National Aeronautics and Space Administration

LAGNIAPPE

John C. Stennis Space Center

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#NASAatHome brings universe to one's house

NASA has launched a new Internet and social media special – NASA at Home – to show and engage people in the agency's discoveries, research and exploration from around the world and across the universe – all from the comfort of their own homes.

NASA at Home offers something for the whole family. It brings together a repository of binge-worthy videos and podcasts, engaging E-books on a variety of topics, do-it-yourself projects, and virtual and augmented reality tours, which include the agency's Hubble Space Telescope and International Space Station, as well as an app that puts one in the pilot's seat of a NASA aircraft.

"We know people everywhere, especially students, are looking for ways to get out of the house without leaving their house," said Bettina Inclán, associate administrator for NASA's Office of Communications. "NASA has a way for them to look to the skies and see themselves in space with their feet planted safely on the ground, but their imaginations are free to explore everywhere we go."

The new special spotlights educational and entertaining resources and activities for families and students in kindergarten and up. It includes everything from formal lesson plans to imagery and stories about science and exploration. It provides users a chance to practice safe science at home and features opportunities to interact and hear from agency experts.

NASA Television also is running NASA at Home-themed programming 10 a.m. to 4 p.m. weekdays, as well as around-the-clock NASA and space-related programming.

To explore and enjoy NASA at Home features, visit the NASA at Home web page.

See special Apollo 13 50th Anniversary section at end of issue

In *A Journey Around the World*, Mark Twain offers this Pudd'nhead Wilson maxim – "Truth is stranger than fiction, but it is because fiction is obliged to stick to possibilities; truth isn't." Ark!

That explains why reality sometimes seems not to imitate art so much as to defy completely anything an artist could imagine. Consider the 1969 film *Marooned*, a fictionalized account of three astronauts adrift in space, out of fuel and quickly running out of oxygen. A pair of spacecraft arrive to the rescue just in time.

Now, fast forward not even a year – and let truth take over. Three astronauts are in deep trouble in space aboard Apollo 13 (of all things). The spacecraft has been severely damaged by an explosion – on April 13 (even Hollywood could not make this up). They must seek refuge in an ancillary craft never intended for such use, endure harsh conditions, complete a trip around the Moon and tackle a range of troublesome problems.

They must rely on an unusual means of navigation. They have plenty of oxygen, but carbon dioxide buildup threatens to overcome them. Water is limited. And, oh yes, they have to perform procedures that not only have not been practiced on previous flights but have never been devised and tried.

Unlike art, there are no rescuers – or shiny new spacecraft – on the way to save the day. In this case, rescue rests not only on the skill of the astronauts but on the utter determination and imagination of a group of Earthbound engineers desperately working to help solve the multiple issues.

They meet the challenge – and the astronauts make it back, completing one of the most storied chapters in American space exploration history. All three of astronauts are hailed as heroes. The president awards them the Presidential Medal of Freedom.

However, in a befitting move, he awards the same medal to the Apollo 13 mission support team, who not only famously refused to consider failure as an option but declined to be bound by what others might have deemed impossible. After all, this was not a Hollywood movie. This was not fiction. This was real life.

Mark Twain and Pudd'nhead Wilson would be proud. We all should be.

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NASA's MOON to MARS MISSION

NASA marine, ground teams key to moving SLS

One day in the sooner-rather-than-later future, people across the nation will rearrange daily schedules to witness a long-anticipated event – the maiden launch of NASA's new Space Launch System (SLS) rocket.

A pair of solid rocket boosters and four RS-25 engines will fire at a south Florida launchpad to generate more than 8 million pounds of thrust, lifting the 321-foot SLS rocket into the sky on its way to the Moon and back.

The launch will herald the beginning of a new great era of space exploration, one set on establishing a sustainable presence on the Moon and placing human footprints on Mars.

In no small part, success of the new era rests on hard work provided by Stennis Space Center, which is testing the rocket engines and SLS core stage that will power the new rocket to unprecedented destinations.

Lagniappe is featuring a series of articles under the "Go ... Go ... Go!" heading that detail aspects of NASA's next step into deep space and Stennis' role in making such missions possible. The following represents the latest installment.

As NASA prepares for the first launch of Artemis I, the first mission of the agency's Space Launch System (SLS) rocket and Orion spacecraft to the Moon, one team will be there every step of the way: the aptly nicknamed "SLS Move Team."

Based out of Marshall Space Flight Center in Huntsville, Alabama, the move team ensures all the flight hardware for the SLS rocket's core stage is safely and efficiently transported from the site where it was manufactured to various test facilities and – ultimately – to its future launch site. From the beginning, the move team has been an integral part of the SLS Program.

"Marshall's Ground and Marine Transportation teams are responsible for the handling and transportation of the SLS rocket's core stage, which is the largest rocket stage NASA has assembled, tested and transported since the Apollo Program," said Robert Rutherford, transportation and logistics engineering group lead at Marshall. "We started logistics planning for both the moves of structural test articles of the individual elements and for the entire Artemis I core stage early on in the program."

While the full team is divided between ground and marine activities, they typically operate as one cohesive unit to transport the large hardware for the megarocket's 212-foot-tall core stage. The huge stage includes two giant propellant tanks and four RS-25 engines, each the size of a compact car.

The teams' coordination and efforts were prominently displayed as the first SLS core stage was rolled out from NASA's Michoud Assembly Facility in New Orleans to the agency's Pegasus barge on Jan. 8, then transported to nearby Stennis Space Center for the Green Run test series. Once the barge and flight hardware arrived at Stennis, the ground team was again at work, helping to prepare, lift and install the hardware into the B-2 Test Stand for the test campaign.

"The effort to move the SLS rocket's core stage from Michoud to Stennis and installing it into the B-2 Test Stand is a result of extensive preparation," said Bryan Jones, logistics engineering and ground transportation team lead at Marshall. "It was a true team effort. Without the support of all parties that play a part in the operations, we would not be able to be successful."

The Ground and Marine Transportation teams have been vital in shipping four structural test articles from Michoud to Marshall for testing. The teams prepared for the move of actual flight hardware with SLS pathfinders during the spring and summer of 2019.

The ground and marine teams spend months meticulously planning and developing detailed transportation move procedures to ensure test articles and flight hardware alike are delivered without a mishap. They use a myriad of specialized equipment, including transporters specifically designed to accommodate and hold the hardware, and Pegasus.

The 310-foot-long barge was modified and refurbished in 2015 to ferry the SLS core stage, which is more than 50 feet longer than the space shuttle external tank and – including ground support and transportation equipment – more than 600,000 pounds heavier.

"Each member of the team understands the privilege and responsibility ... in handling hardware that will enable the United States to send American astronauts to the Moon and on to Mars," said Alan Murphy, team lead of marine operations for Pegasus. "The key to preparation for the Pegasus crew is in the vessel itself. Pegasus has the capacity to carry each of the individual core stage elements in addition to the actual core stage.

"The size of the SLS core stage pathfinder and the flight hardware core stage, although massive, did not intimidate the Pegasus crew as we leaned on our experience from shipping the four structural test articles," he added.

The Ground and Marine Transportation teams coordinate their efforts with numerous other NASA organizations and dozens of agencies to get the hardware from one NASA facility to another.

"Before NASA transports any hardware, teams meet to consider every aspect of the move from the strength of the roadways to the weather the day of the move," Rutherford said. "Because of the SLS core stage's height, weight, width and length, special combinations and modifications had to be made to roads, docks, even power lines, and to the barge itself, to accommodate the total weight and width of the rocket hardware."

Hours of work go into planning and executing the various dynamics of transporting, loading and handling the flight hardware. The final factor for consideration before any move begins is usually the most unpredictable: the weather. Following arrival of Pegasus and the core stage for Artemis I to Stennis for Green Run testing, crews spent several days assessing the wind and rain factors at and above ground level before lifting and installing the stage into the stand.

