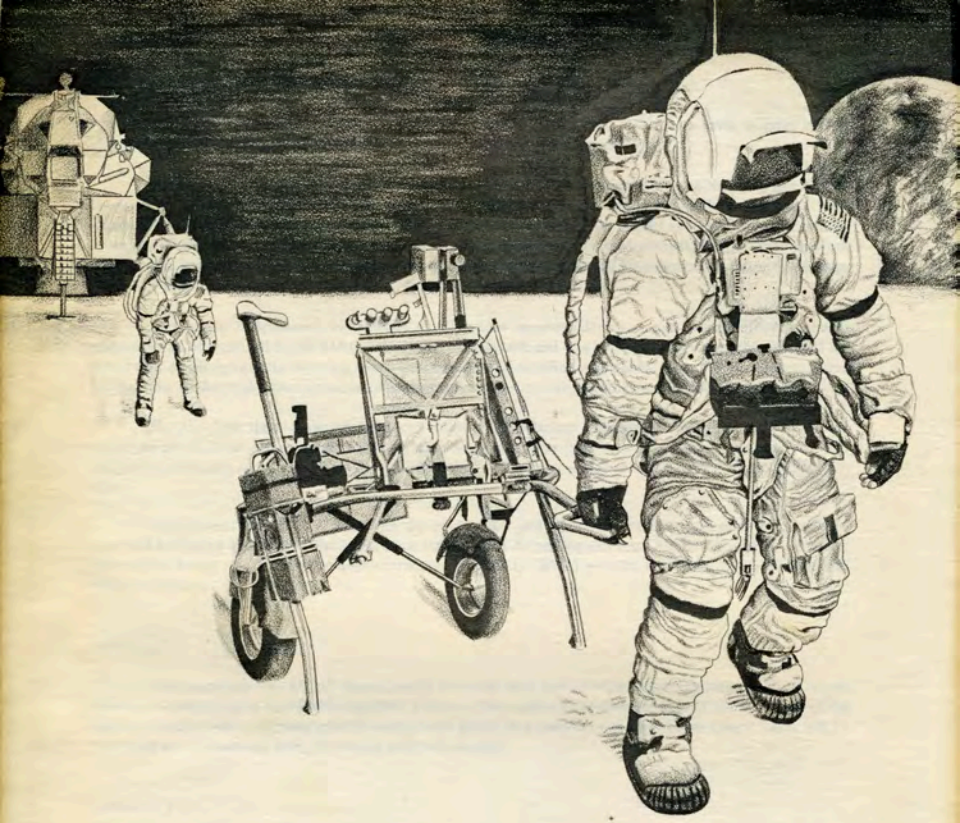


APOLLO 14
LUNAR LANDING
JOHN F. KENNEDY SPACE CENTER

APOLLO 14 MISSION–FLIGHT PROFILE

Apollo 14, America's sixth manned mission to the moon–and the fourth with a lunar-landing objective–is scheduled for liftoff from Cape Kennedy at 3:23 p.m. EST January 31.

The flight will be the most science-oriented to date. Astronauts assigned to it are Navy Captain Alan B. Shepard, Jr., spacecraft commander; Air Force Major Stuart A. Roosa, command module pilot, and Navy Commander Edgar D. Mitchell, lunar module pilot. The objectives will be: to inspect and sample lunar materials; to deploy experiments; to develop man's capability to work in the lunar environment, and to take numerous photographs, especially of possible future exploration sites. Photography will be paramount, comprising a larger portion of the work load than ever before.

The Apollo 14 spacecraft will embody modifications recommended as a result of the abortive Apollo 13 mission. Chief of these will be the addition of a third oxygen tank and of a battery, each to contribute toward the safe return of the astronauts from any point in the quarter-of-a-million-mile route. They will eliminate the need for the lunar module (LM) that served as a life-saver for the crew on the preceding moon-landing attempt.

For the first time, a two-wheeled cart called a Modularized Equipment Transporter (MET) will be employed on the lunar surface to transport cameras, tools and other items as the astronauts proceed with their assigned experiments and duties. Folded, it will be taken to the moon attached to the outside of the LM descent stage.

Shepard and Mitchell will remain on the moon a day and a half, two hours longer than the Apollo 12 crew and half a day longer than the initial lunar landers, Neil Armstrong and Buzz Aldrin. They will move about the surface during two four-to-five-hour extravehicular activity (EVA) periods, separated by a rest period of nearly four hours.

