# Apollo 11 Description

## Mission Overview

Apollo 11 was launched on July 16, 1969, from Cape Kennedy, FL. Commander Neil Armstrong, Command Module Pilot Michael Collins, and Lunar Module Pilot Edwin "Buzz" Aldrin entered lunar orbit on July 19. Armstrong and Aldrin's descent to the surface followed the next day, while Collins remained in the command module, Columbia. The lunar module, Eagle, landed in the southwestern part of Mare Tranquillitatis. After completion of surface operations, including the first ever moonwalk, the crew safely returned to Earth on July 24. The goal of performing the first crewed lunar landing and return to Earth was complete.

While on the surface, Armstrong and Aldrin deployed a seismometer to measure moonquakes, a device to collect a sample of solar wind, and a laser retroreflector to enable precise measurements of the distance between Earth and the Moon. They collected 21.6 kilograms of samples to return to Earth. In addition, they performed ceremonial duties, including unveiling a commemorative plaque on the lunar module, setting up a United States flag, and having a short conversation with then-President Richard Nixon.

## Mission Description

The Apollo 11 mission accomplished the basic mission of the Apollo Program; that is, to land two men on the lunar surface and return them safely to earth. As a part of this first lunar landing, three basic experiment packages were deployed, lunar material samples were collected, and surface photographs were taken. Two of the experiments were a part of the early Apollo scientific experiment package which was developed for deployment on the lunar surface.

The Apollo 11 space vehicle was launched on July 16, 1969, at 8:32 a.m. EST, as planned. The spacecraft and S-IVB were inserted into a 100.7- by 99.2-mile earth parking orbit. After a 2-1/2-hour checkout period, the spacecraft/S-IVB combination was injected into the translunar phase of the mission. Trajectory parameters after the translunar injection firing were nearly perfect, with the velocity within 1.6 ft/sec of that planned. Only one of the four options for midcourse corrections during the translunar phase was exercised. This correction was made with the service propulsion system at approximately 26-1/2 hours and provided a 20.9 ft/sec velocity change. During the remaining periods of free-attitude flight, passive thermal control was used to maintain spacecraft temperatures within desired limits. The Commander and Lunar Module Pilot transferred to the lunar module during the translunar phase to make an initial inspection and preparation, for systems checks shortly after lunar orbit insertion.

The spacecraft was inserted into a 60- by 169.7-mile lunar orbit at approximately 76 hours. Four hours later, the lunar orbit circularization maneuver was performed to place the spacecraft in a 65.7- by 53.8-mile orbit. The Lunar Module Pilot entered the lunar module at about 81 hours for initial power-up and systems checks. After the planned sleep period was completed at 93-1/2 hours, the crew donned their suits, transferred to the lunar module, and made final preparations for descent to the lunar surface. The lunar module was undocked on time at about 100 hours. After the exterior of the lunar module was inspected by the Command Module Pilot, a separation maneuver was performed with the service module reaction control system.

The descent orbit insertion maneuver was performed with the descent propulsion system at 101-1/2 hours. Trajectory parameters following this maneuver were as planned, and the powered descent initiation was on time at 102-1/2 hours. The maneuver lasted approximately 12 minutes, with engine shutdown occurring almost simultaneously with the lunar landing in the Sea of Tranquility. The coordinates of the actual landing point were 0 degree 41 minutes 15 seconds north latitude and 23 degrees 26 minutes east longitude, compared with the planned landing point of 0 degree 43 minutes 53 seconds north latitude and 23 degrees 38 minutes 51 seconds east longitude. These coordinates are referenced to Lunar Map ORB-II-6 (100), first edition, dated December 1967.

A 2-hour postlanding checkout was completed, followed by a partial power-down of the spacecraft. A crew rest period was planned to precede the extravehicular activity to explore the lunar surface. However, the crew elected to perform the extravehicular portion of the mission prior to the sleep period because they were not overly tired and were adjusting easily to the 1/6 gravity. After the crew donned their portable life support systems and completed the required checkouts, the Commander egressed at about 109 hours. Prior to descending the ladder, the Commander deployed the equipment module in the descent stage. The television camera located in the module operated satisfactorily and provided live television coverage of the Commander's descent to the lunar surface. The Commander collected the contingency lunar material samples, and approximately 20 minutes later, the Lunar Module Pilot egressed and dual exploration of the lunar surface began.

During this exploration period, the television camera was deployed and the American flag was raised on the lunar surface. The solar wind experiment was also deployed for later retrieval. Both crewmen evaluated their mobility on the lunar surface, deployed the passive seismic and laser retro-reflector experiments, collected about 47 pounds of lunar material, and obtained photographic documentation of their activities and the conditions around them. The crewmen reentered the lunar module after about 2 hours 14 minutes of exploration.

After an 8-hour rest period, the crew began preparations for ascent. Lift-off from the lunar surface occurred on time at 124:22:00.8. The spacecraft was inserted into a 48.0- by 9.4-mile orbit from which a rendezvous sequence similar to that for Apollo 10 was successfully performed. Approximately 4-1/2 hours after lunar module ascent, the command module performed a docking maneuver, and the two spacecraft were docked. The ascent stage was jettisoned in lunar orbit and the command and service modules were prepared for transearth injection at 135-1/2 hours.

The activities during transearth coast were similar to those during translunar flight. The service module was separated from the command module 15 minutes before reaching the entry interface at 400,000 feet altitude. After an automatic entry sequence and landing system deployment, the command module landed in the Pacific Ocean at 195-1/2 hours. The postlanding procedures involving the primary recovery ship, USS Hornet, included precautions to avoid back-contamination by any lunar organisms, and the crew and samples were placed in quarantine