While the core stage undergoes Green Run testing at Stennis, transportation teams will be at work to ship the launch vehicle stage adapter, the part of the rocket that connects the core stage to the upper part of the rocket. The hardware will move from Marshall, where it is manufactured, on Pegasus to Kennedy, where engineers will prepare it for integration to the rest of the rocket ahead of the launch of Artemis I.

A rocket as large as the SLS rocket does not arrive to the launch pad fully assembled. Teams will assemble, or stack, the various elements and stages of the SLS rocket inside Kennedy's Vehicle Assembly Build-ing before moving the fully assembled rocket to the launch pad. As they have done since the beginning, members of Marshall's ground and marine transportation teams will be on hand to plan and carry out the well-orchestrated effort it takes to transport the various pieces of hardware across the country – and waterways – to Kennedy for the first Artemis launch.

NASA is working to land the first woman and the next man on the Moon by 2024.

‘If ever there were a spring day so perfect’

Spring was underway even as the COVID-19 virus arrived at Stennis Space Center, as this B Test Complex photo shows. One can see the first flight core stage of NASA news Space Launch System rocket installed on the B-2 Test Stand in the background. Green Run testing of the core stage will resume when the Stennis workforce returns to the site.

NASA in the News

NASA premieres *Curious Universe* podcast

NASA’s newest podcast is taking listeners on an adventure to explore the wonders of Earth and help unravel the mysteries of the universe. *NASA’s Curious Universe* explores the wild and wonderful places on home planet Earth and beyond. Host Padi Boyd transports listeners into the world of NASA’s missions, projects and people. Each episode is an invitation to an adventure with a NASA expert, such as astronaut Nick Hague and astrophysicist Michelle Thaller. The show launched April 6 and will visit a wide range of tour stops along NASA’s journeys in science and spaceflight. Listeners will traverse the Amazon rainforest, dive into an astronaut training pool and peer inside a lab where “space crafters” sew for NASA missions. New episodes will be released every Monday. *NASA’s Curious Universe* is designed for all ages and does not require any prior knowledge of NASA or its missions. *NASA’s Curious Universe* is the latest addition to NASA’s podcast portfolio, which includes *Houston, We Have a Podcast, On a Mission* and *Gravity Assist*, among others. Discover all of NASA’s podcasts at online by visiting: NASA Podcasts web page.

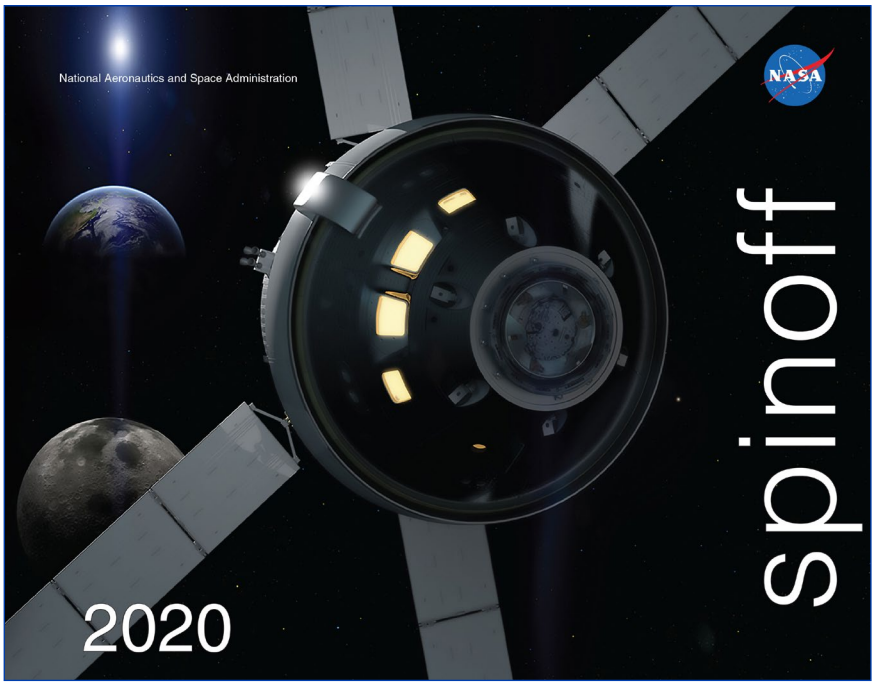
Thousands apply to be NASA astronaut

More than 12,000 people have applied to join NASA’s next class of astronauts, demonstrating strong national interest to take part in America’s plans to explore the Moon and take humanity’s next giant leap – human missions to Mars. Applications were received from every U.S. state, the District of Columbia, and four U.S. territories. However, the process is just beginning for NASA’s Astronaut Selection Board, which will assess the applicants’ qualifications and invite the most qualified candidates to the agency’s Johnson Space Center in Houston for interviews and medical tests before making a final selection. NASA expects to introduce the new astronaut candidates in the summer of 2021. The 12,000 total represents the second-highest number of applications NASA has ever received, surpassed only by the record of 18,300 set by the most recent class of astronauts who graduated in January. Since the 1960s, NASA has selected 350 people to train as astronaut candidates for its increasingly challenging missions to explore space. Forty-eight astronauts now serve in the active astronaut corps. For more information, visit the NASA Astronaut Homepage.

NASA's *Spinoff* highlights Stennis technologies

As NASA pushes the frontiers of science and human exploration, the agency also advances technologies to modernize life on Earth.

NASA's diverse missions spur the creation and improvement of thousands of new products that make life better for people around the world. Dozens of the latest examples are featured in the newest edition of NASA's *Spinoff* publication, including several examples illustrating how NASA is working to shape the coming revolution of autonomous vehicles on the roads and in the air.



The latest edition of the annual publication features a trio of technologies developed at Stennis Space Center.

Spinoff readers will learn how:

- A former astronaut has used his experience with robotic controls for the International Space Station to create a more intuitive controller. Today, it can be used to pilot drones and may be able to improve robotic surgery,
- NASA's partnerships have led to new tools that allow remotely piloted vehicles to safely fly beyond line of sight. These tools already are delivering blood samples and assessing the safety of bridges, and could take over package delivery.
- Telehealth monitoring systems developed to track astronauts' vital signs from the ground now help save lives at hospitals around the world and are starting to help patients at home.

"NASA technology doesn't just improve quality of life on the ground – it also creates jobs, saves money and even saves lives," said Daniel Lockney, executive of NASA's Technology Transfer program.

The publication also highlights smart sensor technology developed at Stennis. Sensors are frontline technology for monitoring and managing the health of any system. They provide measurements needed to detect and even predict faults and failures. Over more than 10 years, Stennis has awarded American GNC Corp. several contracts to develop software and hardware that monitors systems, detecting and predicting faults. This has led to what is known as a smart transducer integrator. The technology can be applied anywhere large sets of sensors are in use.

The publication also includes a "Spinoffs of Tomorrow" section, which highlights 20 NASA technologies available for license, including two from Stennis:

- The NASA Platform for Autonomous Systems. Autonomous operations are critical for the success, safety, and crew survival of NASA deep-space missions. For the last 10 years, Stennis has been developing and demonstrating an innovative software platform, along with expertise and processes for implementation of autonomous operations. The technology can be used in ground test and launch systems, space systems, satellite systems and aeronautics.

- Remote Sensing Toolkit. NASA's policy to make remote sensing data freely and publicly available has long benefited the scientific community, government agencies and nonprofit organizations – but there is significant untapped potential for commercialization. With the Remote Sensing Toolkit, users will be able to find, analyze and use the most relevant data for their research, business projects or conservation efforts. The toolkit provides a simple system to quickly identify relevant sources. It will help users search for data, as well as ready-to-use tools and code to build new tools in such areas as precision agriculture, crop forecasting, conservation, resource management, and natural disaster planning and response.

