

Neil Armstrong

Neil Alden Armstrong (August 5, 1930 – August 25, 2012) was an American astronaut and aeronautical engineer, and the first person to walk on the Moon. He was also a naval aviator, test pilot, and university professor. When he stepped onto the lunar surface on July 21, 1969, he said: "That's one small step for [a] man, one giant leap for mankind."

A graduate of Purdue University, he studied aeronautical engineering with his college tuition paid for by the U.S. Navy under the Holloway Plan. Armstrong became a midshipman in 1949, and a naval aviator the following year. He saw action in the Korean War, flying the Grumman F9F Panther from the aircraft carrier USS Essex. In September 1951, he was hit by anti-aircraft fire while making a low bombing run, and forced to bail out. After the war, he completed his bachelor's degree at Purdue, and became a test pilot at the National Advisory Committee for Aeronautics (NACA) High-Speed Flight Station at Edwards Air Force Base in California. He was the project pilot on Century Series fighters, and flew the North American X-15 seven times. He was also a participant in the U.S. Air Force's Man in Space Soonest and X-20 Dyna-Soar human spaceflight programs.

Armstrong joined the NASA Astronaut Corps in the second group, which was selected in 1962. He made his first spaceflight as commander of Gemini 8 in March 1966, becoming NASA's first civilian astronaut to fly in space. During this mission with pilot David Scott, he performed the first docking of two spacecraft, but the mission was aborted after Armstrong used some of his reentry control fuel to prevent a dangerous spin caused by a stuck thruster. Armstrong's second and last spaceflight was as commander of Apollo 11, the first manned Moon landing. During training for the mission, he was forced to eject from the Lunar Landing Research Vehicle moments before a fiery crash. In July 1969, Armstrong and Lunar Module pilot Buzz Aldrin descended to the lunar surface, and spent two and a half hours outside the spacecraft, while Michael Collins remained in lunar orbit in the Command/Service Module. Along with Collins and Aldrin, Armstrong was awarded the Presidential Medal of Freedom by President Richard Nixon. President Jimmy Carter presented Armstrong with the Congressional Space Medal of Honor in 1978, and Armstrong and his former crewmates received the Congressional Gold Medal in 2009.

After he resigned from NASA in 1971, Armstrong accepted a teaching position in the Department of Aerospace Engineering at the University of Cincinnati, which he held until 1979. He served on the Apollo 13 accident investigation, and on the Rogers Commission, which investigated the Space Shuttle Challenger disaster. He acted as a spokesman for several businesses, and appeared in advertising for Chrysler starting in January 1979.

Contents

Neil Armstrong	
 Armstrong in July 1969	
USAF / NASA astronaut	
Born	Neil Alden Armstrong August 5, 1930 Near Wapakoneta, Ohio, U.S.
Died	August 25, 2012 (aged 82) Cincinnati, Ohio, U.S.
Previous occupation	Naval aviator, test pilot
Alma mater	Purdue University, B.S. 1955 University of Southern California, M.S. 1970
Rank	Lieutenant (junior grade), United States Navy
Time in space	8 days, 14 hours, 12 minutes, and 30 seconds
Selection	1958 USAF Man In Space Soonest 1960 USAF Dyna-Soar 1962 NASA Group 2
Total EVAs	1

Early years
Navy service
College years
Test pilot
Astronaut career
Gemini program
Gemini 5
Gemini 8
Gemini 11
Apollo program
Apollo 11
Voyage to the Moon
First Moon walk
Return to Earth
Life after Apollo
Teaching
NASA accident investigations
Business activities
North Pole expedition
Television and film
Personal life
Illness and death
Legacy
Notes
References
Further reading
External links

Total EVA time	2 hours 31 minutes
Missions	Gemini 8, Apollo 11
Mission insignia	 
Awards	Presidential Medal of Freedom Congressional Space Medal of Honor Congressional Gold Medal NASA Distinguished Service Medal NASA Exceptional Service Medal Air Medal (3)

Early years

Armstrong was born on August 5, 1930, near Wapakoneta, Ohio^{[1][2]} the son of Stephen Koenig Armstrong and Viola Louise Engel. He was of German, Irish and Scottish ancestry^{[3][4]} and had a younger sister, June, and a younger brother, Dean. His father worked as an auditor for the Ohio state government^[5] and the family moved around the state repeatedly, living in 20 towns. Armstrong's love for flying grew during this time, having started early when his father took his two-year-old son to the Cleveland Air Races. When he was five, he experienced his first airplane flight in Warren, Ohio, on July 20, 1936, when he and his father took a ride in a Ford Trimotor, also known as the "Tin Goose".^[6]

His father's last move was in 1944, back to Wapakoneta. Armstrong attended Blume High School, and took flying lessons at the grassy Wapakoneta airfield.^[2] He earned a student flight certificate on his sixteenth birthday, then soloed in August, all before he had a driver's license.^[7] He was active in the Boy Scouts and earned the rank of Eagle Scout. As an adult, he was recognized by the Boy Scouts of America with its Distinguished Eagle Scout Award and Silver Buffalo Award.^[8] On July 18, 1969, while flying toward the Moon inside the *Columbia*, Armstrong greeted the Scouts: "I'd like to say hello to all my fellow Scouts and Scouters at Farragut State Park in Idaho having a National Jamboree there this week; and Apollo 11 would like to send them best wishes". Houston replied: "Thank you, Apollo 11. I'm sure that, if they didn't hear that, they'll get the word through the news. Certainly appreciate that."^[9] Among the very few personal items that Neil Armstrong carried with him to the Moon and back was a old Scout Badge.^[10]

In 1947, at age 17, Armstrong began studying aeronautical engineering at Purdue University. He was the second person in his family to attend college. He was also accepted to the Massachusetts Institute of Technology (MIT). An uncle who had attended MIT dissuaded him from attending, telling him that it was not necessary to go all the way to Cambridge, Massachusetts for a good education. His college tuition was paid for under the Holloway Plan. Successful applicants committed to two years of study, followed

by two years of flight training and one year of service in the U.S. Navy as an aviator, then completion of the final two years of their bachelor's degree.^[11] He did not take courses in naval science, nor did he join the Naval Reserve Officers Training Corps at Purdue.^[12]

Navy service

Armstrong's call-up from the Navy arrived on January 26, 1949, requiring him to report to Naval Air Station Pensacola in Florida for flight training with class 5-49. After passing the medical examinations, he became a midshipman on February 24, 1949.^[13] Flight training was conducted in a North American SNJ trainer, in which he soloed on September 9, 1949.^[14] On March 2, 1950, he made his first aircraft carrier landing on the USS Cabot, an event he considered comparable to his first solo flight.^[14] He was then sent to Naval Air Station Corpus Christi in Texas for training on the Grumman F8F Bearcat, culminating in a carrier landing on the USS Wright. On August 16, 1950, Armstrong was informed by letter that he was a fully qualified naval aviator. His mother and sister attended his graduation ceremony on August 23, 1950.^[15]

Armstrong's assignment was to Fleet Aircraft Service Squadron 7 (FASRON 7) at NAS San Diego (now known as NAS North Island). On November 27, 1950, he was assigned to VF-51, an all-jet squadron, becoming its youngest officer, and made his first flight in a jet, a Grumman F9F Panther, on January 5, 1951. He was promoted to ensign on June 5, 1951, and made his first jet carrier landing on USS Essex two days later. On June 28, 1951, Essex had set sail with VF-51 aboard, bound for Korea, where its VF-51 would act as ground-attack aircraft. VF-51 flew ahead to Naval Air Station Barbers Point in Hawaii, where it conducted fighter-bomber training before rejoining the ship at the end of July.^[16]

