

NEWS & NOTES

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FROM THE ACTING CHIEF HISTORIAN



To say that the last year presented many challenges might be the understatement of a lifetime. As we continued our work in the telework environment, we adjusted to new networking tools, limited access to our collections, and fresh approaches to public history in the virtual world. Despite a mountain of obstacles, we in the NASA History Division persisted and learned important lessons about ourselves and the perseverance of our teammates across the Agency.

In relation to COVID-19, things appear to be moving in a good direction. Fortunately, vaccination rates are climbing steadily, and with that, new cases of the virus continue to fall. At NASA, planning is under way to move our workforce back on-site where possible as overall occupancy caps are lifted as part of a phased reentry to our facilities. Planning is now under way to ensure that we can return in a manner that promotes the continued safety of our workforce.

If absence makes the heart grow fonder, we have certainly grown fond of our archival collections. Thankfully, we were able to continue limited research due to our lifeline of digital collections. I know I am ready to dive back into our paper documents and the 1960s, where I hope to glean important new insights into the early years of Gravity Probe B. How I have missed the world of spinning quartz spheres

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SKYLAB'S VIEW OF HURRICANE AVA

By Erin Doyle

On 25 May 1973, the first of three crewed missions to Skylab launched. The 28-day mission aboard America's first space station had many scientific goals. The astronauts conducted research through medical studies, solar astronomy, spacewalks, and Earth science experiments. One of the mission's goals was to determine the feasibility of using remote sensing techniques to measure global patterns of ocean surface wave conditions and surface wind fields. In an attempt to accomplish this goal, a search was conducted after the launch to locate a wind disturbance in Skylab's path. Researchers wanted as broad of a range of wind speeds as possible to test the equipment on board the station. A tropical storm was intensifying in the Pacific Ocean off the coast of Central and South America; it would soon become Hurricane Ava, and Skylab would pass over it on 6 June, just a few days away. Coincidentally, this would be the day the storm hit its peak Category 5 intensity.¹

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¹ Kumar Krishen, "The Significance of the S-193 Skylab Experiment Using Preliminary Data Evaluation," 1 March 1975, <https://ntrs.nasa.gov/citations/19760025535> (accessed 5 November 2021).

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NASA HISTORY DIVISION
OFFICE OF COMMUNICATIONS



From the Acting Chief Historian (continued)

plunged to cryogenic temperatures! Our appreciation for the work of archivists at NASA and across the world is surely at an all-time high.

As anyone in academia or public history can attest, COVID-19 did not prevent the welcomed arrival of new projects and opportunities. One important collaboration is the development of the NASA–National Air and Space Museum Space Policy and History Forum. We are working with Bhavya Lal, NASA Senior Advisor, and Teasel Muir-Harmony, curator of the Apollo collection at the Smithsonian Institution’s National Air and Space Museum and author of the recent *Operation Moonglow: A Political History of Project Apollo*. The first session of this forum, on 7 July 2021 starting at 4:30 p.m. ET, was a virtual panel discussion on orbital debris; panelists included Lisa Ruth Rand, Jonathan McDowell, and Gabriel Swiney. Bhavya Lal served as moderator.

Another major initiative is planning for a symposium on the topic of “NASA and the Environment” set for late 2022. This event will examine NASA’s efforts in the field of Earth science, its overall impact on local and planetary environments, and much more. The office expects a midsummer call for papers for this event. Please reach out if you have questions or ideas. This event is part of our efforts at NASA History to engage with the larger academic communities and expand the historical context for current and future efforts to explore the issue of climate change.

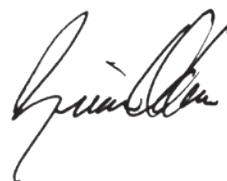
Finally, our efforts to build a stronger, more integrated History and Archival program at the Agency continue with the Mission Support Future Architecture

Program (MAP) process. Our hope is that these efforts will result in the creation of a baseline service capable of capturing and preserving the evidence of NASA’s work, enabling the examination and dissemination of our history, and stimulating new research through collaboration with the external space history community. Our acting Chief Archivist, Holly McIntyre, continues to develop the modern archival tools capable of tying our robust but disunited archival collections together. The return of Steve Garber from his yearlong detail brings his years of rich experience and acute expertise back to the team.

We move forward with the hope that we have turned a corner on a devastating pandemic, prepared ourselves to take on new programs and projects, and positioned the History

and Archive program for success as we return to our Centers and all those lonely, treasure-filled Hollinger boxes. With our new virtual tools firmly implanted in our work, the thought of a new hybrid world increasingly feels more like a safe, inventive place to land.

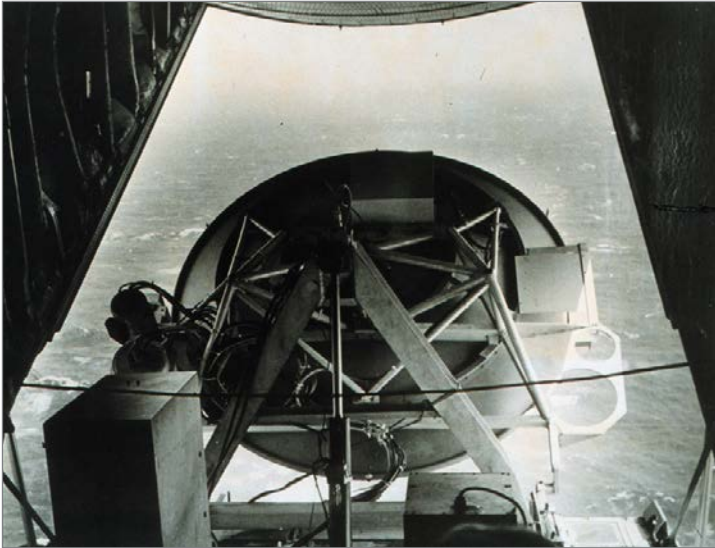
Stay safe,



Brian C. Odom
Acting Chief Historian

“AS ANYONE IN ACADEMIA OR PUBLIC HISTORY CAN ATTEST, COVID-19 DID NOT PREVENT THE WELCOMED ARRIVAL OF NEW PROJECTS AND OPPORTUNITIES.”