Print and digital versions of the latest issue of *Spinoff* are available online. An iPad version is also available for download in the iTunes store.

For more information about NASA's Technology Transfer program, visit *Spinoff* wesite.

INFINITY to exhibit Aerojet Rocketdyne RS-68 engine

Aerojet Rocketdyne, the nation's leading provider of space propulsion and power systems, has made arrangements with the INFINITY Science Center at Stennis Space Center to have the worlds most powerful hydrogen-fueled rocket engine, the RS-68, on display for public viewing.

Aerojet Rocketdyne is providing the engine to the INFINITY, which serves as the official visitor center for Stennis, under a long-term loan agreement. Aerojet Rocketdyne operates an Engine Assembly Facility at Stennis. The facility previously was used to receive, assemble and process space shuttle main engines. It now is doing the same for RS-25 engines that will help power NASA's new Space Launch System rocket, the backbone of the agency's plan to return to the Moon as part of the Artemis program and, eventually, travel to Mars.

Aerojet Rocketdyne conducts an RS-68 engine test on the B-1 Test Stand at Stennis on Feb. 7, 2018.

"Part of our mission at Aerojet Rocketdyne is to inspire future generations who will carry forward our legacy of space exploration, which closely aligns with the mission of the INFINITY Science Center," said Eileen Drake, Aerojet Rocketdyne CEO and president. "The RS-68 rocket engine is an impressive feat of engineering. Having it on display at the center where visitors can see it close up may provide just the spark needed to encourage the next generation of rocket scientists."

The RS-68 produces over 700,000 pounds of thrust (more than 17 million horsepower) at liftoff as it provides main propulsion for United Launch Alliance's Delta IV rocket, which has successfully completed 40 launches to date. These missions have expanded the nation's knowledge of the universe, improved terrestrial communication and navigation capabilities, and provided the advanced in-space systems that protect American warfighters across the globe. Since the 1990s, RS-68 engines have been tested for launch use on the B-1 Test Stand at Stennis.

The RS-68 engine that will be on display at the INFINITY Science Center is a "pathfinder" engine containing development and flight configuration hardware that has been tested extensively at Stennis. The RS-68 pathfinder engine serves as a testbed to train new technicians and engineers, develop new technologies and mature assembly procedures when needed.

"INFINITY Science Center is so excited to display and house the world's most powerful hydrogen-fueled rocket engine. Aerojet Rocketdyne has supported our organization since its inception ,and we are so grateful for this opportunity to house its history," said INFINITY Science Center Executive Director Jill Senn.

INFINITY Science Center is located just off I-10 near the Louisiana-Mississippi border. Dedicated in 2012, the 70,000-square-foot center features an education wing; indoor and outdoor artifacts; Earth and space exhibit galleries; theaters; and live programs and demonstrations. The facility attracts roughly 60,000 visitors annually.

For the latest on NASA/Stennis Space Center status, please click on:

Stennis Emergency Management web page

NASA Coronavirus Response Information web page

For engineer, work at Stennis 'one of the coolest things'

Thom Rich is too young to remember when the first humans walked on the Moon in July 1969, but he does remember the space-related toys he played with as a child.

He also remembers the launch of the first space shuttle – Columbia – in April 1981. "I was in the sixth grade, and they brought in televisions for us to see it," said Rich, a New Orleans native who grew up in nearby Metairie.

Now living just across Lake Pontchartrain in Lacombe, Louisiana, with his wife of 26 years and two sons, Rich works as chief of the Facilities Engineering Services Division at NASA's Stennis Space Center, just inside Mississippi. The site was built in the 1960s to test rocket engines and stages needed to carry those first humans to the Moon. It also tested the engines that launched every one of 135 shuttle missions, including the first 1981 flight.

NASA engineer Thom Rich (r) speaks with a reporter during a 2012 media interview.

Now, the site is testing engines and stages to return humans to the Moon as part of NASA's Artemis program and power eventual missions to Mars. For Rich, this is the next best thing to being old enough to remember the first lunar missions. "I cannot wait to be of an age to remember it firsthand and for my children to experience it," he said. "It is so distant for kids to think of people on another planet or object. This will bring it home."

For Rich, that day is closer than it ever has been since he arrived at Stennis 20 years ago. It was not by intentional design – a friend submitted his resume for a contractor position on site. Rich, electrical engineering degree and experience in hand, received an interview and soon began work as a contractor design engineer, then as a supervisor of several different teams.

After six years as a contractor, Rich joined the NASA team as a design and construction project manager. He served as the contracting officer representative for the A-3 Test Stand construction project and the high-pressure industrial water line project in the B Test Complex. Eventually, Rich was tapped as lead, then deputy chief, of the design and construction project management team for the Stennis test complexes. He was chosen for his current position about a year ago.

In that role, Rich is responsible for various areas related to facility systems – logistics, energy management, operations, maintenance, design, construction and sustainability. The work directly supports Stennis testing of engines and the first flight core stages for NASA's new Space Launch System rocket, the backbone of the Artemis program and future deep space missions.

"The facilities engineering services team ensures the center has all of the facility requirements needed to meet the agency and center missions," Rich said. "All of the support projects for the Green Run (core stage) testing and the testing of RS-25 engines (for SLS) have been run by contracting officer representatives from our group."

Rich loves the work – and his colleagues at the site. "I have never been around so many people that want to get a mission accomplished," he said. "The can-do attitudes and all of the stories behind those attitudes make my work place amazing. It is a family that works together to get everyone to succeed."

As one would expect from a large family, it also offers an amazing level of diversity, Rich noted. "I love to look for different insights," he said. "It helps me broaden my perspectives and helps to shape my opinions and decisions."

All in all, Rich relishes the privilege of working for NASA at Stennis. He pointed to what he experiences in every classroom he visits – "you get undivided attention just because you say you work for NASA."

It is particularly exciting to explain the work conducted at Stennis, installing large rocket engines and stages in place and testing them just as they will fire on actual launches. "What other place can say that they mount a rocket to a building with the intent of keeping it in place to make sure that it works properly?" Rich said. "That is just one of the coolest things imaginable and we have great people here at Stennis that make that happen every day."

1963 – Natural beauty surrounds NASA's new test site

Note: NASA's John C. Stennis Space Center has played a pivotal role in the nation's space program. The following offers a glimpse into the history of the space program and the rocket engine test center.

In 1963, after NASA announced a rocket engine test facility would be built in Hancock County, Mississippi, officials began arriving in the old town of Gainesville.

The Rouchon House at the site became the headquarters, and the first employee of the new Mississippi Test Operations (MTO), Margaret McCormick, was busy making sure everyone checked in, had their assignments and a space to work.

Before the work began, NASA and the Corps of Engineers were captivated by the beauty of the area – the Pearl River winding through the magnolias and pine trees, the huge wisteria in full bloom that time of spring, the air heavy with both humidity and the smell of honeysuckles.

The river itself held its own interesting creatures. Alligators could be seen slowly swimming up, down, and across the riverbanks, as well as the shiny heads of water moccasins slithering through the water and the occasional ripple as bass fed on insects that got too close to the surface.

There were dangers on land as well. Aside from the swarms of mosquitos and the snakes that were on land, wild boars roamed the area, and sometimes, a panther's shrill scream could be heard.

One of the first things that needed to be done before the major construction of the facility could begin was to get to know the area. The first engineer to report to MTO was Obed E. "Dusty" Batson. Batson, a Mississippi native, was instructed to become familiar with "every inch" of the 13,500-acre site.

"There were no roads then, just State Highway 43 that ran through the area, and Upper and Lower Gainesville Roads," Batson recalled. "I would drive as far as I could and get out and walk the rest of the way."