On August 29, 1951, Armstrong saw action in the Korean War as an escort for a photo reconnaissance plane over Songjin.^[17] Five days later, on September 3, he flew armed reconnaissance over the primary transportation and storage facilities south of the village of Majon-ni, west of Wonsan. While making a low bombing run at about 350 mph (560 km/h), Armstrong's F9F Panther was hit by anti-aircraft fire. While trying to regain control, he collided with a pole at a height of about 20 feet (6 m), which sliced off about 3 feet (1 m) of the Panther's right wing.^[18]



F9F-2 Panthers over Korea, with Armstrong piloting S-116 (left)

Armstrong flew the plane back to friendly territory, but due to the loss of the aileron, ejection was his only safe option. Planning to eject over water and await rescue by Navy helicopters, he flew to an airfield near Pohang, but his parachute was blown back over land. A jeep driven by a roommate from flight school picked Armstrong up; it is unknown what happened to the wreckage of his aircraft, F9F-2 BuNo 125122.^[19]

In all, Armstrong flew 78 missions over Korea for a total of 121 hours in the air, a third of which were in January 1952, with the final mission being flown on March 5, 1952. Of 492 U.S. Navy personnel killed in the Korean War, 27 of them were from the Essex on this one war cruise. Armstrong received the Air Medal for 20 combat missions, two gold stars for the next 40, the Korean Service Medal and Engagement Star.^[20] the National Defense Service Medal and the United Nations Korea Medal. His regular commission was terminated on February 25, 1952, and he became an ensign in the United States Navy Reserve. On completion of his combat tour with Essex, he was assigned to a transport squadron, VR-32, in May 1952. He was released from active duty on August 23, 1952, but remained in the reserves, and was promoted to lieutenant (junior grade) on May 9, 1953.^[21] As a reservist, he continued to fly, with VF-724 at Naval Air Station Glenview in Illinois, and then, after moving to California, with VF-773 at Naval Air Station Los Alamitos.^[22] He remained in the reserve for eight years, before resigning his commission on October 21, 1960.^[21]



Armstrong, Neil A., ENS., USNR, 505129/1315
23 May 1952 80-G-679736

Ensign Neil Armstrong on 23 May 1952

College years

After his service with the Navy, Armstrong returned to Purdue, where his best grades came in the four semesters following his return from Korea. He had previously earned average marks, but his final GPA was 4.8 out of 6.0. He pledged the Phi Delta Theta fraternity, and lived in its fraternity house. He wrote and co-directed two musicals as part of the all-student revue. The first was a version of *Snow White and the Seven Dwarves* with songs from the Walt Disney film, including *Someday My Prince Will Come*; the second was titled *The Land of Egelloc*, with music from Gilbert and Sullivan with new lyrics. He was chairman of the Purdue Aero Flying Club, and flew the club's aircraft, an Aeronca and a couple of Pipers, which were kept at nearby Aretz Airport in Lafayette, Indiana. Flying the Aeronca to Wapakoneta in 1954, he damaged it in a rough landing in a farmer's field, and it had to be hauled back to Lafayette on a trailer.^[23] At Purdue, he was also a member of Kappa Kappa Psi National Honorary Band Fraternity,^[24] and a baritone player in the Purdue All-American Marching Band.^[25] Armstrong graduated in January 1955 with a Bachelor of Science degree in Aeronautical Engineering.^[22] In 1970 he completed his Master of Science degree in Aerospace Engineering at the University of Southern California (USC).^[26] He would eventually be awarded honorary doctorates by several universities.^[27]

After returning to Purdue, he met Janet Elizabeth Shearon, who was majoring in home economics at a party hosted by her sorority, Alpha Chi Omega.^[28] According to the couple, there was no real courtship, and neither could remember the exact circumstances of their engagement. They were married on January 28, 1956, at the Congregational Church in Wilmette, Illinois. When he moved to Edwards Air Force Base, he lived in the bachelor quarters of the base, while Janet lived in the Westwood district of Los Angeles. After one semester, they moved into a house in Antelope Valley. Janet never finished her degree, a fact she regretted later in life. The couple had three children together: Eric, Karen, and Mark.^[29] In June 1961, daughter Karen was diagnosed with a malignant tumor of the middle part of her brain stem; X-ray treatment slowed its growth, but her health deteriorated to the point where she could no longer walk or talk. Two-year-old Karen died of pneumonia, related to her weakened health, on January 28, 1962.^[30]

Test pilot

Following his graduation from Purdue, Armstrong decided to become an experimental research test pilot. He applied at the National Advisory Committee for Aeronautics (NACA) High-Speed Flight Station at Edwards Air Force Base.^[31] Although NACA had no open positions, it forwarded his application to the Lewis Flight Propulsion Laboratory in Cleveland, where Armstrong made his first test flight on March 1, 1955.^[31] Armstrong's stint at Cleveland lasted only a couple of months, and on July 11, 1955, he reported for work at the High-Speed Flight Station.^[32]



Armstrong, 26, as a test pilot at the NACA High-Speed Flight Station at Edwards AFB, California

On his first day, Armstrong was tasked with piloting chase planes during releases of experimental aircraft from modified bombers. He also flew the modified bombers, and on one of these missions had his first flight incident at Edwards. On March 22, 1956, he was in a Boeing B-29 Superfortress.^[33] which was to air-drop a Douglas D-558-2 Skyrocket. He sat in the right-hand pilot seat while the left-hand seat commander Stan Butchart, flew the B-29.^[34]

As they ascended to 30,000 feet (9 km), the number-four engine stopped and the propeller began windmilling (rotating freely) in the airstream. Hitting the switch that would stop the propeller's spinning, Butchart found it slowed but then started spinning again, this time even faster than the others; if it spun too fast, it would break apart. Their aircraft needed to hold an airspeed of 210 mph (338 km/h) to launch its Skyrocket payload, and the B-29 could not land with the Skyrocket attached to its belly. Armstrong and Butchart brought the aircraft into a nose-down attitude to increase speed, then launched the Skyrocket. At the instant of launch, the number-four engine propeller disintegrated. Pieces of it damaged the number-three engine and hit the number-two engine. Butchart and Armstrong were forced to shut down the damaged number-three engine, along with the number-one engine, due to the torque it created. They made a slow, circling descent from 30,000 ft (9 km) using only the number-two engine, and landed safely.^[35]

As a research pilot, Armstrong served as project pilot on Century Series fighters, including the North American F-100 Super Sabre A and C variants, the McDonnell F-101 Voodoo, the Lockheed F-104 Starfighter, the Republic F-105 Thunderchief and the Convair F-106 Delta Dart. He also flew the Douglas DC-3, Lockheed T-33 Shooting Star, North American F-86 Sabre, McDonnell Douglas F-4 Phantom II, Douglas F5D-1 Skylancer, Boeing B-29 Superfortress, Boeing B-47 Stratojet and Boeing KC-135 Stratotanker, and was one of eight elite pilots involved in the Parasev paraglider research vehicle program.^[36] Over his career, he flew more than 200 different models of aircraft.^[26] His first flight in a rocket-powered aircraft was on August 15, 1957, in the Bell X-1B, to an altitude of 11.4 miles (18.3 km). He broke the poorly designed nose landing gear on landing, which had happened on about a dozen previous flights of the Bell X-1B. He flew the North American X-15 seven times. His penultimate flight reached an altitude of 207,500 feet (63.2 km).^[37] More importantly for the program, he flew the first flight with the Q-ball system, first flight of the number 3 X-15 airframe, and first flight of the MH-96 adaptive flight control system.^[38] He became an employee of the National Aeronautics and Space Administration (NASA) when it was formally established on October 1, 1958, absorbing NACA.^[39]

