



Neil Armstrong

# NEIL A. ARMSTRONG

1930–2012

Elected in 1978

*“For contributions to aerospace engineering, scientific knowledge, and exploration of the universe as an experimental test pilot and astronaut.”*

BY RICHARD H. TRULY

As long as there are history books, Neil Armstrong will be in them.

In May 1961, President John F. Kennedy had committed the nation “to achieving the goal, before the decade is out, of landing a man on the Moon and returning him safely to Earth.” On July 20, 1969, Neil Armstrong commanded the Apollo 11 mission that simultaneously ended the Soviet-American space race and met America’s goal with more than five months to spare.

Neil, with Colonel Edwin E. “Buzz” Aldrin Jr. at his side, steered their lunar landing craft Eagle to a lunar plain close to the southwestern shore of the Sea of Tranquillity. With the world watching, onboard computer alarms sounding, and the fuel extremely low and getting lower, Neil was in his test pilot element. He skimmed over large boulders covering the planned landing site, and softly touched down. His words to Houston were as historic as his deed: “Houston, Tranquillity Base here, the *Eagle* has landed.”

“Roger, Tranquillity,” CapCom Charlie Duke in mission control replied. “We copy you on the ground. You’ve got a bunch of guys about to turn blue. We’re breathing again. Thanks a lot.” The same could have been said for hundreds of millions of people around the world watching on black-and-white television.

About six and a half hours after landing, with a television camera watching every step, Neil climbed down *Eagle's* ladder, set his feet in the lunar dust, and said: "That's one small step for [a] man, one giant leap for mankind."

The moonwalk lasted 2 hours and 19 minutes, long enough to let Neil and Buzz test their footing and set up an American flag, a television camera, and scientific instruments and collect rock samples.

Apollo 11 left a plaque on the Moon, attached to *Eagle's* ladder leg, which Neil read aloud: "Here men from the planet Earth first set foot upon the moon. July 1969 AD. We came in peace for all mankind."

Aboard the spacecraft *Columbia* about 60 miles overhead, Michael Collins circled in lunar orbit awaiting Neil and Buzz's return. Mike played a crucial role throughout the mission, especially in ensuring a safe docking in lunar orbit prior to returning to Earth.

Apollo 11 capped a tumultuous and consequential decade that saw three assassinations, rioting in American streets, and the buildup of the Vietnam War. But Neil's flying skill had allowed human beings to finally reach that longtime symbol of the unreachable.

~

Neil Alden Armstrong was born on August 5, 1930, on his grandfather's farm five miles west of the small town of Wapakoneta, Ohio, to Stephen Armstrong and the former Viola Louise Engel. His father was a state auditor, which caused the Armstrong family to move every few years to a new Ohio town while Neil was growing up. The Armstrong family was back in Wapakoneta, however, when Neil finished the local Blume High School at age 16. Like so many future astronauts, Neil earned his Eagle Scout badge.

One day at about the age of six, Neil and his father skipped Sunday school and his Dad took him on a ride in a Ford Trimotor airplane, known as the *Tin Goose*. In an oral history later, Neil said that he didn't remember the flight, but it must have impressed him, for he soon became an avid model airplane builder. Building model airplanes was an interest that followed

him from home to the Scouts and later at Purdue and while he was in the Navy. He built a rudimentary wind tunnel by age 14 and by age 15, before he got his driver's license, he had learned to fly.

Neil won a Navy scholarship and entered Purdue University as an engineering student in 1947. In *First Man: The Life of Neil Armstrong*, James R. Hansen wrote that in Neil's first year at Purdue, Chuck Yeager broke the sound barrier in the rocket-powered Bell X-1. It was exciting but bittersweet for young Neil. He thought aviation history had already passed him by.

"All in all, for someone who was immersed in, fascinated by, and dedicated to flight," Neil told his biographer, "I was disappointed by the wrinkle in history that had brought me along one generation late. I had missed all the great times and adventures in flight."

The Navy had other ideas, and interrupted his college years. In 1949 Neil was ordered to Pensacola for flight training. He won his Navy wings 18 months later as a "flying midshipman."

Neil was an ensign by the time he was flying Grumman F9F-2 Panthers as the youngest pilot in the VF-51 *Screaming Eagles*, deployed off the Korean coast aboard USS *Essex* (CV-9). Another pilot in the squadron was Lieutenant Tom Hayward, a future Chief of Naval Operations. Neil flew 78 combat missions, and on September 3, 1951, on a high-speed, very low run he flew into a cable that severed several feet of his Panther's starboard wing. He fought the damaged aircraft's controls until he was over friendly territory before ejecting. Two days later, he was back in combat. It was a hellish cruise for the *Essex*, which suffered 27 Navy fatalities and saw a major flight deck fire.

