

# Apollo XII

## **Apollo XII**

Launch: 11/14/69, 11:22 a.m. EST

Landing (Moon): 11/19/69

Lunar Location: Ocean of Storms

Landing (Earth): 11/24/69, 3:58 p.m. EST

Duration: 10 days, 4 hrs, 36 min

Orbits (Moon): 45 (3 days, 17 hrs, 2 min)

Surface time: 1 day, 7 hrs, 31 min

The primary objectives of Apollo 12 were:

- 1) To prove a pinpoint landing was possible, (Apollo 11 had landed 4 miles from their intended target, and geologists needed a pinpoint landing for detailed studies of specific areas)
- 2) To set up an autonomous scientific station called "The Apollo Lunar Surface Experiment Package" (ALSEP) (This consisted of a seismometer to measure moonquakes, a magnetometer to look for a lunar magnetic field, a sensor to sniff out the moon's tenuous atmosphere and another sensor to search for ions and analyze high-energy subatomic particles) and 3) To visit the Surveyor III spacecraft and return pieces of the probe for study.

November 14<sup>th</sup>, 1969, the day of Apollo 12's launch, it was cold, cloudy and wet. Despite the light rain showers and overcast skies, a large crowd was on hand to witness the launch, including President and Mrs. Nixon, marking the first and only appearance of an incumbent chief executive to witness an Apollo launch. As the cold rain drenched the spectators, Commander Pete Conrad noticed water leaking between the boost protective cover and the spacecraft. He later recalled, "I could see water on my two windows, window 1 and 2. We experienced varying amounts passing across these windows, dependent on how heavily it was raining." The Apollo spacecraft was designed to be launched during rain, and as a Captain in the Navy, Pete Conrad had said that he was ready to do NASA's "all weather" testing. It didn't take long after launch for him to almost regret those thoughts.



Lift-off occurred on schedule at 11:22 a.m. EST. Thirty-six seconds later, as the space vehicle reached 2,000 meters, it was struck by lightning. As Conrad would later recall, "I was aware of a white light. I knew that we were in the clouds; and although I was watching the gauges, I was aware of a white light. The next thing I noted was that I heard the master alarm ringing in my ears, and I glanced over to the caution and warning panel and it was a sight to behold." Almost every warning light that had anything to do with the electrical system was on. Apollo 12, trailing a plume of ionized (and electrically conductive) exhaust gas, had triggered a lightning discharge. Sixteen seconds later, at

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an altitude of 4,400 meters, they sustained a second lightning discharge. Conrad told Houston, "We just lost the [stabilizing] platform, gang. I don't know what happened here; we had everything in the world drop out."

At Mission Control, John Aaron, a bright young flight controller in charge of the electrical system, had no telemetry data on his screen. Aaron had seen this problem before during simulator runs a year before and knew how to fix it. Confidently he said, "Flight, try SCE [Signal Condition Equipment] to Aux." This command was so obscure that neither the flight director, Capcom nor Pete Conrad knew what it meant. It was Alan Bean who knew where to find the switch, and moments later telemetry was back.



Despite the unnerving lightning incident, Apollo 12 flew smoothly into a normal earth orbit. Once the inertial guidance system was realigned and all systems checked out, they heard the message they'd been waiting for: "Apollo 12, the good word is you're Go for TLI [Translunar Injection]." What they were not told was that Mission Control feared that the lightning had damaged the pyrotechnic system used to deploy the parachutes needed for recovery. If the parachutes didn't work, they would die during splashdown. Mission Control decided to continue the mission since this would not affect the moon landing. Once they relit the third stage and headed for the moon, Conrad said, "Al Bean, you're on your way to the moon." To which Bean replied, "Yeah. Y'all can come along if you like."

Three and a half hours into the flight, command module pilot Dick Gordon turned command module Yankee Clipper around, extracted the lunar module Intrepid from its stowage site atop the third stage. The only midcourse correction was significant. All three previous Apollo flights to the moon were along a trajectory called a "free return" that would allow the spacecraft to loop the moon and returning to earth if it failed to attain lunar orbit. However, to reach the desired landing site, Apollo 12 had to enter a hybrid trajectory that would not allow free return.

Arriving at the moon 83 1/2 hours after liftoff, Conrad fired the main propulsion engine for almost six minutes to go into an elliptical lunar orbit. Five hours later, a second burn put the spacecraft into a circular orbit at 60 nautical miles (111 kilometers) altitude, where Yankee Clipper would stay until it was time to return to earth. The spacecraft passed over and photographed Apollo 13's landing area in the Fra Mauro formation, and on the tenth revolution, Conrad notified Capcom Gerald Carr that "You can tell good Captain Shaky [Jim Lovell, commander of Apollo 13] that he can relax. We've got his pictures."

