# Apollo 14 Description

## Mission Overview

Apollo 14 was launched on 31 January 1971 UT 21:03:02 on a Saturn V rocket from Kennedy Space Center. Lunar orbit insertion took place on 4 February 1971 UT 06:59:43. The Lunar Module (LM) landed on the Moon on 5 February 1971 UT 09:18:11, in the hilly upland region 24 km north of the rim of Fra Mauro crater at 3.6 S, 17.5 W, while the Command/Service Module (CSM) orbited the Moon. The lunar ascent module launched from the Moon on 6 February 1971 UT 18:48:42. The command module returned to Earth on 9 February 1971 UT 21:05:00.

The astronauts on Apollo 14 were commander Alan Shepard, Jr., command module pilot Stuart Roosa, and lunar module pilot Edgar Mitchell.

The astronauts made two moonwalk EVAs totaling 9 hours, 23 minutes, one on 5 February and one on 6 February, during which the Apollo Lunar Surface Experiments Package (ALSEP) was placed on the surface and activated, 42.9 kg of lunar samples were acquired, and photographs were taken. The lunar surface stay-time was 33.5 hours. The duration of the lunar orbit was 66.6 hours for a total of 34 orbits.

## Surface Operations

Shepard and Mitchell made two moonwalk extravehicular activities (EVAs) totaling 9 hours, 23 minutes. During this time the astronauts traversed a total of 3.45 km and collected 42.9 kg of lunar samples. The first EVA began at 14:42:13 UT on 5 February and ended at 19:30:03 UT. During this first EVA the astronauts deployed the ALSEP and other experiments in the vicinity of the LM near Doublet Crater. During the second EVA, which took place from 8:11:15 to 12:45:56 UT on 6 February, the astronauts walked almost to the rim of nearby Cone crater, stopping at 13 stations, collecting samples and taking panoramic photographs and magnetometer measurements along the traverse. The astronauts did not reach the rim of Cone Crater as planned but came within about 20 meters of the edge. The traverse totaled approximately 3 km distance, heading out past Triplet, Weird, and Flank Craters and returning along a nearly parallel route. At the end of this walk Shepard used a contingency sampler with a 6-iron connected to the end to hit two golf balls. The LM lifted off the Moon on 6 February at 18:48:42 UT after 33 hours, 31 minutes on the lunar surface.

## Surface Experiments

The Apollo 14 astronauts performed and deployed many experiments on the lunar surface along with the geologic studies, sample return, and surface photography.

* The Soil Mechanics Investigations studied the physical properties of the lunar regolith through photography and astronaut observations.
* The Solar Wind Composition experiment collected samples of solar wind on a large piece of foil which was returned to Earth.
* The Lunar Portable Magnetometer, deployed by the astronauts at various locations near the landing site to study local magnetic sources.

Other experiments were part of the Apollo Lunar Surface Experiments Package (ALSEP) which was emplaced at the landing site by the astronauts. The instruments, connected by cables to a central station which controlled power and communications, ran autonomously. Data collected was converted to a telemetry format and transmitted to Earth. Many of these experiments returned data until January 1976, when the ALSEP network was turned off due to budgetary constraints.

The Apollo 14 ALSEP instruments consisted of:

* A Passive Seismometer, designed to measure seismic activity and physical properties of the lunar crust and interior.
* An Active Seismometer, designed to study the physical properties of the lunar surface and subsurface materials and the structure of the local near-surface layers.
* A Suprathermal Ion Detector. Designed to measure positive ions reaching the lunar surface to provide data on the plasma interaction between the solar wind and the Moon.
* A Cold Cathode Ion Gage, designed to measure the density of neutral particles in the tenuous lunar atmosphere.
* A Charged Particle Lunar Environment Experiment, designed to measure the energy spectra of low-energy charged particles striking the lunar surface.
* A Lunar Dust Detector, designed to assess the long-term effects of the lunar dust, radiation, and thermal environment on solar cells.
* A Laser Ranging Retroreflector, designed to reflect laser pulses from Earth back to their point of origin to make accurate determination of the distance between the earth and Moon.

## Orbital Science Experiments

Investigations were also carried out from lunar orbit in the Apollo 14 Command and Service Module. Hand-held photography and telescopic selenodetic reference point studies were performed from the command module, and instruments operated from the Scientific Instrument Module (SIM) in the Service Module, comprising:

* An S-Band Transponder Experiment designed to carefully track the CSM orbit and measure the lunar gravity field.
* A Bistatic Radar Experiment used measurements of S-Band and VHF reflections to probe electromagnetic and structural properties of the lunar surface.

Additional experiments were also performed in lunar orbit and during the cruise between Earth and Moon

* The Gegenschein Photography Experiment took images of the reflections from dust particles at the Moulton point.
* The Window Meteoroid experiment studied micrometeoroid impacts on the Apollo 14 Command Module heat shield windows to obtain information about the mass flux of micrometeorites.

## Mission Objectives Overview

The primary scientific objectives of the Apollo 14 mission were to:

* Carry out a geological survey, comprehensive sampling, and photographic documentation in the Fra Mauro region
* Emplace and activate surface experiments
* Conduct experiments and photographic tasks from lunar orbit

## References

Apollo 14 Preliminary Science Report, NASA SP-272, published by NASA, Washington, D.C., 1971.

Davies, M. E., and T. R. Colvin, Lunar coordinates in the regions of the Apollo landers, Journal of Geophysical Research, Volume 105, Issue E8, pages 20,227-20,280, 2000.

Ertel, I. D., R. W. Newkirk, and C. G. Brooks, The Apollo Spacecraft: A Chronology Volume 4, 21 January 1966 - 13 July 1974, NASA SP-4009, published by NASA, Washington, D.C., 1978.