The Houston Manned Spacecraft Center: The Right Place with the Right Stuff

By Calvin D. Blair

[T]he vows of this nation can only be fulfilled if we in this nation are first, and therefore, we intend to be first.

– President John F. Kennedy,
September 12, 1962, Houston

A view of Earth from the lunar spacecraft.
Photo courtesy of NASA, AS11-44-6552.

About the size of a beach ball, *Sputnik I*, the world's first artificial satellite, orbited the Earth in a mere ninety-eight minutes. Even as many Americans rushed outside to watch the first space explorer streak across the sky, the emergence of the Soviet satellite in 1957 wounded their perception of U.S. ideological and technological superiority. In response, the military scrambled to design missiles, politicians deepened their rhetoric, pundits struggled to come to grips with the new world order, and, at President Dwight Eisenhower's request, the U.S. Congress created the National Aeronautics and Space Administration (NASA).[1]

Elected in 1960, President John F. Kennedy announced to a joint session of Congress on May 25, 1961, that the United States would place a man on the moon by the end of the decade. Many believed that was an impossible goal, considering the Wright brothers' first flight had taken place less than sixty years earlier. Nevertheless, Houston rose to the occasion to help fulfill President Kennedy's vision and, in doing so, became immortalized in one of mankind's greatest feats —landing on the moon.

The Selection: From Bayou City to Space City

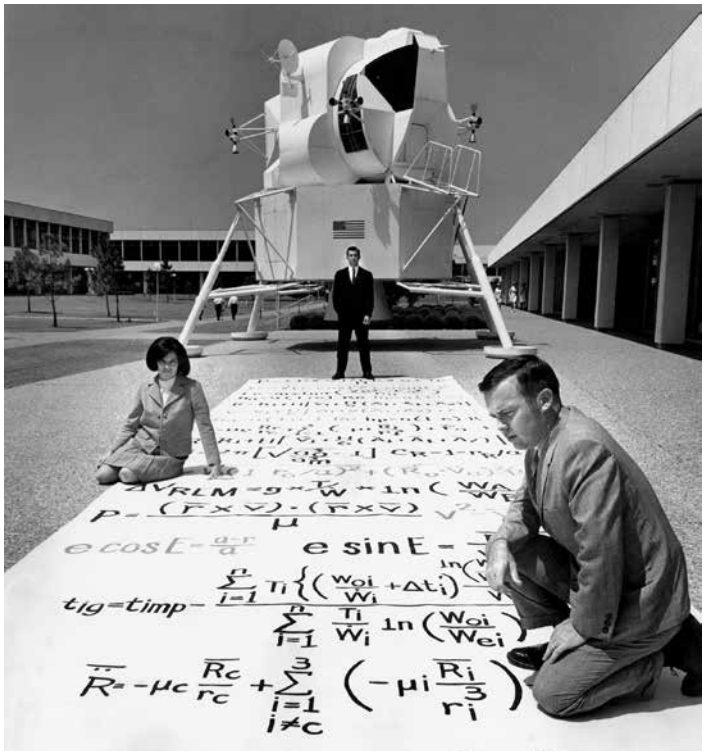
In the long list of people responsible for Houston's selection as the site of the Manned Spacecraft Center (MSC), three men stood above them all: Albert Thomas, a member of the U.S. House of Representatives from Houston; George R. Brown, a co-owner of Brown & Root, which was one of the world's largest construction companies of its kind; and Lyndon Johnson, vice president of the United States and a former U.S senator from Texas who chaired the Senate Special Committee on Space Preparedness. Apart from having a good professional relationship, these three men had a strong friendship. Brown's mentor, Texas state senator Alvin Wirtz, introduced him to Johnson, who was then a rising politician. Brown became one of Johnson's biggest contributors throughout his political career, and Johnson rewarded him with a civilian appointment to the National Space Council. Brown and Thomas also had a strong friendship, dating back to their college years at Rice Institute (now Rice University).[2]