Neil recalled that the author James A. Michener, fresh off a Pulitzer Prize for *Tales of the South Pacific*, was an *Essex* guest in late 1951, and would sit in the VF-51 ready room listening to stories of the guys coming off combat missions. The result was Michener's novel *The Bridges at Toko-Ri*.

Back at Purdue after the Navy, Neil plunged more earnestly into aeronautical engineering studies, his grades rising and a career in sight. In his first year back, he also met Janet Shearon, a freshman student in home economics from Evanston, Illinois.

Neil had set his sights on becoming an experimental test pilot, and soon after his graduation landed an engineering and flying job at the National Advisory Committee on Aeronautics' Lewis Center in Cleveland. But within five months he moved to the NACA High Speed Flight Station (later the NASA Dryden Flight Research Center) in the Mojave Desert at Edwards, California, legendary home to the X-planes. A few months later, in January 1956, Neil and Jan were married. They had two sons, Eric and Mark, and a daughter, Karen.

His first flight in a rocket plane was in the Bell X-1B, a successor to the plane Yeager had first flown faster than the speed of sound. Neil impressed his peers. Another NACA test pilot, Bill Dana, said he "had a mind that absorbed things like a sponge and a memory that remembered them like a photograph." Neil eventually flew seven X-15 flights, reaching the edge of space, and piloted many more of the most innovative and dangerous research aircraft ever developed.

One evening during their early years in California, Neil and Jan attended a lecture by Wernher von Braun in Lancaster. They were surrounded by many interested NACA leaders and test pilots, and heard von Braun say that based on his experience, he believed that a rocket could be built to carry the required load for man to explore space. Jan remembered, "It was the first time I had ever dreamed of a possibility of space travel.... This was an eye opener for me."

It was also during the mid-50s that the Society of Experimental Test Pilots was born; Neil was a charter member. During the first SETP banquet in October 1957, the Soviet Union shocked the world by launching Sputnik.

Even before NASA selected the first *Mercury* astronauts, Neil was involved in not one but two space programs. In June of 1958, at the age of 27, he was one of nine test pilots selected for the USAF Man in Space Soonest program, designed to put a man into outer space before the Soviet Union did. The program was short-lived. That same year, Neil was chosen as a NACA (later NASA) consultant for a military space plane project, the X-20 Dyna-Soar, and in 1960 was secretly named one of the astronauts. The Dyna-Soar was being designed and developed for the USAF by Boeing in Seattle, Washington.

Jan and the children joined Neil on several trips to Seattle, and it was here in the summer of 1961 that tragedy struck the family. On an outing to a local park, two-year-old Karen, whom Jan and Neil called Muffie, took a childhood spill. But the knot on her head led to a series of tests back in California, resulting in a diagnosis of an inoperable brain tumor. After six agonizing months, Karen died in January 1962.

~

Soon after Neil returned to his X-15 engineering and flying, he was attracted by another opportunity. NASA was receiving applications for the second group of astronauts, following the Mercury Seven. Neil quietly decided to go for it. His flying reputation after seven years at Edwards had preceded him; in September he was tapped for the NASA astronaut corps in Houston.

In Houston, he began training for flights in the two-person *Gemini* spacecraft, forerunner to the three-person *Apollo*. His first crew assignment was as backup commander to Gordon Cooper on *Gemini V*. In March 1966, Neil became the first American civilian astronaut to fly in space as commander of *Gemini VIII*.

The purpose of the planned *Gemini VIII* 55-orbit mission was severalfold, but directly focused on capabilities needed for the coming *Apollo* lunar missions. A critical aspect of the mission included demonstrating a rendezvous and docking with an *Agena* target vehicle and a planned long spacewalk, which his copilot David R. Scott would accomplish. Both Neil and Dave were orbital rookies. On March 16, 1966, they were strapped into their *Titan II/Gemini* on pad 19 at the Kennedy Space Center as the target *Atlas/Agena* lifted off pad 14. Neil and Dave lifted off shortly thereafter, with the *Agena* in orbit above them.

With the flight just a few hours old, Neil performed the rendezvous and then the first successful docking of two vehicles in space. They passed into the night and out of contact with Houston at the Tananarive tracking station.

Once docked, however, the joined spacecraft began to unexpectedly roll, and attempts to steady the vehicles were unsuccessful. Thinking that the problem was aboard the *Agena*, Neil undocked the *Gemini*, but the rolling only increased, to the point that the crew was in danger of passing out. The problem

was a stuck-on roll thruster aboard the *Gemini*. The astronauts turned the control thrusters off, switching to the reentry control system. Stability was slowly restored, but once the reentry propulsion was activated, the crew was told by mission control to prepare to deorbit before the end of their only day in orbit.