That is how Batson got to know every inch of the site, and his knowledge assisted in determining the locations of many buildings, support facilities and equipment. That year, spring was definitely a time of growth for the new NASA facility.

A 1963 photo from the banks of the East Pearl River provides a look at the landscape surrounding NASA's new rocket engine test site. Teams arriving at the south Mississippi site to begin constructing the rocket engine test site encountered both natural beauty and possible dangers as well, particularly in the area wildlife.

Hail & Farewell

NASA welcomes the following:

Leslie Anderson	Lead Accountant	Office of the Chief Financial Officer

Office of Diversity and Equal Opportunity

Felicia Fuksman – Holocaust survivor

The Holocaust is a haunting reminder of man's capacity for evil.
Warren Christopher, U.S. Secretary of State, 1993-97

The Holocaust Days of Remembrance was established by the U.S. Congress to memorialize the 6 million Jews murdered in the Holocaust – as well as the millions of non-Jewish victims of Nazi persecution. This time is set aside to honor and remember the victims of the Holocaust and their liberators. The great brutality of which mankind is capable must never be forgotten.

In 1995, Felicia Lewkowitz Fuksman was the guest speaker for the Holocaust Remembrance Program at Stennis Space Center. This month, Felicia's courageous story is revisited.

Felicia Lewkowitz was born in Lodz, Poland where she lived with her parents, two brothers and two sisters. She was 19 years old when the Nazis attacked her native Poland in 1939. Her father and brother were seized on the street and taken for labor. They were never seen again. Lewkowitz' mother and younger brother perished in Lodz, after she was torn from them.

In February 1940, the Nazis established a large ghetto in Lodz. Guarded by Nazis and their collaborators, 170,000 Jews were forced to live in an impoverished district of the city measuring about 1.5 square miles. Lewkowitz and her sisters were forced to live the ghetto. Her older sister, Rachel, died of tuberculosis, and her younger sister, Esther, froze to death begging for food on the streets.

Lewkowitz worked as a nurse in a German factory. Every 10 days, each person received a ration of one piece of bread. In the hospital where Lewkowitz worked, they would often hold a dead body for a few days, so they could receive that person's ration of bread. Ghetto residents died of starvation and disease. Many committed suicide.

In August 1944, Lewkowitz was deported to Ravensbruck labor camp, a women's concentration camp. It was very cold, and they were given only light clothes, a light blanket and a little straw to sleep on. To stay warm, they wrapped themselves in pieces of paper. Workers were issued one set of clothes, which they worked and slept in for nine months. There was no water to bathe or wash clothes, so they used coffee and tea to wash their hands and faces.

After being at Ravensbruck for several months, Lewkowitz was deported to a Nazi labor camp at Wittenberg, Germany. In April 1945, the camp was liberated by Russian troops.

After liberation, Lewkowitz returned to Lodz and discovered that no relatives had survived. She lived for three years in a displaced persons camp in Berlin and later moved to the United States to live in New York.

In 1950, Lewkowitz immigrated to New Orleans, where she met Max Fuksman, a fellow survivor from Lodz, who had been liberated at Bergen-Belsen concentration camp. They married and had three daughters and five grandchildren. Max Fuksman died in in 1982, and Felicia died in 2012 at the age of 92.

Throughout her lifetime, Lewkowitz traveled through the South, teaching about the dangers of human evil and the fragility of civilization. She emphasized the need to remember the Holocaust so future generation do not repeat similar atrocities.

Information included in this article was collected from an interview of Felicia Fuksman by Plater Robinson of the Southern Institute for Education and Research at Tulane University. The full Fuksman interview may be viewed online.

For U.S. Navy employee, Stennis experience put world in perspective

Steve Faber is a New York native through and through. He was born in Brooklyn, lived a short while in Islip on Long Island, grew up and lived his college years in Queens. Although he has worked for the Naval Oceanographic Office (NAVOCEANO) at NASA's Stennis Space Center for almost 34 years, he still remembers those earlier years fondly. "If I have to pick three things I miss about New York City, they would be pizza, Italian Ices and museums – in that order," he said.

One thing Faber does not remember from those years is learning about the Holocaust. That education would come later, thanks to an office assignment and an aging Jewish woman. For Faber, who has now led Holocaust Days of Remembrance programs at Stennis for 30 years, it would be nothing short of an awakening.

Faber arrived at Stennis in May 1986, settling in Slidell, Louisiana, to begin a self-described "eclectic" career with NAVOCEANO. He and his wife later moved to nearby Lacombe, which he characterized as a "beautiful small town" full of age-old live oaks.

At Stennis, Faber's career covered a range of areas. He began as a geophysicist but also trained sailors; served as a ship surveyor; worked with fleet customers, requirements drivers and systems designers; supported oceanographic environmental work; and served 18 years as the senior NAVOCEANO representative, leading teams for multi-month at-sea missions. He also served as lead for environmental support for South Korea, developing a close working partnership with its national Navy.

For the last year-and-a-half, Faber has served as NAVOCEANO's International Program Coordinator. In that role, he works closely with the Naval Meteorology and Oceanography Command on foreign disclosure issues, as well as on Freedom of Information requests. "What I love the most about working at Stennis at NAVOCEANO is the knowledge that I am working to strengthen our national security," Faber said. "I know that the work I am doing, that NAVOCEANO is doing, supports those who are defending our nation. It is an honor for me to be a part of this greater good."

Steve Faber has spent more than 30 life-changing years as a U.S. Navy employee at Stennis Space Center.

Faber's experience at Stennis exposed him to the importance of diversity – in the workplace and beyond. "I work with a diverse team, from the leadership on down," he said. "From my early days at NAVOCEANO, I feel that the command took equal opportunity and diversity very seriously." The office eventually would team with the Stennis Diversity Council to host diversity programs on site.

For Faber, though, the most life-changing exposure to diversity began with a 1990 assignment to write an article on Kristallnacht, the 1938 organized attack on German Jews commonly as "the Night of Broken Glass." He subsequently was asked to help organize Holocaust Days of Remembrance programs on site.

The first program in 1991 featured a pair of PBS films. "Having not grown up learning about the Holocaust and the magnitude of the atrocities, those movies tore my heart to shreds," Faber said.

In 1995, Faber was introduced to a group of Holocaust survivors in the New Orleans area, including a woman named Felicia Fuksman. Fuksman subsequently spoke during the 1996 Stennis program, talking about family she lost in the Holocaust and about her own experiences in the Lodz ghetto and the Ravensbruck concentration camp. She told of two friends who saved her life when she had given up, of her liberation by the Russian Army and of her return to Lodz, only to find someone else living in her house and with her possessions, refusing to surrender either. "Felicia put the world into perspective," Faber said. "Felicia bared her soul to show how dark things can get and how we must never let this happen again."

Faber took the message to heart. Though he will turn over leadership of Stennis Days of Remembrance programs to someone else next year, he is still quick to remind everyone of the importance of the observance. Not only were 6 million Jews killed during that period but also another 10 million people who did not fit – the sick, disabled, mentally ill, gypsies, university staff, various Christian sects, communists, homosexuals, political prisoners and prisoners of war.

"Many ask, 'Why do we still hold this observance?' The Holocaust ended over 70 years ago," Faber said. "We must make the promise that these kinds of atrocities never again plague our world. We hold this observance so we can recognize and respond to the warning signs of genocide. As long as genocide remains a threat, we must continue to ask ourselves about the consequences of *action* – and of *inaction*. That is how we strive to fulfill the promise of Never Again."

For Faber, the Holocaust period clearly shows the importance of highlighting and promoting diversity. "There are too many examples of man's inhumanity to man – the atrocities of the Armenian massacres, Bosnia-Herzegovina, Darfur, and the North Korean work camps," he said. "Keeping the memory of the Holocaust alive allows us to talk about these atrocities. This is why remembrance of Holocaust is so important."