Armstrong was involved in several incidents that went down in Edwards folklore or were chronicled in the memoirs of colleagues. The first occurred during his sixth X-15 flight on April 20, 1962, while Armstrong tested a self-adjusting control system. He flew to a height of over 207,000 feet (63 km) (the highest he flew before Gemini 8), but the aircraft nose was held up too long during its descent to demonstrate MH-96 g-limiting performance, and the X-15 ballooned back up to around 140,000 feet (43 km), an effect sometimes erroneously described as "bouncing off the atmosphere". At that altitude, the air is so thin that aerodynamic surfaces have almost no effect. He flew past the landing field at Mach 3 (2,000 mph, 3,200 km/h) at over 100,000 feet (30 km) in altitude, and ended up 40 miles (64 km) south of Edwards. After sufficient descent, he turned back toward the landing area, and barely managed to land without striking Joshua trees at the south end. It was the longest X-15 flight in both time and distance from the ground track.^[40]

Four days later, Armstrong was involved in a second incident, when he flew for the only time with Chuck Yeager. Their job, flying a T-33, was to evaluate Smith Ranch Dry Lake in Nevada for use as an emergency landing site for the X-15. In his autobiography, Yeager wrote that he knew the lake bed was unsuitable for landings after recent rains, but Armstrong insisted on flying out anyway. As they attempted a touch-and-go, the wheels became stuck and they had to wait for rescue. In Armstrong's version of the events, Yeager never tried to talk him out of it and they made a first successful landing on the east side of the lake. Then Yeager told him to try again, this time a bit slower. On the second landing, they became stuck, provoking Yeager to fits of laughter.^[41]

Many of the test pilots at Edwards praised Armstrong's engineering ability. Milt Thompson said he was "the most technically capable of the early X-15 pilots". Bill Dana said Armstrong "had a mind that absorbed things like a sponge". Those who flew for the Air Force tended to have a different opinion, especially people like Yeager and Pete Knight, who did not have engineering degrees. Knight said that pilot-engineers flew in a way that was "more mechanical than it is flying", and gave this as the reason why some pilot-engineers got into trouble: their flying skills did not come naturally.^[42]



Armstrong and X-15 #1 after a research flight in 1960

A few weeks later on May 21, 1962, Armstrong was involved in what Edwards' folklore called the "Nellis Affair". He was sent in an F-104 to inspect Delamar Dry Lake in southern Nevada, again for emergency landings. He misjudged his altitude, and also did not realize that the landing gear had not fully extended. As he touched down, the landing gear began to retract; Armstrong applied full power to abort the landing, but the ventral fin and landing gear door struck the ground, damaging the radio and releasing hydraulic fluid. Without radio communication, Armstrong flew south to Nellis Air Force Base past the control tower, and wagged his wings, the signal for a no-radio approach. The loss of hydraulic fluid caused the tailhook to release, and upon landing, he caught the arresting wire attached to an anchor chain, and dragged the chain along the runway.^[43]

It took thirty minutes to clear the runway and rig another arresting cable. Armstrong telephoned Edwards and asked for someone to collect him. Milt Thompson was sent in an F-104B, the only two-seater available, but a plane Thompson had never flown. With great difficulty, Thompson made it to Nellis, but a strong crosswind caused a hard landing and the left main tire suffered a blowout. The

runway was again closed to clear it, and Bill Dana was sent to Nellis in a T-33, but he almost landed long. The Nellis base operations office then decided that to avoid any further problems, it would be best to find the three NASA pilots ground transport back to Edwards.^[43]

Armstrong made seven flights in the X-15 between November 30, 1960, and July 26, 1962.^[44] He reached a peak altitude of 207,500 feet (63.2 km) in the X-15-3,^[45] and a top speed of Mach 5.74 (3,989 mph, 6,420 km/h) in the X-15-1, and left the Flight Research Center with a total of 2,400 flying hours.^[46]

Astronaut career



Armstrong in an early Gemini spacesuit

In June 1958, Armstrong was selected for the U.S. Air Force's Man In Space Soonest program, but the Advanced Research Projects Agency (ARPA) cancelled its funding on August 1, 1958, and on November 5, 1958, it was superseded by Project Mercury, a civilian project run by NASA. Ironically, as a NASA civilian test pilot, Armstrong was ineligible to become one of its astronauts at this time, as selection was restricted to military test pilots.^{[47][48]} In November 1960, he was chosen as part of the pilot consultant group for the X-20 Dyna-Soar, a military space plane under development by Boeing for the U.S. Air Force, and on March 15, 1962, he was selected by the U.S. Air Force as one of seven pilot-engineers who would fly the X-20 when it got of the design board.^{[49][50]}

However, in April 1958, NASA announced that applications were being sought for the second group of NASA astronauts for Project Gemini, a proposed two-man spacecraft. This time, selection was open to qualified civilian test pilots.^[51] Armstrong visited the Seattle World's Fair in May 1962, and attended a conference there co-sponsored by NASA on space exploration. After he returned from Seattle on June 4, he applied to become an astronaut. His application arrived about a week past the June 1, 1962, deadline, but Dick Day, a flight simulator expert with whom Armstrong had worked closely at Edwards, saw the late arrival of the application and slipped it into the pile before anyone noticed.^[52] At Brooks Air Force Base at the end of June, Armstrong underwent a medical exam that many of the applicants described as painful and at times seemingly pointless.^[53]

NASA's Director of Flight Crew Operations, Deke Slayton, called Armstrong on September 13, 1962, and asked whether he would be interested in joining the NASA Astronaut Corps as part of what the press dubbed "the New Nine"; without hesitation, Armstrong said yes. The selections were kept secret until three days later, although newspaper reports had been circulating since earlier that year that he would be selected as the "first civilian astronaut".^[54] Armstrong was one of two civilian pilots selected for this group;^[55] the other was Elliot See, another former naval aviator.^[56] NASA publicly announced the selection of the second group at a press conference on September 17, 1962. Compared with the Mercury Seven astronauts, they were younger,^[53] and had more impressive academic credentials.^[57]

Gemini program

Gemini 5

On February 8, 1965, Armstrong and See were announced as the backup crew for Gemini 5, with Armstrong as its commander, supporting the prime crew of Gordon Cooper and Pete Conrad. The purpose of the mission was to practice space rendezvous and to develop procedures and equipment for a long-duration flight of seven days. These would be required for a mission to the Moon. With two other flights (Gemini 3 and Gemini 4) in preparation, there were six crews competing for simulator time, resulting in Gemini 5 being postponed. The mission lifted off on August 21.^[58] Armstrong and See watched the launch at Cape Kennedy, and then flew to the Manned Spacecraft Center in Houston.^[59] The mission was generally successful, despite a problem with the fuel cells that prohibited a rendezvous. They practiced a "phantom rendezvous", carrying out the maneuver without a ggrt.^[60]