Together, Brown, Thomas, and Johnson used their influence and knowledge to ensure Houston was an attractive MSC option for NASA, which had previously denied Rice Institute's request for a research program. Thomas chaired the House Independent Offices Appropriations Subcommittee, which oversaw NASA's budget. When Thomas was absent, NASA selected Beltsville, Maryland, as the site for the Goddard Space Flight Center, and Thomas did not approve. When it came time to review NASA's budget for the 1960 fiscal year, Thomas called NASA administrator Keith Glennan and threatened to cut NASA's funding if Houston was not chosen as a site for a research facility, saying,"Now look here, Dr., let's cut out the bull! Your budget calls for $14 million for Beltsville and I am telling you that you won't get a god-damned cent of it unless that laboratory is moved to Houston."[3]

Thomas, Brown, and Johnson knew Houston could be a viable candidate for the MSC site because Houston met all of NASA's criteria, even though it was not initially the front-runner. It had access to the ocean, navigable water ways that did not freeze, a mild climate, a thousand acres of land priced right for current and future development, universities within proximity, an airbase to accommodate military aircraft, and a business community excited to foster future technological advancements.[4]

Houston's leaders took advantage of the city's lucrative position and navigated their way through the halls of power to emerge as the vanguard of the space race. Thomas,

The original seven Mercury astronauts, each wearing a cowboy hat, are on stage at the Sam Houston Coliseum during the welcome ceremonies and barbecue dinner.
Photo courtesy of NASA.



Mathematicians and engineers played a critical role in the success of the Apollo 11 mission. One of the most influential among them, John C. Houbolt (not shown) insisted on the lunar-orbit rendezvous linking two spacecraft to protect the astronaut's safety. It was used for the first time in the Apollo 11 mission.

Photo courtesy of the Houston Metropolitan Research Center, Houston Public Library, MSS0087-2488.

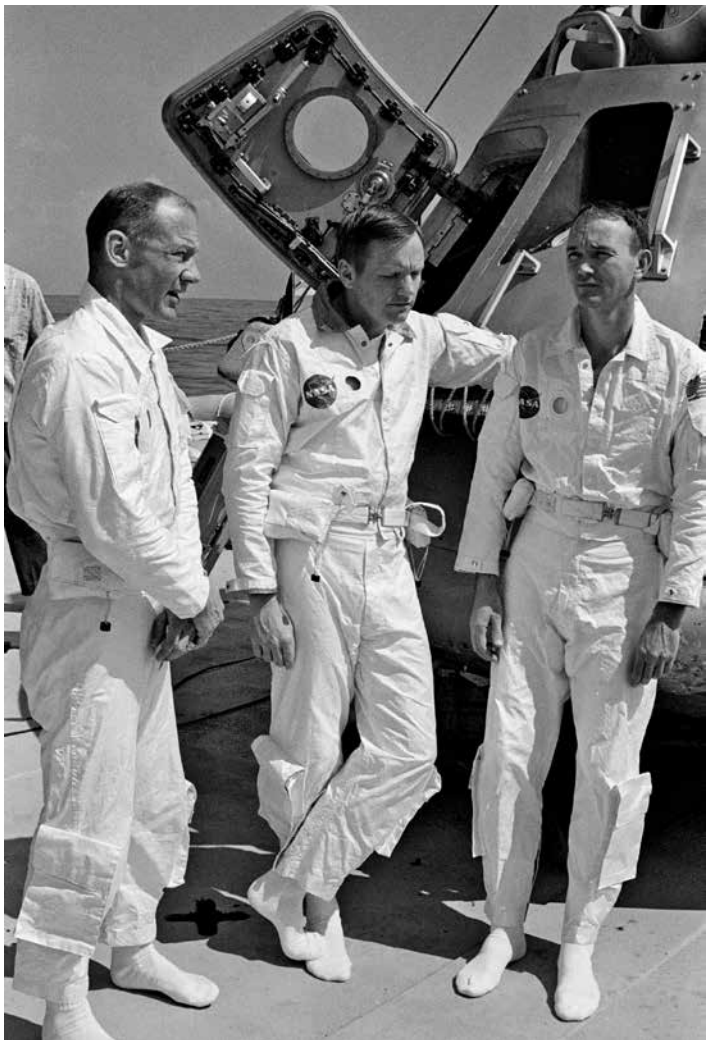
Brown, and Johnson had access to Kennedy's budget proposal, which included $60 million to fund construction of the MSC. On May 23, 1961, the three leaders received word from the new NASA administrator James Webb that he was considering Houston due to Brown and Thomas's interest in expanding Rice's space research. In an impromptu meeting held in June 1961 with Thomas, Brown, Webb, and Morgan Davis, the chairman of Humble Oil and Refining Company (now ExxonMobil), Thomas presented a plan to obtain the land and build the NASA facility in Houston.[5]