The story is a compelling one – three astronauts are stranded, their spacecraft without enough fuel to return to Earth and oxygen running low. NASA marshalls its forces to save them, even if it takes untested and untried procedures, as the world rallies in support of the efforts. Problem after problem emerges, but against all expectations and hope, the desperate efforts succeed. The astronauts are saved.

It is a made-for-Hollywood moment. Actually, it is a made-for-Hollywood movie, titled *Marooned* and released in the months following the Apollo 1 mission that landed the first humans on the Moon in July 1969. NASA cooperated with the production, with agency officials invited to premiere showings.

In the lead up to its own lunar mission, even the crew of Apollo 13 attended a viewing of the film. Just weeks later, they found themselves experiencing just such a crisis in real life as an onboard explosion threatened not only their mission but their lives.

The Hollywood movie is all but forgotten. However, the drama of the real-life mission endures and even exceeds any imagined scenario – three stranded astronauts forced to abandon the main body of their spacecraft and survive in a vehicle never meant for such use, life-sustaining consumables running low, driven to perform procedures devised on the fly, required to fly deeper into space than any human ever, deprived of sleep and necessary hydration, facing an uncertain and perilous re-entry back to Earth.

As if that scenario is not enough to stretch the limits of credulity, consider the outcome – three astronauts surviving four days in a space meant for only two, improvising procedure after procedure, constructing a makeshift filter to prevent their asphyxiation by carbon dioxide buildup, enduring near-freezing temperatures for days and, in the words of one crew member, violating "every specification on every piece of equipment on the vehicle" in order to prevail, finally splash landing not only safely but within just a few miles of their original designated return site.

50th Anniversary Issue

Apollo 13 mission

April 11-17, 1970

The Apollo 11 mission and astronauts may have been the first to reach the surface of the Moon, but the argument can be made that the Apollo 13 flight, which failed in its attempt to land on the lunar surface, became the stuff of true legend.

One day after the successful splashdown, then-President Richard Nixon awarded the three astronauts – and the ground crew that enabled their return – the Presidential Medal of Freedom. Fifty years later, the fascination with the mission remains.

As NASA highlights the golden anniversary of what has been declared a "successful failure" and "its finest hour," all aspects of the history-making mission are being relived.

The COVID-19 virus precluded planned in-person events, but a host of online avenues exist for exploring and reliving the mission, including the opportunity to view Apollo 13 programming on NASA TV; to participate in social media activities; to hear two of the Apollo 13 astronauts recall the mission in a new podcast; and to access photos, video, transcripts and audio from the mission.

One also can enjoy the factoids, photos and feature on the following pages, drawn from accounts of the mission, as well as from the in-flight journal of communications between ground control and the astronauts.

However, the best way to remember – and pay homage – to the incredible saga may be to walk outside one evening and look skyward in sheer wonder at the daring of those who dreamed of going and, defying all odds and obstacles, not only went but prevailed.

Listening close, perhaps one will even hear echoes of the simple words of the poet:

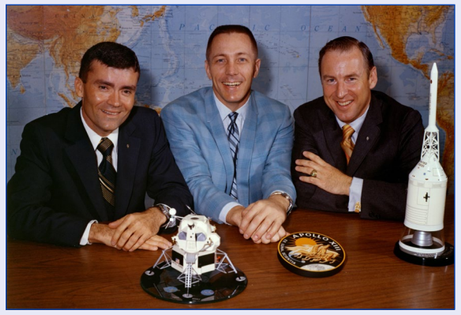
Listen to the MUSTN'TS, child
Listen to the DON'TS
Listen to the SHOULDN'TS
The IMPOSSIBLES, the WON'TS
Listen to the NEVER HAVES
Then listen close to me
Anything can happen, child
ANYTHING can be.

Apollo 13 – ‘Houston, we’ve had a problem here’

Launch of Apollo 13 drew ho-hum attention, but there was public fascination with the mission number. The astronauts insisted they were not superstitious, and NASA set launch for April 11, 1970, or 4/ 11/ 70 – adding a four, two ones, a seven and a zero totals 13 – at 1: 13 p.m. CDT or 13:13 military time.

Apollo 13 lifts off at 1:13 p.m. CDT on April 11, 1970. Click to enlarge image

Apollo 13 originally was to be flown by Alan Shepard, Stuart Roosa and Edgar Mitchell. However, Shepherd had just been cleared for flight again after resolving an inner-ear problem and needed more time to get up to speed. The Apollo 14 crew – commander Jim Lovell, command module pilot Ken Mattingly and lunar module pilot Fred Haise – was asked to move to Apollo 13. Mattingly would be exposed to measles and replaced just two days prior to launch by backup command module pilot John “Jack” Swigert, too late for the new crew to take an official photo in flight suits. Lovell, 42, was the world’s most traveled astronaut at the time, with three previous missions and 572 spaceflight hours. Haise, 36, had served as the backup lunar module pilot for the Apollo 8 and Apollo 11 missions. Swigert, 38, had been part of the support crew for the Apollo 7 mission. Apollo 13 would be his only trip to space for both Haise and Swigert.



Apollo 13 crew members (r to l): Commander Jim Lovell, command module pilot Jack Swigert, lunar module pilot Fred Haise. Click to enlarge image

Minutes into the flight, Jim Lovell reports the altitude from the onboard computer readout, which differs slightly from the ground readout. “Well, HAL might be a little bit off,” Lovell responds. Someone had taped a sign to the onboard computer – “My name is HAL” – a reference is to the malevolent computer in the film, *2001: A Space Odyssey*. Capsule communicator (CAPCOM) Vance Brand replies, “I can’t imagine how that got there. Just remember, you have to be nice to HAL.”

A day into the flight, CAPCOM Joe Kerwin takes a few minutes to read the news to the crew. He reports on two types of earthquakes – an actual one in the Philippines and a figurative one from the announcement that the Beatles would no longer perform as a group. He also notes air traffic controllers – on strike for a few weeks – were returning to work, then adds, “You’ll be happy to know that the controllers here … are still on the job.” Jim Lovell responds, “Thank goodness for that.”

Thirty-two hours into the flight, Haise asks Mission Control Center, “Are the flowers blooming yet?” Control responds that none have been seen. The exchange is a reference made throughout the mission as to whether original command module pilot Ken Mattingly has developed the measles after being exposed and scrubbed from the flight. Mattingly never did develop the measles.

The Apollo 13 crew conducted a TV broadcast 55 hours into the mission. At one point, there is a bang in the spacecraft. Jim Lovell, on-camera, stops in mid-sentence, “Stand by one.” Fred Haise chimes in, “Yes, I got them with the cabin repress valve again there.” Pressing the valve to ensure the proper pressurization of the spacecraft usually results in an audible bang. “Every time he does that our hearts jump in our mouth,” Lovell admits.

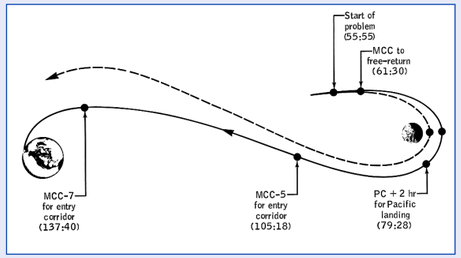
Fred Haise appears onscreen during an Apollo 13 TV broadcast. Click to enlarge image

Loss of two oxygen tanks in an onboard explosion 56 hours into the mission threatened the very survival of the command module and its crew. The spacecraft used a combination of limited batteries and three large fuel cells to provide electricity for its systems, with the fuel cells generating most of the power. The cells combined hydrogen and oxygen in a reaction that produced electricity, as well as potable water. The electricity powered the spacecraft’s systems, and the water was used both for cooling the spacecraft’s systems, as well as for drinking and other things.

