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50th anniversary of the moon landing

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NASA Langley's "fingerprints" all over the Apollo mission

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On July 20, 1969, Neil Armstrong took a “small step” on the moon — but the giant leap to get him there began a full decade earlier in Hampton.

It began in the imaginations and hubris of engineers, technicians and scientists at NASA Langley Research Center who took an audacious presidential directive in 1961 and ran with it.

Even as the spotlight moved away from Hampton and toward a flashy new sister center in Houston, the Apollo 11 mission was still designed and honed with Langley expertise.

Now, as the 50th anniversary of that historic mission approaches and NASA is newly tasked to return humans to the lunar surface in 2024, Langley officials and Apollo veterans tout the center’s role in the long lead-up to putting the first man on the moon — from the Mercury and Gemini projects to mapping the lunar surface.

“All of that was born here at Langley — the ideas and the creation of the architecture that allowed us to do that,” said Walt Engelund, director of the Space Technology and Exploration Directorate at Langley.

Retired aeronautics engineer Ed Kilgore is an Apollo veteran. He rose to head the engineering division at Langley, and then to lead NASA’s Office of Aeronautics and Space Technology. He was in a meeting in Washington in 1961 when then-NASA Administrator James E. Webb interrupted to say he’d just gotten a call from President John Kennedy.

“He wants us to go to the moon, put a man on the moon, within this decade,” Kilgore, now 97 and a Newport News resident, recalls Webb saying. “And, of course, I said, ‘Yes, sir. We will do it.’

“We had to work our tails off to get it done.”

Christopher Columbus Kraft, 95, the legendary Langley engineer who helped establish NASA' s Mission Control Center and went on to lead the newly minted Johnson Space Center in Houston, said his Apollo-era colleagues rose to the massive challenge:

"We never doubted that we could do what we set out to do."

Mercury

The Soviets started it.

When the USSR launched the first man-made satellite into orbit on Oct. 4, 1957, Sputnik struck such fear and awe into U.S. hearts that the National Advisory Committee for Aeronautics, or the NACA, was recommissioned as NASA: the National Aeronautics and Space Administration.

One of its mandates was to put an American in orbit — fast.

NASA christened it Project Mercury, culled the ranks of military test pilots for seven likely astronauts and brought them to Hampton Roads for training:

Scott Carpenter, Gordon Cooper, John Glenn, Virgil "Gus" Grissom, Alan Shepard, Walter "Wally" Schirra and Donald "Deke" Slayton.

The men were assigned a regimen of physical exercise and skin-diving to simulate the weightlessness of space and the possible sensory deprivation of re-entry. A space capsule was floated in Langley's big hydrodynamics tank or in the nearby Back River so they could practice scrambling out of it.

Meanwhile, Langley engineers and scientists in the Space Task Group, led by Robert Gilruth, brainstormed on the nuts and bolts.

Legendary researcher Max Faget, for instance, devised key components of the mission: the simple, nonlifting body shape of the capsule that could cut a ballistic path through the atmosphere without overheating or over-accelerating. He also promoted small attitude jets to maneuver the craft in orbit, retrorockets and a parachute for final descent.

Engineers conducted hundreds of wind tunnel tests of scale models of the capsule and capsule/rocket configurations. They launched capsule models on research rockets at NASA Wallops Flight Facility on the Eastern Shore or dropped them at high speed into a water tank.

Langley also designed and led a two-year mission to build and manage 17 tracking stations around the globe — often in remote and hostile areas. These stations were considered critical not only to track the path and health of the capsule, but to keep tabs on the astronaut inside.

Finally, on May 5, 1961, Shepard slid into a Mercury capsule at Cape Canaveral and blasted 115 miles into the air and back again, a 15-minute ride that captured international headlines.

Unfortunately, Soviet cosmonaut Yuri Gagarin beat him to it — launching three weeks earlier, lapping the planet once, then parachuting safely back to Earth.

Still, Shepard's — and NASA's success — galvanized the collective imagination. Twenty days after Shepard's rocket ride, in a historic address to Congress, Kennedy challenged the nation to put a man on the moon and return him safely before the decade was out.

"Time for a great new American enterprise," Kennedy said. "In a very real sense, it will not be one man going to the moon … it will be an entire nation."

Grissom was up next in a nearly identical launch as Shepard's — 15 minutes straight up and down again. Then on Feb. 20, 1962, John Glenn made his historic three-orbit, 81,000-mile trek around the planet.

By May 1963, three more Mercury astronauts had taken their turns — a heart condition had grounded Slayton. Soon after, its mission completed, Project Mercury formally ended.

