

APOLLO 17: THE LAST MEN ON THE MOON

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ABSTRACT

The Apollo program was the name of NASA's project to land humans on the Moon. With the success of Apollo 11 in 1969, which put astronauts on the lunar surface for the first time in history, the U.S. was able to declare victory in the space race against the Soviet Union during the Cold War. Apollo 17 (December 7–19, 1972) was the final mission of NASA's Apollo program, the most recent time humans have set foot on the Moon or traveled beyond low Earth orbit. Commander Gene Cernan and Lunar Module Pilot Harrison Schmitt walked on the Moon, while Command Module Pilot Ronald Evans orbited above. Apollo 17 was the first mission to include a scientist in its crew. Their mission continued the focus on science, with the astronauts spending the most time on the lunar surface and picking up the largest samples of any in the program.

Key words: Moon, astronauts, NASA, The Apollo Missions

Introduction

Apollo 17 (December 7 - 19, 1972) was the final mission of the Apollo program carried out by the American Space Agency NASA. The Apollo 17 mission was launched from Launch Complex 39 at the Kennedy Space Center on December 7, 1972. The Apollo 17 crew members were Harrison Schmitt, Ronald Evans, and Gene Cernan. Mission Commander Gene Cernan and Lunar Module Pilot Harrison Schmitt, walked on the Moon, while Command Module Pilot Ronald Evans orbited the Moon. Schmitt was the only geologist to reach the Moon.



Fig 1 - The astronauts of the Apollo 17 mission

It was the only launch-pad delay in the Apollo program caused by a hardware problem, one that was solved in less than three hours. It was also the only Apollo mission launched at night. As the rocket headed toward the moon, it recorded a photo

of Earth known as *The Blue Marble*. This photograph is one of the most reproduced images in history. *The Blue Marble* was not the first clear color image taken of an illuminated face of Earth, since such images by satellites had already been made and released as early as 1967, and is the second time such a photo was taken by a person after the 1968 photograph *Earthrise* taken by William Anders of Apollo 8.



Fig 2 - The Blue Marble, taken by the Apollo 17 crew

Materials and methods

Apollo 17 mission continued the focus on science, with the astronauts spending the most time on the lunar surface and picking up the most samples of any mission in the program. The mission broke several records for manned spaceflight, including the longest manned lunar landing mission (12 days and 14 hours), longest total duration of lunar - surface

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extravehicular activities (22 hours and 4 minutes), largest lunar sample return (about 110 kg), longest period in lunar orbit (6 days and 4 hours). Two main objectives in selecting the Apollo 17 landing site: to sample lunar mountain material older than the Greater Imbrium and to investigate the possibility of relatively recent volcanic activity. The area thus chosen was Taurus-Littrow, where the formations that were seen and illustrated from orbit were believed to be volcanic in nature. Because all three crew members had supported previous Apollo lunar missions, they were familiar with the Apollo spacecraft and had more time for geology missions.

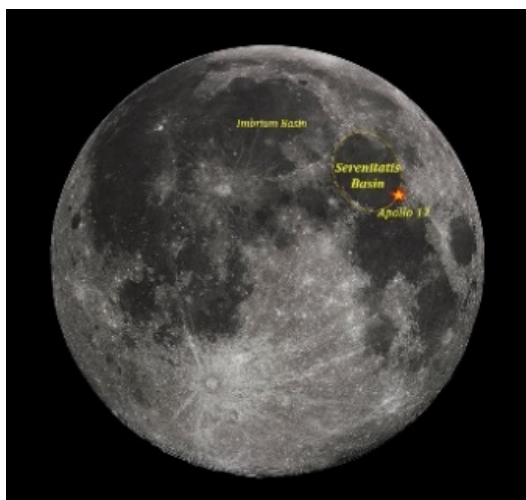


Fig 3 - The landing site of the Apollo 17 mission

With the later Apollo missions so focused on science, and with a geologist on board for Apollo 17, it was considered choosing the lunar valley called Taurus-Littrow as the destination for Apollo 17. Apollo 17 landed in the Taurus-Littrow valley on the eastern edge of Mare Serenitatis. The geological variety of that valley tipped the decision toward the location. Points of interest to Taurus-Littrow scientists included Shorty Crater, believed to hold evidence of past volcanic vents, and several large boulders spotted in photographs taken by the Apollo 15 crew. The mission was extended by the electric powered lunar vehicle that carried instruments, scientific equipment, communications equipment and lunar samples. Apollo 17 astronauts spent a record 22 hours performing extravehicular activities on the Moon. The astronauts drove about 34 kilometers with the lunar rover. As Cernan and Schmitt worked near the rim of Shorty Crater the next day, Schmitt exclaimed that he could see orange soil. But when Cernan climbed up to take a look, he also saw the orange earth. Later

