
1953	Langley [5/5–13/1953]	

**NACA Triennial Inspections**

1954	Lewis [6/2–4/1954]	
1955	Ames [6/27–28/1955]	
1956	Langley [10/10–16/1956]	Lewis 10x10 [5/22/1956]
1957	Lewis [10/4–10/1957]	
1958	Ames [7/14–6/1958]	
1959	Langley [10/12–17/1959]	

**NASA Inspections**

1964	Langley [5/18–19/1964]
1966	Lewis [10/4–7/1966]
1968	Langley [10/2–6/1968]
1973	Lewis [9/26–30/1973]

**NASA LANGLEY—  
THE BEGINNING OF IT ALL**

At the beginning of World War I (WWI), the United States had a mere 23 military aircraft, Great Britain 400, Germany 1,000, and France 1,400. This dismal situation led prominent U.S. advocates of air power to aggressively push Congress for a remedy. After several failed attempts to create a government advisory board and a government-sponsored laboratory, a rider to the Naval Appropriations Act in 1915 created the National Advisory Committee for Aeronautics but did not give it a mandate or funding to build a research laboratory. The Committee had a minuscule \$5,000 budget and was obliged to contract

out research work to academia and other government organizations. Nonetheless, during that first year of operation, Committee members and advocates proposed an \$85,000 increase to the NACA budget for fiscal year 1917 in order to build a laboratory. This request was initially vetoed by President Wilson and was attacked by Secretary of the Navy Josephus Daniels for the NACA “getting outside their position as advisors merely...”<sup>40</sup> However, deft political maneuvering by Smithsonian Secretary Charles Walcott and NACA Chairman General George Scriven ensured that the appropriation was finally approved as part of the 1917 budget.

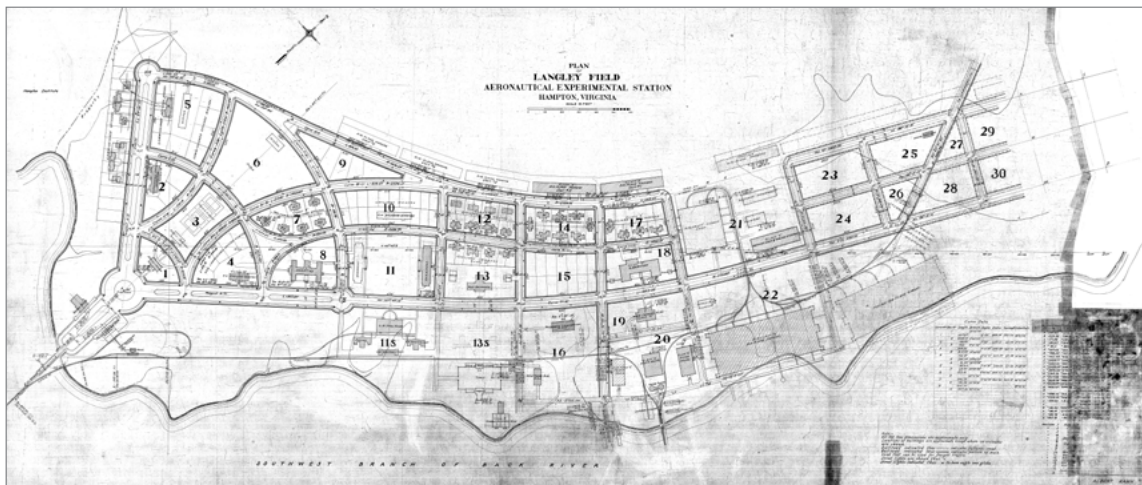
Extended studies and debates on where to build the NACA laboratory finally led to the selection of 15 potential sites. One, in Hampton, Virginia, included several large tracts of land with patents dating back to 1634. The owners were anxious to bring new growth to the area.

The Army chose noted industrial architect Albert Kahn to design the new base, and his vision is still readily apparent today—both in the architecture of Langley Air Force Base and in the traffic design. His dredge-and-fill plan allowed the building of structures along the waterfront, with the critical airfield slightly farther inland. This decision was one that would plague both the military and the NACA/NASA, even now, with frequent flooding associated with major storms.

The NACA was allotted block 16 of the property and began construction of the first civilian aviation research laboratory in 1917, to be known as Langley Memorial Aeronautical Laboratory (LMAL). The laboratory was officially dedicated on 11 June 1920 with the completion of its first two buildings, the Laboratory and Tunnel One.

<sup>40</sup> Secretary of the Navy Josephus Daniels to President Woodrow Wilson, 30 November 1915.





Albert Kahn plan for the Office Area of Langley Field. The NACA was permitted the use of Block 16. (Copyright material used by permission of Albert Kahn Associates, Inc., Detroit, Michigan, and the Bentley Historical Library, University of Michigan, Ann Arbor, Michigan)



Block 16 sometime prior to 1934. The laboratory is at the top of the image, Tunnel One to the far left, and Variable Density Tunnel adjacent to it. (NASA photo)



At the end of WWI, the NACA struggled with forging the role it would take in aeronautics. The first wind tunnel was already outdated by the time it was built but served to spur young scientists into conceiving a series of innovative tunnels that would leapfrog capabilities anywhere else in the world. The first revolutionary concept placed the conventional wooden wind tunnel inside a closed pressure vessel to more accurately simulate full-scale conditions. The pressure vessel was built at the Newport News Shipbuilding and Drydock Company and shipped to Langley by barge. The Variable Density Tunnel (VDT) became operational in 1923, and its results positioned Langley as a recognized leader in aerodynamics.

With its successes, the NACA was able to secure additional land from the Army and expand its research capability. The Propeller Research Tunnel (PRT) became operational in 1927 and was key to testing full-scale aircraft propellers along with their engines and fuselage shapes. The most significant result from testing in the PRT was the streamlined engine cowling, which reduced drag. In recognition of this important contribution, the NACA received the coveted Collier Trophy in 1929.

With the success of the PRT, Congress was favorable to the construction of the Full-Scale Tunnel (FST), so named due to its capability to test full-scale aircraft under powered conditions. Constructed during the Depression, it became operational in 1931 and, at that time, was the world's largest wind tunnel. This tunnel became a major test facility for WWII—vintage military aircraft. Following that war, the tunnel was used for the testing of emerging concepts such as delta wings, free-flying models, and vertical takeoff and landing aircraft. With the formation of the Space Task Group at Langley and the beginning of Project Mercury, the FST entered the Space Age. Although it was designated a National Historic Landmark in 1985 for its remarkable contributions, the oldest operating tunnel at Langley was demolished in 2010.

Another tunnel built during this time period as a Works Progress Administration (WPA) project was the 8-Foot High-Speed Tunnel. Built of reinforced concrete rather than welded steel, the tunnel was initially capable of Mach 0.75, but it was later modified to permit transonic testing. It was here that Richard Whitcomb conceived of aircraft modifications later tested in the 8-Foot Transonic Pressure Tunnel, modifications that allowed aircraft to break the speed of sound and earned Whitcomb a Collier Trophy. (The 8-Foot Transonic Pressure Tunnel was built at the location of the former PRT.)

Other research facilities built by this time in the East Area were the Two-Dimensional Low-Turbulence Tunnel, the Two-Dimensional Low-Turbulence Pressure Tunnel, the Atmospheric Wind Tunnel (Tunnel One), the Rectangular High-Speed Tunnel (VDT), the 19-Foot Pressure Tunnel, the 15-Foot Free-Spinning Tunnel, the 12-Foot Low-Speed Tunnel, hangars for flight research aircraft, and two Tow Tanks.

The NACA became concerned about the increase in aeronautical research in Europe as Hitler began his rise in power. They operated an office in Paris with the intention of conducting aeronautical espionage. Of particular concern were reports that Germany had nearly 2,000 well-trained personnel compared to 350 at LMAL. From this disparity came the recommendation to disperse our country's capabilities to several locations and to expand the capabilities at Langley. Several years later, key Langley personnel moved to Moffett Field to start the second center, named for Joseph Ames. Then, in 1942, additional personnel moved to Lewis Field in Ohio to start the Aircraft Engine Research Laboratory, now known as Glenn Research Center.

Available space within the confines of the Army base at Langley had virtually disappeared by the time WWII started. The NACA began looking to the western side of the base and additional private land beyond that. Land was acquired in 1939 through the War Department, and by 1940, the Structures and





Pre-1935 view of what is now referred to as the East Area—the land permitted by the Army for NACA use. (NASA photo)

Materials Research Facility was completed, making it the first building to be constructed in the West Area. It was quickly followed by the 16-Foot High-Speed Tunnel and the Stability Tunnel in 1941, the Impact Basin and the Model Supersonic Tunnel in 1942, and two 7- by 10-Foot Tunnels put into operation in 1942 and 1945.