The Apollo 13 explosion occurred inside oxygen tank No. 2, which originally was installed on the Apollo 10 service module. The tank was removed prior to that launch for necessary work and was dropped in the process. Fearing damage, it was replaced by another tank. Upon inspection, it was determined the dropped tank had suffered no damage. Unfortunately, damage to a fill line inside the tank was not detected. The tank was assigned to the Apollo 13 mission. During preflight testing, the tank would not drain properly because of the damaged fill line. Engineers dismissed the issue since the tank would not need to be drained on the mission. They also decided to heat the tank and “boil off” the remaining liquid oxygen. That action created a serious problem as the tank overheated and damaged the Teflon insulation coating its interior wiring. The overheating was not recognized by ground crew members and created the situation that led to the onboard explosion.

Mission Control Center and astronauts executed several procedures in an attempt to restore the command module to health. That changed at the 56:09:07 mark of the mission – about 18 minutes into the crisis – when Jim Lovell announced, “It looks to me, looking out the hatch, that we are venting something. We are – We are venting something out into the – into space.” There was nothing worse a commander could report. Suddenly, everyone knew they faced a full-blown crisis.

Two of the most famous Apollo 13 quotes are Hollywood creations – “Houston, we have a problem” and “Failure is not an option.” What the astronauts actually said was, “Houston, we’ve had a problem here.” Also, flight director Gene Kranz never said, “Failure is not an option,” although he later used the sentence as the title of his autobiography. What he did tell his controllers was – “I have never lost an American in space, sure as hell aren’t going to lose one now. This crew is coming home. You got to believe it. Your team must believe it. And we must make it happen.”



A chart shows Apollo 13’s trajectory around the Moon and back. Click to enlarge image

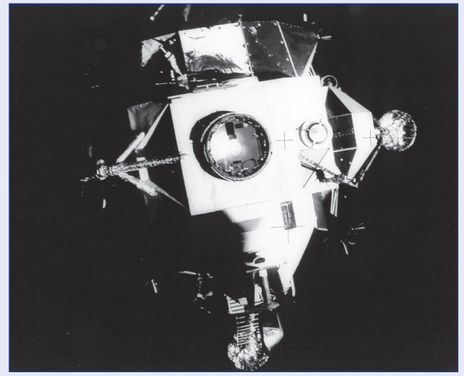
As the extent of the crisis became known, ground controllers began discussing how to get the astronauts home. One option was a direct abort – turn the craft around, fire every last drop of fuel in the service module engine and head straight back to Earth. However, no one knew if the service module engine had been damaged or not. A second option was to let Apollo 13 continue around the Moon, which would sling it back to Earth. That journey would take several days. Could the crew be kept alive? Opinions were split, and Kranz later recalled that he felt it best to buy some time, figure out exactly what they were facing and act accordingly. He decided to hold the course.

Trajectory of the spacecraft was a critical issue. Earlier missions had been fired on a true free-return trajectory. If something happened, they could hold the course, and the trip around the Moon would send them properly back to Earth. Apollo 13 had been aimed differently. Left to its original course, the trip around the Moon would return the spacecraft toward Earth – but would miss the planet by several thousand miles. Returning it to the proper trajectory would require firing the lunar module descent engine. The question was – for how long and at what throttle power? It took hours – and the work of numerous people – to determine and verify the answer. However, as Jim Lovell said later, the correcting engine fire represented a true milestone for the mission.

As the Apollo 13 crew neared their trip around the Moon, CAPCOM Vance Brand reported the Apollo 13 third stage booster had just hit the lunar surface as planned. “Well, at least something worked on this flight,” Jim Lovell quipped.

Eighty-two hours into the mission, ground control reports lunar module *Aquarius* is performing even better than expected as far as power usage. “Very good,” Fred Haise responds. “Way to be. I’ll tell you, this *Aquarius* has really been a winner.”

NASA had considered using the lunar module as a lifeboat as early as 1962 but dismissed the idea because it could not imagine a failure so great that it would be needed. “I never heard of the lunar module being used in the sense that we used it,” agreed Fred Haise, considered an expert on the vehicle. “We had procedures, and we had trained to use it as a backup propulsion device, the rationale being that the thing we were really covering was the failure of the command module’s main engine. ... But we never really thought and planned, and obviously, we didn’t have the procedures to cover a case where the command module would end up fully powered down.”



The lunar module is viewed from the command module after it was jettisoned on April 17, 1970. Click to enlarge image

Water was a critical issue on the lunar module. It used batteries rather than fuel cells for power, so it was unable to mix hydrogen and oxygen to produce water. It had a fixed supply for cooling equipment and for astronauts to drink. To preserve it, controllers turned off as many lunar module systems as possible to reduce the equipment heat load. The astronauts also placed themselves on a strict six ounces per day limit.

Apollo 13 – ‘Houston, we’ve had a problem here’

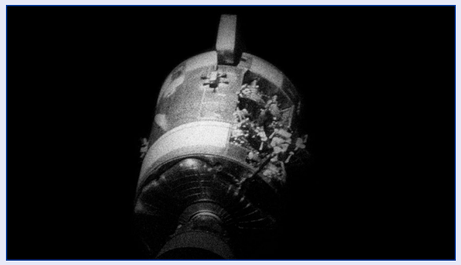
Apollo 13 astronauts were able to capture some images of the Moon out of the lunar module windows.
Click to enlarge image

Food was a point of some levity during the mission. Ninety-seven hours in, Fred Haise is left alone as his crewmates try to sleep. He radios CAPCOM Vance Brand, “With all this other procedures you’ve been working on there, I thought I was going to have a new one for you. How to get four gingerbread cubes apart. I think they were stuck together with epoxy.” Haise reports he has solved the problem but not without the cubes crumbling. Then, he quips, “You can tell we’re feeling pretty good, Vance, when we start complaining about the food.” Brand responds, “Yes, that’s good to hear. I think everybody’s feeling better down here, too.”

At 118 hours in, Jim Lovell radios there is no need for refrigerator on board. “I just brought out some hot dogs, and they’re practically frozen.” The astronauts later told a second story. Fred Haise left the lunar module to retrieve something from the command module and asked Jack Swigert to hold his hot dogs. On return, Swigert told him, “Fred, I got an emergency here. I squeezed too hard and it drifted off someplace. Check around for two loose frankfurters.” Swigert recalled, “That broke Fred up for about five minutes. I was still holding that empty package when he came back. We had a few laughs over this one.” Haise added, “I thought you had eaten them, that’s why. You just can’t trust these command module pilots when you leave them in charge of the lunar module.”

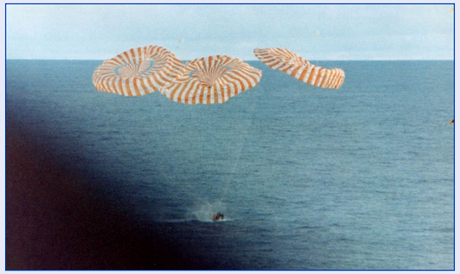
On the final evening in space, the temperature aboard Apollo 13 dropped very low. Everything in the spacecraft was covered with water, which signaled potential trouble. If visible, water also had to be forming behind the instrument panels, where wiring lay. Following the Apollo 1 fire, NASA had revised its procedures and demanded waterproof coating on all wiring and connections. When the Apollo 13 astronauts began to power up the command module, they would learn whether that precaution had been enough or if the moisture would short out a connection. Fred Haise later would credit the rewiring done after Apollo 1 with saving Apollo 13 from possibly sparking a fire while powering up the command module.

One of the major areas of focus as Apollo 13 returned to Earth focused on powering up the command module for reentry. NASA never had powered up a command module in space. Ground personnel usually spent a full day or more doing so prior to launch, and the unit remained operational through the mission. The Apollo 13 crew did not have that kind of time – or power. Finalizing and checking the power up procedure took several days, to the point that the crew seemed to grow antsy for its delivery. When it arrived, it was pages long and newly devised. It was up to the astronauts – particularly Jack Swigert – to execute it. Despite fatigue, cold and stress, and despite the fact that he was relying on a procedure delivered by static-filled radio communication across tens of thousands of miles, Swigert succeeded.