examination of samples of that soil taken back to Earth showed that the rocks were tiny spheres of colored glass. These probably came from a volcanic vent. Apollo 17 collected important samples of all three rock types. This site was chosen for Apollo 17 as a location where rocks both older and younger than those previously returned from other Apollo missions, as well as from the Soviet Moon missions 16 and 20, could be found. There were two main geological targets for this site: to obtain samples of ancient rocks from the lunar mountain's crust and to look for evidence of young volcanic activity on the valley floor. The Apollo 17 crew collected 110 kilogram of rocks and soil samples, including a deep drill core that included material from 3 meters below the lunar surface.



Fig. 4 - Extravehicular activity in the Apollo 17 mission

Apollo 17 was the sixth and final mission of the Apollo program to explore the lunar surface, but it was the first in which a scientist got to investigate the Moon directly. Harrison H. Schmitt was a geologist who had been part of the backup crew for Apollo 15. On Apollo 17, he served as the pilot of the lunar module, "Challenger". Eugene A. Cernan was the commander and Ronald E. Evans piloted the command module, "America". On December 11, 1972, while Evans continued to orbit the Moon, Cernan and Schmitt flew Challenger to a site on the southeastern edge of the Mare Serenitatis (Sea of Serenity) between massive units in the southwestern Taurus Mountains south of Littrow Crater. Known as the Taurus-Littrow site, it was a flat-floored valley in a broken mountain range.

Results and discussions

They landed 200 meters from the intended landing point. Scientific objectives of the Apollo 17 mission included, geological surveying and sampling of materials and surface features in a preselected area of the Taurus - Littrow region; deploying and activating surface experiments; and conducting in-flight experiments and photographic tasks during lunar orbit. These objectives included deployed experiments, such as the Apollo Lunar Surface Experiments Package, or ALSEP, with a heat flow experiment; lunar seismic profiling, or LSP; lunar surface gravimeter, or LSG; lunar atmospheric composition experiment, or LACE; and lunar ejecta and meteorites, or LEAM. The mission also included lunar sampling and lunar orbital experiments. Biomedical experiments included the Biostack II experiment and the BIOCORE experiment.

During the moon landing, Evans remained in lunar orbit in the command module. He operated a set of orbital experiments that were conducted in the service module. As on Apollos 15 and 16, these included high-resolution mapping cameras and a laser altimeter, but there were also some new experiments. The Lunar Sounder experiment was a ground-penetrating radar that photographed structures in the lunar crust more than a kilometer below the lunar surface. The Ultraviolet Spectrometer Experiment measured the composition of the lunar atmosphere, and the Infrared Radiometer Experiment measured how the temperature of the lunar surface changed during the lunar day and night. Evans also made visual observations of the lunar surface, guided by detailed reference books created before launch.

Conclusions

Apollo 17 spent a total of 6 days and 3 hours in lunar orbit, circling the Moon 75 times. During the return trip to Earth, Evans made a 1-hour, 6-minute spacewalk to collect film from the mapping cameras and sounding radar, which were in the Science Instrument Module, which was part of Spaceship Service Module. The crew landed in the Pacific Ocean on December 19.

While this crew was the last one so far to have visited the Moon, NASA plans more lunar trips in the coming decade.

Rezumat

Apollo 17 (7 - 19 Decembrie 1972) a fost misiunea finală a programului Apollo realizat de Agenția Spațială Americană NASA. Misiunea Apollo 17 a fost lansată la Complexul de Lansare 39 de la Centrul spațial Kennedy în data de 7 decembrie 1972. Membrii echipajului misiunii Apollo 17 au fost Harrison Schmitt, Ronald Evans și Gene Cernan. Comandantul misiunii Gene Cernan și pilotul modulului lunar Harrison Schmitt, Ronald Evans au mers pe Lună, în timp ce pilotul modulului de comandă Ronald Evans orbitat în jurul Lunii. Schmitt a fost singurul geolog care a ajuns pe Lună.

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