# Apollo 15 Description

## Mission Overview

Apollo 15 was launched on 6 July 1971 UT 13:34:00 on a Saturn V rocket from Kennedy Space Center. Lunar orbit insertion took place on 29 July 1971 UT 20:05:47. The Lunar Module (LM) landed on the Moon on 30 July 1971 UT 22:16:29, near the Hadley Rille and Apennine Mountains (26.13 N, 3.63 E), while the Command/Service Module (CSM) orbited the Moon. The lunar ascent module launched from the Moon on 2 August 1971 UT 17:11:22. The command module was returned to Earth on 7 August 1971 UT 20:45:53.

The astronauts on Apollo 15 were commander David Scott, command module pilot Alfred Worden, and lunar module pilot James Irwin.

Three excursions on the first Lunar Roving Vehicle (LRV) lasted a total of 18 hours and 35 minutes and traversed 27.9 km. The lunar surface stay-time was 66.9 hours. During the stay, the Apollo Lunar Surface Experiment Package (ALSEP) was placed and activated, and 77.31 kg of rock and soil samples were collected. The duration of the lunar orbit was 145 hours for a total of 74 orbits. The small sub-satellite was deployed from the CSM on 4 August 1972 UT 20:13:19 and left in lunar orbit for the first time.

## Surface Operations

Scott and Irwin made three moonwalk extra-vehicular activities (EVAs) totaling 18 hours, 35 minutes. During this time they covered 27.9 km and collected 77.31 kg of rock and soil samples. The LRV was used to explore regions within 5 km of the LM landing site. This was the first time a vehicle of this type had been used, and its performance on the lunar terrain was very successful. Two hours after landing the cabin was depressurized and Scott performed a standup EVA for 33 minutes, describing and photographing the surrounding terrain from the LM upper hatch. The first moonwalk EVA was on 31 July from 13:13:10 UT to 19:45:59 UT, during which time the LRV was unloaded, deployed, and driven. Photographs of the lunar surface were taken and geologic samples were collected from the LM site and during the three geological traverses. The traverse on the first EVA covered 10.3 km to the edge of Hadley Rille to Elbow Crater and near St. George Crater and back to the LM, where a core sample was taken from three meters below the surface. The ALSEP was deployed at the end of the traverse. On the second EVA, on 1 August from 11:48:48 UT to 19:01:02 UT, the LRV was driven on a 12.5 km traverse southeast along the base of the Apennine Mountains near Index, Arbeit, Crescent, Dune, and Spur craters and back to the ALSEP site. On the third EVA on 2 August from 08:52:14 UT to 13:42:04 UT the LRV was driven a total of 5.1 km west to Scarp Crater and northwest along the edge of Hadley Rille and back east across the mare. The LM lifted off the Moon on 2 August at 17:11:22 UT after 66 hours, 55 minutes on the lunar surface.

## Surface Experiments

The Apollo 15 astronauts performed and deployed many experiments on the lunar surface along with the geologic studies, sample return, and surface photography.

* The Solar Wind Composition experiment collected samples of solar wind on a large piece of foil which was returned to Earth
* The Soil Mechanics Investigations studied the physical properties of the lunar regolith using observations recorded by video and audio and a surface penetrometer which recorded data on a drum which was returned to Earth

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 September 1977, when the ALSEP network was turned off due to budgetary constraints.

The Apollo 15 ALSEP instruments consisted of:

* A Passive Seismometer, designed to measure seismic activity and physical properties of the lunar crust and interior
* A Lunar Surface Magnetometer, designed to measure the magnetic field at the ALSEP site
* A Solar Wind Spectrometer, designed to measure protons and electrons from the solar wind and magnetotail plasma impinging on the lunar surface
* 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 Heat Flow Experiment, designed to measure the rate of heat loss from the lunar interior and the thermal properties of lunar material
* A Cold Cathode Ion Gage, designed to measure the density of neutral particles in the tenuous lunar atmosphere
* 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 Earth and the Moon
* A Lunar Dust Detector, designed to assess the long-term effects of the lunar dust, radiation, and thermal environment on solar cells

## Orbital Science Experiments

Investigations were also carried out from lunar orbit in the Apollo 15 Command and Service Module. Hand-held photography was performed from the command module, and a suite of instruments operated from the Scientific Instrument Module (SIM) in the Service Module, comprising:

* Metric and Panoramic cameras to take photographs of the lunar surface from orbit
* A Laser Altimeter using reflected laser pulses to profile the topography of lunar surface
* A Gamma-ray Spectrometer Experiment to measure gamma ray emissions from the lunar surface to determine composition
* An X-ray Fluorescence Spectrometer Experiment to measure secondary X-ray emissions from the lunar surface to determine composition
* An Alpha Particle Spectrometer Experiment to measure radon gas emissions from the lunar surface
* An S-Band Transponder Experiment designed to carefully track the CSM orbit and measure the lunar gravity field
* An Orbital Mass Spectrometer Experiment to study the tenuous lunar atmosphere and search for active lunar volcanism
* A Bistatic Radar Experiment used measurements of S-Band and VHF reflections to probe electromagnetic and structural properties of the lunar surface
* A Subsatellite released from the CSM into lunar orbit with instruments to measure the Moon’s gravity field, magnetic field, and distribution of charged particles

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

* The Ultraviolet Photography Experiment took images of Earth and the Moon in UV
* 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 15 Command Module heat shield windows to obtain information about the mass flux of micro-meteorites

## Mission Objectives Overview

The primary scientific objectives of the Apollo 15 mission were to:

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

## References

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