Previously criticized for an overemphasis on aerodynamics, the new facilities in the West Area included structures, materials, and propulsion in addition to wind tunnels. Research was often directed to broad structural issues rather than a specific aircraft. Significant contributions to aircraft during WWII included drag cleanup, revisions to pilot's flight

manuals based on testing of over 100 military prototypes, improved laminar-flow airfoils and boundary layer flow, aircraft ditching characteristics, and the value of innovative aircraft shapes such as swept wings. Catastrophic aircraft failures were thoroughly and quickly researched and modifications designed for immediate retrofit of military aircraft.

The demands of WWII had the largest impact on the personnel and facilities at Langley until the launch of the Russian Sputnik in 1957 and the start of the space race. The NACA had been dabbling in hypersonic flight already, but the urgency in responding to Sputnik had an immediate effect on the agency. In 1958, the NACA was dissolved and replaced by the National







**GENERAL VIEW OF BUILDINGS OF THE NACA LANGLEY MEMORIAL AERONAUTICAL LABORATORY  
West Area, Langley Field, Va.**

- |                                   |  |
|-----------------------------------|--|
| 1. Water Tower                    | 8. Power Plant                                 |
| 2. 16-Foot High-Speed Tunnel      | 9. Cooling Tower                               |
| 3. West Substation                | 10. Impact Basin                               |
| 4. West Model Shop                | 11. Model Supersonic Tunnel                    |
| 5. Stability Tunnel               | 12. Warehouse                                  |
| 6. Structures Research Laboratory | 13. West Shop                                  |
| 7. West Heating Plant             | 14. Sewage Disposal Plant (under construction) |

View of the West Area buildings in 1942. (NASA photo)

Aeronautics and Space Administration (NASA). The “new” Langley Research Center changed emphases to the space program, and the Space Task Group (STG) was formed. After a brief stay in the West Area, the 35 STG members moved to the East Area, where they had offices in the first NACA Administration building. After extensive reviews, seven astronauts were chosen and shared an office on the second floor of the building that had been Tunnel One and the Atmospheric Wind Tunnel. The astronauts were joined by over 300 other new personnel.

The space program during Project Mercury consumed about 64 percent of the total Langley workload, and the Apollo program would grow to even more. Work

spanned most of the facilities across the Center and included tests of capsule models, design of reentry vehicles and heat-shield structures, development of control requirements and parachute recovery systems, studies of water landing behavior, all aspects of astronaut training, development of the couch used during launch and reentry, and the list goes on and on. Even though STG was moved to Houston, local enthusiasm for the program remained high, and Hampton renamed a road and six bridges for individual astronauts.

In 1961, while NASA was still working through the challenges involved in orbiting Earth, President Kennedy announced his ambitious goal to land a man on the Moon. This seemingly impossible task caught the team







Lunar Landing Research Facility with simulated Moon surface used for astronaut training. (NASA photo)

docking procedures that they had to master in order to return to Earth.

In the summer of 1969, when Neil Armstrong landed on the Moon, few outside of the Hampton, Virginia, area thought about the research and development efforts of NASA Langley, which totaled over 300 discrete projects. But without that work, historian James Hansen wrote, “an American lunar landing that summer day may not have been possible.”<sup>41</sup>

In 1985, the National Park Service conducted a Man in Space-themed study that led to the designation of five unique facilities at Langley as National Historic Landmarks. In another effort, the entire Center, plus the original NACA buildings on Langley Air Force Base, was listed on the Virginia Landmarks Register in 2011 and the National Register of Historic Places in 2012. This designation, plus Langley’s Programmatic Agreement with the Virginia Historic Preservation Office and Advisory Council of Historic Preservation, has been the motivation behind thoroughly documenting the Center’s history and salvaging artifacts for reuse in new construction or displays.

41 James R. Hansen, *Spaceflight Revolution: NASA Langley Research Center from Sputnik to Apollo* (repr., London: Forgotten Books, 2013), pp. 390–391.

Langley has adopted an aggressive revitalization plan to consolidate its campus to a core area and includes the demolition of facilities that have outlived their usefulness. Advances in technology have played a major role in testing procedures and are a major consideration in the new face of NASA Langley. As we start another century of research, the challenges faced by those first pioneer researchers will be harder and harder to understand. In today’s world, it is hard to imagine life without computers, airplanes, and space exploration.

## IN THE WORDS OF THOSE WHO WERE THERE: ORAL HISTORIES FROM THE NACA DAYS

By Rebecca Wright

Before NASA, there was the NACA, or National Advisory Committee for Aeronautics, established in 1915. Its original focus as designated by the federal government was for the advisory panel of 12 people “to supervise and direct the scientific study of the problems of flight, with a view to their practical solutions.”<sup>42</sup> During the next 43 years, with a more broadened purpose, the work of NACA members impacted aircraft developed for wars, commercial travel, and journeys beyond Earth’s atmosphere.

However, on 1 October 1958, with the birth of the nation’s space agency, the NACA began a quiet evolution at the four facilities where it had thrived. At the Langley, Ames, and Lewis (later Glenn) Research Centers, as well as at the High Speed Flight Station (later Dryden Flight Research Center and now Armstrong), NACA members transitioned easily to the new organization, NASA. They took their experience, their knowledge, their passion, and the traditions gained from working as

42 Naval Appropriations Act, 1916 (Public Law 271, 63rd Cong., 3rd sess., passed 3 March 1915 [38 Stat. 930]).



the NACA and used them to forge future achievements in American aviation and spaceflight.

This past summer, NASA Chief Historian Bill Barry challenged the Johnson Space Center (JSC) History Office to gather as much oral history as possible from surviving NACA employees in preparation for the centennial of the organization's creation. The team from Houston has been facilitating oral history projects since 1997, when JSC's ongoing project first began.

To assist their effort, history offices at Langley, Glenn, and Ames provided lists of possible candidates for interviews and, if needed, space at the Centers to conduct interview sessions. Within three months, information from 34 NACA alumni had been collected. The questions focused on the day-to-day activities during their NACA years, seeking details about the tools, methods, and projects with which they were involved. If applicable, they were asked to share their thoughts about the impact of the transition to NASA on their jobs and careers.

The roles of the participants ranged from former high-level decision-makers and engineers to mathematicians, photographers, technicians, and a nurse. As in all oral histories, the participants provided unique insights, but some similar themes emerged from the conversations as well.

The most prevalent centered on the belief that in order to succeed in their jobs, they had been given "freedom to fail." By being allowed to test rigorously and research thoroughly, the engineers learned valuable lessons to apply in future tasks. They explained how they shared this acquired knowledge along with specifics from the results of their work in reports and technical memorandums, but only after following a "brutal and time-consuming" process.

As Hank Cole said, "NACA just did not put out false information—everything had to be checked and rechecked." These reports were reviewed by the head of the editorial division only after being reviewed by

committees that included "the author, and then you had an expert senior scientist on the field, as the chairman, and then they liked to get somebody in between, and then a junior, somebody just starting. The junior member would usually want to change the grammar, and then, of course, the others would question your mathematics and all that, and so forth. Editorial committees were a major, major thing."

Many of these NACA documents served as standards for the aviation industry because the NACA was at the forefront of aviation research. For the employees, the extensive process proved to be a valuable method of information exchange and validation among those with experience and those being trained to become the next generation of experts.

No boundaries existed between NACA employees when meeting a common goal, they said. By working freely across divisions, they embraced a "cradle-to-grave" methodology that allowed research engineers to be responsible for the design of the model, as well as its construction and installation, and finally to write the report about the results. On some occasions, a back-of-the-envelope design would be taken directly to a machine shop for development. Thanks to this unique learning experience, those walking an idea through its life cycle understood the complete process, as well as the contributions of the other disciplines. Plus, all involved had an opportunity to build relationships with and gain a respect for others at the center.

During its time, the NACA attracted and recruited brilliant researchers from all over the country. Those interviewed for the oral history project talked about the leadership of these men and the value of working side by side with these mentors as their own careers were maturing. As part of the NACA culture, employees (new and long-term) learned from each other through hearty peer discussions and informal conversations, sometimes in lunchrooms, where the final solution became a product of the group. The NACA environment earned the reputation that any aviation issues tackled—minor or major—would achieve



technical merits immensely important to aviation safety and efficiency.

In 1958, NACA centers became NASA facilities and employees across the Agency added another mission—to take Americans to a new frontier beyond Earth’s orbit. When asked about the transition, Christopher C. Kraft, legendary aerospace engineer and former Director of Johnson Space Center, answered:

The N-A-S-A was still the N-A-C-A; they had just had additional duties called space. A whole new relationship then developed between the NASA government and the aerospace industry. Now, we were responsible for the hardware like the Air Force and the Navy were responsible for their hardware. [However], the NASA engineer was a very different animal than the people in the services—we knew technically as much about what they were doing as they did, and in some instances, more. Some instances, less, but our background, having been in the aerospace industry ourselves, was pretty good.