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After Conrad and Bean entered and activated the lunar module, command module pilot Dick Gordon turned the spacecraft so that the long axis of the command and service module was perpendicular to the flight path with the lunar module outward from the moon. He retracted the docking latches, and fired his attitude-control thrusters to move Yankee Clipper away from Intrepid. On the backside of the moon in the 13th revolution, the computer triggered a 29-second firing of the descent engine, bringing the low point of Intrepid's orbit to 8.1 nautical miles (15 kilometers). As the lander passed north of Mare Nectaris, Conrad turned it on its back with the descent engine pointed along the flight path and switched the engine on to begin the final approach.



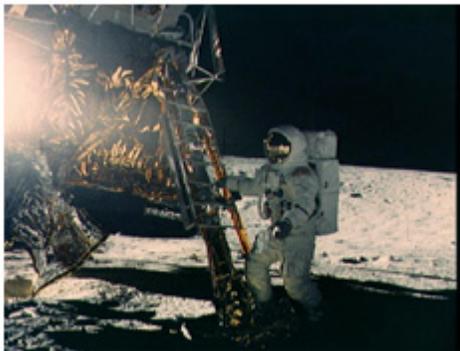
At 7,000 feet, Intrepid nosed over into a near-upright position, and Conrad could see the lunar surface for the first time. The principal landmark identifying his landing point was a pattern of craters the astronauts called "Snowman;" Surveyor III lay halfway up the eastern wall of the crater that was the Snowman's torso. Intrepid was targeted for the center of the crater. As soon as he could see out the window, Conrad exclaimed, "Hey, there it is [Snowman]! There it is! Son of a gun! Right down the middle of the road!" Then, as Bean called out altitude, velocity, and quantity of fuel remaining, Conrad maneuvered the craft with his hand controller to pick a smooth spot to land on. The engine exhaust began kicking up dust about a hundred feet (30 meters) above the surface, and by the time Intrepid reached 50 feet (15 meters), the cloud obscured the surface completely. At 1:54:36 a.m. EST on November 19th, Pete Conrad made a blind landing, exactly where, he could not tell, but certainly close to the intended spot. Had there been windows in the back of the lunar module, Conrad could have spotted the Surveyor as soon as the dust settled, 535 feet (163 meters) away. He had made a blind, pinpoint landing.



Five and half hours after landing, Conrad squeezed out the hatch, and then clambered down the ladder to the bottom rung. Conrad knew that people would not remember what was said by the third man to set foot on the moon, but he also knew what he was going to say because he had a bet to win. An Italian journalist he knew was convinced that NASA had told Neil Armstrong what to say, and Conrad could not convince her otherwise. As proof this was not so, Conrad had

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written down ahead of time what he was going to say and bet her \$500 he would say it. As he stepped off onto the landing pad, Conrad remarked the words he had written in the summer of 1969, "Whoopee! Man, that [step] may have been a small one for Neil, but it's a long one for me." According to Conrad, he was never able to collect on the bet. One of the first things he noticed was that he was going to get extremely dirty: the surface dust was finer and deeper than he had expected.



After Conrad had collected the contingency sample Bean joined him on the surface, bringing the television camera with him. A few minutes later, Houston reported that the camera was not working. cursory attempts at troubleshooting (including hitting it with a hammer) were fruitless, and television coverage for the mission - desirable but not essential - had to be written off. Later examination determined that the image-tube target in the camera had been damaged by exposure to intense light. Apparently Bean had inadvertently pointed the camera at the sun or a

reflection off the lunar module while helping Conrad set up a directional antenna.

The primary objective of their first excursion was to deploy the scientific experiments. On the cuff of their left arm was a checklist for them to follow during their EVA's on the moon. However, the backup crew of Dave Scott and Jim Irwin had arranged for a few "additions." There, on the pages of the checklist, were cartoons of Conrad and Bean as Snoopy, the beagle from the comic strip "Peanuts." But what really made them laugh were the Playboy pinups annotated with proper geological terminology: "Don't forget: Describe the protuberance..."

Conrad and Bean unloaded the scientific package easily, picked a spot 130 meters (425 feet) northwest of the Lander, and laid out the instruments without any serious difficulty. After nearly four hours on the surface, the astronauts returned to the lunar module, dusted each other off as best they could without a brush or vacuum cleaner, and climbed back inside.