Liftoff

The spacecraft will lift off from Launch Complex 39A before what is again expected to be a record number of viewers and a world-wide television audience. Two minutes and 46 seconds later, the first stage of the Saturn V rocket will drop away and the second will ignite. In a minute or so, the launch escape tower will be jettisoned and, six minutes later, the second stage will separate.

Outward Trip

The flight profile will be essentially the same as that used during earlier missions. Launched on an azimuth of 72 degrees, Apollo 14 will be boosted to a 103-nautical-mile parking orbit 11 minutes after liftoff. After circling the earth one and a half times while its systems are checked, the space vehicle will be prepared for a translunar injection burn. Two and a half hours after launch, the Apollo will leave earth orbit on course to the moon.

Circling Moon

The spacecraft, at 2:01 a.m. February 4, will begin its lunar orbit insertion, planned for a high point of 170 nautical miles and a low of 57 nm. At 2:29 a.m., the spent S-IVB stage will complete a programmed flight plan that ends in impact against the moon, repeating a feature of the Apollo 13 mission. The resulting shock will be measured by the seismology experiment left behind on the Apollo 12 flight.

While circling the moon, Shepard and Mitchell will thoroughly check the LM systems and communications before preparing to descend to the lunar surface. The two spacecraft will undock at 11:50 p.m.

Touchdown

Touchdown is scheduled for 4:16 a.m. on February 5. The final vertical descent phase preceding the landing will start at an altitude of about 100 feet. When probes extending about five feet below three of the LM's four footpads touch the moon's surface, lights will flash in the spacecraft as a signal to shut off the descent engine. The resulting drop should end with negligible impact.

Landing Site

The landing site will be in the Fra Mauro Formation, an extensive geologic area covering large portions of the lunar surface around Mare Imbrium. It is 30 miles north of Fra Mauro, the 58-mile-wide crater named for a 15th Century Italian monk and mapmaker, and the same chosen for the Apollo 13 flight. A hilly upland region, it is quite different from the flat landing sites chosen for Apollos 11 and 12. New attention recently was focused on it by radio signals from the seismic station set up by the Apollo 12 astronauts, probably caused by moonquakes that appeared to originate in Fra Mauro when the moon came closest to the earth.

The Formation is a blanket of debris that may have come from as deep as 100 miles below the original lunar crust when Mare Imbrium, the largest recognizable impact structure on the moon, was formed. Scientists believe it was probably created by (1) ballistic ejection of material at the time of the tremendous impact four or five million years ago of a smaller moon or a huge meteorite, and (2) the outward surge of gas and debris. Sampling this blanket may help unfold the early history of the moon, the earth, and the solar system. Traces of the corresponding period here on earth have been erased by erosion, melting of primordial rocks, and other natural events.

Near the landing point is a cavity nearly 1,000 feet across and 250 feet deep known as Cone Crater. Blocks of original Imbrium material can be seen scattered around its rim. Shepard and Mitchell plan to walk up its sloping outer wall, photograph it, and collect samples.

Lunar Surface Activities

After resting for about four and a half hours, the astronauts will depressurize the LM in readiness for the first EVA. About 9:10 a.m. on February 5, Shepard will descend to the surface and begin unstowing the equipment to be used in connection with their activities. He will be followed 27 minutes later by Mitchell.

When the equipment has been unpacked, Shepard will deploy the solar wind composition experiment. Then Mitchell will reenter the LM to switch the TV camera to the surface S-band antenna, already erected by his companion.

Setting up ALSEP

Upon rejoining Shepard, Mitchell will assist him in deploying a United States flag, and then they will turn their attention to the two-wheel cart and the experiments package (ALSEP). After moving out to the chosen deployment site about 300 feet west of the LM, they will set up the ALSEP and photograph it, as well as the laser reflector, using color film.

While Shepard collects samples in the area, Mitchell will conduct the active seismic experiment. He will lay out 310 feet of cable and stick three vibration detectors, or geophones, into the surface at 150-foot intervals. As he walks back to a central recording and relay station, he will fire 21 cartridges, one every 15 feet, with a device called a "thumper." The procedure will send vibrations through the lunar surface to give scientists new information about the outer lunar crust.

Shepard will next set up and arm a four-barrel mortar about 10 feet from the central station. The mortar will be equipped to hold four high-explosive grenades that will be rocket-launched by radio command from earth six months after the astronauts have departed. These will explode at 500, 1,000, 3,000, and 5,000-foot ranges, with charges proportionate to range. The consequent vibrations will be picked up by the geophones and provide data on the moon's structure to a depth of 2,000 feet. This could help in the future search for water, it is believed, if there is any under the surface.

