SPECIAL ANNIVERSARY SERIES

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FROM LANGLEY TO THE MOON

Apollo 11 at 50:

Researchers from the Hampton facility had their 'fingerprints' all over history-making space mission

By Tamara Dietrich
Staff writer

HAMPTON — 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 leadup 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

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The Apollo 11 Lunar Module ascent stage, with astronauts Neil A. Armstrong and Buzz Aldrin aboard, is photographed from the Command and Service Modules during rendezvous in lunar orbit July 21, 1969.
COURTESY OF NASA

TODAY: Engineers, technicians and scientists at Langley take a presidential directive and run with it.

MONDAY: Langley's iconic gantry: a source of awe for interns and visiting kids and a critical piece of equipment.

TUESDAY: Apollo anniversary events in Hampton Roads.

WEDNESDAY: They say it's a hoax ... There are those who still insist we never went to the moon.

THURSDAY: Neil Armstrong and Buzz Aldrin prepare at Langley for their walk on the moon.

FRIDAY: Hampton native Chris Kraft, one of the primary architects of the U.S. space program, reflects.

SATURDAY: The moon landing, told through oral histories and other NASA accounts.

SUNDAY: From Apollo to Artemis to Mars — NASA Langley eyes the next giant leap.

EXPERT SAYS MASS SHOOTING 'ONE OF THE COLDEST' HE'S HEARD OF

Motivation for deadly rampage at Virginia Beach Municipal Center still unknown

By Joanne Kimberlin
Staff writer

VIRGINIA BEACH — Why?

That remains the question on many minds six weeks after the deadly workplace rampage at the Virginia Beach Municipal Center.

It could be months before investigators discover what set off the worst mass shooting in the region's history.

Or never.

In nearly one-fourth of similar tragedies across the country last year, no motive was found, according to a U.S. Secret Service report released last week.

And if investigators do find something — the spark, the thing that pushed DeWayne Craddock over the edge that day — it still won't make sense to the rest of us. Because, thankfully, the vast majority of humans would never — could never — do what he did, under any circumstances.

Plumbing the depths of a mass shooting is a minefield.

Details are painful for families and friends. Co-workers and community are traumatized. Media outlets grapple with how much to even utter the shooter's name, concerned about awarding the notoriety some killers might seek.

But examining these episodes and the people behind them is the only hope.

"Fail to dissect," said Jason Parker, a psychologist and senior lecturer at Old Dominion University, and society is doomed "for history to keep repeating itself."

In the aftermath of each, familiar debates emerge.

Firearms advocates, concerned about the possibility of more gun control, point to mental illness as the culprit.

Mental health advocates, concerned about stigmatizing the millions of harmless people with some form of mental illness, point to the easy availability of guns.

Both arguments oversimplify what just happened, said Frank Farley, a former president of the American Psychological Association and more recently, the Society for the Study of Peace, Conflict and Violence.

Craddock, a public works engineer, turned his workplace into a war zone — killing 11 of his colleagues and a contractor, and wounding four others before dying in a hail of police gunfire.

"In my long career, I've found it's nearly always due to a recipe with more than one ingredient," said Farley, who teaches at Temple University in Philadelphia and is an internationally recognized

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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

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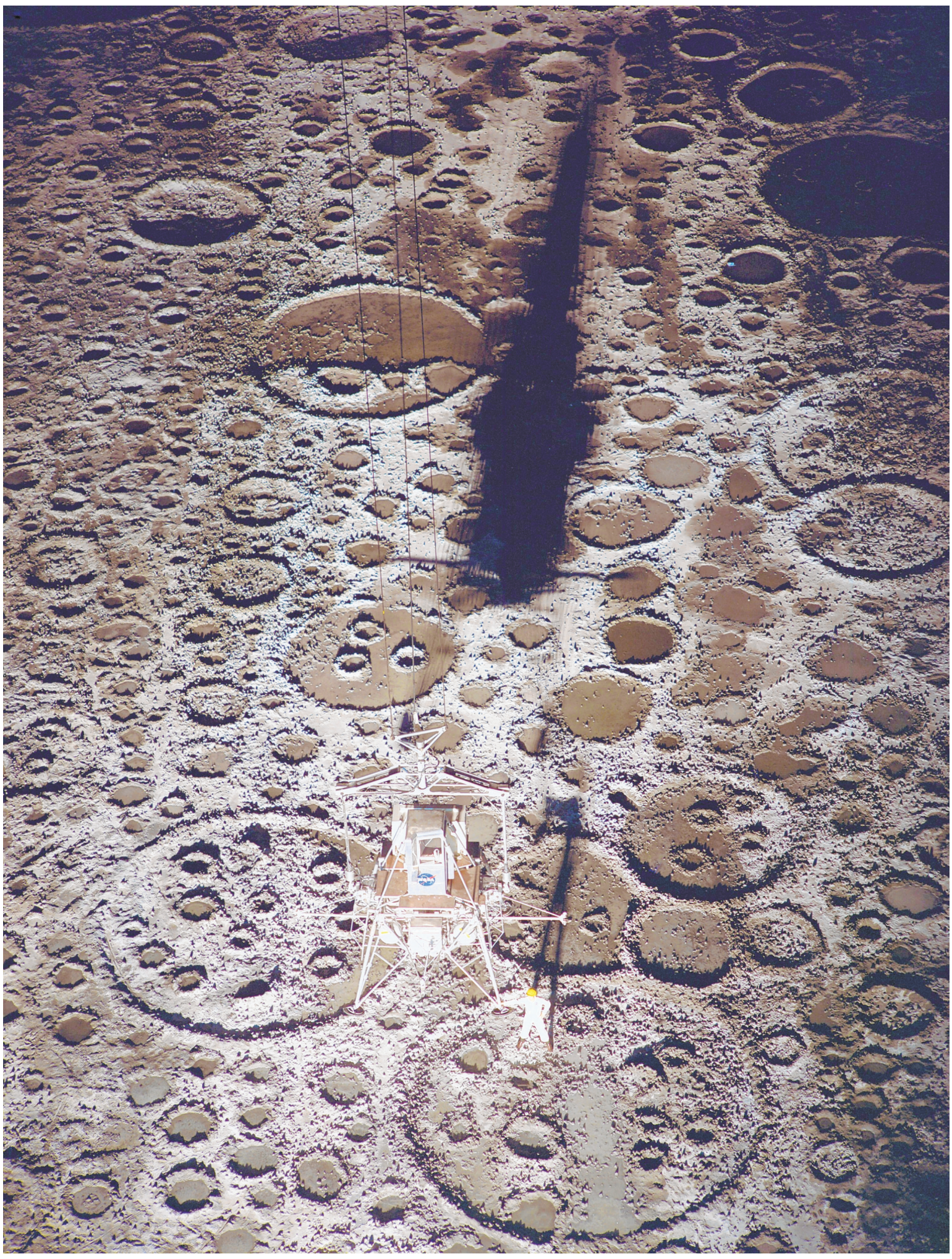