After a brief evaluation of the day's work and some discussion of the next day's plans, Houston signed off and the two astronauts strung up their hammocks and turned in. On Apollo 11, Neil Armstrong and Buzz Aldrin had difficulty finding a way to sleep comfortably in the cramped LM. Hammocks were added on Apollo 12 and Conrad and Bean found them quite comfortable in lunar gravity. Even in the bulky space suits, their weight was barely enough to sag the Beta-cloth hammocks.

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Neither one could get much sleep though. Just as they would fall asleep, the pitch of Intrepid's cooling pumps would change and wake them up. Then there were the space suits, even with the helmets and gloves off, they were uncomfortable to sleep in. They would have preferred to take them off, but with all the dust, there was a risk of clogging a zipper or wrist ring. Conrad was also in pain from a misadjusted suit. The right leg was a little too short, and his suit bore down on his shoulder. Bean spent nearly an hour readjusting Conrad's suit.



During the second EVA, which lasted about four hours, Conrad and Bean covered more than one kilometer (3,300 feet), following a large-scale photographic map prepared for the traverse. On the nearly featureless lunar surface, colors and textures were not always easy to determine, and when they were, the astronauts tended to use nonscientific terms in describing them - probably a symptom of their sensitivity to possible misuse of geological terminology. At one point Conrad noted a rock containing a "ginger-ale-bottle green" crystal (which was probably olivine). After Buzz Aldrin drew criticism from scientists for his misidentification of biotite, Conrad and Bean may have been more sensitive to what they were saying. Conrad later

admitted he was fairly sure the sample was olivine, but "he wasn't about to say so," for fear of making a mistake.

Two hours into the traverse, the astronauts were on the edge of the Surveyor crater. The slope of the crater wall was much less than it had appeared the day before, when the low sun cast long, deceptive shadows. Pausing to reload a camera and survey the situation, they decided it would be easier to walk across the slope of the crater wall rather than come down from the rim. Approaching from the side, they could take photographs of the landing-pad imprints and the trenches dug by Surveyor's remotely controlled arm without disturbing the surface. These would be compared with television pictures transmitted from the spacecraft immediately after its landing.

Now that they were at Surveyor, it was time for Conrad and Bean's little surprise. Prior to the mission, they had received an automatic timer for the Hasselblad camera and Conrad had smuggled it onboard in the pocket of his space suit. What they wanted to do was mount the camera on the tool carrier and then pose, side by side, next to the Surveyor. Conrad couldn't wait to hear people ask, "Who took the picture?" Prior to this EVA, Conrad had placed the timer in the tool carrier. The problem was it was now full of rocks and lunar dust. Bean realized too much precious time



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was being spent looking for it and that it was buried inside the tool bag, lost amidst all the dust.

Examination of the Surveyor, the only human artifact ever encountered in lunar exploration, was among the more interesting parts of the mission for Conrad and Bean. What they noticed first was that much of its originally white surface had turned brown - a change they attributed to a deposit of dust when they found it could be wiped off. After photographing the surrounding surface and examining the spacecraft, they removed the Surveyor's television camera and cut off pieces of electrical cable and structural tubing for study by scientists at the Jet Propulsion Laboratory. They decided to remove the trenching scoop as well and collected soil samples.



Back in their spacecraft, Conrad and Bean noticed that they had carried in considerably more lunar dust than Armstrong and Aldrin had reported. Conrad told Houston they looked like "a couple of bituminous coal miners right at the moment, but we're happy." Sitting on the floor in his grimy space suit, Conrad couldn't believe that he and Bean had climbed back into the LM after only four hours outside during their second excursion and with a couple of hours of extra oxygen still in their backpacks. He was frustrated but he had agreed that if Mission Control gave him one time extension, he wouldn't ask for another.

Despite the fact that they had tripled the existing record for lunar surface activity, spending 7 hours and 45 minutes on the lunar surface, Bean and Conrad were not exhausted and had expended about 10 percent less energy than anticipated. Both returned to the lunar module with almost 40 percent of their oxygen supply remaining on both excursions. So with time to kill, two dirty, tired but happy "coal miners" ate lunch and started on their checklist for liftoff.