Gemini 8



Armstrong, 35, suiting up for Gemini 8 in March 1966

The crew assignments for Gemini 8 were announced on September 20, 1965. Under the normal rotation system, the backup crew for one mission would become the prime crew for the third mission after, but Slayton designated David Scott as the pilot of Gemini 8.^{[61][62]} Scott was the first member of the third group of astronauts, whose selection was announced on October 18, 1963, to receive a prime crew assignment.^[63] See was designated to command Gemini 9. Henceforth, each Gemini mission would be commanded by a member of Armstrong's group, with a member of Scott's group as the pilot. Conrad would be Armstrong's backup this time, with Richard F. Gordon Jr. as his pilot.^{[61][62]} Armstrong became the first American civilian in space; the first civilian (and first woman) was Valentina Tereshkova of the Soviet Union, nearly three years earlier. A textile worker and amateur parachutist,

she was aboard Vostok 6 when it launched on June 16, 1963.^[64] Armstrong would also be the last of his group to fly in space, as See died in a T-38 crash on February 28, 1966, that also took the life of crewmate Charles Bassett. They were replaced by the backup crew of Tom Stafford and Gene Cernan, while Jim Lovell and Buzz Aldrin moved up from the backup crew of Gemini 10 to become the backup for Gemini 9,^[65] and would eventually fly Gemini 12.^[66]

The mission launched on March 16, 1966. It was to be the most complex yet, with a rendezvous and docking with an unmanned Agena target vehicle, and the second American extravehicular activity (EVA) by Scott. In total, the mission was planned to last 75 hours and 55 orbits. After the Agena lifted off at 10:00:00 EST,^[67] the Titan II rocket carrying Armstrong and Scott ignited at 11:41:02 EST, putting them into an orbit from which they would chase the Agena.^[68] The rendezvous and first-ever docking between two spacecraft was successfully completed after 6.5 hours in orbit.^[69] Contact with the crew was intermittent due to the lack of tracking stations covering their entire orbits. Out of contact with the ground, the docked spacecraft began to roll, and Armstrong attempted to correct this with the Orbital Attitude and Maneuvering System (OAMS) of the Gemini spacecraft. Following the earlier advice of Mission Control, they undocked, but found that the roll increased dramatically to the point where they were turning about once per second, indicating a problem with Gemini's attitude control. Armstrong decided the only course of action was to engage the Reentry Control System (RCS) and turn off the OAMS. Mission rules dictated that once this system was turned on, the spacecraft had to re-enter at the next possible opportunity. It was later thought that damaged wiring made one of the thrusters become stuck in the on position.^[70]

There were a few people in the Astronaut Office, most notably Walter Cunningham who felt that Armstrong and Scott "had botched their first mission".^[71] There was speculation that Armstrong could have salvaged the mission if he had turned on only one of the two RCS rings, saving the other for mission objectives. These criticisms were unfounded; no malfunction procedures had been written, and it was only possible to turn on both RCS rings, not just one or the other.^[72] Gene Kranz wrote, "the crew reacted as they were trained, and they reacted wrong because we trained them wrong." The mission planners and controllers had failed to realize that when two spacecraft are docked together, they must be considered to be one spacecraft. Kranz considered this the most important lesson.^[73] Armstrong himself was depressed that the mission had been cut short,^[74] canceling most mission objectives and robbing Scott of his EVA. The Agena would be re-used as a docking target by Gemini 10.^[75] Armstrong and Scott received the NASA Exceptional Service Medal,^[76] and the Air Force awarded Scott the Distinguished Flying Cross as well.^[77] Scott was promoted to lieutenant colonel, and Armstrong received a \$678 raise in pay to \$21,653 a year (equivalent to \$163,319 in 2017), making him NASA's highest paid astronaut!^[74]



Recovery of Gemini 8 from the western Pacific Ocean; Armstrong sitting to the right

Gemini 11

The final assignment for Armstrong in the Gemini program was as the back-up Command Pilot for Gemini 11, announced two days after the landing of Gemini 8. Having trained for two flights, Armstrong was quite knowledgeable about the systems and was more in a teaching role for the rookie backup Pilot, William Anders.^[78] The launch was on September 12, 1966,^[79] with Conrad and Gordon on board, who successfully completed the mission objectives, while Armstrong served as Capsule communicator (CAPCOM).^[80]

Following the flight, President Lyndon B. Johnson asked Armstrong and his wife to take part in a 24-day goodwill tour of South America.^[81] Also on the tour, which took in 11 countries and 14 major cities, were Dick Gordon, George Low, their wives, and other government officials. In Paraguay, Armstrong impressed dignitaries by greeting them in their local language, Guarani,^[82] in Brazil he talked about the exploits of the Brazilian-born Alberto Santos-Dumont, who was regarded as having beaten the Wright brothers with the first flying machine with his 14-bis.^[83]

Apollo program

On January 27, 1967, the date of the Apollo 1 fire, Armstrong was in Washington, D.C., with Cooper, Gordon, Lovell and Scott Carpenter for the signing of the United Nations Outer Space Treaty. The astronauts chatted with the assembled dignitaries until 18:45, when Carpenter went to the airport, and the others returned to the Georgetown Inn, where they each found messages to phone the Manned Spacecraft Center. During these telephone calls, they learned of the deaths of Gus Grissom, Ed White and Roger Chaffee in the fire. Armstrong and the group spent the rest of the night drinking scotch and discussing what had happened.^[84]



Armstrong floats to the ground after ejecting from Lunar Landing Research Vehicle 1

On April 5, 1967, the same day the Apollo 1 investigation released its final report on the fire, Armstrong assembled with 17 other astronauts for a meeting with Slayton. The first thing Slayton said was, "The guys who are going to fly the first lunar missions are the guys in this room."^[85] According to Cernan, one of the astronauts present, Armstrong showed no reaction to the statement. To Armstrong it came as no surprise—the room was full of veterans of Project Gemini, the only people who could fly the lunar missions. Slayton talked about the planned missions and named Armstrong to the backup crew for Apollo 9, which at that stage was planned to be a medium Earth orbit test of the Lunar Module-Command/Service Module combination.^[86]

This crew assignment was officially announced on November 20, 1967.^[87] For crewmates, he was assigned Lovell and Aldrin, the crew of Gemini 12. After design and manufacturing delays in the Lunar Module (LM), Apollo 8 and Apollo 9 swapped prime and backup crews. Based on the normal crew rotation scheme, Armstrong would command Apollo 11.^[86] There would be one change. Mike Collins on the Apollo 8 crew began experiencing trouble with his legs. Doctors diagnosed the problem as a bony growth between his fifth and sixth vertebrae, requiring surgery.^[88] Lovell took his place on the Apollo 8 crew and, when he recovered, Collins joined Armstrong's crew.^[89]

To give the astronauts experience with how the LM would fly on its final landing descent, NASA commissioned Bell Aircraft to build two Lunar Landing Research Vehicles (LLRV), later augmented with three Lunar Landing Training Vehicles (LLTV). Nicknamed the "Flying Bedsteads", they simulated the Moon's one-sixth of Earth's gravity by using a turbofan engine to support the remaining five-sixths of the craft's weight. On May 6, 1968, about 100 feet (30 m) above the ground, Armstrong's controls started to degrade and the LLRV began rolling.^[90] He ejected safely. Later analysis suggested that if he had ejected half a second later, his parachute would not have opened in time. His only injury was from biting his tongue. The LLRV was completely destroyed.^[91] Even though he was nearly killed, Armstrong maintained that without the LLRV and LLTV, the lunar landings would not have been successful, as they gave commanders valuable experience in the behavior of lunar landing craft.^[92]