We had to develop a working relationship with the industry. That was a new relationship that had to develop as we wrote the RFPs [requests for proposals], evaluate[d] the RFPs, and then contracted for it and then built it. Building it and testing it and proving its systems, evaluations—that was a whole new set of engineering circumstances that we at NACA did not have. We had to learn how to do that. But it was beneficial to both sides, both the contractors and ourselves, and the truth of the matter is I think we probably saved lives. [And] that created a new set of engineers, which are called flight controllers.

Embedded in the transcripts, readers will find the pride the members of this illustrious organization continue to have knowing that the NACA legacy survives. They know that the NACA’s research techniques, improbable theories, and versatile methodologies introduced decades ago continue to serve as a foundation for many of the successes in modern aviation and aerospace technology.

The transcripts from these interviews have been posted online together with those gathered in two previous oral history projects, reflecting a significant contribution to the historical record for generations to come. To access the collection, visit [http://www.jsc.nasa.gov/history/oral\\_histories/naca.htm](http://www.jsc.nasa.gov/history/oral_histories/naca.htm).

## THE NACA’S INFLUENCE ON STENNIS SPACE CENTER

By Daphne Alford

NASA’s John C. Stennis Space Center was not even a dream when the National Advisory Committee for Aeronautics was established in 1915. As NACA’s centennial draws near, however, the nation’s largest rocket engine test center is a clear heir to the early group.

The NACA was created by Congress to “supervise and direct the scientific study of the problems of flight, with a view to their practical solutions.” For the next 43 years, the NACA’s group of aeronautical engineers would engage in groundbreaking and fundamental work that still enables flight technologies of the 21st century. The NACA ceased to exist with the creation of NASA in 1958. However, Stennis Space Center not only is continuing in the spirit of the organization but builds on its legacy.

Since its creation in 1961, Stennis Space Center has evolved not only in size, but in expertise. Created to test the Apollo-era engines and rocket stages that carried humans to the Moon more than 40 years ago, the





NASA engineers conduct a test of Project Morpheus's HD4B-LT engine at the E-3 Test Stand at Stennis Space Center on 20–21 February 2014. (NASA photo)

large test stands at the site were retrooled to test all of the main engines that powered Space Shuttle missions. They also have been adapted to test commercial and next-generation rocket engines and core stages, as well as engines and rocket stages for NASA's Space Launch System, which will carry humans deeper into space than ever before.

Meanwhile, the site's E Test Complex was built in the later 1980s and early 1990s with versatility and adaptability in mind. The three-stand complex includes seven separate test cells capable of supplying ultra-high-pressure gases and cryogenic fluids, using

a variety of rocket propellants. The complex supports or has supported test projects with several commercial spaceflight companies, including Aerojet Rocketdyne's AJ26 engines for Orbital Sciences Corporation, which is partnered with NASA to provide cargo resupply missions to the International Space Station. The E complex also supports innovative efforts, such as testing for NASA's Project Morpheus to develop a prototype planetary lander that could evolve to carry cargo and technologies safely to space destinations such as asteroids or Mars.

In addition to those efforts, the Stennis federal city houses a variety of federal, state, academic, and private organizations, including Lockheed Martin and Rolls-Royce North American, which engage in a range of aeronautical research and test efforts.

A century ago, the NACA laid a foundation of innovation and excellence that enabled future advances in aviation and spaceflight. In the same way, Stennis Space Center supports and enables aeronautical and astronautical missions not only of today, but of days to come.



## NEWS FROM HEADQUARTERS AND THE CENTERS

### NASA HEADQUARTERS WASHINGTON, DC

#### History Program Office

By Bill Barry

With the NACA centennial fast upon us, the preparations in the History Program Office have been in high gear all fall. In addition to coordinating the centennial symposium (3–4 March 2015 at the National Air and Space Museum), we’ve been pushing the production of several centennial-related publications as well as Web content and social media. Work on all of this NACA centennial material has revealed (at least to me) the awkward truth that not only is the legacy of the NACA underappreciated, but our historical understanding of the NACA is pretty weak. This is not a result of a lack of data or records. There are many rich primary sources; it is just that they are relatively underexplored. As a result, good secondary sources and analysis are hard to come by. Given how the NACA was transformed into NASA, it is easy to see how the deep aeronautics research and engineering heritage was overlooked in the excitement of new missions and the growth in personnel and budgets. Nonetheless, one of the publications we are putting out for the centennial is an annotated bibliography on the NACA (produced for us by the Federal Research Division of the Library of Congress), and it is less than 40 pages long. The takeaway here is that there is a rich vein of largely unexplored aerospace history ripe for mining by historians now and yet to come. I hope that one of the results of our focus on the NACA centennial will be an increase in historical work on this important yet relatively underexplored subject.

In addition to the centennial and the continuing work of pushing a variety of publications out the door,

we’ve made significant progress in 2014 toward some difficult, but not-so-obvious, long-term objectives. One of those is to get back into the practice of holding history program reviews on a regular basis. With all of the negative pressure on government travel from budget issues and sequestration (at least last year), we haven’t had a face-to-face meeting of NASA history and archival staff since November 2011 (when we

“

**IN ADDITION TO THE CENTENNIAL AND THE CONTINUING WORK OF PUSHING A VARIETY OF PUBLICATIONS OUT THE DOOR, WE’VE MADE SIGNIFICANT PROGRESS IN 2014 TOWARD SOME DIFFICULT, BUT NOT-SO-OBVIOUS, LONG-TERM OBJECTIVES.**

”

met at Glenn Research Center). The Headquarters Office of Communications leadership has agreed to support a history program review in 2015, and we are working on those plans now. Another less-visible issue, but one that I’ve been concerned about for some time, is the lack of an archival/history program at Goddard Space Flight Center. Senior leadership at Goddard is very supportive, but the trick has been finding a way through the bureaucratic hoops to kick-start the program. We are now moving ahead with plans to establish an archival/reference collection program with the expert help of our own Chief Archivist Jane Odom. I see this as a key first step to an eventual full-fledged history program at Goddard. Internally, we are also working here at Headquarters to retool some of our own processes. This overhaul includes implementing a new software management tool for our publications,



one that should bring us into the 21st century for project management. As always, bureaucratic change is a challenge, but our focus on these priorities for the last couple of years is finally beginning to show fruit.

On the personnel front, there are also great things happening. As noted elsewhere in this edition, our team of civil servants and contractors won NASA Headquarters Honor Award recognition this fall. The archive renovation project here was a huge challenge, but excellent planning and some amazing teamwork have paid off in a great result. It was great to see the team get some well-deserved recognition. Some of you may have noticed that former intern Andres Almeida is back working for us part-time. We had a special project for him to work on related to coordinating volunteer efforts and making all of our publications available in PDF format. (At the moment, all NASA History publications are available online, but many of the earliest items were put online in HTML format only.) As usual, Andres has done a great job of dealing with some challenging problems with good humor and grace. We've also had the pleasure this fall of working with interns Amy Wallace and Nolan Lott. They have been indefatigable in a wide variety of tasks, but they have really done an amazing job of expanding and improving our social media impact. They have expanded our Flickr site (which now hosts the former GReat Images in NASA [GRIN] collection—now called NASA on the Commons—and much more), and they are getting our toe in the Instagram waters (as part of the larger NASA Instagram account). You can view our Flickr collection at <https://www.flickr.com/photos/nasacommons>. One initiative that I've been particularly pleased with is our "Document of the Week" on our Facebook account. We are now highlighting some of the interesting treasures in our archival collections with a brief writeup on the significance of a document, along with a picture of it, once each week. This has been particularly helpful in drawing attention to the NACA as we head toward the centennial in March. It also doesn't seem to have hurt our growth in readership. Our Facebook like count has gone from about 18,000 in January 2014 to over 2 million at the

start of November. As I said, we have some amazing interns—well matched to an incredible staff.

### Historical Reference Collection

By Jane H. Odom

The Headquarters Historical Reference Collection (HRC) reopened to NASA staff and the public on 10 September after nearly a year's closure. The previous day, History Program Office staff held a grand reopening ceremony attended by nearly 100 people from Headquarters, the National Air and Space Museum, and other local institutions. Since then, we have experienced a slow trickle of researchers who have come in person from institutions such as the National Air and Space Museum, the University of Pennsylvania, the Free University of Berlin, and York University in Toronto.



Jane Odom, Headquarters; Anne Mills, Glenn Research Center; and April Gage, Ames Research Center, enjoy networking and getting caught up between sessions at the Joint Annual Meeting of the Society of American Archivists, Council of State Archivists, and National Association of Government Archivists and Records Administrators, held in Washington, DC, in late August.