Skylab's View of Hurricane Ava (continued)

A microwave antenna deployed from the back end of a C-130 aircraft measures surface wind speeds and wave height. (Photo credit: National Oceanic and Atmospheric Administration)

Cross-agency research was conducted on Ava, with NASA, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Air Force all involved. In order to verify the estimates made through remote sensing techniques from Skylab, NOAA flew a research aircraft through the storm's eyewall to collect wind speeds. These were then compared to the instrument data from Skylab to determine the accuracy of Skylab's instruments. This was the first time NOAA had flown inside a Pacific hurricane. The aircraft was able to capture the rapid increase in wind speeds as it approached the eye of the storm. Over a 2-mile flight distance, taking only 37 seconds of flight time, the wind speeds went from 90 to 137 knots (104 to 158 miles per hour). In other words, Category 2 hurricane-strength winds to Category 5—strength winds. Instruments aboard Skylab and the NOAA aircraft were also able to measure wave heights of 40 feet, the first hurricane wave heights to be measured by remote sensors.² Astronauts on Skylab described the hurricane as being so large that it took up the entire window, obscuring anything below the clouds. Aboard

the station, astronaut Joseph F. Kerwin said that Ava looked “like an artist’s description of a hurricane. It looks like an enormous spiral.” The astronauts took photographs from inside the station showing the view of the hurricane through the window.³

After Hurricane Ava’s peak intensity, it intersected Skylab’s path on 6 June. Ava then gradually deteriorated over the next six days and would stay out at sea, never making landfall. Despite its unprecedented strength, the storm resulted in zero reported fatalities and no reported damages. Outside of the scientific research, the hurricane’s intensity broke records and became the strongest Pacific hurricane on record;

today it ranks at number five. Ava’s minimum pressure was 915 millibars as a Category 4 storm. However, the



Hurricane Ava as captured by a Skylab astronaut. The eyewall can be seen as an indentation of clouds in the upper left corner of the photograph. (Photo credit: NASA)

2 Robert A. Baum, “Eastern North Pacific Hurricane Season of 1973,” *Monthly Weather Review* 102, no. 4 (1 April 1974): 296–306, [https://doi.org/10.1175/1520-0493\(1974\)102<0296:ENPHSO>2.0.CO;2](https://doi.org/10.1175/1520-0493(1974)102<0296:ENPHSO>2.0.CO;2) (accessed 5 November 2021).

3 “First Hurricane,” *Desert Sun* (9 June 1973).

pressure record for Ava is not complete by today's standards. The only recorded pressure during its 24 hours as a Category 5 storm is 928 millibars. With this gap in data, the exact strength of the hurricane compared to other Pacific hurricanes cannot be determined with certainty.



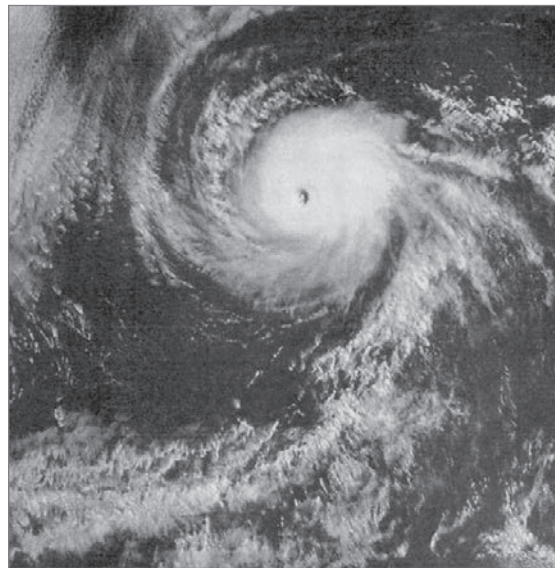
THE AIRCRAFT WAS ABLE TO CAPTURE THE RAPID INCREASE IN WIND SPEEDS AS IT APPROACHED THE EYE OF THE STORM.



The data collected on board Skylab marks the first time remote sensing was used to study a hurricane in such a comprehensive manner. This was done primarily with two instruments: the radiometer, which measures the intensity of electromagnetic radiation, and the scatterometer, which measures the portion of microwaves scattered, or the roughness. It does this by sending out a beam and calculating the scattering from the amount of the beam it receives back.⁴ Early analysis showed that the radiometer and scatterometer on Skylab “can be used to measure wind speeds up to 48 knots.” While those instruments were not capable of measuring the severity of Ava’s winds, researchers gained insights on the limitations of remote sensing and how it could be improved in the future. Based on the Skylab experiments, researchers made recommendations on how the instruments could be modified to increase the range of wind speeds measurable by remote sensing, and these helped to design the next generation of weather satellites and Earth observation systems.

The NOAA-2 satellite was also directly above the storm at peak intensity. Orbiting 630 miles above Skylab, the satellite was also able to take photos showing the storm and spectacularly defined eyewall.

As a result of the collaborative research between NASA, NOAA, and the U.S. Air Force, Ava was the most comprehensively studied hurricane using remote sensing at the time. Data collected from the storm were used in studies in the years that followed, including one which proved Nimbus-5’s ability to “delineate rain areas and provide semi-quantitative rainfall rates” for oceanic cyclones. The research conducted provided foundations for further science and more precise methods of measuring wind speed and direction as well as wave heights.⁵ Knowledge of these variables allows for better weather forecasting models that provide better forecasting for coastal zones and benefit global shipping routes and offshore platforms.