Astronauts were able to capture images of the damaged service module after it was jettisoned prior to reentry.
Click to enlarge image

With re-entry looming, the astronauts performed the somewhat tricky process of jettisoning the service module and lunar module. Jettisoning the service module required Jack Swigert to be in the command module while Jim Lovell and Fred Haise remained in the lunar module. Buttons to jettison the service module and lunar module were side-by-side. As time for the procedure drew near, Swigert later recounted that he woke from a fitful attempt at sleep, fearful of accidentally hitting the button to jettison the lunar module instead of the service module, separating the crew and dooming them all to death. He quickly went into the command module and taped a piece of paper over the button for jettisoning the lunar module.



Apollo 13 astronauts splash down right on target April 17, 1970.
Click to enlarge image

Once the service module was successfully jettisoned, the astronauts crowded to the small windows to glimpse a view of the vehicle. They were amazed at the sight. “There’s one whole side of the spacecraft missing,” Jim Lovell exclaimed to the ground team. “It looks like it got to the (main engine) bell (or conelike nozzle), too,” Fred Haise said. As astronauts continued to view the vehicle, however, they surmised that the bell may not have been damaged but simply stained by the explosion. The inability to determine for sure if the bell had been damaged reaffirmed the wisdom of not attempting to fire that engine for a direct abort home following the oxygen tank explosion. With a potentially damaged bell, the engine may have malfunctioned, fired improperly or even exploded.

As reentry neared, Jack Swigert spoke to ground controllers. “I know all of us here want to thank all you guys down there for the very fine job you did,” he said. “That’s affirm, Joe,” Jim Lovell added. “I’ll tell you,” CAPCOM Joe Kerwin responded. “We all had a good time doing it.” Communications were lost soon afterward as Apollo 13 reentered Earth’s atmosphere. At the expected time for renewed contact, Mission Control began calling the astronauts, with no initial reply. The time stretched, adding to the nervous situation. Then, Swigert’s voice was heard, “Okay, Joe.” Kerwin quickly responded, “We read you, Jack.”

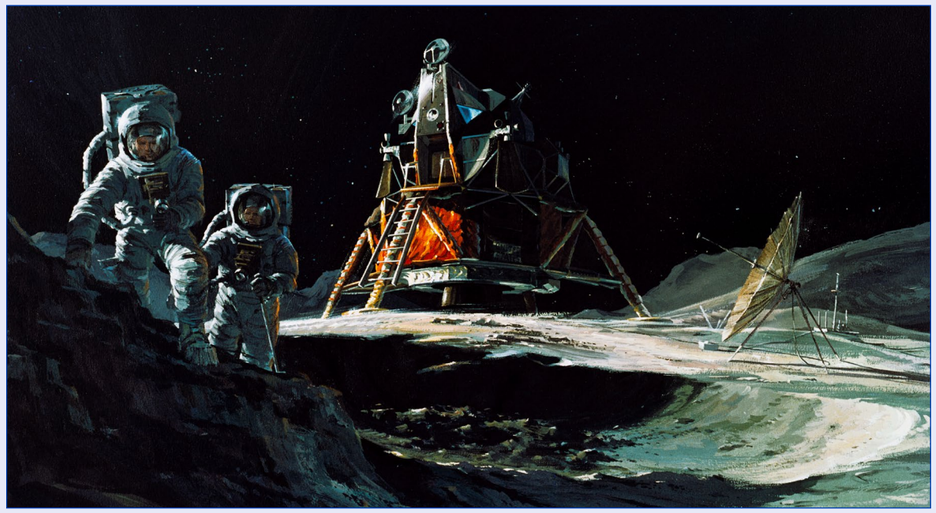
Once Apollo 13 successfully reentered the atmosphere, the last item of concern was whether the parachutes would open or had they frozen in space. Less than a minute after contact with the astronauts was reestablished, Swigert reported they had seen the drogue chutes open through the windows. A second later, Mission Control announced, “Got you on the television, babe.” The celebration began. Apollo 13 was home.

Despite the difficulties and the need to correct trajectory several times, Apollo 13 was the most accurate splashdown to date of the five missions that had flown to the Moon. By the end of the Apollo Program, it ranked as the second-most accurate. (Note: Apollo splashdowns were generally accurate. Only three of the eight Moon missions hit two miles or more from their target point. Four landed 1.5 miles or less away. Apollo 14 came down just 0.7 miles off target.)

NASA did not leave the cause of the Apollo 13 explosion to speculation. Theories of what had happened were put to the test. Technicians used a replica oxygen tank and heated it just as the Apollo 13 tank had been heated during preflight. The overheating caused exactly the damage they had suspected. They then installed the tank in sample service module and stirred it. In the test, the overheating damage did indeed result in wires sparking, causing the test tank to rupture and blow off the side panel of the sample service module.

Flight director Gene Kranz (second from left) and Mission Control personnel celebrate return of Apollo 13.
Cick to enlarge image

In a 2005 article for the Institute of Electrical and Electronics Engineers, Stephen Cass wrote: “To the outsider, it looked like a stream of engineering miracles was being pulled out of some magician’s hat as Mission Control (Center) identified, diagnosed and worked around life-threatening problem after life-threatening problem on the long road back to Earth. … But what was going on ... wasn’t a trick or even a case of engineers on an incredible lucky streak. It was the manifestation of years of training, teamwork, discipline and foresight that to this day serves as a perfect example of how to do high-risk endeavors right.”



Apollo 13 astronauts Jim Lovell and Fred Haise never had a chance to complete their trip to the lunar surface. However, an artist’s conception provides a view – albeit unrealistic – of the two astronauts exploring the lunar surface.
Click to enlarge image

Fred Haise Jr. – native son-turned-enduring hero

Fred Haise laughs during a visit to INFINITY Science Center, where visitors celebrated his 80th birthday.

Fred Haise laughs like someone who has discovered the secret – that every day is a gift to be enjoyed. It is not even necessary to hear him laugh to realize this. Just seeing a photo of him in full-face delight is enough.

He has seen behind the curtain. He knows the joy of being alive. At 87 years old, it is more than just the fact that he has enjoyed a full life. One easily could say Haise has enjoyed multiple lives – as a fighter pilot, research pilot, celebrated astronaut, aerospace executive and, eventually, inspirational paragon.

He wears the lives comfortably, like the retired victor moving in the ease of his own experiences and remembrances, a sentiment Haise likely would decline to consider. He is an engineer after all, mainly given to analyzing, calculating and reasoning instead of speculation and hypotheticals.

Then – you hear him laugh.

Fred Wallace Haise Jr. was born in the Mississippi coastal town of Biloxi in November 1933. At the time, the city boasted little more than 15,000 residents, before the mini-population boom that would come with the arrival of World War II and Keesler Air Force Base.

Haise attended local schools – Gorenflo Elementary School and Biloxi High School. He completed high school two years early and headed to Perkinston Junior (now Mississippi Gulf Coast Community) College to study journalism. "My initial interest in journalism developed through work on the Biloxi High School newspaper as sports editor, followed by two years at Perkinston as sport editor and editor of the *Bulldog Barks,*" he said.

That training was interrupted by the Korean War and Haise's interest in serving his country. "My father advised me to become a commissioned officer if I joined the military," he said. "The only program that fit, being 18 years old with only two years of college, was the Naval Aviation Cadet Program that led to becoming a naval aviator."

Haise had never even flown on a plane. Nevertheless, he enlisted in the program. "Almost from my first flight, I knew that I loved flying," he said. "That led me to a career in aviation and space."