Today, its impact is still embedded in the identity and even some of the infrastructure of Hampton Roads. Military Highway, which runs through Hampton and Newport News, was renamed Mercury Boulevard. Small bridges were named after each astronaut. The road to NASA Langley is called Commander Shepard Boulevard. There's a Virgil I. Grissom Library in Newport News.

More recently, three black female mathematicians who worked as "human computers" at Langley — calculating trajectories for Mercury, Gemini and Apollo astronauts, breaking gender and color barriers — were featured in the 2016 best-selling book "Hidden Figures" and its namesake film.

One of those women, Katherine Johnson, now 100 years old and living in Newport News, has been showered with international honors, including a Medal of Freedom from President Barack Obama in 2015. Two years later, NASA Langley named its new Computational Research Facility after her.

And in June, the street outside NASA headquarters in Washington was renamed "Hidden Figures Way."

As Project Mercury drew to a close, an editorial in the Daily Press noted that the country had "arrived at the threshold of space."

But the axis of NASA's space race had shifted. Langley would still play a key role in shaping the mission to the moon, in training and technologies, but the national spotlight had swiveled to Houston.

Shooting for the moon

With the moon firmly in NASA's sights, Langley redoubled its efforts.

"We started out pushing toward going straight to the moon," said Kilgore. "That turned out to be an almost impossibility."

A straight, direct ascent would require a rocket that was just too big, and a prohibitive payload of fuel for the crew to blast off again from the lunar surface.

It was Langley and aerospace engineer John Houbolt that devised the final architecture for Apollo: a lunar-orbit mission with a combined command module and lunar lander. Astronauts could undock the

lander while in lunar orbit, ride it to down to the surface, launch again, rendezvous and dock with the orbiting command module and return to Earth.

But this plan required training astronauts to fly in a new and complex way: to rendezvous and dock two separate vehicles orbiting at breakneck speeds.

It was up to Langley engineers to develop the techniques and hardware for this new effort, called Project Gemini.

The center's Space Mechanics Division built a Rendezvous Docking Simulator along a 210-foot track in the rafters of its hangar and hung full-scale mock-ups of the Gemini and Apollo cockpits.

There, Armstrong and other Gemini astronauts learned to finesse the tricky space rendezvous; docking was easier to manage.

Then they made 10 manned flights between March 1965 and November 1966 to nail down the procedure, learn to operate in weightlessness and conduct spacewalks.

Langley also built a massive gantry called the Lunar Landing Research Facility to develop the techniques and training for pilots to land a rocket-powered vehicle on the moon.

Engineers also devised a contraption of canvas slings and steel suspension cables that can angle an astronaut at 80 degrees against an inclined walkway at the gantry. The Reduced Gravity Walking Simulator taught astronauts to walk and maneuver in the moon's minimal gravity.

The gantry still stands — a six-legged behemoth of steel lattice looming 240 feet high and 400 feet long. The national historic landmark has been repurposed for aeronautics testing and, more recently, to test new NASA and commercial designs for crewed spacecraft.

But before any astronaut could land on the moon, NASA had to know what the surface looked like.

So Langley was tasked yet again, this time under engineer and mission designer Norman Crabill, to develop and manage lunar orbiters to take detailed, high-resolution photographs of specific regions of the lunar surface to identify safe landing sites.

Giving the Lunar Orbiter project to Langley engineers was controversial. Physical chemist and Nobel laureate Harold Urey, for instance, complained to Administrator Webb that he was entrusting this crucial scientific program to "a bunch of plumbers."

Even NASA's expectations were modest — earlier lunar probes out of NASA's Jet Propulsion Laboratory in California had had mixed success.

"We were assigned five spacecraft," Crabill said, "in hopes that maybe two or three of them would work."

Instead, all five orbiters worked spectacularly — the first three mapped the proposed landing sites so well that the remaining orbiters went on to map 98% of the lunar surface, including the Sea of Tranquility, where Armstrong would land just three years later.

By the time Armstrong set food on the moon, and despite Langley's decade of preparing for that moment, it was Houston and Cape Canaveral in the limelight.

"But there wouldn't have been an Apollo program — a successful Apollo program — without Langley," said Joel Levine, a research professor at William and Mary and a retired senior research scientist at NASA Langley.

Engelund is philosophical.

"We may not get the spotlight shone on us when the big missions actually fly, but I think everybody here at Langley knows that we have our fingerprints all over those missions and that enabling technology that we provide," Engelund said.

"So I think that gives us the 'feel good' that everybody needs. We're OK with that."

NASA committee lobbied for Neil Armstrong to be the first on the moon. Here's why they picked him.

https://www.dailypress.com/news/dp-nws-apollo-50-armstrong-aldrin-20190627-story.html

When Neil Armstrong and Edwin "Buzz" Aldrin practiced landings at the NASA Langley Research Center's gantry, no one cared who got off first.