This view of Hurricane Ava was taken by Nimbus-5 on 6 June 1973. (Photo credit: Baum et al., 1973)

4 NASA Earth Observatory, “Remote Sensing,” *NASA Earth Observatory*, 17 September 1999, https://earthobservatory.nasa.gov/features/RemoteSensing/remote_08.php (accessed 5 November 2021).

5 Lewis J. Allison, Edward B. Rodgers, Thomas T. Wilheit, and Robert W. Fett, “Tropical Cyclone Rainfall as Measured by the Nimbus 5 Electrically Scanning Microwave Radiometer,” *Bulletin of the American Meteorological Society* 55, no. 9 (1 September 1974): 1074–1090, [https://doi.org/10.1175/1520-0477\(1974\)055<1074:TCRAMB>2.0.CO;2](https://doi.org/10.1175/1520-0477(1974)055<1074:TCRAMB>2.0.CO;2) (accessed 5 November 2021).

NEWS FROM HEADQUARTERS AND THE CENTERS

JOHNSON SPACE CENTER (JSC)

Houston, TX

By John Uri

Environmental History of NASA's Johnson Space Center

NASA's Johnson Space Center sits on the ancestral lands of the Karankawa and Akokisa Native American people. For hundreds, if not thousands, of years, they enjoyed the natural bounty afforded them by one of the most diverse ecosystems in the United States—the Texas coastal prairie. Once comprising over 6.5 million acres from south Texas into Louisiana, less than 65,000 acres, or less than 1 percent, remains, and much of that is under threat. The prairie's plant population that still covers parts of JSC has high conservation value and represents an important regional ecosystem element in need of conservation. The prairie provides habitat for insects that in turn are a food source for native and migratory birds that make their first stop after crossing the Gulf of Mexico along the Central Flyway from Central and South America. Loss of the critical prairie habitat would have ripple effects across hundreds of species.

Early European explorers and settlers reported that the now-extinct Karankawa people periodically set large fires for hunting and to fend off mosquitos. The fires had the effect of suppressing woody vegetation and kept the prairie open and free of brush and trees. European settlers arrived in large numbers in the late 1700s and early 1800s, bringing horses and cattle that, through their grazing, kept the prairie open. In 1832, Stephen F. Austin secured a land grant on the north shore of what

is now Clear Lake, adjacent to where JSC sits today, establishing Anglo-American ownership in the area. For many decades, the owners used the land to raise cattle, unknowingly maintaining the historical open prairie ecosystem.

In 1903, at the invitation of the Houston Chamber of Commerce, Seito Saibara, an authority on agriculture and president of Doshisha University in Kyoto, arrived from Japan and settled in Webster, Texas, near the current site of JSC, to teach rice farming. He and his family planted a variety of Japanese rice on land that later became JSC. Linear ditches, swells, roadways, and dikes to help direct the flow of irrigating water over rice crops altered parts of the prairie ecosystem, although much of the land remained in its historic condition well into the 20th century. By 1920, the land belonged to wealthy cattleman James "Silver Dollar" West, who ran a 30,000-acre ranch on which he built a 17,000-square-foot mansion that stood until 2019. Upon discovery of oil on the property, West sold the land to the Humble Oil Company. In 1962, Humble donated the land to Rice University, which in turn transferred 1,000 of the 1,600-acre tract



This map of the Texas Gulf Coast shows the historic distribution of the coastal prairie ecosystem. The inset shows the greater Houston metropolitan area and the location of Johnson Space Center. (Image courtesy of NASA/Matthew Strausser)



Left: Planting time on a Japanese rice farm near Houston, in the area around where JSC sits today. (Image courtesy of NASA/Matthew Strausser) Right: Cattle on the site of what became the Manned Spacecraft Center, now JSC. (Photo credit: NASA)

to the federal government to build NASA's Manned Spacecraft Center, now JSC.

Construction of the Center and the adjacent communities, businesses, roads, and other infrastructure caused significant disruption to the coastal prairie ecosystem. Over 22,000 acres of the remaining land that the Humble Oil Company held became part of the Friendswood Development Company, which rapidly urbanized the land around the space center. In 1968, fewer than 4,000 people lived in the Clear Lake City community north of the Center. By 1970, that number had doubled, and doubled again by 1974. Today, the population of the area surrounding JSC numbers

around 150,000. The exponential urban growth in the area consumed ranches, paved over coastal prairie, and drained nearby wetlands. Native and non-native trees planted in the bedroom communities significantly increased forested areas where prairie once stood. With the expanding urbanization, the wildlife habitat around JSC became divided, isolated, and fragmented. Wildlife populations that once traveled freely across fenced pastures and moved between isolated stands of trees found themselves restricted for the first time.

Despite the urbanization around the Center, coastal prairie still occupies the largest portion of JSC's area, about 750 of the Center's 1,600 acres. However, many



Left: The Manned Spacecraft Center, now Johnson Space Center, is shown under construction in 1962, with undeveloped open prairie visible to the north of the Center, a grove of pecan trees at left, and a stand of oaks at right near the James West mansion. (Photo credit: NASA) Right: Roughly the same view of JSC in 2015, showing extensive urbanization, expanded tree cover, and significant loss of prairie habitat. (Photo credit: NASA)





Three aerial views of Johnson Space Center. Left: Aerial view from 1944 showing extensive native coastal prairie, with a small stand of trees in the north. Middle: A 2010 aerial view, showing the paved-over areas and additional forested sections mostly by invasive species, with the 1944 tree cover areas shown in orange. Right: Color-coded map, with green representing remaining coastal prairie habitat; red representing built-up areas such as buildings, roads, and parking lots; and blue representing areas of invasive species. (Image credit: Images courtesy of NASA/Matthew Strausser)

of the original native grasses are no longer present, likely as a result of overgrazing during the cattle ranching days. Other invasive species, such as Chinese tallow and Johnson grass, have made significant inroads onto the JSC property. In terms of wildlife conservation, JSC provides an important semi-natural area on multiple scales. On the facility level, the wildlife benefits those who work on and visit the Center. On the landscape scale, JSC represents one of the few unurbanized and semi-natural areas in southeast Harris County. On the regional level, JSC retains a significant part of the last 1 percent of Texas coastal prairie left in the world and is an important element in preserving the natural and cultural history of the area. On the global level, JSC plays host to a number of grassland and migratory birds whose annual migrations bring them to the Center from across the Western Hemisphere.