They deorbited to an emergency target about 500 miles east of Okinawa and were picked up by the destroyer USS *Leonard Mason* (DD-852) after floating alone for two hours in the Western Pacific. Neil commented later that *Gemini* made a fine spacecraft, but a lousy boat.

Both Neil and Dave were bitterly disappointed that all the objectives of the mission were not accomplished, but they were home and safe. Two days after returning to Houston, Neil was assigned as backup commander to Pete Conrad on *Gemini XI*, his final assignment before the *Apollo* missions began.

In January 1967 NASA suffered a crippling setback when a cockpit fire during *Apollo* launch pad tests killed astronauts Gus Grissom, Ed White, and Roger Chaffee. As a result of the investigation, the *Apollo* command module was redesigned over the next year.

In April, on the Monday after NASA's formal release of the pad accident report, Deke Slayton called together 18 of the astronauts, including Neil, and told them that they would be the ones to fly the first lunar missions. He laid out the strategy for the series of early missions, and at the end of the meeting he named the first three crews. Neil was named commander of the backup crew for *Apollo 9*. In a later shake-up of the schedule, Neil was moved up as the backup commander to Frank Borman on *Apollo 8*, the first flight to circumnavigate the Moon, doing so at Christmastime in 1968. And this put Neil in position to command *Apollo 11*.

NASA's mid-1962 decision to use Lunar Orbit Rendezvous as the design roadmap for *Apollo* had mandated the need for a Lunar Module (LM), a contract eventually awarded to Grumman. The Lunar Landing Research Vehicle (LLRV) was intended to provide design input to the LM and the Lunar Landing Training Vehicle (LLTV) to prepare *Apollo* commanders

for the actual landing. At various points in the project, Neil had design input into both vehicles. To familiarize themselves with the lunar landing profiles, the astronauts used helicopters, but their control characteristics were so different from the LM that this approach was discarded as the primary trainer.

The basic LLRV/TV design included a jet engine, pointing down, which operated at 5/6 of the vehicle weight, simulating the 1/6 Earth gravity of the Moon. Large downward-firing thrusters, plus multiple but smaller attitude thrusters, all controlled by the crewman as he was strapped into a Weber ejection seat, simulated the LM descent engine and reaction control system. Eventually, two modified LLRVs and three LLTVs were used as trainers at Ellington Air Force Base in Houston.

These were some of the strangest flying machines in the history of aviation. They looked like flying bedsteads—and they proved to be dangerous. On March 6, 1968, Neil flew a training flight at Ellington Field in one of the converted LLRVs. As he was making a low approach to landing, the vehicle control began to seriously degrade and then failed completely. The LLRV was below 100 feet, rolling into a 30-degree bank when Neil ejected in the last split second. His parachute opened just before he impacted a grassy area adjacent to the runway, and the LLRV was destroyed. Neil suffered a bit tongue. An hour later, he was back at his desk in the astronaut office, quietly shuffling papers.

Before the *Apollo* program was done, three of the five LLTVs were lost in out-of-control ejections. Neil flew a total of 27 training missions in them.

With training complete, *Apollo 11* lifted off for the Moon from Kennedy Space Center Launch Complex 39 on July 16, 1969, and splashed down 210 nautical miles south of Johnston Atoll in the Pacific on July 24, where the crew was picked up by USS *Hornet* (CVS-12).

Neil, Buzz, and Mike spent a full month in quarantine, before and after the historic mission. When they emerged, it was into a different world.



The *Apollo 11* astronauts were swamped with relentless media and public attention. In a single day, in mid-August 1969, the astronauts and their families departed Houston on Air Force 2 and attended huge ticker-tape parades in New York City and Chicago. They then flew to Los Angeles, where President Nixon hosted them at the elegant Century Plaza Hotel that evening at a dinner attended by more than 1,000 people. They were presented with the Medal of Freedom by Vice President Agnew at the dinner. The crew later addressed a joint session of the US Congress, and departed in September on a nonstop 45-day international tour of 23 nations, on every continent except Antarctica.

At the 1969 SETP annual meeting later that year, Neil described the lunar landing to the gathered experimental test pilots. Later at the banquet, he sat next to Charles Lindbergh, who was inducted that year into the Society as an Honorary Fellow.

For about a year, Neil served as NASA deputy associate administrator for aeronautics at NASA Headquarters. He initiated a research program on digital "fly-by-wire" control systems that, now matured, have revolutionized much of modern aviation. But he tired of the Washington desk job. Ignoring many high-level offers in business and academia, he returned to Ohio as a professor of aeronautical engineering at the University of Cincinnati, and he and Jan bought a 300-acre farm near Lebanon, Ohio. For the next eight years, he taught in the small aeronautics department at Cincinnati.