After the activity around the ALSEP is completed, the astronauts will return to the LM, collecting samples along the way. With equipment and samples stored, they will reenter the spacecraft, repressurize the cabin, and thus end EVA 1.

Roosa Takes Photos

Astronaut Roosa, in the meantime, will continue to circle the moon in the command/service module, changing its orbital plane at the proper time to make it coincide with the LM orbital plane when it ascends from the surface. As his spacecraft swoops to within 10 miles of the highlands around the Crater Descartes, he will photograph future landing sites, using for the first time a modified aerial reconnaissance camera. He will also try to get pictures of the craters caused by the impact of spent upper stages of Apollos 12, 13 and 14 against the moon.

EVA 2

At 5:38 a.m. on February 6, EVA 2 will begin. Shepard, when he reaches the surface again, will begin stowing sample-gathering equipment on the MET. Mitchell will descend from the LM a short time later and will take a reading of the lunar magnetic field, using a portable magnetometer.

During the next hour or so, they will collect core tube samples and begin a geology traverse, gathering material and taking photos, this time in black and white. After visiting the Cone Crater, they will return to the LM, collect rocket-exhaust contaminated samples of the soil beneath it, stow the samples and other items, reenter the LM, and repressurize the cabin.

Liftoff

At 1:47 p.m. on February 6, the engine will be ignited and the ascent stage of the LM boosted into lunar orbit to rejoin the CSM in which Roosa has been circling the moon. The LM will rise and attempt a first orbit burn rendezvous, thus cutting the time between liftoff and docking to an hour and 56 minutes, compared with the usual three hours and 40 minutes.

After docking, Shepard and Mitchell will transfer back to the command craft, taking with them the samples and selected items of equipment. The LM will next be separated. By radio command from Houston, Texas, it will be jettisoned onto the lunar surface, creating another seismic event.

Return to Earth

An hour or so later, the CSM will be injected into a transearth trajectory. On February 9, Apollo 14 will reenter the earth's atmosphere at 400,000 feet, traveling at a speed of nearly 24,700 miles per hour. Splashdown is scheduled for 4:03 p.m. EST in the Pacific Ocean.

The crew will be transferred by helicopter from the spacecraft to the recovery ship, the *USS New Orleans*, and will enter the Mobile Quarantine Facility. Later the crew will fly by helicopter to Samoa, enter another MQF on a C-141 aircraft for the flight back to the Lunar Receiving Laboratory at the Manned Spacecraft Center in Houston. The crew will remain in quarantine up to 21 days from completion of the second EVA.

THE JOHN F. KENNEDY SPACE CENTER

In addition to serving as America's jumping-off spot to the moon, NASA's John F. Kennedy Space Center has become one of the nation's leading tourist attractions. Thousands of visitors arrive daily to be conducted through the various facilities of this national Spaceport from which have been launched both manned and unmanned missions.

Situated on an 88,000-acre tract comprising a 35-mile stretch of historic Merritt Island in east Florida, it has the second largest building, the largest door, the largest windows, and the largest mobile ground vehicle in the world. The Center represents one of the largest peacetime construction jobs this nation has ever undertaken.

The site itself is rich in historical tradition. Indian burial grounds existing on its acreage date back to the time of Christ. It was one of the very early gateways through which western civilization came into the New World. Originally known as Cape Canaveral, a name given it by the explorer, Ponce de Leon, it was renamed in memory of the late President John F. Kennedy shortly after his assassination.

Construction of the Center has involved two areas. One is the industrial area where more than 50 structures have been built to house administrative, engineering, laboratory, assembly, and checkout activities of the space program. On the other is situated Launch Complex 39, where the Apollo/Saturn V vehicles are assembled, checked out, and launched.

Vehicle Assembly Building (VAB)

A major attraction of the entire Center is the Vehicle Assembly Building. Its high-bay area is 525 feet tall, its low-bay area, 210 feet. A four-story Launch Control Center connects with the high bay by an enclosed bridge. Its main doorway is 456 feet tall, its windows, 400 feet. It is the world's second largest building in volume, containing nearly 130 million cubic feet of interior space and covering eight acres of ground. If laid end to end, the pilings beneath it, driven 160 feet to bedrock, would extend 128 miles. In its high-bay area are four vehicle assembly and checkout bays, in any one of which the 363-foot-tall Apollo space vehicles can be assembled.