Our nearly 2,000-cubic-foot collection of archive materials and books has been returned safely and in good condition from an off-site warehouse. Best of all, our full complement of archive reference services has resumed, along with numerous processing and digitization projects. One project included a review of a





half-dozen boxes of Federal Records Center materials on Shuttle-Mir and the International Space Station. After a historical appraisal, dozens of documents were copied and added to existing subject files in the HRC.

Also, we processed 2 cubic feet of *Space Shuttle Decision* sources from author Tom Heppenheimer integrated them into a previously processed collection of his. The new portion consists of correspondence and reports from 1965 to 1983.

Additionally, nearly 400 PDFs were recently entered into the existing digital press conference collection. The collection includes a few human spaceflight and early Space Shuttle press conference transcripts; however, the bulk of the collection focuses on the Apollo program. We have added them to our internal database for use in answering reference questions and plan also to add them to our external reference collection site at <https://mira.hq.nasa.gov/history/>.

## AMES RESEARCH CENTER (ARC)

### Moffett Field, California

By Glenn Bugos

Continuing celebrations of the 75th anniversary of the founding of Ames showed the vibrancy in the long legacy and culture of Ames. The Ames Exchange, our employee organization, hosted an Ames family picnic on 7 August on the parade ground of Moffett Field. In addition to Ames staff and their families, many retirees came to reunite with the people they had worked with over the years. A memory wall of historical photographs invited everyone to jot a note on where they had been at that point in Ames history. Adjacent to the picnic, many of the 900 interns who worked at Ames over the summer stood by posters describing their research work and fielded questions, some no doubt from those scientists and engineers who had pioneered the field years before. The day was a beautiful display of past, present, and future.



Top: Harvey Allen at Ames. At the Ames family picnic, the TechEdSat CubeSat team from San Jose State University, pictured with their mentor Marc Murbach (with graying hair), posed with a cutout of Ames celebrity Harvey Allen, the intellectual progenitor of all reentry technology. Bottom: Kay Twitchell (r) and Carolina Rudisel (l), queens of the Ames 75th anniversary celebrations, pose, like so many of the Ames family that day, with head cutouts of Ames luminaries. (NASA Ames photo)



The Collings Foundation visits Moffett Field and keeps history alive by offering rides in aircraft like the B-17, the B-21, and the P-51. (NASA Ames photo)



As part of its 75th anniversary celebration, Ames installed exhibits in storefronts, eateries, and public buildings in downtown Mountain View and Sunnyvale to bring the excitement of space exploration to the Center's closest neighbors. This one shows the evolution of the Chemistry and Mineralogy instrument on the Mars Science Laboratory. (NASA Ames photo)



At the Ames family picnic, attendees sign a commemorative banner and, on a wall of historical photos, write comments on where they were at important points in the Center's past. (NASA Ames photo)

The Directors Colloquia series during the summer of our 75th anniversary took a historical tone, notably with talks by Lew Braxton, reviewing his rise through the ranks at Ames, and by newly selected Ames Associate Fellow Raj Venkatapathy, reviewing the history of reentry technology. In addition, Jack Boyd met with a local history group, the Mountain View Historical Society, to tell them how our Center has grown up along with their town. Also, Jack and Glenn Bugos sat and signed copies of the Ames history book, which provided a great chance to jot thank-you notes to many people for their role in making the recent history of NASA Ames so exciting.

## ARMSTRONG FLIGHT RESEARCH CENTER (AFRC)

Edwards Air Force Base, California

By Christian Gelzer

The Mate-De-mate Device (MDD) at AFRC was the first such structure built to load and unload the Space Shuttle from the Shuttle Carrier Aircraft, predating a second MDD at Kennedy Space Center (KSC) by 18 months to accommodate the arrival of Enterprise and the atmospheric flight-testing done at the Center. The first orbiter had to be trucked from Rockwell's site in Palmdale to the Center because there was no lifting structure at Plant 42, but once the orbiter was at AFRC, the MDD came into play every time Enterprise was loaded onto the 747.

In contrast to the later MDD built at Kennedy, Armstrong's MDD was designed to be transportable: "all components of the facility, including the structural framing, platforms, machinery, electrical systems, mechanical (plumbing), etc., [were to] be designed and detailed for erection and disassembly into units for transport on either trucks or C-5 cargo planes to





Columbia sits in the Mate-De-mate Device at the Dryden Flight Research Center (now Armstrong) being serviced following its first orbital mission. Attached by umbilical hoses to the Shuttle's aft are the purge and cooling units. The Shuttle Carrier Aircraft sits on the taxiway waiting to be pulled in and under the orbiter once it is lifted for attachment. Arrayed in a long line at the bottom of the photo are 11 immense concrete blocks of specific weight, used in combination each year to load-test the MDD and validate its lifting capacity.

relocation and routine reassembly at a different site.”<sup>1</sup> For many years, it retained that capability even though it was never disassembled. The one time a Shuttle landed “out” (on Northrup Strip at White Sands, New Mexico), NASA opted to send in large cranes to do the heavy lifting. Eventually, the disassembly feature was welded over.

Unlike the MDD at Kennedy, where the orbiters typically spent little time, Armstrong’s MDD usually had orbiters hanging in it for a week or more while the crew (120 or so from KSC) worked around the clock preparing it for its final lift onto the Shuttle Carrier Aircraft’s back, followed by its cross-country flight. Attaching the tail-cone fairing was one of the final tasks, and although it would appear simple, the work could go from a 6-hour job into a daylong battle. The orbiters were custom vehicles, after all.

<sup>1</sup> Joan Deming and Patricia Slovinac, archaeological consultants, and Karen J. Weitze, Weitze Research, “Survey and Evaluation of NASA-Owned Historic Facilities and Properties in the Context of the U.S. Space Shuttle Program: Hugh L. Dryden Flight Research Center,” November 2007.

With the Space Shuttle Program complete, there is no further use for such a unique structure, so the MDD is being disassembled—finally—albeit with cutting torches. Once part of the tallest structure at Armstrong, with a grand view of everything around, the MDD’s high-quality steel will eventually be part of new buildings and bridges.

## GLENN RESEARCH CENTER (GRC)

Cleveland, Ohio

By Anne Mills

**G**lenn Research Center will celebrate its 75th anniversary in January 2016, and in preparation, we are working to enhance access to our collections. This quarter, nearly 100 oral history audio tapes were digitized and transcribed. These include many retiree interviews undertaken as part of recent book projects. Additionally, and also in preparation for the 2015 NACA Centennial, many of the Annual Inspection Volumes have been scanned and made searchable. These are invaluable resources, as they serve as miniature time capsules, concisely explaining research at the Center in a consolidated format for each year.

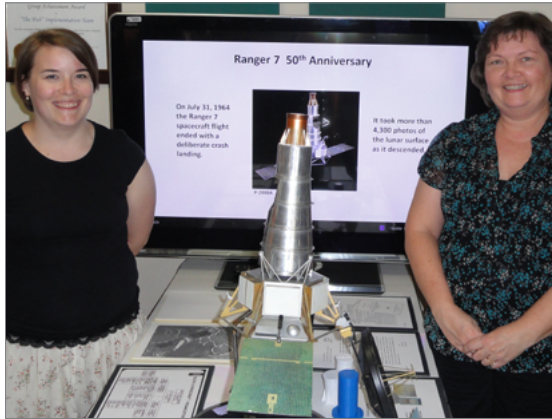
Ten pieces of original artwork from our archival collection were on display at the 2014 Cleveland Ingenuity Festival. The pieces, by retired technical illustrator Les Bossinas, are conceptual portrayals of living and working in space. The IngenuityFest celebrates the intersection of technology and art. The festival has been celebrated annually in Cleveland since 2005 as a weekendlong festival of performances, demonstrations, special art installations, and talks.



## JET PROPULSION LABORATORY (JPL)

Pasadena, California

By Erik Conway



Kate McManus (left) and Julie Cooper (right) with the Ranger 7 50th anniversary exhibit.

### Summer Intern

During her nine-week internship with the JPL Archives, Kate McManus created an inventory of JPL photo resources. The 19,000-item spreadsheet identifies what has been digitized, where the files are stored, and which images exist only as hard copies that can't be easily accessed by researchers. She also performed a test-scanning project to help the Archives plan future digitization projects and create new digital finding aids. She inventoried 7 cubic feet of documents, photographs, and ephemera and fully processed one small collection. She also used her knowledge of the photo collection and Russian language skills to assist with several research requests. Kate returned to St. Catherine University in St. Paul, Minnesota, to complete the final year of her master's degree in library science with a focus in archives.