Lots of people had set foot in Hampton, Virginia.

But when the target was the moon — not just the stunningly accurate replica put together by Langley's engineers — that consideration became critical. The first man to set foot on the moon would become an iconic international hero, perhaps the most famous person in the world, and the embodiment of NASA's public image.

Ultimately, of course, the choice was Armstrong, who on July 20, 1969, told Houston and the world that he was about to take "one small step for a man, one giant leap for mankind." But that happened only after the quiet but forceful lobbying of four men — administrators Chris Kraft, Bob Gilruth, George Low and astronaut Deke Slayton — who had formed an unofficial advisory committee that wielded much influence at NASA.

"We wouldn't ordinarily weigh in and interfere with that kind of decision," said Kraft, the Hampton native who designed the Mission Control center and became its first flight director. "But we felt very strongly about Neil being first."

On previous Gemini and Apollo flights, the decision was purely logistical. The module pilot would take the spacewalks, so that the commander could remain in control of the craft.

Upon returning to Earth, whoever had easier access to the hatch emerged first. In public statements, NASA suggested the same protocol would be in place for the moon landing — it would be a simple logistical decision.

“But there was a private discussion among those four chief people — Gilruth, Low, Kraft and Deke,” NASA historian and author James Hansen said. “They knew whoever did step out first would become a world famous individual. They felt that he would become another Charles Lindbergh, and all four men felt unanimously that Neil was very Lindbergh-like — better, personality-wise, to handle the fame and celebrity that would come with it.”

Lindbergh, the legendary American aviator who captured the world’s attention in 1927 with his solo flight from New York to Paris, was a stoic man — articulate but not glib or colorful, a family man who was comfortable in the spotlight but never sought it.

Armstrong was the same way, whereas Aldrin was known to be more outspoken and colorful — closer, perhaps, in personality to the original Mercury 7 astronauts who put “the right stuff” on display for the public but, in most cases, relished their newfound celebrity.

Ed Kilgore, who worked at NASA from 1944-82 and served as head of engineering at the Langley Research Center, said: “The first astronauts we had were very capable people, but as test pilots they were very fast livers. They did everything fast. They drove fast and they partied fast, but they were very successful at what they did. Gilruth was looking for a new set of people and wanted to get them away from the partying atmosphere. He told me, ‘When I interviewed Neil, I knew that was the guy I really wanted to do this job.’ He knew Neil would never do anything to embarrass the country.”

It was understood that commander Armstrong and lunar module pilot Aldrin would land on the moon while command module pilot Michael Collins would remain in orbit until it was time for the two modules to rendezvous for the return to Earth.

By most accounts, Aldrin — as lunar module pilot — wanted very much to take the first step on the moon. He pointed to the protocol of the pilot taking spacewalks while the commander stayed on board, though that was not a consideration when the module was sitting on the moon rather than traveling through space. Aldrin was a West Point graduate and a decorated fighter pilot during the Korean War, while Armstrong was the first civilian chosen to serve as an astronaut.

But Kraft, Gilruth, Low and Slayton, while confident in Aldrin’s abilities as an astronaut, had their concerns.

“There was an egotistical feeling in Aldrin that didn’t seem to be there in Neil,” Kraft said. “That was going to be difficult to overcome. In the end, he did a perfect job at what we asked him to do. He saw what we did, and he never complained to me about it. We’re good friends today.”

As for Armstrong, he fit the bill perfectly.

He said the right things in the right way, and said little else. He immediately retired as an astronaut — he was too valuable a resource for NASA to risk sending him back into space again. Kilgore had an office near Armstrong's and traveled with him frequently, running interference for the crowds that would mob the worldwide celebrity in airports.

"The last time I saw Neil," Kilgore said, "he finally decided he could not do his job in Washington. There were too many interruptions. So he got a job teaching at the University of Cincinnati, but he had the same problem there with just a different set of people. The president of the university would bring people in every day to meet Neil. He couldn't do his job. So he finally decided he would become something of a hermit, and he did."

Armstrong turned down many requests from aspiring biographers, but James Hansen persisted and after three years was able to persuade him. "First Man: The Life of Neil A. Armstrong" was published in 2005 and later adapted into a 2018 film that won the Academy Award for its visual effects.

Aldrin wrote two autobiographies, "Return to Earth" in 1973 and "Magnificent Desolation" in 2009. He wrote and spoke of his battles with depression and alcoholism, as well as three marriages that ended in divorce.

Armstrong died in 2012 at age 82. President Barack Obama praised him for "a moment of human achievement that will never be forgotten." Armstrong's family described him as "a reluctant American hero" and made this simple request: "The next time you walk outside on a clear night and see the moon smiling down at you, think of Neil Armstrong and give him a wink."