The remaining prairie is critical for these birds as their first rest and feeding stop after crossing the Gulf of Mexico along the Central Flyway. The JSC Wildlife Management Plan provides a framework for the maintenance of the coastal prairie ecosystem to allow native and migratory species to thrive and to prevent the spread of invasive species. For example, mowing and judicious use of herbicides are the most effective methods for reducing non-native plants, especially trees and shrubs.

With special thanks to JSC wildlife biologist Matthew Strausser for providing information and images for this article. For more information about JSC's wildlife management projects, please visit JSC Wildlife 101 at <https://centerops.jsc.nasa.gov/blog/2020/12/jsc-wildlife-101/>.



**ON THE LANDSCAPE SCALE,
JSC REPRESENTS ONE OF
THE FEW UNURBANIZED AND
SEMI-NATURAL AREAS IN
SOUTHEAST HARRIS COUNTY.**



MARSHALL SPACE FLIGHT CENTER

By Brian Odom

The world of COVID-19 brought many drastic changes to our job structures as archivists and historians. For Marshall, mandatory telework status began on 13 March 2020 as the Center moved to Stage 3 of our Agency's response framework. During that time, access to the Center was restricted to "mission-essential personnel only." On 27 March, Marshall Center Director Jody Singer announced that the Center would be

moving to Stage 4 of the response framework, calling for *all* employees to move to telework status. Singer also called for an orderly transition of buildings, operations, and hardware to a “safe condition” until on-site work could safely resume.

including the Army’s Redstone, the Saturn I and IB vehicle booster stages, and the F-1 engine for the Saturn V. Later modifications to the stand enabled it to support testing associated with the Space Shuttle and Ares programs.

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”**

Much of the work over the past months involved Jordan Whetstone, the Marshall Archivist, carefully packing the entire archival collections for the move to our new home. Jordan has done an exceptional job. Currently, preparations are still under way to move the collections, restore our research capability, and get back to the business of exploring the Center’s important history.

A situation we all hoped would last only weeks dragged on for more than a year and, along the way, transformed nearly every aspect of our work environment. Virtual meeting tools originally intended as a supplement to our daily work became our lifelines to our teammates. The increasing constraints of our new work environment forced us to adapt almost every aspect of our work as we continued to support NASA leadership, respond to reference requests, and proactively capture the history of continuing important work at the Center from the Space Launch System to the Imagine X-ray Polarimetry Explorer (IXPE).

The past year has taught us a myriad of valuable lessons. Environment and infrastructure must be imperative considerations in our efforts to modernize the history and archival function at the Agency. Our important archival collections necessitate controlled temperature and humidity along with a delicate balance of access and preservation. Strategic decision-making and a high degree of imaginative thinking are necessary if our programs are to successfully preserve our past, capture our present, and plan for our future. The year 2020 was proof that no amount of imaginative thinking can ever encompass every conceivable instance. However, our successful navigation of those obstacles provides us with an increased confidence that we are on the right track.

During this transition, we also discovered that we would be moving our entire Marshall archives. This came about when our previous home since the 1980s, building 4200, was scheduled for decommissioning due to safety and environmental issues. While moving felt like bad news, the opportunity to build our new home in the historic Marshall East Test Area blockhouse felt like a more than appropriate solution. Originally built in 1957 and utilized in conjunction with the Propulsion and Structural Test Facility, this blockhouse supported the testing of programs

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GLENN DOCUMENTED POLLUTANTS IN AIR LANES

By Bob Arrighi



Pictured is the Convair F-106B Delta Dart with air-sampling equipment. (Photo credit: NASA)

Most of the national concern regarding aircraft emissions in the late 1960s and early 1970s focused on smog and the low-altitude pollution that directly affected daily life. With ever-increasing air traffic and the prospect of supersonic transport aircraft, however, it became evident that the effects of aircraft emissions at higher altitudes required greater attention. There was particular concern regarding nitrogen oxides (NO_x), which produced ozone in the upper atmosphere and lower troposphere.

Studies, such as the massive Climate Impact Assessment Program, were undertaken, but there remained a dearth of data on the actual contaminant concentrations at these altitudes. Such an investigation would require a universal approach.

In 1972, NASA's Lewis Research Center (today, NASA Glenn) established the Global Air Sampling Program (GASP). The multiyear program utilized four commercial airliners to collect atmospheric information while flying their normal routes.

GASP was led by Lewis veteran Porter Perkins, who, in the late 1940s, had persuaded airline companies to perform in-flight collection of water droplets for the National Advisory Committee for Aeronautics' (NACA's) icing research program. A new Combustion and Pollution Research Branch was established in the Airbreathing Engines Division to manage the overall GASP program and to develop and calibrate the equipment.



THE MULTIYEAR PROGRAM UTILIZED FOUR COMMERCIAL AIRLINERS TO COLLECT ATMOSPHERIC INFORMATION WHILE FLYING THEIR NORMAL ROUTES.



In 1972, Lewis worked with United Airlines to verify the plausibility of such an effort. Boeing's new 747s were selected for the program because of the advanced instrumentation and extra space afforded by their wide bodies. The GASP system was designed so that it did not occupy passenger space, necessitate major maintenance, or interfere with normal operation of the aircraft.

Lewis engineers modified several commercial instruments to measure ozone, water vapor, carbon dioxide, and nitrogen oxide. Ten of these devices were flight-tested on Ames Research Center's CV-990 in November 1972. Four were selected for the program, with additional fluorocarbon samplers introduced later. Meanwhile, Lewis engineers developed a collector to gather suspended particles in filters for further analysis. The collector was flight-tested on board Lewis's F-106B Delta Dart in the summer of 1973.