PHOTOS COURTESY OF NASA

The Lunar Landing Module is photographed at night at the Lunar Landing Research Facility at Langley Reasearch Center in Hampton.

A vehicle for the Lunar Landing Research Facility sits outside a hangar at Langley Research Center in an undated photo.

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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.

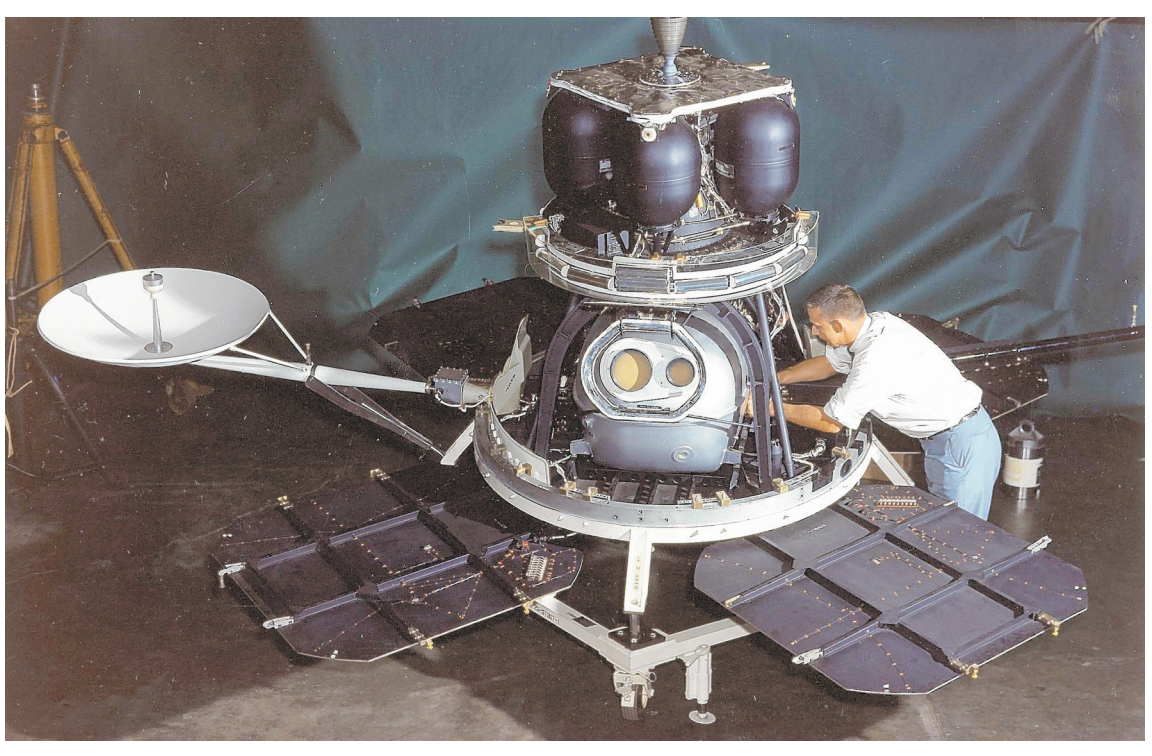
"We started out pushing toward going straight to the moon," said Kilgore. "That turned out to be an almost impossibility."

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.

PHOTOS COURTESY OF NASA

The original seven Mercury astronauts pose for a photo in their flight suits at NASA Langley Research Center in March 1961 . From left, Lt. M. Scott Carpenter, Capt. Gordon Cooper, Col. John H. Glenn Jr., Capt. Virgil "Gus" Grissom, Lt. Comdr. Walter Schirra, Lt. Comdr. Alan B. Shepard Jr. and Capt. Donald K. "Deke" Slayton.



Between 1966 and 1967, the Lunar Orbiter program, managed by NASA Langley, helped mission managers pick the best landing sites for the Apollo astronauts, including the exact spot in the Sea of Tranquility for the first manned moon landing on July 20, 1969.

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 foot 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."

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