Brown and Thomas used their connections to Rice University, where Brown chaired the board of trustees, to coordinate the transfer of 1,000 acres of land from Humble Oil to Rice University that then donated the property to the federal government for the MSC. There was just one problem: the site for the new center stood within the city limits of Pasadena, and NASA wanted to say "Houston" when it landed on the moon. Thus, the mayors of Houston and Pasadena struck a deal swapping the MSC property for the natural area along Armand Bayou, which has become a renowned nature center.[6]

In the meantime, Houston was moving ahead. Rice University prepared a presentation for Webb on the programs it could offer to help educate the MSC's workforce. On September 19, 1961, NASA announced Houston as the MSC site. Brown & Root received a contract to construct the center, and Rice received $192,000 in fellowship money from the federal government to fund Rice graduate students.[7]

The choice of Houston puzzled some individuals, among them flight director Eugene "Gene" Kranz, who had worked at the NASA Launch Operations Center in Florida at Cape Canaveral (now Kennedy Space Center). However, he quickly realized NASA's success depended on its access to bright, young minds, and Houston delivered. Kranz pointed out, "By the time we started the search for the raw talent we needed to go to the moon, this [Houston] was the right decision because we could go to Universities and we'd bring in entire graduating classes."[8]

Just as Thomas, Brown, and Johnson took the reins as powerbrokers from their predecessors, a new wave of settlers to Houston helped mankind conquer the cosmos. In June 1961, Thomas foresaw the future of Houston, saying, "[NASA] will bring some of the smartest people in the world to Houston to work and raise their families," and so it did. As NASA employees began to relocate to Houston, they struggled to find housing close to the MSC until they discovered the newly developed Timber Cove subdivision. Some "NASA employees moved into the neighborhood, including rocket scientists, engineers, spacecraft designers, and four of the original Mercury 7 astronauts." Timber Cove, just like Houston, was forever changed by the pres-



From left to right, Edwin E. "Buzz" Aldrin Jr., Neil A. Armstrong, and Michael Collins stand in front of the Apollo Boilerplate 1102 during a training exercise for Apollo 11 on May 24, 1969.

Photo courtesy of NASA, S69-34882.

Armstrong and Aldrin can be seen performing lunar extravehicular activity on the monitor in the Mission Operations Control Room in the Mission Control Center (MCC). Gene Kranz led a massive restoration effort that brought Mission Control to its former glory for the moon landing's fiftieth anniversary. Kranz reflected on seeing the restored MCC, "It was dynamite. ... the emotional surge at that moment was incredible… believe it or not, I could hear the people talking in that room from 50 years ago." Photo courtesy of NASA, S69-39817.

ence of NASA and its employees. As historian Rebecca Wright noted, "Collectively, they transformed their neighborhood… and the subdivision evolved into a close-knit community."[9]

On September 21, 1962, President Kennedy visited Houston, where he spoke at Rice Stadium, proclaiming, "We choose to go the Moon in this decade and other things, not because they are easy, but because they are hard." Kennedy also spoke to the spirit of Houston's boosters, who worked tirelessly behind the scenes for years to bring the MSC to Houston, adding, "This City of Houston, this State of Texas, this country of the United States was not built by those who waited and rested and wished to look behind them. This country was conquered by those who moved forward—and so will space."[10]