Apollo 11

After Armstrong served as backup commander for Apollo 8, Slayton offered him the post of commander of Apollo 11 on December 23, 1968, as Apollo 8 orbited the Moon.^[93] In a meeting that was not made public until the publication of Armstrong's biography in 2005, Slayton told him that although the planned crew was Armstrong as Commander, Lunar Module (LM) Pilot Buzz Aldrin and

Command Module (CM) Pilot Michael Collins, he was offering Armstrong the chance to replace Aldrin with Jim Lovell. After thinking it over for a day Armstrong told Slayton he would stick with Aldrin, as he had no difficulty working with him and thought Lovell deserved his own command. Replacing Aldrin with Lovell would have made Lovell the Lunar Module Pilot, unofficially the lowest ranked member, and Armstrong could not justify placing Lovell, the commander of Gemini 12, in the number 3 position of the crew.^[94] The crew of Apollo 11 was officially announced on January 9, 1969, as Armstrong, Collins and Aldrin, with Lovell, Anders and Fred Haise as the backup crew.^[95]



The Apollo 11 crew portrait. Left to right are Armstrong, Michael Collins, and Buzz Aldrin

According to Chris Kraft, a March 1969 meeting between Slayton, George Low, Bob Gilruth and Kraft determined that Armstrong would be the first person on the Moon, in part because NASA management saw him as a person who did not have a large ego. A press conference on April 14, 1969, gave the design of the LM cabin as the reason for Armstrong's being first; the hatch opened inwards and to the right, making it difficult for the Lunar Module Pilot, on the right-hand side, to exit first. At the time of their meeting, the four men did not know about the hatch consideration. The first knowledge of the meeting outside the small group came when Kraft wrote his book.^[96]^[97] Methods of circumventing this difficulty existed, but it is not known if these were rejected or even considered at the time. Slayton added, "Secondly, just on a pure protocol basis, I figured the commander ought to be the first guy out ... I changed it as soon as I found they had the time line that showed that. Bob Gilruth approved my decision."^[98]

Voyage to the Moon

A Saturn V rocket launched Apollo 11 from Launch Complex 39 site at the Kennedy Space Center on July 16, 1969, at 13:32:00 UTC (09:32:00 EDT local time).^[99] Armstrong's wife Janet and two sons watched from a yacht moored on the Banana River.^[100] During the launch, Armstrong's heart reached a top rate of 110 beats per minute.^[101] He found the first stage to be the loudest—much noisier than the Gemini 8 Titan II launch. The Apollo CM was relatively roomy compared to the Gemini spacecraft. None of the Apollo 11 crew suffered from space sickness, as some members of previous crews had. Armstrong was especially happy, as he had been prone to motion sickness as a child and could experience nausea after doing long periods of aerobatics.^[102]



Aldrin took this photo of Armstrong in the cabin after the completion of the EVA on July 21, 1969

The objective of Apollo 11 was to land safely rather than to touch down with precision on a particular spot. Three minutes into the lunar descent burn, Armstrong noted that craters were passing about two seconds too early, which meant the LM *Eagle* would probably touch down beyond the planned landing zone by several miles.^[103] As the *Eagle's* landing radar acquired the surface, several computer error alarms appeared. The first was a code 1202 alarm, and even with their extensive training, neither Armstrong nor Aldrin was aware of what this code meant. They promptly received word from CAPCOM Charles Duke in Houston that the alarms were not a concern; the 1202 and 1201 alarms were caused by an executive overflow in the Lunar Module computer. As described by Buzz Aldrin in the documentary *In the Shadow of the Moon*, the overflow condition was caused by his own counter-checklist choice of leaving the docking radar on during the landing process, so the computer had to process unnecessary radar data and did not have enough time to execute all tasks, dropping lower-priority ones. Aldrin stated that he did so with the objective of facilitating re-docking with the CM should an abort become necessary, not realizing that it would cause the overflow condition.^[104]

When Armstrong noticed they were heading toward a landing area which he believed was unsafe, he took over manual control of the LM, and attempted to find an area which seemed safer, taking longer than expected, and longer than most simulations had taken.^[105] For this reason, there was concern from Mission Control that the LM was running low on fuel.^[106] Upon landing, Aldrin and Armstrong believed they had about 40 seconds left on their fuel, including the 20 seconds' worth which had to be saved in the event

of an abort.^[107] During training, Armstrong had landed the LLTV with less than 15 seconds left on several occasions, and he was also confident the LM could survive a straight-down fall from 50 feet (15 m) if needed. Analysis after the mission showed that at touchdown there was 45 to 50 seconds of propellant burn time left.^[108]

The landing on the surface of the Moon occurred several seconds after 20:17:40 UTC on July 20, 1969,^[109] at which time one of three 67-inch (170 cm) probes attached to three of the Lunar Module's four legs made contact with the surface, a panel light inside the LM lit up, and Aldrin called out, "Contact light." Armstrong shut the engine off and said, "Shutdown." As the LM settled onto the surface, Aldrin said, "Okay. Engine stop", then they both called out some post-landing checklist items. After a ten-second pause, Duke acknowledged the landing with, "We copy you down, *Eagle*." Armstrong announced the landing to Mission Control and the world with the words, "Houston, Tranquility Base here. The *Eagle* has landed." Aldrin and Armstrong celebrated with a brisk handshake and pat on the back before quickly returning to the checklist of tasks needed to ready the Lunar Module for liftoff from the Moon should an emergency unfold during the first moments on the lunar surface.^{[110][111][112]} After Armstrong had confirmed touchdown, Duke re-acknowledged, and expressed the flight controllers' anxiety: "Roger, Tranquility. We copy you on the ground. You got a bunch of guys about to turn blue. We're breathing again. Thanks a lot."^[107] During the landing, Armstrong's heart rate ranged from 100 to 150 beats per minute.^[113]

First Moon walk

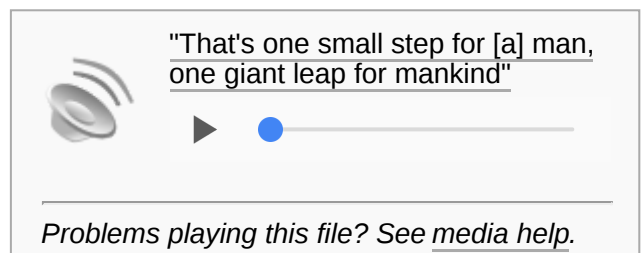
Although the official NASA flight plan called for a crew rest period before extravehicular activity, Armstrong requested that the EVA be moved to earlier in the evening, Houston time. Once Armstrong and Aldrin were ready to go outside, *Eagle* was depressurized, the hatch was opened and Armstrong made his way down the ladder first.^[114] At the bottom of the ladder Armstrong said, "I'm going to step off the LM now". He then turned and set his left boot on the lunar surface at 02:56 UTC July 21, 1969,^[115] then spoke the now-famous words, "That's one small step for [a] man, one giant leap for mankind."^[116]