### Ranger 7 50th Anniversary Exhibit

Julie Cooper and intern Kate McManus created an exhibit for the Ranger 7 50th anniversary week. The centerpiece of the exhibit was a 1/6-scale Ranger Block III model, along with archival documents and a large-format slide show that included photographs

and information that told the story of the Ranger missions and how spacecraft models were used in the 1960s. When the model was discovered in storage, the omnidirectional antenna on top of the model was missing, so the Archives provided drawings and photographs to JPL, where the staff created a replacement antenna on a 3D printer. The exhibit will soon be added to the Archives exhibit Web page at <http://beacon.jpl.nasa.gov/exhibits>.



Members of the Ranger 7 television experiment team stand near a scale model of the Ranger spacecraft and lunar globe, which were used to visualize the spacecraft and its orientation as it reached the Moon. From left: Ewen Whitaker (research associate at the Lunar and Planetary Laboratory at the University of Arizona, Tucson), Dr. Gerard Kuiper (director of the Lunar and Planetary Laboratory), and Ray Heacock (Lunar and Planetary Instruments section chief at JPL).



## OTHER AEROSPACE HISTORY NEWS

### NATIONAL AIR AND SPACE MUSEUM (NASM)

By Michael Neufeld

*Hubble's Legacy: Reflections by Those Who Dreamed It, Built It, and Observed the Universe with It* (Smithsonian Institution Scholarly Press, 2014), edited by Roger Launius (NASM Associate Director; also Space History) and David DeVorkin (Space History), was just published. The book is based upon papers given at a conference in November 2009 at the National Air and Space Museum, celebrating the return and display of the Hubble Space Telescope's (HST's) Corrective Optics Space Telescope Axial Replacement (COSTAR) and Wide Field and Planetary Camera 2 (WFPC2) instruments, "the instruments that saved Hubble." The conference covered three phases of the HST's history and legacy and consisted of talks given by those directly involved in each of the phases: 1) the conceiving and selling of the idea of a large, orbiting, optical telescope to astronomers, NASA, and the U.S. Congress, followed by its creation as the HST and its definition as a serviceable mission; 2) its launch, the discovery of the flawed mirror, the engineering of the mirror fix, subsequent servicing missions, decisions on upgrades, and the controversy over a "final" servicing mission; and 3) the HST's public image after launch—how the mirror fix changed its public image, how the HST then changed the way we visualize the universe, and how the public saved the final HST servicing mission. The conference was made possible by support from Ball Aerospace, and the proceedings, to be published in hard copy later this year, are available now as a free e-book at <http://opensi.si.edu/index.php/smithsonian/catalog/book/57>.

The 11-foot-long Starship Enterprise studio model that was used in filming the original *Star Trek* television series (NBC, 1966–69) has been taken off display in NASM's Mall museum. Artifact curator Margaret Weitekamp (Space History) supervised its removal for

conservation in preparation for its new display location in the renovated Boeing Milestones of Flight Hall, which will open in July 2016. Displayed beginning in September 1974 in the Arts and Industries Building's "Life in the Universe" exhibit, this significant cultural icon has been exhibited in various locations in the museum since that building's opening in July 1976, although it has also been off display occasionally. Since March 2000, it had been in a custom-built display case on the lower level of the museum's store. The Enterprise model will not be on public view while it is being evaluated and treated. It was moved to the Emil Buehler Conservation Laboratory at the Steven F. Udvar-Hazy Center in Chantilly, Virginia. The final plan for the model's treatment will depend upon what is found during the physical examination of the artifact. Check the Boeing Milestones of Flight Hall Web site (<http://airandspace.si.edu/exhibitions/milestones-of-flight/online/>) and follow the museum on social media for updates on the treatment of the Enterprise model and the other artifacts in the Boeing Milestones of Flight Hall.

Five NASM historians presented papers at the 12th Annual Conference of the International Association for the History of Transport, Traffic and Mobility (T2M) held at Drexel University in Philadelphia, 18–21 September. For the conference theme, "Spinoffs of Mobility: Technology, Risk, and Innovation," Roger Launius and Valerie Neal (Space History), joined by Matt Hersch, presented a session on space travel. Dom Pisano, Roger Connor, and Bob van der Linden (all Aeronautics Division) presented a session titled "Risk and the Unintended Consequences of Aviation Technology." Their topics ranged from railroads and the Space Shuttle to 9/11, aerial bootlegging, and air crimes. Titles and abstracts can be found at <http://www.t2m.org/conferences/2014-philadelphia>.

As curator of Robert Goddard's Smithsonian artifacts, Michael Neufeld (Space History) participated



in an event honoring him in Roswell, New Mexico, 17–18 October 2014, titled “Goddard, Dreams, Hopes and Reality: Aiming for the Stars” (<http://robertgoddard.org/>). Among other things, he spoke on the topic of “Robert Goddard and Wernher von Braun.”

## AMERICAN ASTRONAUTICAL SOCIETY (AAS) HISTORY COMMITTEE

By Michael Ciancone, Chair

The recipients of the 2013 Emme Award for Astronautical Literature are Chris Impey and Holly Henry for *Dreams of Other Worlds: The Amazing Story of Unmanned Space Exploration* (Princeton University Press). Members of the Emme Review Panel included Dr. Rick Sturdevant, Dr. De Witt Kilgore, Dr. Asif Siddiqi, and Michael Ciancone.

De Gruyter Oldenbourg is publishing the English-language translation of Hermann Oberth’s seminal work, *Die Rakete zu den Planetenräumen* [*The Rocket into Planetary Space*] (Oldenbourg, 1925). In anticipation of the publication of the translation, De Gruyter Oldenbourg also reissued the original German-language edition. Dr. Trevor Sorensen led the translation and editorial effort for the AAS History Committee, supported by a team of specialists that included Dr. Joachim Kehr (German Aerospace Center/German Space Operations Center, retired), Dr. Rick Sturdevant (Air Force Space Command), Dr. Peter Englert (University of Hawaii at Manoa), Michael Ciancone (NASA), Lars Oliefka (European Space Agency), and Joni Wilson (copy editor extraordinaire).

As a result of the persistence and diligence of series editor Dr. Rick Sturdevant, and with the efforts of volume editors Christophe Rothmund and Kerrie Dougherty, as well as copy editor Joni Wilson, Univelt has published the 2009 and 2010 proceedings in the International Academy of Astronautics (IAA) History

Series. Subsequent volumes in the series are at various stages in the publishing pipeline.

## SOCIETY FOR HISTORY IN THE FEDERAL GOVERNMENT (SHFG)

### Call for Papers—Federal History Journal

*Federal History*, the journal of the Society for History in the Federal Government, seeks articles for its January 2016 issue. *Federal History* features scholarship on the history of the federal government, including military history, 1776–present. We welcome manuscripts from SHFG members and others working in the federal government, as well as independent scholars and historians working in public history and academia. Visit <http://shfg.org/shfg/publications/federal-history-journal/> for the current issue, past issues, and details on submissions, which should be sent to [editor-shfg-journal@shfg.org](mailto:editor-shfg-journal@shfg.org).

## NASA FELLOWSHIP RECIPIENTS

In conjunction with the Society for the History of Technology (SHOT), the History of Science Society (HSS), and the American Historical Association (AHA), NASA History funds fellowships for doctoral candidates and those who hold a doctorate, the goal of which is to assist scholars at all stages of their careers by supporting a range of research and writing projects to promote a better understanding of how public and private aerospace has reshaped the world from the beginnings of human flight to the present.

The History of Science Society Fellowship in the History of Space Science funds a nine-month research project, related to any aspect of the history of space science, from the earliest human interest in space to the present. Jordan Bimm, a doctoral candidate at Canada’s York University, is the 2014–15 HSS-NASA Fellow. The award will provide \$21,000 in funding for



the research phase of Bimm's dissertation, "Making Astronauts: Subject Formation and Early American Space Medicine, 1949–1961." Bimm is the first scholar at a Canadian institution to receive the award.

The AHA Fellowship in Aerospace History is offered annually to support a significant scholarly research project in aerospace history and provides the Fellow with an opportunity to engage in advanced research in all aspects of the history of aerospace, from the earliest human interest in flight to the present, including cultural and intellectual history, economic history, the history of law and public policy, and the history of science, engineering, and management. Brian M. Jirout is this year's recipient. His research project is entitled "One Space Age Development for the World: The American Landsat Civil Remote Sensing Program in Use, 1964–2014." Jirout is researching the political and international history of NASA's Landsat Earth observation satellite program during and after the Cold War. His study traces the evolution of the program from an experimental project into a commercial venture, which became suspended in political debate between the national security establishment and the scientific community. He situates Landsat internationally as an instrument of foreign relations that fostered the use of remote sensing technology abroad through data packages, expertise, and ground stations. Jirout suggests that the Landsat program is a useful case study for understanding science and technology policy change since the 1960s.