Fifty years after lobbying for Armstrong to be the first man on the moon, Kraft said he knows it was the right choice.

"He was a consummate test pilot and a consummate American, if I can put it that way," Kraft said. "He was overcome with getting the job done and getting it done right, and you could see that in almost everything Neil Armstrong did. He was going to do it right and make it happen for his country. Man, how could you ever ask anyone to do more than that?"

NASA's historic gantry remains connected to storied past

https://www.dailypress.com/news/dp-nws-apollo-50-gantry-legacy-20190701-story.html

For some, it's part of the scenery on their commute over Wythe Creek Road.

To those who know its story, it's an important part of American history.

It’s a source of awe for summer interns and visiting kids on field trips. And it’s still a functioning, critical piece of equipment for NASA, unique in its capabilities for impact tests.

For Lisa Jones, it’s been her office for more than 30 years, but there’s also a symbolic significance to the towering gantry at NASA Langley Research Center.

“It’s a reminder of what humans can achieve,” said Jones, the facility manager.

The gantry, who’s current official name is the Landing and Impact Research Facility, is famous for its role in preparation for the moon landing 50 years ago.

Then called the Lunar Landing Research Facility, the gantry — rigged with suspension cables, a hydraulic bridge and a hoist system — simulated the moon’s gravity for Apollo 11 astronauts to practice their landing.

The gantry stands 240 feet tall and 400 feet long, providing the space to to fly a rocket-powered test vehicle up to 17 mph and with a fair amount of space to move around.

Langley engineers also simulated walking on the moon using a series of cables and straps and a backboard that enabled astronauts to walk at an angle at a fraction of Earth’s gravity.

Center lore has it that the contraption was dreamed up by an engineer while lying on his couch watching a college football game.

“He was pushing his feet against the arm of the couch and he goes, ‘You know, if that was at the correct angle, I’d have one-sixth G on my spine,’” said Jones. “And that’s how they came up with that backboard.”

Knowing how minimal gravity would act on a human body leaping on the lunar surface was vital.

“It’s not like landing on a trampoline,” Jones said. “You know you’re coming back down on a trampoline. ...They were afraid they were going to jump and just leave the moon behind and keep going.”

For training purposes, Langley engineers also recreated a portion of the lunar surface beneath the gantry. They built craters out of concrete — patches of worn concrete are still visible — and had astronauts train at night.

They did such a realistic job simulating a lunar landing that Armstrong said later that actually landing on the moon was “like Langley.” And real videos of Apollo astronauts training at the gantry have appeared on hoax websites as “proof” the lunar landings were staged.

To this day, conspiracy theorists look to footage of the gantry in use to justify their belief the moon landing was faked.

Decades after Apollo 11 and decades into her work at the gantry, the connection to the past is still palpable and still special for Jones, enough to bring on waves of emotion every now and then when she

stops and thinks about getting to work in the same place as a few “crazy and brave” astronauts she watched on television when she was 6 years old.

While a testament to NASA’s past accomplishments, the gantry is far from a museum or memorial, although Jones does welcome many guests and tour groups to the facility.

It has had a robust second life as a place for scientists and engineers to perform various tests, often involving crashes or impacts.

As Jones put it, they get to break a lot of things.

That’s not as simple as it may sound.

The tests are the work of a dedicated team, and they often have only one chance to do a test properly, which can lead to some sleepless nights, Jones said. Even though something is planned to break, it needs to break in a way that offers meaningful data for the people or agencies conducting the test. There are highly-coordinated mechanisms at work to ensure tests go smoothly.

That happened at a recent plane drop, which sent an out-of-use commercial airliner plummeting into the dirt.

The crowd that gathered included friends and family of NASA employees, among them many children, all maneuvering to get the best view of the plane through the chain-link fence and the best video on their phones. Some brought camp chairs in anticipation of a long wait, which ended up a prudent move.

Martin Annett, head of the Structural Dynamics Branch at Langley, said he was in no hurry to do the drop, saying making sure everything was set up for a successful test was the most important thing. But despite the delay and the smothering heat of June in Virginia, the crowd didn’t falter or retreat back to the indoors.

They waited to see the gantry in action, even if only for a few seconds.

Plenty of people ask to go up to the top of the gantry, Jones said, but she can’t grant all the requests. But she understands the desire. There are few structures with a comparable legacy.

Plus, the view from up top is breathtaking, among the best on the Peninsula. On a crisp, clear fall day, she said you can see the eastern edge of Virginia Beach.

And once you know some of gantry’s legacy, you can pause to imagine the scenes from 50 years ago.