Armstrong prepared his famous epigram on his own.^[117] In a post-flight press conference, he said that he decided on the words "just prior to leaving the LM."^[118] In a 1983 interview in Esquire Magazine, Armstrong explained to George Plimpton: "I always knew there was a good chance of being able to return to Earth, but I thought the chances of a successful touch down on the moon surface were about even money—fifty-fifty ... Most people don't realize how difficult the mission was. So it didn't seem to me there was much point in thinking of something to say if we'd have to abort landing."^[117] In 2012, his brother Dean Armstrong claimed that Neil had shown him a note with a draft of the line months before the launch.^[119] Historian Andrew Chaikin, who had interviewed Armstrong in 1988 for his book A Man on the Moon, disputed that he had ever claimed coming up with the line spontaneously during the mission.^[120]



Play media

Armstrong describes the lunar surface



Recordings of Armstrong's transmission do not evidence the indefinite article "a" before "man", though NASA and Armstrong insisted for years that static had obscured it. Armstrong stated he would never make such a mistake, but after repeated listenings to recordings, he eventually admitted he must have dropped the "a".^[116] He later said he "would hope that history would grant me leeway for dropping the syllable and understand that it was certainly intended, even if it was not said—although it might actually have been".^[121] It has since been claimed that acoustic analysis of the recording reveals the presence of the missing "a".^{[116][122]} Peter Shann Ford, an Australian computer programmer, conducted a digital audio analysis and claims that Armstrong did, in fact, say "a man", but the "a" was inaudible due to the limitations of communications technology of the time.^{[116][123][124]} Ford and James R. Hansen, Armstrong's authorized biographer, presented these findings to Armstrong and NASA representatives, who conducted their own analysis.^[125] Armstrong found Ford's analysis "persuasive."^[126] However, the article by Ford was published on his website rather than in a peer-reviewed scientific journal and linguists David Beaver and Mark Liberman wrote of their skepticism of Ford's claims on the blog Language Log.^[127] Thus, NASA's transcript continues to show the "a" in parentheses.^[128] A 2016 peer-reviewed

study again concluded Armstrong had included the article.^[129] When Armstrong made his proclamation, Voice of America was rebroadcast live via the BBC and many other stations worldwide. The estimated global audience at that moment was 530 million,^[130] out of an estimated world population of 3.631 billion people.^[131]



Armstrong on the Moon

About 20 minutes after the first step, Aldrin joined Armstrong on the surface and became the second human to set foot on the Moon, and the duo began their tasks of investigating how easily a person could operate on the lunar surface. Early on, Armstrong unveiled a plaque commemorating their flight, and also planted the flag of the United States. The flag used on this mission had a metal rod to hold it horizontal from its pole. Since the rod did not fully extend, and the flag was tightly folded and packed during the journey, the flag ended up with a slightly wavy appearance, as if there were a breeze.^[132] Shortly after their flag planting, President Richard Nixon spoke to them by a telephone call from his office. The President spoke for about a minute, after which Armstrong responded for about thirty seconds.^[133] In the Apollo 11 photographic record there are only five images of Armstrong partly shown or reflected. The mission was planned to the minute, with

the majority of photographic tasks performed by Armstrong with the single Hasselblad camera.^[134]

After helping to set up the Early Apollo Scientific Experiment Package, Armstrong went for a walk to what is now known as East Crater, 65 yards (59 m) east of the LM, the greatest distance traveled from the LM on the mission. Armstrong's final task was to remind Aldrin to leave a small package of memorial items to deceased Soviet cosmonauts Yuri Gagarin and Vladimir Komarov, and Apollo 1 astronauts Grissom, White and Chaffee.^[135] The time spent on EVA during Apollo 11 was about two and a half hours, the shortest of any of the six Apollo lunar landing missions;^[136] each of the subsequent five landings were allotted gradually longer periods for EVA activities—the crew of Apollo 17, by comparison, spent over 22 hours exploring the lunar surface.^[136] In a 2010 interview, Armstrong explained that NASA limited his Moon walk to two hours because they were unsure how the spacesuits would handle the extremely high temperature of the Moon.^[137]

Return to Earth

After they re-entered the LM, the hatch was closed and sealed. While preparing for the liftoff from the lunar surface, Armstrong and Aldrin discovered that, in their bulky spacesuits, they had broken the ignition switch for the ascent engine; using part of a pen, they pushed the circuit breaker in to activate the launch sequence.^[138] The *Eagle* then continued to its rendezvous in lunar orbit, where it docked with *Columbia*, the Command and Service Module. The three astronauts returned to Earth and splashed down in the Pacific Ocean, to be picked up by the USS Hornet.^[139]

After being released from an 18-day quarantine to ensure that they had not picked up any infections or diseases from the Moon, the crew were feted across the United States and around the world as part of a 45-day "Giant Leap" tour. Armstrong then took part in Bob Hope's 1969 USO show, primarily to Vietnam.^[140] In May 1970, Armstrong traveled to the Soviet Union to present a talk at the 13th annual conference of the International Committee on Space Research; after arriving in Leningrad from Poland, he traveled to Moscow where he met Premier Alexei Kosygin. He was the first westerner to see the supersonic Tupolev Tu-144 and was given a tour of the Yuri Gagarin Cosmonaut Training Center, which Armstrong described as "a bit Victorian in nature".^[141] At the end of the day, he was surprised to view delayed video of the launch of Soyuz 9—it had not occurred to Armstrong that the mission was taking place, even though Treshkova had been his host and her husband Andriyan Nikolayev, was on board.^[142]



The Apollo 11 crew and President Nixon during the post-mission quarantine period

Life after Apollo

Teaching

Armstrong announced shortly after the Apollo 11 flight that he did not plan to fly in space again.^[143] He was appointed Deputy Associate Administrator for aeronautics for the Office of Advanced Research and Technology at ARPA, but served in this position for only a year, and resigned from it and NASA in 1971.^[144] He accepted a teaching position in the Department of Aerospace Engineering at the University of Cincinnati,^[145] having decided on Cincinnati over other universities, including his *alma mater*, Purdue, because Cincinnati had a small aerospace department. He hoped that the faculty members would not be annoyed that he came straight into a professorship with only the USC master's degree.^[146] He began this while stationed at Edwards years before, and finally completed it after Apollo 11 by presenting a report on various aspects of Apollo, instead of a thesis on the simulation of hypersonic flight. The official job title he received at Cincinnati was University Professor of Aerospace Engineering. After teaching for eight years, he resigned in 1979 without explaining his reason for leaving.^[147]

NASA accident investigations

Armstrong served on two spaceflight accident investigations. The first was in 1970, after the explosion and aborted lunar landing of Apollo 13. As part of Edgar Cortright's panel, he produced a detailed chronology of the flight. Armstrong opposed the report's recommendation to re-design the service module's oxygen tanks, which were the source of the explosion.^[148] In 1986, President Ronald Reagan appointed him to the Rogers Commission which investigated the Space Shuttle Challenger disaster of that year. As vice chairman, Armstrong was in charge of the operational side of the commission.^[149]