The GASP system automatically took readings every five minutes once the 747s reached normal cruising altitudes between 20,000 and 40,000 feet. Air flowed into two tubes jutting from the front of the aircraft to the particle collector and the gas analyzers. The system did not require any attention from the pilots or crew.

Lewis strove to make the GASP program a truly global endeavor. The four 747s equipped with GASP systems

were flown by United Airlines across the United States, including Hawaii; by Pan Am on its many international routes, including South America; and by Qantas throughout Asia, Europe, and the Pacific. The majority of the GASP data was gathered in the Northern Hemisphere, which experienced the most airline traffic and industrial activity.

NASA researchers received data from unexpected regions in October 1977, when Pan Am conducted a special round-the-world flight to mark the company's 50th anniversary. With much fanfare, a new, modified 747SP flew over both poles during the 54-hour journey. Receiving lesser attention was the fact that the unique flight was also recording atmospheric data for NASA.

NASA employed its CV-100 and F-106B aircraft to augment the airline data with additional sampling over the Southwest and Great Lakes regions. In the summer of 1977, the F-106B also conducted a 3,000-mile, nine-day sampling mission over Alaska.

The airline companies swapped out the GASP data tapes and filters when the 747s paused for routine maintenance. Erwin Lezberg led a team at Lewis that performed the data reduction and preliminary analysis. They synched the raw data with meteorological and aircraft performance information. Lezberg's group authored initial reports highlighting the availability of the GASP statistics for NASA contractors and the National Oceanic and Atmospheric Administration. The final data were then permanently stored at the National Climatic Center, the world's largest active archive of weather data.

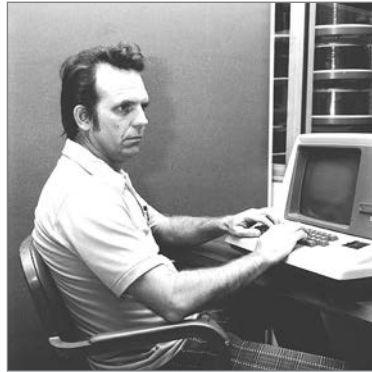
The GASP flights produced the first atmospheric analysis for many geographical areas, improved the existing data for other regions, and substantially enhanced previous weather balloon and ground station recordings. Researchers have used the GASP database over the years for a variety of studies and analysis.



EARTH RESOURCES LABORATORY

By Jessica Herr

On 9 September 1970, NASA established the Earth Resources Laboratory (ERL) at what was then the Mississippi Test Facility (MTF), now Stennis Space Center (SSC). Robert Piland, the Deputy Director of Science and Applications at the Manned Spacecraft Center in Houston, was selected to head the new laboratory. ERL researched applications of remote sensing techniques. It also provided valuable information for the seafood, forestry, and agriculture industries through data generated by aircraft flown from both Houston and Stennis Airport in conjunction with images from satellites and Skylab. The then-Director of MTF, Jackson Balch, was building MTF into a multi-agency facility after the Apollo program ended and was excited to have a big piece of



Alabama native Ronnie Pearson, a mathematician in the National Space Technology Laboratories' Earth Resources Laboratory, designed most of the Earth Resources Laboratory Applications Software, the Laboratory's basic software package. (Photo credit: NASA)

his "environmental Center" come to MTF. The ERL's establishment at MTF marked the beginning of a state-of-the-art environmental research facility on the Mississippi Gulf Coast. Balch began developing a consortium of environmental management. With ERL as the backbone, other agencies joined in the consortium, including the Department of the Interior's United States Geological Survey (USGS) and Earth Resources Observation Systems (EROS) regional office, NOAA's National Data Buoy Program Office, the Remote Sensing Engineering Development Office, the Experimental Field Test and Integration Center, the National Oceanographic Instrument Center, and the EPA's National Pesticide Monitoring Laboratory.

UPCOMING MEETINGS

The 2022 American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum will be held virtually and in San Diego, California, **3–7 January 2022**. Visit <https://scitech.aiaa.org> for details.

The American Astronautical Society's annual Goddard Memorial Symposium will be held virtually and in Greenbelt, Maryland, **16–18 March 2022**. Visit <https://astronautical.org/events/goddard> for more details.

The annual meeting of the National Council on Public History will be held in Montreal, Quebec, Canada, **23–27 March 2022**. Visit <https://www.ncph.org> for more details.

The annual Spring Meetings of the International Astronautical Federation will be held in Paris, France, **29–31 March 2022**. Visit <http://www.iafastro.org> for more details.

The annual meeting of the Organization of American Historians will be held virtually and in Boston, Massachusetts, **31 March–3 April 2022**. Visit <https://www.oah.org> for more details.

THE REMEMBERED ASTRONAUT

By Catherine Baldwin



John Young and Michael Collins after the Gemini X spaceflight. (Photo credit: NASA)

Michael Collins was born on 31 October 1930 in Rome, Italy. Like many children of that era, Michael became interested in spaceflight through science fiction. The adventures of Buck Rogers and Flash Gordon, paired with his schoolwork on the solar system, sparked in young Michael an aspiration to visit Mars. After receiving his bachelor of science degree from West Point in 1952, Collins chose to pursue an Air Force career. He described his trajectory post-West Point as “stair-step.” He said during an oral history in 1997, “When I graduated from the military academy, there was no Air Force Academy, but we had a choice of going into the Army or the Air Force. The Air Force seemed like a more interesting choice. Then the question was to fly or not to fly. I decided to fly. To fly

little planes or big ones? I became a fighter pilot. To keep flying the same or new ones? I became a test pilot. And so, you see I’ve stair-stepped up through five or six increments then, and it was a simple, logical thing to go on to the next increment, which was higher and faster, and become an astronaut rather than a test pilot. So that’s how it happened.”¹

As an experimental flight-test officer at Edwards Air Force Base, he tested Air Force aircraft for performance and stability. While at Edwards, he heard about NASA’s search for test pilots. He applied for the second astronaut group (the New Nine) and was not selected. Knowing the difficulty of some of the physical and mental tests astronaut candidates had to endure, he began to prepare. He would run up a nearby steep hillside as training for the treadmill tests, brushed up on his astronomy and space science, and kept up to date with aviation and space news. He applied again and was selected as an astronaut in 1963, as part of the third astronaut class (the Fourteen). He and his family moved to Houston so that he could begin astronaut training. His primary responsibilities in Houston included working on extravehicular operations and the development of spacesuits.