Training: Do it Again, and Again, and Again

Originally unsure about the demands of spaceflight, NASA sought the best astronaut candidates who could withstand a set of rigorous tests. Only military test pilots could apply, and 508 did. After screening for age and height requirements, NASA chose 110 men and subjected them to high heat to test their tolerance, an endurance test to measure lung strength by how many balloons they could blow up, and a psychological analysis asking the candidates to provide, for example, twenty unique answers to the question, "Who am I?" The first astronauts selected, dubbed the "Mercury 7," included Scott Carpenter, Gordon Cooper Jr., John Glenn Jr., Virgil "Gus" Grissom, Walter "Wally" Schirra Jr., Alan Shepard Jr., and Donald "Deke" Slayton.

NASA divided its space flight program into stages: Mercury, Gemini, and Apollo. The goal of Mercury, which carried one man in the space capsule, was to place a human in orbit around the globe, determine man's ability to function in microgravity, and recover him safely when returned to Earth. After adding "The New 9" astronauts, Gemini missions carried two men to demonstrate they could stay in space for longer periods, conduct space walks, rendezvous, and dock in space, essential components for a moon landing. In the culminating program, Apollo, the three-man crews first demonstrated the ability to orbit the moon, and, finally, to land men on the moon and bring them home safely.[11]

The man in charge of selecting the astronaut crews for the Apollo missions was Deke Slayton, who insisted that all the astronauts "were essentially equal" and made his assignments purely on seniority.[12] Sadly, Apollo 1, saw the first loss of life for the space program when Roger Chaffee, Ed White, and Gus Grissom died in a fire during a test on the Florida launch pad in 1967. The unexpected tragedy and additional problems with construction of the lunar module delayed NASA's schedule but did not deter its mission.

The second round of astronauts included one of NASA's first civilian astronauts, X-15 test pilot Neil Armstrong, who had a degree in aeronautical engineering. Edwin "Buzz" Aldrin, who had a doctorate and a dissertation on orbital rendezvous, entered with "Astronaut Group 3, as did West

Gene Kranz at the flight director console during a simulation in April 1965. Gemini IV was the first mission to be managed at Houston's Mission Control Center. Photo courtesy of NASA, S68-55503.

Point graduate Michael Collins after a career as a fighter pilot in the Air Force. Despite NASA's strict training regimens and protocol meant to leave little or nothing to chance, a set of unforeseen circumstances led to the selection of Aldrin, Armstrong, and Collins for the Apollo 11 mission to land on the moon. The retirements of Wally Schirra and Frank Borman and the deferment of James McDivitt from Apollo 8 to Apollo 9 resulted in a shake-up that saw Armstrong and Aldrin assigned to Apollo 11. Collins, originally scheduled to fly on Apollo 8, had back surgery, resulting in his return to the astronaut selection pool and assignment to the Apollo 11 crew.[13]

Armstrong, Aldrin, and Collins reached their dream of travelling to the moon by unconventional means. Some might even call it luck. Director of flight operations Christopher Kraft liked to quote legendary University of Texas football coach Darrell Royal, "Luck is what happens when preparation meets with opportunity." NASA and the MSC saw to it that these men were prepared for their 240,000-mile journey to the moon. The astronauts travelled the world preparing for every eventuality. They learned how to survive in the desert and the lava flows of Hawaii, and how to "kill and eat a snake in the jungles of Panama." In May 1968 Armstrong had to eject from the lunar landing training vehicle after it started to tilt uncontrollably, causing it to crash into a large fireball as Armstrong floated safely back to Earth. The Apollo 11 crew logged an estimated 2,000 hours in the flight simulators in addition to their other preparations.[14]

Fate ordained these men the knights of the skies, but they did not achieve this feat alone. Three new Houstonians—Gene Kranz, Richard Koos, and Steve Bales—made the final call to land or abort the mission just seconds before the *Eagle* module touched down.[15]

Kranz stumbled upon an advertisement for the Space Task Group while flipping through a copy of *Aviation Week* magazine while working at Holloman Air Force Base in New Mexico. He opened the magazine on his desk and looked at the ad every time he entered his office. Kranz recalls, the Space Task Group "captured my imagination." After consulting with his wife, Kranz and his family decided they would prefer life in Virginia to Cape Canaveral so he applied to NASA and the family moved to Virginia in 1960.[16] At the time, NASA was still creating the procedures and protocols for mission launches. Ironically, Kranz became directly responsible for shaping and creating the very flight director's position for which he later gained notoriety.