Business activities

After Armstrong retired from NASA in 1971, he acted as a spokesman for several businesses. The first company to successfully approach him was Chrysler, for whom he appeared in advertising starting in January 1979. Armstrong thought they had a strong engineering division, plus they were in financial difficulty. He later acted as a spokesman for other companies, including General Time Corporation and the Bankers Association of America. He acted as a spokesman for U.S. businesses only.^[150] Along with spokesman duties, he also served on the board of directors of several companies, including Marathon Oil, Learjet, Cinergy (Cincinnati Gas & Electric Company), Taft Broadcasting, United Airlines, Eaton Corporation, AIL Systems and Thiokol.^[151] He joined Thiokol's board after he served on the Rogers Commission; the Space Shuttle Challenger was destroyed due to a problem with the Thiokol-manufactured solid rocket boosters. He retired as chairman of the board of EDO Corporation in 2002.^[152]



Neil Armstrong (second from right in the middle row) visits with U.S. Air Force members during a March 2010 USO stop in Southwest Asia. Seated next to him on the left are astronauts Jim Lovell and Gene Cernan

North Pole expedition

In 1985, professional expedition leader Mike Dunn organized a trip to take men he deemed the "greatest explorers" to the North Pole. The group included Armstrong, Edmund Hillary, Hillary's son Peter, Steve Fossett, and Patrick Morrow, and arrived on April 6, 1985. Armstrong said he was curious to see what the North Pole looked like from ground level, as he had only seen it from the Moon.^[153]

Television and film

In 2010, he voiced the character of Dr. Jack Morrow in Quantum Quest: A Cassini Space Odyssey,^[154] a 2010 animated educational sci-fi adventure film initiated by JPL/NASA through a grant from Jet Propulsion Lab.^[155] Between 1991 and 1993, he hosted First Flights with Neil Armstrong, an aviation history documentary series on A&E.^[156]

Personal life

Some former astronauts (such as U.S. Senators John Glenn and Harrison Schmitt) actively sought political careers after leaving NASA, but although Armstrong was approached by political groups from both parties, he declined all offers. He described his political leanings as favoring states' rights and opposing the United States acting as the "world's policeman".^[157]

In the late 1950s, Armstrong applied at a local Methodist church to lead a Boy Scout troop. When asked for his religious affiliation, he labeled himself as adeist.^{[158][159]} His mother later said that Armstrong's religious views caused her grief and distress in later life as she was more religious.^[160]

In 1972, Armstrong was welcomed into the town of Langholm, Scotland, the traditional seat of Clan Armstrong he was made the first freeman of the burgh, and happily declared the town his home.^[161] The Justice of the Peace read from an unrepealed 400-year-old law that required him to hang any Armstrong found in the town.^[162]

In November 1978, Armstrong was working at his farm near Lebanon, Ohio. As he jumped off the back of his grain truck, his wedding ring got caught in the wheel, tearing off the tip of his left hand's ring finger. He collected the severed digit and packed it in ice, and surgeons reattached it at the Jewish Hospital in Louisville, Kentucky.^[163] In February 1991, a year after his father had died, and nine months after the death of his mother, he suffered a mild heart attack while skiing with friends at Aspen, Colorado.^[164]

Armstrong's first wife, Janet, divorced him in 1994, after 38 years of marriage.^[165] He had already met his second wife, Carol Held Knight,^[166] in 1992 at a golf tournament, where they were seated together at the breakfast table. She said little to Armstrong, but two weeks later she received a call from him asking what she was doing—she replied she was cutting down a cherry tree; 35 minutes later Armstrong was at her house to help out. They were married on June 12, 1994, in Ohio, and then had a second ceremony, at San Ysidro Ranch, in California. He lived in Indian Hill, Ohio.^[167]

Armstrong is generally referred to as a "reluctant" American hero. John Glenn, the first American to orbit Earth, recalled Armstrong's legendary humility. "He didn't feel that he should be out huckstering himself," Glenn told CNN. "He was a humble person, and that's the way he remained after his lunar flight, as well as before."^{[168][169]}



Quincy Jones presents platinum copies of 'Fly Me to the Moon' to John Glenn (left) and Armstrong, September 24, 2008

After 1994, Armstrong refused all requests for autographs because he found that his signed items were selling for large amounts of money and that many forgeries were in circulation; any requests that were sent to him received a form letter in reply, saying that he had stopped signing. Although his no-autograph policy was well known, author Andrew Smith observed people at the 2002 Reno Air Races still trying to get signatures, with one person even claiming, "If you shove something close enough in front of his face, he'll sign."^[170] He also stopped sending out congratulatory letters to new Eagle Scouts, because he believed these letters should come from people who knew the Scouts personally.^[171]

Use of Armstrong's name, image, and famous quote caused him problems over the years. MTV wanted to use his quote for its now-famous identity depicting the Apollo 11 landing when it launched in 1981, but he refused.^[172] Armstrong sued Hallmark Cards in 1994 after they used his name and a recording of the "one small

step" quote in a Christmas ornament without permission. The lawsuit was settled out of court^[173] for an undisclosed amount of money which Armstrong donated to Purdue.^[174]

In May 2005, Armstrong became involved in an unusual legal dispute with his barber of 20 years, Mark Sizemore.^[175] After cutting Armstrong's hair, Sizemore sold some of it to a collector for \$3,000 without Armstrong's knowledge or permission.^[176] Armstrong threatened legal action against Sizemore unless he returned the hair or donated the proceeds to a charity of Armstrong's choosing. Sizemore, unable to retrieve the hair, decided to donate the proceeds to the charity of Armstrong's choice.^[177]



Armstrong speaks in February 2012 on the 50th anniversary of John Glenn's first spaceflight

From the early 1980s, Armstrong was the subject of a hoax saying that he converted to Islam after hearing the adhan, the Muslim call to prayer, while walking on the Moon. The Indonesian singer Suhaemi wrote a song called "Gema Suara Adzan di Bulan" ("The Resonant Sound of the Call to Prayer on the Moon") which described Armstrong's conversion; the song was discussed widely in various Jakarta news outlets in 1983.^[178] Other similar hoax stories were seen in Egypt and Malaysia. In March 1983, the U.S. State Department responded by issuing a global message to Muslims saying that Armstrong "has not converted to Islam".^[179] However, the hoax was not completely quieted; it surfaced occasionally for the next three decades. A part of the confusion stems from the similarity between Armstrong's American residence in Lebanon, Ohio, and the country of Lebanon, which has a majority population of Muslims.^{[179][180]}

Illness and death

Armstrong underwent bypass surgery on August 7, 2012, to relieve blocked coronary arteries.^[181] Although he was reportedly recovering well,^[182] he developed complications in the hospital and died on August 25, in Cincinnati, Ohio, aged 82.^{[183][184]} After his death, Armstrong was described, in a statement released by the White House, as "among the greatest of American heroes—not just of his time, but of all time".^{[185][186]} The statement further said that Armstrong had carried the aspirations of the United States' citizens and that he had delivered "a moment of human achievement that will never be forgotten".^[187]

His family released a statement describing Armstrong as a "reluctant American hero [who had] served his nation proudly, as a navy fighter pilot, test pilot, and astronaut ... While we mourn the loss of a very good man, we also celebrate his remarkable life and hope that it serves as an example to young people around the world to work hard to make their dreams come true, to be willing to explore and push the limits, and to selflessly serve a cause greater than themselves. For those who may ask what they can do to honor Neil, we have a simple request. Honor his example of service, accomplishment and modesty, and 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."^[188] This prompted many responses, including the Twitter hashtag "#WinkAtTheMoon".^[189]