The NASA Fellowship in the History of Space Technology, offered by SHOT, funds a Fellow for an academic year. The Fellowship may support advanced research related to all aspects of space history, leading

to publications on the history of space technology broadly considered, including cultural and intellectual history, institutional history, economic history, the history of law and public policy, and the history of engineering and management. The recipient of this year's Fellowship is Elizabeth A. Kessler, whose project is entitled "Time Capsules: Postcards for Aliens or Prescriptions for Cosmic Citizenship." In her proposed project, Dr. Kessler takes an innovative approach to the ways in which science and technology—in this case, rockets, space probes, and satellites—have been deployed to shape a kind of "cosmic citizenship." She explores the creation, contents, and composition of three particular time capsules produced in the past 75 years (1939, 1977, and 2012), each of which she conceptualizes as artifacts moving not only through time but also through cosmic space. The principal conceit of her project is to use these time capsules to critically examine expectations about science

and technology and their embodiment in material culture at particular moments of time. In doing this, she seeks to uncover how these time capsules were meant "to reconcile science and technology with the demands of cosmic citizenship." The seemingly disparate subjects of her study highlight one of the strengths of Dr. Kessler's project: it juxtaposes historical episodes that scholars have not typically studied in tandem. Her project promises to be a superb and valuable addition to the literature on material culture, the history of spaceflight, and conceptions of "cosmic citizenship."

“

**THE AHA FELLOWSHIP  
IN AEROSPACE  
HISTORY IS  
OFFERED ANNUALLY  
TO SUPPORT A  
SIGNIFICANT  
SCHOLARLY  
RESEARCH PROJECT  
IN AEROSPACE  
HISTORY.**

”



## REVIEW: *THE ENIGMA OF AN AEROFOIL*

By Robert A. Ormiston, Emeritus Scientist, U.S. Army Aviation Development Directorate, Aeroflightdynamics Directorate (Research, Development, and Engineering Command) at Moffett Field, California

One of the enduring fascinations of flight is the mystery of how an airplane wing generates lift to overcome the force of gravity. David Bloor's *The Enigma of the Aerofoil: Rival Theories in Aerodynamics, 1909–1930* (Chicago: University of Chicago Press, 2011) tells the story of the emergence, in the earliest days of aviation, of two rival scientific theories about the aerodynamic lift of an airfoil moving through a fluid. The “discontinuity theory” was championed by British researchers led by the British Advisory Committee for Aeronautics (ACA), formed in 1909 and chaired by Lord Rayleigh. The ACA was the model for the American NACA in 1915. The “circulation theory” was developed by German researchers more or less under the leadership of Ludwig Prandtl. The mathematical models embodied in the two theories were radically different, but the German circulation theory compared far better with contemporary experimental measurements than the British discontinuity theory. Nevertheless, the British continued their efforts to advance the discontinuity theory and, for nearly 20 years, rejected the German approach as insufficiently rigorous from a mathematical perspective. Ultimately, the circulation theory prevailed while the discontinuity theory was all but forgotten.

The book is aimed at unraveling why the rivalry arose, what sustained it, and how it was resolved. The author

has done a remarkable job of uncovering key factors that explain the two different approaches and why the British resisted the circulation theory. This is an impressive scholarly work that includes extensive notes and bibliography.

In a nutshell, the author attributes the rivalry to the differences in the culture, socialization, and institutions of the two groups. In particular, the British researchers, steeped in the tradition of mathematical physics (Cambridge academics), could not accept an abstract circulation model that ignored real-fluid viscosity, despite the fact that it greatly complicated the problem. And in fact, viscosity would not be introduced until the advent of supercomputers. The Germans, coming from the tradition of technical mechanics, recognized circulatory flow as a reasonable abstraction that enabled an approximate, but eminently acceptable, inviscid potential flow model, which would be useful in actually designing aircraft.

In this very readable book, the author expertly guides the reader through the complex subtleties (and even some underlying mathematics) of basic fluid mechanics. In addition, the author examines the seminal contemporary work

to illustrate and explain how the pioneers teased out the secrets of airfoil lift, not unlike a good detective story. The author brings historical figures to life in a way that enables a better appreciation of their individual approaches and the magnitude of the overall scientific achievement. For me—a practicing aerospace researcher rather than a historian of science—the book

“  
**IN THIS VERY READABLE BOOK, THE AUTHOR EXPERTLY GUIDES THE READER THROUGH THE COMPLEX SUBTLETIES (AND EVEN SOME UNDERLYING MATHEMATICS) OF BASIC FLUID MECHANICS.**  
 ”





revealed fascinating details of the works of Rayleigh, Frederick Lanchester, Martin Wilhelm Kutta, Nikolai Joukowski, George Hartley Bryan, Prandtl, and Albert Betz, among others, as well as key British experimenters, and also revealed how the fundamental theories underpinning modern aerodynamics were discovered and experimentally verified. In the process, it deepened my understanding and appreciation of airfoil aerodynamics, even after a lifetime spent exploring aerodynamics.

Bloor's work illustrates once again that scientific discovery is typically a messy and contentious process, with researchers fighting to unravel nature's mysteries. Modern students of aerodynamics, struggling to grasp

the ever elusive logic of circulation theory, might be comforted by reading *The Enigma of the Aerofoil* because it will help them to realize that some of the leading pioneers of fluid mechanics struggled as well. Evidence of such struggles is so often absent in textbooks written after the arguments are (mostly) settled.

In sum, *The Enigma of the Aerofoil* is an outstanding and important contribution to the history and science of aeronautics.

## RECENT PUBLICATIONS AND ONLINE RESOURCES

---

### UPCOMING NASA PUBLICATIONS

*The NACA: An Annotated Bibliography*, compiled by Alice R. Buchalter and Patrick M. Miller of the Federal Research Division, Library of Congress (Monographs in Aerospace History, No. 55, NASA SP-2014-4555). A limited number of hard copies will be printed, and the monograph will be available as a free download in early 2015.

*The NACA and NASA at the Century Mark*, by Roger Launius (NASA SP-2015-4416). In the tradition of *Orders of Magnitude* and *Testing Aircraft, Exploring Space*, former NASA Chief Historian Roger Launius provides a short, popular history of the NACA and NASA to mark the centennial of the establishment of the NACA. The book will be available in early 2015.

*Emblems of Exploration: Logos of the NACA and NASA*, by Joseph R. Chambers and Mark A. Chambers (Monographs in Aerospace History, No. 56, NASA SP-2015-4556). Joe Chambers (NASA Langley, retired) and his son Mark have dug into the history of

NACA and NASA emblems and logos and found some fascinating stories behind the insignia that we all think we know. This heavily illustrated monograph will be available in early 2015.

### COMMERCIALY PUBLISHED WORKS

Compiled by Chris Gamble

*Curiosity: An Inside Look at the Mars Rover Mission and the People Who Made It Happen*, by Rod Pyle (Prometheus Books, July 2014). The author provides a behind-the-scenes look into the mission of the Mars Science Laboratory Curiosity—the robotic rover that is now providing researchers with unprecedented information about the Red Planet. Drawing on his contacts at NASA and the Jet Propulsion Laboratory, the author provides stunning insights into how an enthusiastic and diverse team uses a revolutionary onboard laboratory of chemistry, geology, and physics instruments to unravel the profound secrets of Mars.



*DK Eyewitness Books: Space Exploration*, by Carole Stott (DK CHILDREN, August 2014). An informative guide to the mysteries beyond Earth and its atmosphere, *DK Eyewitness Books: Space Exploration* takes young readers on a journey through the solar system and highlights advancements in space technology. Discover how satellites help us forecast the weather, how the Large Space Simulator is used to test spacecraft, what happens at liftoff and blastoff, and how the landing craft probes and explores planets. Learn about a day in the life of an astronaut, including how a special sleeping bag helps the astronaut to sleep in weightless conditions, how astronauts repair an orbiting spacecraft from the outside, and how an astronaut's body is affected upon reentering Earth's atmosphere in this updated edition of a best-selling title from the Eyewitness series.

*Fifty Years of European Cooperation in Space: Building on Its Past, ESA Shapes the Future*, by John Krige (Beauchesne Editeur, June 2014). This book details 50 years of European collaboration in space, from the origins of the program in 1964 to its rich complexity today. The book charts the early moves by scientific statesmen and governments to establish not one, but two organizations: the European Space Research Organisation (ESRO) for science and later applications and the European Launcher Development Organisation (ELDO) for launchers. Krige explores how tight financial constraints on ESRO, the tribulations of ELDO's launcher, and a major tilt toward close technological cooperation with NASA in the early 1970s led to the formation of a single organization in 1975, the European Space Agency (ESA).

*Final Frontier: The Pioneering Science and Technology of Exploring the Universe*, by Brian Clegg (St. Martin's Press, August 2014). *Star Trek* was right—there is only one final frontier, and that is space. This book describes the massive challenges that face explorers, both human and robotic, in uncovering the current and future technologies that could take us out into the galaxy on a voyage of discovery where no one has gone before...but one day someone will. In a time of recession, escapism

is always popular—and what greater escape from the everyday can there be than the chance of leaving Earth and exploring the universe? With a rich popular cultural heritage found in science fiction movies, books, and TV shows, this is a subject that entertains and informs in equal measure.