After serving as the backup pilot for Gemini VII, he made his first venture into space on 18 July 1966 as the pilot for the Gemini X mission. Collins and command pilot John Young successfully rendezvoused with two separate targets and set a new altitude record for human spaceflight. Collins also performed two spacewalks. On the first, he photographed stars in ultraviolet light, a feat possible only above Earth’s atmosphere. On the second, he retrieved an experiment package from the side of another spacecraft, the Gemini VIII Agena. This mission was an important stepping-stone for NASA on the way to the Moon.

¹ Michael Collins, oral history interview conducted by Michelle Kelly, Houston, TX, 8 October 1997, https://historycollection.jsc.nasa.gov/JSCHistoryPortal/history/oral_histories/CollinsM/MC_10-8-97.pdf (accessed 18 November 2021).



CMP Michael Collins practicing in the Command Module simulator on 19 June 1969 at Kennedy Space Center. (Photo credit: NASA)

Collins's selection for the Apollo 11 crew was anything but linear. He was originally slated to fly on Apollo 8, but a loose disc in his back grounded him for a few months. So instead, he served as CAPCOM for that flight and was later chosen for the crew of Apollo 11.

Even while training, Collins was aware of the far-reaching importance of the first human Moon landing. "It was of some importance to people in virtually every little corner of the globe, and I felt that very keenly, and I felt that in a negative sense as well as a positive. The negative was, hey, don't screw it up. I mean, I felt a tremendous feeling of, you know, I could make some stupid little mistake and just make the whole program look ridiculous in the eyes of the whole globe. So I felt a heightened feeling of responsibility and worry because of the responsibility."²

As the Command Module Pilot (CMP), Collins spent many hours training on his own as Neil Armstrong and Edwin "Buzz" Aldrin trained for their tasks on the lunar surface. He remained in the Command Module for the duration of

the mission, orbiting the Moon alone while Armstrong and Aldrin spent time on the lunar surface. The CMP is integral to the safe return of the mission, but the importance of this role often eludes the public, with many people referring to Collins as the "loneliest man in history." Fondly referring to the Command Module as his "happy little home," Collins pushed back on the idea that he was lonely or that he had somehow drawn a short straw as the CMP.

After Collins left NASA in 1970, he spent a year as the Assistant Secretary of State for Public Affairs for the Department of State. Then, in 1971, he joined the Smithsonian Institution as the third director of the National Air and Space Museum. The museum saw great change under Collins's seven-year tenure. He worked tirelessly to ensure that there would be a National Air and Space Museum on the National Mall, overseeing the planning and the construction of the new museum building. The building opened to the public in 1976, a few days ahead of schedule and below its budgeted cost. In 1978, he left the National Air and Space Museum to become the Under Secretary of the Smithsonian Institution, a role he held until 1980. Collins wrote a number of books, the most famous of which, *Carrying the Fire* (1974), chronicles his time at NASA.



Michael Collins in front of the Lunar Module at the National Air and Space Museum. (Photo credit: National Air and Space Museum)

Michael Collins passed away on 28 April 2021. As the news of his passing spread around the world, social media began to light up with tributes, not just to the heroic astronaut of Apollo 11, but to the man. His humor and his kindness were extolled in the same breath as his achievements. As we continue to mourn his passing, we remember the man who inspired the next generation of space lovers and who was a beloved father and grandfather. His legacy lives on, and he will not be forgotten.

² Ibid.

OBITUARY: HENRY “HARRY” MCDONALD



Dr. Henry “Harry” McDonald, NASA Ames Director (1996–2002), photo taken 25 May 1999. (Photo credit: NASA/Dominic Hart)

At the end of May this year, we learned of the passing of former Ames Research Center Director Henry “Harry” McDonald on 25 May. McDonald was the eighth Center Director, serving from 1996 to 2002.

During his tenure, McDonald led Ames as the Center emerged from one of the most tumultuous periods in the Center’s history, following a zero base review that had been initiated by Administrator Daniel Goldin following budget cuts. In spite of how fraught the time was leading up to McDonald’s arrival, under his leadership, the Center flourished. Ames emerged as the Agency’s Center of Excellence in Information Technology, took the lead in developing the field of

astrobiology at NASA, and founded NASA Research Park, which created multiple partnerships of enduring strategic importance.

McDonald was a native of Scotland and earned his bachelor’s and doctoral degrees in engineering from the University of Glasgow. In the United States, McDonald would become the head of the gas dynamics group at United Technologies Research Center in Hartford, Connecticut. He then went on to found Scientific Research Associates and later moved on to Pennsylvania State University, where he served as the assistant director of computational sciences and as a professor of mechanical engineering at the Applied Research Laboratory. McDonald brought to Ames those decades of experience in both academia and industry. People at Ames knew and respected his work even before he arrived.

In a message to the Ames workforce, Center Director Eugene Tu noted that McDonald had been instrumental in his own career development and that McDonald had selected Tu for key opportunities to lead the High-Performance Computing and

Communications and Information Technology programs. Tu wrote, “I’ve tried to carry on his inestimable legacy at the helm of NASA Ames. I will always be indebted to Harry for his leadership, mentorship, and friendship during the time he served as our center director and in the years since.”