After training, Haise served as a U.S. Marine Corps fighter pilot until 1956. In the ensuing decade, he earned a bachelor's degree in aeronautical engineering from the University of Oklahoma, served in the Oklahoma Air National Guard, was recalled to U.S. Air Force service during the Berlin Crisis, graduated as the most outstanding student in Class 64A at the Aerospace Pilot School at Edwards Air Force Base and flew as a research pilot at NASA's Lewis (now Glenn) Research Center, as well as a civilian research pilot at NASA's Flight Research Center at Edwards.

The experiences gave Haise the chance to fly

Fred Haise prepares to take off in T-38 aircraft on April 8, 1970.
Click to enlarge image

multiple aircraft. Through his life, he would accumulate more than 9,000 hours of flying time, including more than 6,000 in jets.

All of that flying did not lead immediately to an interest in space. "I was certainly aware of the

Prior to his selection as an astronaut, Fred Haise served as a research pilot at two NASA facilities.
Click to enlarge image

Mercury Program and even got to meet some of the original seven astronauts when they came to Lewis for training," he recalled. "At that time, it was not clear there would be anyone flying into space beyond Mercury. It wasn't until the announcement by President Kennedy of going to the Moon and the emergence of the Gemini and Apollo Programs that I became interested in joining the space program."

Haise was one of 5,000 to apply as a member of NASA's Astronaut Group 5. After testing, medical examinations and selection panel interviews, he emerged as the highest-scoring applicant of all and was one of 19 astronaut candidates chosen.

After training, Haise served as a backup crew member on the Apollo 8 mission, the first to travel around the Moon. He was scheduled as a member of the Apollo 11 crew with Neil Armstrong and Buzz Aldrin. However, Michael Collins had been withdrawn from an earlier mission because of illness and was shuffled down to Apollo 11 following his recovery, moving Haise to backup.

The chance to fly to space finally came with Apollo 13, accompanying commander Jim Lovell and command module pilot Ken Mattingly. However, the mission would launch with backup command module pilot Jack Swigert replacing Mattingly, who has been exposed to the measles.

The flight proceeded as expected until an oxygen tank 56 hours in created a crisis that would hold the world spellbound for the next four days. Haise was in the lunar module at the time of the incident. When he made it to his command module seat, he saw oxygen tank No. 2 was gone. "The strongest emotion for me was right after the explosion when I first surveyed the instrument panel and confirmed that we had lost oxygen tank No. 2," he said. "I knew without referring to he mission rules that this called for an abort (of the lunar landing). I was sick of my stomach with disappointment, realizing that all the training I had done to fly Apollo 8, 11 and 13 was wasted."

Despite the well-documented drama to follow, Haise said he was never concerned about a return to Earth. "I never felt that we would not have a chance to attempt a reentry," he said. "The environment was wearing (however), as we had to live in a damp, mid 30-degree crew cabin for four days without adequate clothing."

During their trip around the Moon and back to Earth, the crew had to perform a number of emergency procedures. "The training on my prior

Fred Haise poses in flight gear at the Apollo 13 launch site in Florida on April 1970, just days prior to mission liftoff.
Click to enlarge image

A technician adjusts Fred Haise's lunar extravehicular visor assembly) during mission training Feb. 3, 1970
Click to enlarge image

missions only came into play where the procedures were the same for Apollo 13," Haise noted. "Most of our workarounds for Apollo 13 were unique. Real-time workarounds developed by Mission Control and contractors saved the day."

General aviation experience helped the astronauts most, Haise explained. "I think the general ability to deal with the unexpected or with handling failures goes back to my aviation experience over the years from 1953," he said. "I have been on fire several times, once receiving burns over 65 percent and spending three months in a hospital. I have had experience with engine failures and other more minor system failures over the years."

As the spacecraft circled the dark side of the Moon, Haise and Swigert peered out the windows for their first close look at the lunar surface. "One of the two things that was unique with my spaceflight experience were the views out the window, both from low-Earth orbit, as well during the passage to and from the Moon and, in particular, our brief look at the backside from an altitude of a little over 130 miles," Haise said. "I was impressed with how much more rugged the backside looked without any of the large dark areas (mares) seen on the front side from Earth."

Continued on following page

Fred Haise Jr. – native son-turned-enduring hero

Fred Haise smiles after receiving NASA's Ambassador of Exploration Award (an encased Moon rock) on Dec. 2, 2009.

Fred Haise signs a young visitor's space suit during Stennis Space Center activities celebrating the 32nd anniversary of the Apollo 11 mission in 1970. Haise, a Biloxi native, served as lunar module pilot on the mission.

Fred Haise speaks during a dedication event for relocation of the Saturn V S-IC-15 rocket stage (seen in background). The stage was tested at Stennis Space Center to launch the Apollo 19 mission with Haise as commander until NASA canceled the final Apollo flights.

Continued from previous page

After circling the moon, Haise was able to glimpse the Fra Mauro region where he and Lovell had been scheduled to land. One could wonder at the emotions he felt, but Haise recalled, "I did not feel any added disappointment as I viewed the area."

He takes the same view when asked to glean lessons from the experience. "I don't think there were any new lessons from Apollo 13 (compared to other missions) as to the importance of training or being prepared and having teamwork to work through unplanned circumstances," he said. "All missions had to deal with problems. In fact, both Apollo 14 and 16 almost aborted their landings."

Haise remained with NASA for nine years after Apollo 13. He served on the backup crew for Apollo 16 and was scheduled to command the Apollo 19 mission, until it was canceled. He subsequently commanded three of five free flight test missions for the Space Shuttle Program, demonstrating the aerodynamic design and landing capability of the new vehicle. He was scheduled to fly a shuttle mission, but it became clear rollout of the new vehicle would be delayed.

Haise subsequently left NASA in 1979 to work as a Grumman Aerospace Corp. executive, retiring in 1996.

The Biloxi native was inducted into the U.S. Astronaut Hall of Fame in 1997. In December 2009, NASA presented Haise with the agency's Ambassador of Exploration Award, a recognition of his role as a spokesperson for space. Haise presented the encased Moon rock he received to his former elementary school for display to students.

Haise has remained a staunch supporter of Stennis Space Center, which he first visited as a rookie astronaut. He also has been a tireless advocate for INFINITY Science Center, the official visitors center for Stennis. "I think aviation, space and science museums are important for the knowledge imparted to young and old," he said. "For the young, it is possible the interesting things they see and learn about will inspire them to make the most of the talent with which they are blessed.

"INFINITY also serves as a beacon along the highway into Mississippi to encourage people to visit and stay awhile," he continued. "It gives them a view of the incredible work being done at Stennis Space Center. Through the hands-on exhibits and special programs, education is provided to many visiting young people."

INFINITY visitors can learn about Haise as well. His Apollo 13 flight suit is on view. The Apollo 19 booster stage that would have launched him to the Moon also is located there, clearly seen by vehicles leaving Louisiana to enter Mississippi.

Decades removed, Haise no longer lives on the Gulf Coast. However, there is no doubt he still resides in the area, bigger than life for all to know.

There is one photo of Haise and his Apollo 13 crewmates that commands attention. Following splashdown, they had been delivered to the nearby USS Iwo Jima. They are being greeted by U.S. Navy Rear Adm. Donald C. Davis, commander of Recovery Task Force. Ship crew members are everywhere to catch a glimpse.

Lovell is nearest the admiral, flanked by Swigert, both with full smiles. Haise is at the foreground end of the line, looking to his right, his hand raised in greeting to welcoming sailors. A small smile plays on his face and in his eyes.

One can just tell – he knows a secret.

Rear Adm. Donald C. Davis (USN), Recovery Task Force commander, welcomes Fred Haise (left), Jack Swigert, and Jim Lovell aboard the U.S. Iwo Jima after their safe return to Earth. on April 17, 1970.
Click to enlarge image