*Flying the Beam: Navigating the Early US Airmail Airways, 1917–1941*, by Henry R. Lehrer (Purdue University Press, July 2014). With air travel a regular part of daily life in North America, most tend to take the infrastructure that makes it possible for granted. However, the systems, regulations, and technologies of civil aviation are in fact the product of decades of experimentation and political negotiation, much of it connected to the development of airmail as the first commercially sustainable use of airplanes. From the lighted airways of the 1920s through the radio navigation system in place by the time of World War II (WWII), this book explores the conceptualization and ultimate construction of the nation's first airways systems. The book traces the development of the aeronautical navigation of the United States airmail airways from 1917 to 1941. Chronologically organized, the book draws on period documents, pilot memoirs, and archival material to trace the development of the system. The author shows how visual cross-country navigation, possible only in good weather, was developed into all-weather "blind flying." The daytime techniques of "following railroads and rivers" were supplemented by a series of lighted beacons (later replaced by radio towers) crisscrossing the country to allow the nighttime transit of long-distance routes, such as the one between New York and San Francisco. Although today's airway system extends far beyond the continental United States and is based on digital technologies, the way pilots navigate from place to place basically uses the same infrastructure and procedures that were pioneered almost a century earlier.

*From Lysander to Lightning: Teddy Petter, Aircraft Designer*, by Glyn Davies (The History Press, June 2014). Lysander, Canberra, Lightning, and Folland Gnat are massive names in the world of aviation, but



less well known is their designer, William Edward Willoughby “Teddy” Petter. Only three aspects bound together these top-class aircraft: each was radical, all were successful in Britain and overseas, and were all born of the genius of Teddy Petter. This book tells the story of Petter’s life and family, from his ability to inspire loyalty in his teams, to his eccentricities, to his retirement to a religious commune in France. Here Davies not only explores Petter’s life but also expands on the nature of his remarkable aircraft and why they were so legendary.

*Here Be Dragons: The Rise of SpaceX and the Journey to Mars*, by Stewart Money (Apogee Prime, August 2014). From its earliest trials and near-disaster on the remote Pacific atoll of Kwajalein to four successful missions to the International Space Station, *Here Be Dragons* vividly details the first era of SpaceX. The story is also one of a unique public-private partnership with NASA that holds the promise of a new era of space exploration.

*How To Find the Apollo Landing Sites: Everything You Need To Know*, by James Chen and Adam Chen (Springer, June 2014). This book is for anyone who wants to be able to connect the history of lunar exploration to the Moon visible above. It addresses what Apollo equipment and experiments were left behind and what the Apollo landings sites look like now. Each Apollo mission is examined in detail, with photos that progressively zoom in to guide the reader in locating the Apollo landing sites. Guided by official NASA photographs from the Lunar Reconnaissance Orbiter and the original Apollo missions, the reader can view the Moon with a new appreciation of the accomplishment of landing astronauts on its surface. Countless people have gazed at the Moon in the night sky knowing the successes of the Apollo program in landing humans on the Moon. Using the information in this guide, casual and serious observers can point out where the Apollo landings occurred and learn why those sites were chosen.

*Howard’s Whirlybirds: Howard Hughes’s Amazing Pioneering Helicopter Exploits*, by Donald J. Porter

(Fonthill Media, September 2014). Covering the period from World War II until the mid-1980s, this story is rich with tales of technological breakthroughs and test-flying bravado made possible by a small crew of engineers and daring pilots. Written by a technical expert and industry insider, the book is a fascinating and alternative view on the phenomenal pioneer, complete with previously unpublished photographs and material that will fascinate the aviation and military historian, as well as the casual reader and cinema buff.

*Hubble’s Legacy: Reflections by Those Who Dreamed It, Built It, and Observed the Universe with It*, edited by Roger D. Launius and David DeVorkin (e-book and print edition, Smithsonian Institution Scholarly Press, August 2014). As mentioned in the “Other News” section of this newsletter, the development and operation of the Hubble Space Telescope (HST) have resulted in many rich legacies, most particularly in science and technology—but in culture as well. It is also the first telescope in space that has been utilized as effectively as if it were situated on a mountaintop here on Earth, accessible for repair and improvement when needed. This book, which includes contributions from historians of science, key scientists and administrators, and one of the principal astronauts who led many of the telescope’s servicing missions, captures the history of this iconic instrument.

*Into the Unknown Together: The DOD, NASA, and Early Spaceflight*, by Mark Erickson and Air University Press (reprint of original 2005 edition, Military Bookshop, August 2014). Colonel Erickson examines the use of space exploration as a tool to secure international prestige and national pride as part of the Cold War struggle with the Soviet Union during the Eisenhower, Kennedy, and Johnson administrations. He looks at the creation of NASA, the evolving NASA–Department of Defense (DOD) relationship, and the larger context in which this relationship was forged. He focuses on the human-spaceflight projects—Projects Mercury, Gemini, and Apollo; Dyna-Soar; and the Manned Orbiting Laboratory—by examining the geopolitical, domestic political, and bureaucratic environments in



which decisions concerning these projects were made. By blending in the individuals involved, the obstacles that were overcome, and the achievements of the United States space program, Erickson reveals a special transformation that took place during this chapter of American history. This work was originally published in 2006.

*The Iranian Space Endeavor—Ambitions and Reality*, by Parviz Tarikhi (Springer-Praxis, September 2014). For those who see the trend of progress and movement of the Iranian space endeavor from the outside, it can be difficult to understand what goes on behind the scenes. However, for one who observes these events firsthand, they take on a very different meaning. In this book, the author brings new and different profiles of Iran's space endeavor to light. Iran claims to be the ninth leading country in the world capable of manufacturing satellites and launching them, plans to land an astronaut on the Moon within a decade, and says its own president plans to be the first Iranian astronaut to travel into space. The author reveals in this book that not all of these claims are quite as they seem. In addition to technical explanations, the book includes historical, legal, social, and cultural aspects of Iran's space program.

*Mars Up Close: Inside the Curiosity Mission*, by Marc Kaufman (National Geographic, August 2014). National Geographic and science journalist Marc Kaufman combines inside stories, fascinating facts, and eye-popping pictures (some never before seen) of the Red Planet and NASA's groundbreaking Curiosity mission. For pop science, space, and technology lovers, *Mars Up Close* takes you inside the Curiosity mission, showcasing the people, science, and stories central to this unprecedented exploration of Mars.

*The Meaning and Value of Spaceflight: Public Perceptions*, by William Sims Bainbridge (Springer, September 2014). This book presents a comprehensive study of American public perceptions about the meaning of space exploration by analyzing vast troves of questionnaire data collected by many researchers and polling firms over a span of six decades. It does not simply

report the percentages about who held various opinions but employs sophisticated statistical techniques to answer profound questions and achieve fresh discoveries. Since the end of the space race between the United States and the Soviet Union, social scientists have almost completely ignored space exploration as a topic for serious analysis, and this book seeks to rectify that lack of study.

*Michoud Assembly Facility (Images of America)*, by Cindy Donze Manto (Arcadia Publishing, September 2014). Prior to WWII, the site of the future Michoud Assembly Facility was used to grow sugar, hunt muskrat, and build railroad and telephone lines. In 1941, the world's largest industrial site was built there, covering 43 acres of unobstructed, low-humidity, air-cooled space under one roof to construct C-46 cargo planes. The Korean War required the assembly of Sherman and Patton tanks there, while the space race compelled the design and assembly of the colossal Saturn I, IB, and V rocket boosters for the Apollo program. The 1970s saw the fabrication of the enormous external tank for the Space Shuttle program. Today, Michoud Assembly Facility continues to support America's space program by building major components for the Orion Multi-Purpose Crew Vehicle.

*Neil Armstrong: A Life of Flight*, by Jay Barbree (Thomas Dunne Books, July 2014). Working from 50 years of conversations he had with Neil Armstrong—from notes, interviews, NASA spaceflight transcripts, and remembrances of those Armstrong trusted—the author writes about Neil's three passions: flight, family, and friends. This inside story of Neil Armstrong's life includes his combat missions in the Korean War; his piloting of a rocket plane called the X-15 to the edge of space; his successful flying of the first emergency return from Earth orbit, during which he saved his Gemini 8 spacecraft; and his landing on the Moon's Sea of Tranquility in the Apollo 11 Lunar Module.

*The Origins of Satellite Communications, 1945–1965*, by David J. Whalen (reprint of the 2002 edition, Smithsonian Institution Scholarly Press, July 2014).