Connected with the VAB is the Launch Control Center, a four-story structure that serves as the electronic brain of Launch Complex 39. In it are four control and firing rooms, each capable of checking out and launching a space vehicle independently.

Mobile Launcher

The Mobile Launcher is another major attraction. Weighing 12 million pounds, it serves as the platform upon which the space vehicles are mounted and fired. Its movable base is a two-story affair that houses computer systems, digitally-controlled equipment for propellant loading, hydraulic test sets, propellant and pneumatic lines, electrical power systems, and water systems.

The platform covers more than half an acre. At one end is an integral umbilical tower that supports the spacecraft. It is 380 feet tall, is equipped with nine swing arms for direct access to the vehicle, and is topped by a 25-ton hammerhead crane.

Transporter

The Transporter is the means by which a space vehicle, after it has been assembled on the launcher in the VAB, is moved to the launch site. This vehicle is larger than a baseball diamond and weighs six million pounds. It moves on four double-tracked traction units driven by electric motors, and can carry up to 12 million pounds, enabling the vehicle to be transported in launch-ready condition. Its speed is one mile per hour.

Crawlerway

The Transporter moves over a special road capable of supporting loads of over 18 million pounds. A dual roadway 130 feet wide, its surface and base are eight feet thick.

Mobile Service Structure

After the spacecraft has reached the launch pad, the Mobile Service Structure makes possible external access to the vehicle. It is more than 400 feet high, a movable, steel-truss affair equipped with five platforms that close around the vehicle, all of which can be relocated and two of which are powered to move up and down.

Launch Pad

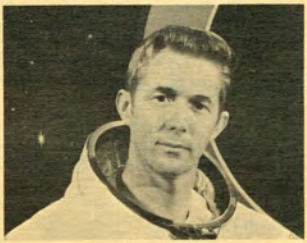
Final preparations take place at the launch site. The Space Center has two of these sites, each eight-sided polygons with a 3,000-foot diameter. Before the launch takes place, the Transporter moves the Mobile Service Structure away and leaves the Mobile Launcher and spacecraft in upright position on the pad.

THE APOLLO 14 CREW

ALAN B. SHEPARD, JR., spacecraft commander, is a Captain in the U.S. Navy. He was one of the Mercury astronauts named by NASA in April 1959 and was the first American to journey into space. On May 5, 1961, in the Freedom 7 spacecraft, he was launched by a Redstone vehicle on a suborbital flight that carried him to an altitude of 116 statute miles. Two years later, he was designated Chief of the Astronaut Office, directing all activities involving astronauts. Grounded for some time as a result of an inner ear disorder, he was named to the crew of Apollo 14 after the difficulty was corrected.

A native of East Derry, N.H., and a graduate of the U.S. Naval Academy, Captain Shepard has had an extensive career in the Navy as a test pilot and aircraft readiness officer. He has logged more than 4,700 hours of flying time, 2,900 of them in jet aircraft. The father of two children, he is married to the former Louise Brewer of Kennett Square, Pa.

STUART ALLEN ROOSA, command module pilot, is a major in the U.S. Air Force and has been on active duty since 1953, acquiring 4,300 flying hours, 3,900 of them in jet aircraft. He was one of the 19 astronauts selected by NASA in April 1966 and was named to the support crew for the Apollo 9 flight.



A graduate with honors in aeronautical engineering from the University of Colorado, he served both as an Air Force test pilot and fighter pilot. For two years, he was Chief of Service Engineering at Tachikawa Air Base, Japan. A native of Durango, Colorado, but now residing in Tucson, Arizona, he is married to the former Joan C. Barrett of Tupelo, Mississippi, and is the father of four children.

EDGAR DEAN MITCHELL, lunar module pilot, is a commander in the U.S. Navy. Since joining the service in 1952, he has had a distinguished career in operational and test flight and in engineering and engineering management, accumulating 3,600 hours of flight time, 1,500 of them in jets. He came to NASA after graduating first in his class from the Air Force Aerospace Research Pilot School, where he was both student and part-time instructor. He was selected for astronaut training in April 1966 and later became a member of the Apollo 9 support crew.

He holds several college degrees, including a Doctorate in Aeronautics/Astronautics from the Massachusetts Institute of Technology. Born in Hereford, Texas, and now residing in Artesia, New Mexico, he is married to the former Louise Elizabeth Randall of Muskegon, Michigan, and has two children.

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