A posting on the website for Craft Funeral Home in Erdenheim, Pennsylvania, indicates that in lieu of flowers, contributions may be made in McDonald’s name to the American Alumni of Glasgow University, 183 Wolf Harbour Road, Milford, CT 06461-1961.

McDonald’s tenure is covered in the most recent edition of [Atmosphere of Freedom](#) on pages 30–35.

CORRECTING THE JOHN GLENN “SEVEN-ORBIT” MYTH

By Rick Booth, Guernsey County, Ohio, Historian

On 20 February 1962, astronaut John H. Glenn, Jr., became the first American to orbit Earth. He flew what the entire world regarded as a completely successful preplanned three-orbit mission. American television viewers knew in advance that the goal of the flight of Friendship 7 was to achieve three circuits around the globe. They breathed a collective sigh of relief after each successive orbit was authorized as a “go,” plus a final grand exhalation when Glenn splashed down on time and on target within sight of one of his assigned recovery ships, the destroyer Noa. Why, then, do the majority of Americans who think they know the story of John Glenn’s flight today believe that his mission was cut short after “only” three orbits, four orbits short of the flight’s original seven-orbit goal? It all has to do with a faulty sensor in Glenn’s capsule and, arguably, the most misleading quotation in NASA’s history: “You have a ‘Go,’ at least seven orbits.”

“

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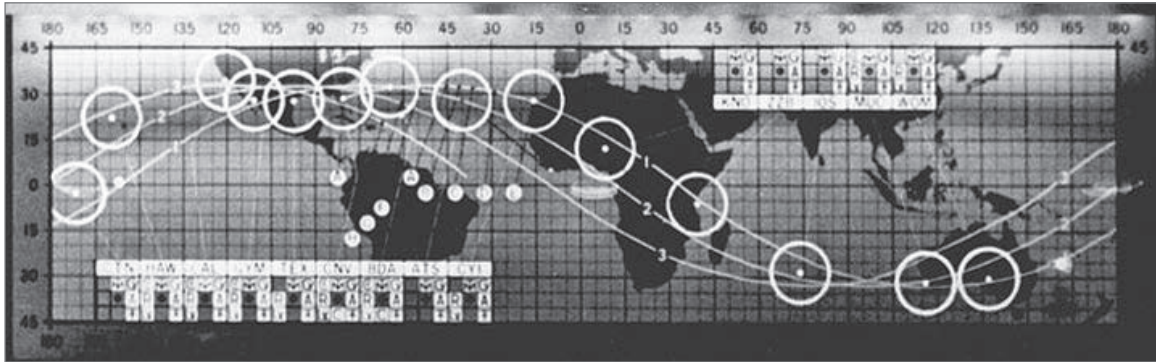
Just 26 seconds after sustainer engine cutoff, when Glenn first went into a weightless state in orbit, he received the “‘go’ for seven” call. It did not, however, mean that the mission’s goal had been changed to be seven orbits. Rather, it reflected a call made by computer, based on tracking data, indicating that the flight trajectory of Friendship 7 would not decay into



John Glenn and Friendship 7. (Photo credit: NASA)

an atmospheric reentry in fewer than seven orbits. As such, it was simply a green-light call saying that three orbits could definitely be achieved, with even more available in case of some extremely unlikely and terrible emergency. The same seven-orbit safety calculation—apparently the output of a “canned” computer program designed to rapidly check the first seven orbits and no more—was made for all subsequent Project Mercury flights as well. This rapid check was necessary within the first few seconds of orbital insertion to decide if an immediate abort was needed. A decision made quickly enough could then still bring the capsule down in the Atlantic Ocean if it appeared that not even a single orbit was guaranteed.

Later in the flight, a faulty sensor sent a signal indicating that the heat shield on the capsule might have become accidentally detached. This resulted in the



The Mercury Control three-orbit wall map used to track the flight of Friendship 7. (Photo credit: NASA)

well-known story of the decision to keep the retro-rocket package attached to the capsule during reentry to hold the heat shield in place until air pressure alone could stabilize it.

During pre-splashdown live flight news coverage that day, the general public was not made aware of the “go’ for seven” call at all, nor the heat shield problem. The heat shield scare was revealed to the press in post-flight briefings and only hit the newspapers the next day. The “go’ for seven” call remained not widely known of for much longer—until NASA released a documentary film entitled *Friendship 7* two or three months after the flight. Likewise, the blessing Scott Carpenter gave to the flight, “Godspeed, John Glenn,” was first heard by the general public in this same film. It had been found on a Cape Canaveral blockhouse recording that had not been broadcast and that Glenn himself had not heard on the day of the flight.

When the hour-long *Friendship 7* film was released, the complete three-orbit success of John Glenn’s flight was still fresh in America’s mind. When the film included audio of the “go’ for seven” call without further explanation of its meaning, it stood out as a peculiar statement at the time, but it was clear from its context in the film, as well as in collective social memory, that it was not a statement of the mission’s goal. Left unexplained, it just seemed puzzling to the casual film viewer in 1962.

About a decade later, however, NASA released another film recapping the achievements of Projects Mercury, Gemini, and Apollo, in which “go’ for seven” was repeated with no context indicating the true original three-orbit goal. Indeed, the editing of this retrospective film accidentally seems to imply that a seven-orbit mission had been flown since no mention was made of the fact that the mission ended after three orbits.

In subsequent years, popular books and films quite systematically began to get the story of the flight of Friendship 7 wrong, declaring it a seven-orbit mission, ended early after just three orbits due to the heat shield problem. Writers and filmmakers, puzzled by the discrepancy between the known three orbits and the “go’ for seven” call, seized upon the heat shield problem as the apparent reason for ending the flight early. Tom Wolfe’s 1979 book *The Right Stuff* did not make the mistake, but the film version in 1983 did. When John Glenn returned to space in 1998, *PBS Newshour* and ABC’s *20/20*, among others, repeated the aborted-mission myth, as did *Newsweek* in print.