In the weeks leading up to the Apollo 11 mission, Kranz and his "white team" trained tirelessly for every contingency, as the simulation supervisor (sim sup), Richard Koos, increased the pressure on the team. Koos was one of the earliest pioneers of the Space Task Group with a background at Army Missile Command at Ft. Bliss, Texas. Kranz said, "We went through a series of scenarios that was almost—seemed like forever. It was only a couple of weeks, but it seemed a lifetime where we could not do anything right. Everything we would do, we would either wait too long and crash or we would jump the gun and abort when we didn't have to, and the debriefings were absolutely brutal during that period of time."[17]

Kranz recounted the story of a final practice session they had that proved fortuitous, "[W]e were just about ready to finish up the training with the Apollo 11 crew. Then Sim Sup [Koos] stuck it to us again. The final training runs, invariably, are supposed to be confidence-builders." Koos did not see it that way and went through more challenges, which resulted in the crew performing more aborts. "I think it was

Approximately 300,000 people attended the ticker tape parade in downtown Houston on August 16, 1969, to congratulate Neil Armstrong and the other astronauts.
Photo courtesy of the Houston Metropolitan Research Center, Houston Public Library, RGD0006N-3813R3-004.

either last or second to last training exercise…" Kranz recalled, "We saw a series of computer program alarms. We'd never seen these before in training. We'd never studied these before in training. My guidance officer, Steve Bales, looked at the alarms and decided we had to abort."[18]

Steve Bales arrived at NASA as one among a long list of young, new hires. After receiving a bachelor's of science degree in aeronautical engineering from Iowa State University, Bales applied to and accepted a job offer from NASA at twenty-two years old. Four years later, he served as the guidance officer under Kranz's white team, which was responsible for the lunar module's navigational systems. A year younger than Bales when he arrived at NASA, Jack Garman graduated from the University of Michigan with a bachelor's of science in engineering physics with a specialty in computing. NASA sent Garman to trainings across the country, sharpening his skills on the inner workings of computers, which resulted in him becoming an important leader on Bale's support staff. Channeling his expertise and work ethic, Garman led the Instrumentation Lab at the Massachusetts Institute of Technology and made regular trips to Cambridge to oversee the construction and programming of the computers that would power the Apollo program. Garman was in the training session with Bales and Kranz when Bales incorrectly called an abort because of a computer error.[19]

With two weeks before the launch of the Saturn V rocket carrying the Apollo 11 spacecraft, Kranz wanted his guidance team to know every computer code. "I want a total expose, and I don't give a damn how long it's going to take him," Kranz asserted. "If he has to work all night or all week or every day from now to the launch, he's going to understand these program alarms."[20] Bales, Garman, and the rest of the team proceeded to study all of the codes, no matter how unlikely they were to occur. Garman created a cheat sheet that he described in 2001, "I still have a copy of it. It's handwritten, under a piece of plastic, and we wrote it down for every single computer run and stuck it under the glass on the console."[21]

Thanks to one difficult simulation supervisor, one meticulously prepared flight director, one humble guidance officer, and a support staff intimately familiar with every aspect of the onboard computers, opportunity met preparation. At 3:14 p.m. CDT, the alarm bells started on the lunar module. Only three minutes from the eventual touchdown on the moon, with fuel running out, Bales was called upon to give a "go" or "no go" ruling on the mission. According to Kranz, "There's two types of alarms. These are the exact ones that we blew in the training session on our final training day." Bales immediately went to his headset with Garman, and Garman, using his notes, determined the codes were "just like a simulation." As told by Chris Kraft, "When flight director Gene Kranz pressed him for his answer, young Mr. Bales' response was the loudest and most emphatic 'go' I have ever heard." Bales remembered the codes—1201 and 1202. And he recalled later, "[My friends] gave me a t-shirt that had those two alarms on it when I retired."[22]

Kraft reminisced that the support staff "in Houston were with their astronauts each step of the way," and that can equally apply to all of those working at MSC to fulfill NASA's missions. Jerry Bostick, the flights dynamic officer of Apollo 11, reflected on the lunar landing's importance to the space race: "We've done what we came to do, we want to do it a bunch more times, but we have proved it can be done.

