# Apollo 12 Description

## Mission Overview

Apollo 12 was launched on 14 November 1969 UT 16:22:00 on a Saturn V Rocket from Kennedy Space Center. Lunar orbit insertion took place on 18 November 1969 UT 03:47:23. The Lunar Module (LM) landed on the Moon on 19 November 1969 UT 06:54:35, in the Oceanus Procellarum (Ocean of Storms) region at 3.012 degrees South and 23.422 degrees West while the Command and Service Module (CSM) orbited the Moon. The lunar ascent module lifted off from the Moon on 20 November UT 14:25:47. After docking with the CSM at 17:58:22 UT, the LM was jettisoned at 20:21:30 and intentionally crashed into the Moon creating the first recorded artificial moonquake. Trans-earth injection began at 20:49:16 UT on 21 November with a firing of the CSM main engine. The Apollo 12 Command Module splashed down in the Pacific Ocean on 24 November 1969 at 20:58:24 UT after a mission elapsed time of 244 hours, 36 minutes, 24 seconds.

The astronauts on Apollo 12 were commander Charles Conrad, Jr., command module pilot Richard F. Gordon, and lunar module pilot Alan L. Bean.

Apollo 12 was the second mission in which humans walked on the lunar surface and returned to Earth. During their 31.5-hour stay on the Moon, the astronauts deployed and activated the Apollo Lunar Surface Experiment Package (ALSEP) near the landing site, performed scientific experiments, took photographs, examined the nearby Surveyor 3 spacecraft which had landed on the Moon in April 1967 and removed pieces for later examination on Earth, and collected 34 kg of lunar samples on two moonwalk extravehicular activities (EVAs) totaling 7 hours and 50 minutes. The lunar surface stay-time was 31.5 hours and the lunar orbit lasted 89 hours, with a total of 45 orbits.

## Surface Operations

Conrad and Bean made two moonwalk extra-vehicular activities (EVAs) of a total duration of 7 hours 45 minutes covering a total traverse distance of 1.35 km. The first was from 11:32:35 to 15:28:38 UT (6:32 a.m. to 10:28 a.m. EST) and involved sample collections in the vicinity of the LM and deployment of the ALSEP and solar wind composition foil collector. The TV camera was inadvertently pointed towards the Sun when it was being set up and the vidicon tube was damaged rendering the camera inoperable. At the end of the EVA they visited a wide subdued crater near the landing site. On the second EVA, on November 20 from 03:54:45 to 07:44:00 UT (10:54 p.m. Nov. 19 to 2:44 a.m. Nov. 20 EST) they completed a 1.3 km geology traverse, visiting Head, Bench, and Sharp craters collecting samples and taking photographs. They then visited Surveyor crater and examined the Surveyor 3 spacecraft, bringing back about 10 kg of parts including the Surveyor camera for later study on Earth. They collected a total of 34.4 kg of rock and soil samples and also collected the solar wind foil. The LM lifted off on 20 November at 14:25:47 UT (9:25 a.m. EST) after spending 31 hours 31 minutes on the Moon.

## Surface Experiments

The Apollo 12 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 using tools and observations recorded by video and audio
* The Solar Wind Composition experiment collected samples of solar wind on a large piece of foil which was returned to Earth
* Pieces of the Surveyor 3 lander were collected by the crew and bought back to Earth for examination.

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 12 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 Cold Cathode Ion Gage, designed to measure the density of neutral particles in the tenuous lunar atmosphere
* 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 12 Command and Service Module. Hand-held photography was performed from the command module, and other investigations were performed from lunar orbit and during the cruise between Earth and Moon:

* The Multispectral Photography Experiment obtained photographs of the Moon at different wavelengths to map lunar surface color variations
* The Window Meteoroid experiment studied micrometeoroid impacts on the Apollo 12 Command Module heat shield windows to obtain information about the mass flux of micrometeorites
* An S-Band Transponder Experiment carefully tracked the CSM orbit and measured the lunar gravity field

## Mission Objectives Overview

The primary scientific objectives of the Apollo 12 mission were to:

* Carry out a geological survey, comprehensive sampling, and photographic documentation in the Oceanus Procellarum region
* Emplace and activate surface experiments
* Land in proximity to and return sample pieces of the Surveyor 3 lunar lander
* Conduct experiments and photographic tasks from lunar orbit

## References

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