Aldrin, said that he was "deeply saddened by the passing. I know I am joined by millions of others in mourning the passing of a true American hero and the best pilot I ever knew. I had truly hoped that on July 20th, 2019, Neil, Mike and I would be standing together to commemorate the 50th Anniversary of our moon landing ... Regrettably, this is not to be."^{[190][191]} Collins said: "He was the best, and I will miss him terribly."^{[192][193]} NASA Administrator Charles Bolden said that: "As long as there are history books, Neil Armstrong will be included in them, remembered for taking humankind's first small step on a world beyond our own".^{[194][195]}



Photograph of Armstrong as a boy at his family memorial service in Indian Hill, Ohio, near Cincinnati, on August 31, 2012



Armstrong's burial at sea on September 14, 2012

A tribute was held in Armstrong's honor on September 13 at Washington National Cathedral, whose Space Window depicts the Apollo 11 mission and holds a sliver of Moon rock amid its stained-glass panels.^[196] In attendance were Armstrong's Apollo 11 crewmates, Michael Collins and Buzz Aldrin; Gene Cernan, the Apollo 17 mission commander and last man to walk on the Moon; and former Senator and astronaut John Glenn, the first American to orbit the Earth. In a eulogy, Charles Bolden said, "Neil will always be remembered for taking humankind's first small step on a world beyond our own, but it was the courage, grace, and humility he displayed throughout this life that lifted him above the stars." Cernan recalled Armstrong's low-fuel approach to the Moon: "When the gauge says empty we all know there's a gallon or two left in the tank!" Diana Krall sang the song "Fly Me to the Moon". Collins led prayers. Scott recalled their Gemini 8 mission with

Armstrong when he spoke, possibly for the first time, about an incident in which glue spilled on his harness and prevented it from locking correctly minutes before the hatch had to be sealed or the mission aborted. Armstrong then called on Conrad to solve the problem, which he did, to continue the mission without stopping the countdown clock. "That happened because Neil Armstrong was

a team player, he always worked on behalf of the team."^[196] On September 14, Armstrong's cremated remains were scattered in the Atlantic Ocean during a burial-at-sea ceremony aboard the USS *Philippine Sea*.^[197] Flags were flown at half-staff on the day of Armstrong's funeral.^[198]

Legacy

Armstrong received many honors and awards, including the Presidential Medal of Freedom from President Nixon,^[199] the Cullum Geographical Medal from the American Geographical Society,^[200] and the Collier Trophy from the National Aeronautic Association, all in 1969,^[201] the NASA Distinguished Service Medal in 1970,^[76] the Dr. Robert H. Goddard Memorial Trophy in 1970,^[202] the Sylvanus Thayer Award by the United States Military Academy in 1971,^[203] the Congressional Space Medal of Honor from President Jimmy Carter in 1978,^[76] and the Congressional Gold Medal in 2011.^[204] Armstrong and his Apollo 11 crewmates were the 1999 recipients of the Langley Gold Medal from the Smithsonian Institution.^[205] On April 18, 2006, he received NASA's Ambassador of Exploration Award.^[206] The Space Foundation named Neil Armstrong as a recipient of its 2013 General James E. Hill Lifetime Space Achievement Award.^[207] Armstrong was also inducted into the Aerospace Walk of Honor, the National Aviation Hall of Fame, and the United States Astronaut Hall of Fame.^{[208][209]} He was awarded his Naval Astronaut badge in a ceremony on board the aircraft carrier USS *Dwight D. Eisenhower* on March 10, 2010, in a ceremony attended by Lovell and Cernan.^[210]



Michael Collins, President George W. Bush, Neil Armstrong, and Buzz Aldrin during celebrations of the 35th anniversary of the Apollo 11 flight, July 21, 2004

The lunar crater Armstrong, 31 miles (50 km) from the Apollo 11 landing site, and asteroid 6469 Armstrong are named in his honor.^[211] There are more than a dozen elementary, middle and high schools named in his honor in the United States,^[212] and many places around the world have streets, buildings, schools, and other places named for Armstrong and/or Apollo.^[213] The Armstrong Air and Space Museum, in Armstrong's hometown of Wapakoneta,^[214] and the airport in New Knoxville, Ohio, where he took his first flying lessons when he was fifteen, are named after him.^[215] Purdue University announced in October 2004 that its new engineering building would be named Neil Armstrong Hall of Engineering in his honor;^[216] the building cost \$53.2 million and was dedicated on October 27, 2007, during a ceremony at which Armstrong was joined by fourteen other Purdue Astronauts.^[217] The NASA Dryden Flight Research Center was renamed the NASA Neil A. Armstrong Flight Research Center in 2014.^[218]



President Barack Obama poses with Apollo 11 astronauts, from left, Buzz Aldrin, Michael Collins, and Neil Armstrong, on the 40th anniversary of the Apollo 11 lunar landing on July 20, 2009

In September 2012, the U.S. Navy announced that the first *Armstrong*-class vessel is named RV *Neil Armstrong*. The ship was christened on March 28, 2014, launched on March 29, 2014, passed sea trials August 7, 2015, and delivered to the Navy on September 23, 2015. It is a modern oceanographic research platform capable of supporting a wide range of oceanographic research activities conducted by academic groups.^[219]

Armstrong's authorized biography, *First Man: The Life of Neil A. Armstrong*, was published in 2005. For many years, Armstrong turned down biography offers from authors such as Stephen Ambrose and James A. Michener, but agreed to work with James R. Hansen after reading one of Hansen's other biographies.^[220] A film adaptation of the book starring Ryan Gosling and directed by Damien Chazelle is scheduled to be released in October 2018.^[221]

In a 2010 *Space Foundation* survey, Armstrong was ranked as the #1 most popular space hero,^[222] and in 2013, *Flying* magazine ranked him at #1 on its list of the "51 Heroes of Aviation".^[223] The press often asked Armstrong for his views on the future of spaceflight. In 2005, Armstrong said that amanned mission to Mars will be easier than the lunar challenge of the 1960s; "I suspect that even though the various

questions are difficult and many, they are not as difficult and many as those we faced when we started the Apollo [space program] in 1961." In 2010, he made a rare public criticism of the decision to cancel the Ares I launch vehicle and the Constellation Moon landing program.^[224]

In an open public letter also signed by fellow Apollo veterans Lovell and Cernan, he noted, "For The United States, the leading space faring nation for nearly half a century, to be without carriage to low Earth orbit and with no human exploration capability to go beyond Earth orbit for an indeterminate time into the future, destines our nation to become one of second or even third rate stature".^[225] Armstrong had also publicly recalled his initial concerns about the Apollo 11 mission, when he had believed there was only a 50 percent chance of landing on the Moon. "I was elated, ecstatic and extremely surprised that we were successful", he later said.^[226] On November 18, 2010, aged 80, Armstrong said in a speech during the Science & Technology Summit in The Hague, Netherlands, that he would offer his services as commander on a mission to Mars if he were asked.^[227]

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External links

- Armstrong's official NASA biography
- Neil Armstrong at *Encyclopædia Britannica*
- Neil Armstrong Commemorative Website – University of Cincinnati
- Armstrong website, formerly maintained by the Armstrong family, at the *Wayback Machine* (archived June 17, 2013)
- Neil Armstrong on *IMDb*
- Appearances on *C-SPAN*
- FBI file on Neil Armstrong

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