Established in 1979, Tranquillity Park commemorated the tenth anniversary of the Apollo 11 mission, which landed in the moon's Sea of Tranquility. Visitors can see space themed installations, such as a replica of Armstrong's first footprint and memorials to those lost in the Challenger *and* Columbia *accidents.* Photo courtesy of the Houston Metropolitan Research Center, Houston Public Library, RGD006N-1979-2419-015.

We met the President's goal. We beat the Russians."[23]

When the astronauts returned home safely, Houstonians lined the streets of downtown to throw a ticker tape parade for the men who had stood on the moon. It could not have been done without the vision set forth by Albert Thomas, George Brown, and Lyndon Johnson to secure the MSC for Houston. It would not have happened without the hard work and endless training by Buzz Aldrin, Neil Armstrong, and Michael Collins to fly to the moon. It might have been delayed without the meticulous preparation of Gene Kranz, Stephen Bales, and Jack Garman, not to mention the thousands of other NASA employees, contractors, and university programs. All these factors forever linked Houston to its nickname "Space City" and culminated in this unforgettable moment:

> **Ed Aldrin**: Contact light. Okay. Engine stop. ACA – out of descent. Mode control – both auto. Descent engine command override – off. Engine alarm – off. 413 is in.
> **Capsule Communicator** (CAPCOM): We copy you down *Eagle*.
> **Neil Armstrong**: Houston. Tranquility Base here. The *Eagle* has landed.

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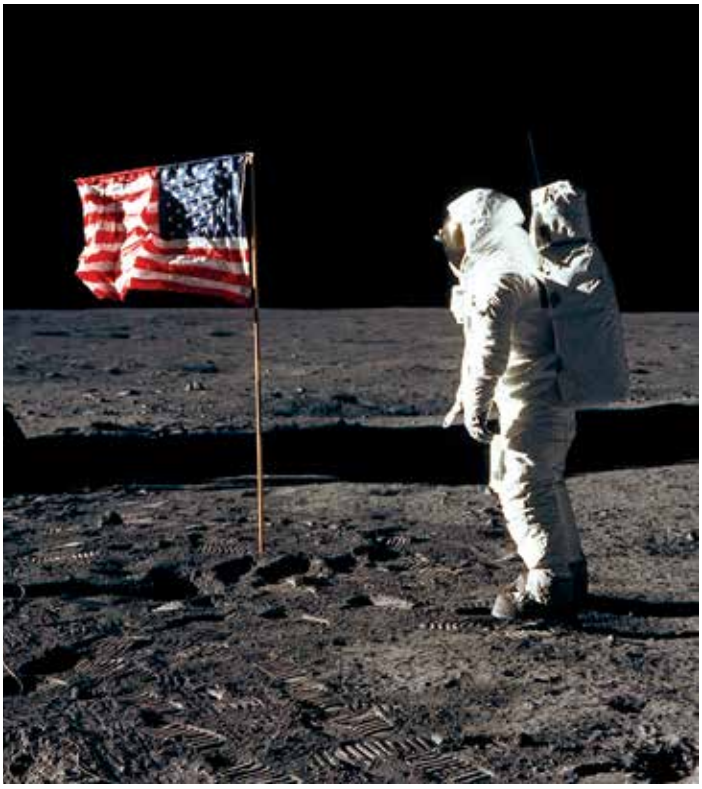

Neil Armstrong photographed astronaut Buzz Aldrin posing with the U.S. flag during the Apollo 11 mission on July 20, 1969.
Photo courtesy of NASA, AS11-40-5875.