Conventional assumptions hold that government research and development efforts produced the satellite communications industry. David J. Whalen has looked deeply into the history of the industry and presents remarkable new information to tell a much different story. He finds that most of the satellite technology was privately developed by AT&T and Hughes Aircraft Company and that the market for satellite communications existed before the government stepped in. In this detailed history of satellite communications' earliest years, Whalen explains that NASA, the White House, and Congress intervened in satellite communications development to show the world that the nation was in the space race and that the billions of dollars the U.S. government planned to spend would result in practical applications.

*The Overview Effect: Space Exploration and Human Evolution*, by Frank White (3rd edition, Library of Flight series, American Institute of Aeronautics and Astronautics, September 2014). More than 30 years ago, Frank White coined the term "overview effect" to describe the cognitive shift in awareness that results from the experience of viewing Earth from orbit or the Moon. He found that, with great consistency, this experience profoundly affects space travelers' worldviews—their perceptions of themselves and our planet, and our understanding of the future. White found that astronauts know from direct experience what the rest of us know only intellectually: we live on a planet that is like a natural spaceship moving through the universe. In this new edition of *The Overview Effect*, the author expands on his original concept. Using interviews with, and writings by, numerous astronauts and cosmonauts, he describes space exploration and settlement as necessary next steps in the evolution of human civilization and consciousness.

*Religions and Extraterrestrial Life—How Will We Deal With It?* by David A. Weintraub (Springer, August 2014). Knowing the answer to the question of whether humanity has company in the universe will trigger one of the greatest intellectual revolutions in history, not the least of which will be a challenge for at least some

terrestrial religions. Which religions will handle the discovery of extraterrestrial life with ease and which will struggle to assimilate this new knowledge about our place in the universe? Some religions as currently practiced appear to be viable only on Earth. Other religions could be practiced on distant worlds but nevertheless identify both Earth as a place and humankind as a species of singular spiritual religious importance, while some religions could be practiced equally well anywhere in the universe by any sentient beings. The author guides readers on an invigorating tour of the world's most widely practiced religions. It reveals what, if anything, each religion has to say about the possibility that extraterrestrial life exists and how, or if, a particular religion would work on other planets in distant parts of the universe.

*Soviet Space Dogs*, by Olesya Turkina, edited by Damon Murray and Stephen Sorrell (FUEL Publishing, September 2014). This book is dedicated to the dogs who were crucial to the success of the early Soviet space program. All of them formerly homeless on the Moscow streets, they fitted the necessary profile: small, robust, placid, and able to withstand the punishing preparations for spaceflight. They were also photogenic. On 3 November 1957, Laika was the first Earth-born creature into outer space, giving her instant global fame. Her death a few hours after launching was used to transform her into a symbol of patriotic sacrifice. Subsequent canine space travelers Belka and Strelka were the first to return alive and were immediately featured in children's books and cartoons. Images of the "Space Dogs" proliferated, reproduced on everyday goods across the Soviet Union: cigarette packets, sweet tins, badges, stamps, and postcards. This book uses these ephemeral items to illustrate the poignant tale of how the unassuming Soviet Space Dogs became legends.

*Soyuz Owners' Workshop Manual: 1967 Onwards (All Models)—An Insight into Russia's Flagship Spacecraft, from Moon Missions to the International Space Station*, by David Baker (Haynes Publishing, September 2014). This book tells the story of Soyuz from its origin as



successor to the Vostok-era capsules, which carried the first cosmonauts into space, to the Zond spacecraft, which aimed to send humans to the Moon and back, and the robotic Progress cargo-tanker vehicles, which replenish the International Space Station. Soyuz has proven to be the most versatile spacecraft ever built, serving many roles across five decades.

*Tracking Apollo to the Moon*, by Hamish Lindsay (soft-cover reprint of the original 2001 edition, Springer, September 2014). One of the wonderful aspects of the nation's human spaceflight programs was the opportunity for people around the globe to participate in one of humanity's greatest adventures. As NASA scientists laid out the groundwork for achieving a human spaceflight program, it was obvious that they would require extensive operations around the world. One of the most challenging features of this plan was to build a worldwide network of tracking stations to provide

communications with the orbiting spacecraft. Australia is located roughly 180 degrees longitude from the launch site, Cape Canaveral, and so occupied not only a unique position but a very critical one. Determining the position of the spacecraft as it traveled above the Australian continent was critical to determining the craft's orbit. Parameters for properly managing the entire operation, such as the time of retrofire (paramount to recovery of the crew) and the information required for signal acquisition at each of the tracking sites around the world, are but two examples.

*The History Program Office gives sincere thanks to volunteer Chris Gamble, who compiles this section for us every quarter. Please note that the descriptions have been derived by Chris from promotional material and do not represent an endorsement by NASA.*

## UPCOMING MEETINGS

---

The 19th Annual Space Exploration Educators Conference will take place on **5–7 February 2015** at Space Center Houston in Houston, Texas. Visit <http://spacecenter.org/education-programs/teacher-programs/teachers-seec/> for more details.

The 53rd Robert H. Goddard Memorial Symposium will be held **10–12 March 2015** in Greenbelt, Maryland. Visit <http://www.astronautical.org/goddard> for more details.

The 45th Lunar and Planetary Science Conference will be held **16–20 March 2015** in The Woodlands, Texas. Visit <http://www.hou.usra.edu/meetings/lpsc2015/> 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.



## OBITUARY: NOEL HINNERS (1935–2014)

Dr. Noel William Hinnners began his career by assisting in the selection of landing sites on the Moon for the Apollo program from 1963 to 1972 while working at Bellcomm, Inc. At NASA, he served as the Deputy Director of Lunar Programs (1972–74), Associate Administrator for Space Science (1974–79), Director of Goddard Space Flight Center (1982–87), and Associate Deputy Administrator and Chief Scientist (1987–89). Dr. Hinnners left NASA permanently in 1989 and went to Martin Marietta (later Lockheed Martin Space Systems), from which he eventually retired in 2002 as the vice president of flight systems with responsibilities including managing the company's involvement in NASA's Mars Surveyor Program, Mars Reconnaissance Orbiter, and Stardust

and Genesis Discovery missions. During a hiatus from NASA from 1979 to 1982, he served as the director of the Smithsonian Institution's National Air and Space Museum (1979–82) and was a member of the National Research Council Space Studies Board (1981–82).

Dr. Hinnners was born on 25 December 1935. He received his bachelor's degree in social science and agricultural research from Rutgers University (1958), a master's in geology from the California Institute of Technology (1960), and a Ph.D. in geochemistry from Princeton University (1963). He passed away on 5 September 2014.

### NASA HEADQUARTERS HISTORY PROGRAM OFFICE STAFF CONTACT INFORMATION:

<b>William Barry</b> Chief Historian	<i>bill.barry@nasa.gov</i> 202-358-0383
<b>Nadine Andreassen</b> Program Support Specialist	<i>nadine.j.andreassen@nasa.gov</i> 202-358-0087
<b>Colin Fries</b> Archivist	<i>cfries@mail.hq.nasa.gov</i> 202-358-0388
<b>Stephen Garber</b> Historian	<i>stephen.j.garber@nasa.gov</i> 202-358-0385
<b>John Hargenrader</b> Archivist	<i>jhargenr@mail.hq.nasa.gov</i> 202-358-0387

<b>Jane Odom</b> Chief Archivist	<i>jane.h.odom@nasa.gov</i> 202-358-0386
<b>Yvette Smith</b> Editor	<i>yvette.smith-1@nasa.gov</i> 202-358-5196
<b>Elizabeth Suckow</b> Archivist	<i>elizabeth.suckow-1@nasa.gov</i> 202-358-0375
<b>Amy Wallace</b> Intern	<i>amy.l.wallace@nasa.gov</i> 202-358-4495
<b>Nolan Lott</b> Intern	<i>nolan.j.lott@nasa.gov</i> 202-358-0893



**CREATED AND PRODUCED BY:**

Giny Cheong, Newsletter Editor

Lisa Jirousek, Editor

Lindsay Dirienzo, Graphic Designer

Tun Hla, Printing Specialist

Trenita Williams, Mail Coordinator

Carl Paul, Distribution

# JOIN THE NASA HISTORY PROGRAM OFFICE ONLINE ON OUR SOCIAL NETWORKS!



Get short, timely messages and stay updated on a wide variety of topics by following [@NASAHistory](https://twitter.com/NASAHistory) on Twitter.



Learn the history of NASA's exploration of the universe and its many discoveries about our home planet by liking the Facebook page at

<https://www.facebook.com/NASAHistoryOffice>.



Find our collection of great images from NASA history at NASA on the Commons on Flickr:

<https://www.flickr.com/photos/nasacommons>.



National Aeronautics and Space Administration

**NASA Headquarters**

300 E Street SW

Washington, DC 20546

[www.nasa.gov](http://www.nasa.gov)