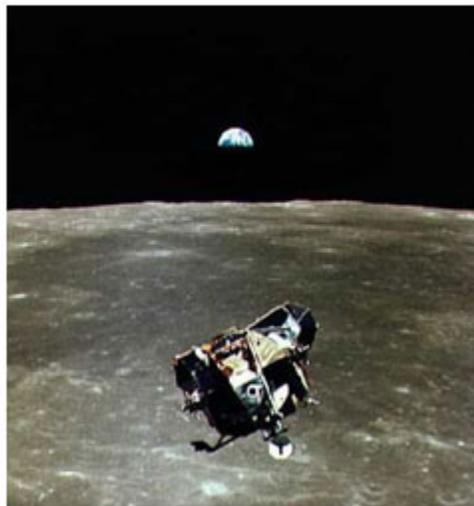
Prior to Intrepid's liftoff from the moon, Conrad could see that Bean was nervous. He had had similar feelings during Gemini V wondering, after a week in the frigid cold of space, if the retro rockets would fire. Conrad asked, "Beano, are you worried about the engine?" When Bean answered "Yep," Conrad tried to humor him by saying, "Well, there's no sense worrying about it, Al, because if it don't work, we're just gonna become the first permanent monument to the space program." Later in the morning of November 20, 1969, Intrepid's ascent stage lifted off the moon on time.

During the hour and a half it would take for Intrepid to rendezvous, Commander Pete Conrad asked Lunar Module Pilot Alan Bean if he would like to take a minute and fly Intrepid. The fact was that even though Bean was called the "lunar module pilot," all the flying was done by the commander. While other commanders may not have thought of or allowed it, Conrad had the compassion to share a flying experience that most astronauts would never know. When Alan Bean questioned the fact that Mission Control might find out, it became apparent that Conrad had this all planned out; they were on the backside of the moon and no one would know. So for

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a brief few minutes, on the backside of the moon, Alan Bean became a true lunar module pilot thanks to his good friend, Pete Conrad.

Back in lunar orbit, the dust the lunar explorers had brought in with them began to float, thick enough to be visible in the cabin. After the two spacecraft had docked, they attempted to vacuum up the dust, with little success. When command module pilot Dick Gordon opened the tunnel to the LM, he saw two dim figures floating in a cloud of dust. He refused to allow them back in to mess up his "nice clean spacecraft," possibly because it might cause electrical problems or possibly to harass his friends that he was so happy to see. So he made Conrad and Bean remove and package their filthy suits, hoping to minimize contamination of the command module.



In spite of their efforts, considerable dust clung to everything they brought back and remained suspended in the atmosphere; the environmental control system seemed not to filter it out as completely as had been expected. With little time left before they had to jettison the lunar module, Conrad and Bean strapped themselves into their command module seats the same way they had entered the world...naked.

Intrepid, now a useless hulk, still had one more contribution to make to the scientific objectives of the mission. For the benefit of seismologists wanting to calibrate the instrument that Conrad and Bean had just left on the moon, Mission Control now burned the empty spacecraft's remaining fuel to take it out of orbit. At a speed of 1.67 kilometers per second (3,735 miles per hour) the ascent stage plowed into the moon 76 kilometers (47 miles) east-southeast of the instrument package, producing a bizarre response: the seismometer recorded vibrations that persisted almost undiminished for nearly an hour. It was so completely unlike anything ever seen on earth that seismologists had no immediate explanation. One scientist compared the result to striking a church bell and hearing the reverberations for 30 minutes.

Yankee Clipper stayed in lunar orbit for 11 more revolutions, finishing up photography and landmark tracking, looking at sites being considered for Apollo 14 and 15. Then the crew boosted their spacecraft out of lunar orbit and settled in for the three-day voyage home.

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Early on the morning of November 24, Apollo 12 splashed down some 600 kilometers (375 miles) east of Pago Pago, 3.5 kilometers (2 miles) from the recovery ship U.S.S. Hornet. The concern over the parachute pyrotechnics being damaged by the lightning strike was unfounded. The landing was rough, however. Apparently Yankee Clipper hit a rising wave as it swung on its parachutes hard enough to dislodge a 16-mm movie camera from its bracket and slam it into Alan Bean's forehead, momentarily stunning him and opening a 1-inch (2.5-centimeter) cut, which Conrad bandaged.

The recovery swimmers soon arrived, tossed respirators and coveralls - replacing the biological isolation garments that the Apollo 11 crew had found so objectionable - into the command module, then assisted the astronauts into the raft. The astronauts had a four-day trip aboard ship to Hawaii, then a nine-hour flight to Houston. On the morning of November 29, Conrad, Bean, and Gordon entered the Lunar Receiving Laboratory for their 11-day stay in quarantine.



Apollo 12 was a complete success on many fronts. The procedural changes incorporated to improve landing accuracy had allowed Conrad to put Intrepid down within sight of Surveyor III, exactly as intended. Now astronauts could go places the scientists wanted them to. Lunar exploration had been easy for both Conrad and Bean. They had oxygen to spare when they returned with nearly 75 pounds (34 kilograms) of samples from the surface of Oceanus Procellarum. The surface experiments they had set up were returning streams of data, and scientists agreed the astronauts had done a remarkable job.