Just days after John Glenn died in December 2016, the highly acclaimed movie *Hidden Figures* was released. Both the film and the book on which it was based claimed the flight of Friendship 7 was cut short by the heat shield problem. Indeed, in an on-screen written epilogue, the film told its viewers, “John Glenn successfully completed three of a scheduled seven orbit flight.”

Usually, great and heroic events, like fish stories, tend to get bigger and grander with repeated retellings over time. Unfortunately, the retelling of John Glenn’s flight of Friendship 7 represents a rare case of a heroic success story heading in the opposite direction. The truth is that on 20 February 1962, America and the entire world reveled in the complete success of John Glenn’s three orbits around the world. It is only due to wide, unexplained repetition of the “go’ for seven” clip, combined with an assumed heat shield rationale for aborting the flight short of its original goal, that the flight of Friendship 7 is today usually described in popular culture as a “relatively successful partial failure.”

This year, 18 July 2021 marked the 100th anniversary of the birth of America’s first orbital astronaut, John H. Glenn, Jr., in Cambridge, Ohio. A large celebration took place in both the town of his birth and in

“
**THE MOON HAD SUDDENLY
 COME WITHIN REACH.**
 ”

nearby New Concord, where he grew up. As a part of the two-community commemoration, the planners got the word out that they still remember the flight of Friendship 7 as a complete, unmitigated success there and would like for the rest of the world to once again fully remember what a wonderfully good, completely successful day 20 February 1962 was for all the world. Lest we forget, John Glenn landed on time and on target after three orbits of Earth that day. The world watched as America came roaring back into the space race based on that success. The Moon had suddenly come within reach.

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OTHER AEROSPACE HISTORY NEWS

AMERICAN ASTRONAUTICAL SOCIETY (AAS) HISTORY COMMITTEE

By Michael Ciancone, Chair

2020 Emme Award for Astronautical Literature

The Emme Award, named for NASA's first historian, Eugene M. Emme, recognizes outstanding books that advance public understanding of astronautics based on originality, scholarship, and readability. The Emme Award Panel, chaired by Dr. Don Elder, is in the process of reviewing submitted titles. Other members of the Panel are Dr. Rick Sturdevant, Dr. Jennifer Levasseur, and Dr. De Witt Kilgore.

The Panel has begun receiving nominated titles for consideration over the summer and will announce their selection(s) in late 2021.

International Academy of Astronautics (IAA) History Series

The series editor, Dr. Rick Sturdevant, reports that Bob Jacobs has all the materials in hand for IAC (International Astronautical Congress) 2018 (Bremen, Volume Editor: Hannes Mayer) and IAC 2019 (Washington, DC, Volume Editor: Oti Liepack). His intent is to complete the 2018 volume this summer and the 2019 volume by the end of the year.

Membership Updates

- Steve Doyle has stepped down after 30 years of service to the Committee.
- The Committee welcomed several new members: Professor Mai'a Cross (Northeastern University), Alan Ladwig (To Orbit Productions), and Rachel Tillman (Viking Mars Missions Education and Preservation Project).

CALL FOR PAPERS: HISTORY OF NASA AND THE ENVIRONMENT SYMPOSIUM

Date: 29–30 September 2022

Location: Georgetown University/Hybrid

Organizers: NASA, Georgetown University, and New Jersey Institute of Technology

NASA is called the space agency, but in a broader sense, we could be called an environmental agency.... Virtually everything we do, manned or unmanned, science or applications, helps in some practical way to improve the environment of our planet and helps us understand the forces that affect it.

—NASA Administrator James Fletcher
to Congress, March 1973

To more critically analyze the historical connection between NASA and the environment, the NASA History Division and Georgetown University invite proposals for papers to be presented at a two-day symposium, 29–30 September 2022, at Georgetown University, Washington, DC. The purpose of the symposium is to analyze the long history of NASA's interest in, responses to, exploration of, and impact upon environments as broadly construed. The planning committee thus welcomes papers exploring NASA's relationship to environments on Earth, on other planetary bodies, and in deep space, as well as papers undertaking a variety of methodological approaches including not only the history of science, environmental history, and the history of technology, but also social, cultural, political, economic, legal, and other types of historical analysis. Diverse scholars at every seniority level are encouraged to apply, and the organizers are pleased to provide funding for hotel accommodations for two nights near the university.



Possible topics for papers include, but are not limited to, the following:

- NASA and the environmental movement
- NASA and environmental justice/inequality
- Environmental impact of NASA technology and development
- International collaboration/global environment
- Space exploration and human health/biology
- Environmental history of NASA facilities
- NASA responses to environmental changes on Earth and in space
- Cultural histories of NASA and the environment
- Earth and space photography/art
- Environmental analog sites/artificial landscapes
- Earth-observing technologies
- Remote sensing and geographic information systems
- Earth science applications/missions/policies
- NASA and climate change science
- Planetary sciences
- Planetary protection protocols
- History of exobiology/astrobiology
- Environmental control and life-support systems
- Orbital debris/space junk
- Environmental history of space colonies
- Decadal planning
- Biographies of NASA Earth/space scientists



The Apollo 6 (Spacecraft 020/Saturn 502) unpiloted space mission was launched from Pad A, Launch Complex 39, Kennedy Space Center (KSC), Florida. The liftoff of the huge Apollo/Saturn V space vehicle occurred at 7:00:01.5 a.m. EST on 4 April 1968. (Photo credit: NASA)

The format of the symposium will be a combination of panel discussions, keynote talks, and group discussion. The intention is to publish an anthology of selected papers.

Submission Procedures

If you wish to present a paper or have questions, please send an abstract of no more than 400 words and a short biography or curriculum vitae, including affiliation, by 1 July 2022 to

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