In subsequent years, Neil turned his attention to corporate life, where he briefly tried his hand as national spokesperson for Chrysler. But his principal interest turned to corporate boardrooms where, over the years, he served as a director for many companies, both in the local area such as Cincinnati Gas and Electric Company, and on the national scene, including United Airlines, Morton Thiokol, and the Eaton Corporation.

Neil served on several national studies and commissions, most prominently as vice chairman to former Secretary of State William P. Rogers on the commission to investigate the loss of the Space Shuttle *Challenger* in 1986. Rogers was "Mr. Outside,"

based on his extensive Washington political experience, and Neil ran the commission as “Mr. Inside,” principally devoting himself to the technical accident investigation itself.

Throughout his life, Neil remained active in flying organizations like the SETP and the Golden Eagles, a small group of former Navy and Marine carrier pilots whose members are legend in the history of naval aviation. He took pride in his membership in the National Academy of Engineering, and was active in several NAE efforts. One was the selection of the Top 20 Engineering Achievements of the Twentieth Century. Neil presented the results at the National Press Club, where he said, “Science is about what is; engineering is about what can be.”

In February 1991 Neil suffered a slight heart attack while skiing in Aspen, Colorado, but incurred little heart damage. He was released from the hospital the next day, and within six months had passed his private pilot’s license physical with no restrictions.

After a period of separation, Neil and Jan’s marriage of 38 years ended with a divorce in 1994. Neil later married Carol Knight, a widow whose husband had been killed in a light airplane accident in 1989. Carol was the mother of two children, Molly and Andrew, and she and Neil lived in Indian Hill, a suburb of Cincinnati.

After the postflight parades and the world tour for the Apollo 11 astronauts, Neil gradually withdrew from the public eye. He was not reclusive, but as much as possible he sought to lead a private life. He was careful to preserve the positive image and immense accomplishment that he, Mike, Buzz, and the NASA *Apollo* team had achieved, but he always deflected credit from himself. Though he traveled and often gave speeches, he rarely gave media interviews and avoided the spotlight. He was a quiet, private man, and, at heart, a first-rate aeronautical engineer and test pilot.

Over the years, Neil was decorated by 17 nations. In addition to the Presidential Medal of Freedom, he was the recipient of the Congressional Gold Medal, Congressional Space Medal of Honor, Explorers Club Medal, Robert F. Goddard Memorial Trophy, NASA Distinguished Service Medal, Harmon

International Aviation Trophy, Royal Geographic Society Gold Medal, Fédération Aéronautique Internationale Gold Space Medal, American Aeronautical Society Flight Achievement Award, Robert J. Collier Trophy, AIAA Astronautics Award, Octave Chanute Award, and John J. Montgomery Award.

~

On August 25, 2012, Neil Armstrong died of “complications following a cardiac procedure” according to a family statement. He was 82 years old. The statement continued, “He remained an advocate of aviation and exploration throughout his life and never lost his boyhood wonder of these pursuits.... [A]s much as Neil cherished his privacy, he always appreciated the expressions of good will from people around the world and from all walks of life.”

Remembrances flowed in from across America and the world. Michael Griffin, president of AIAA, summed it up for all of us when he said, “Neil Armstrong showed us how to be famous with dignity, how to be celebrated without becoming a celebrity, and how to do it with a gracious modesty and the unyielding courage to do the right thing as he saw it. We will miss him dearly, not so much for what he did, but for who he was.”

A private service for family and friends was held in Cincinnati. A few days later, the nation said goodbye at a national memorial service at the National Cathedral in Washington, DC, on September 13. Music filled the cathedral, which was overflowing with family, friends, dignitaries, fellow astronauts and Golden Eagles, sailors, naval officers, and members of the public.

The following morning with his family on the deck, Neil Armstrong was buried at sea from the USS *Philippine Sea* (CG-58) in the waters of the Atlantic Ocean. Over the horizon and to the west lay the Kennedy Space Center’s Launch Complex 39, where it all began.

**Author's Acknowledgment**

In writing this tribute I relied on many sources, particularly John Noble Wilford's *New York Times* article about Neil of August 25, 2012, and Neil's authorized biography by James F. Hansen, *First Man: The Life of Neil A. Armstrong*. Several close friends of Neil assisted me with edits. A special thanks to Carol Armstrong, to Jan, Rick, and Mark Armstrong, and to Neil's sister June Armstrong Hoffman for their gracious help. Most of all, I depended on memories of a man who was my friend for almost five decades. America is fortunate that such a talented, humble, and gracious man was the person who represented her in the most celebrated achievement of the 20th century.