

Beetles on the Moon

As part of the ARTEMIS project, NASA plans to put astronauts on the Moon again in 2025, and female astronauts for the first time. This will increase interest in the history of the Apollo missions. Albert A. Jackson was an instructor for the Apollo astronauts in the 1960s.

Dr. Jackson, you are a contemporary witness to the Apollo program: In the 1960s, you trained astronauts to land on the Moon. Is NASA's Artemis project just a revival of Apollo or something more?

I remember between 2000 and 2010, we were wondering what was going to happen with human spaceflight. When the Shuttle program ended in 2011, there was only Russian access to the ISS. Ares I would have been a cost-effective national solution, but instead we had a ten-year gap. I believe Artemis is feasible. But I don't think Artemis III will be the first manned lunar landing since Apollo 17 in 1972 - as early as 2025 .

Can you tell us how you became an astronaut instructor and what you had to do?

It was more of a coincidence. I applied to NASA and was hired in January 1966. First I worked in the Gemini program, and later on a simulator for the lunar module's rocket-powered training module. Five-sixths of its weight was supported by a jet engine mounted vertically in a gimbal at the vehicle's center of gravity. A system of gyroscopes and hydraulic servos kept the engine vertical, mimicking gravity on the Moon. One day, it crashed. It was unstable in the ocean breeze in Houston. Two others crashed with test pilots. No one was hurt, but the program was abandoned after the third accident in favor of the lander simulator (Figure 1).

In early 1967, I was assigned as a subsystem chief instructor for the abort guidance system on the Lunar Module Simulator. I sat at the instructor's console almost every day from 1967 to September 1970. There aren't many exciting jobs like that! We were several instructors, and the crews spent most of their time doing routine exercises. Even though we trained lunar descents and ascents, the lunar orbit rendezvous was critical. We spent nights flying the simulator to validate its operation. Many error messages were written.

The first mission we supervised was Apollo 9, an exercise just for the Earth orbit rendezvous. But for some reason, the ascents from the lunar surface were trained first. From 30 minutes before launch, everything went smoothly, but after launch, the ascent engine burned and burned until the fuel ran out, the shuttle veered into a ballistic course, and crashed into the Moon! It took about a day to figure out what had gone wrong: Since it was originally Apollo 9, the gravitational constant in the simulation was that of the Earth, not the Moon!

You worked with the astronauts every day. Did that create personal relationships?

We only saw them professionally. They knew us, but we never became friends with them. They all had a sense of humor and were always calmly focused on their task, which is pretty amazing considering the 25,000 hours they spent in the simulators.

I remember one funny incident when the lunar surface model was in operation. Neil and Buzz had done a descent and landing. Normally the regular view out the lunar module window was the landing site. Some technician had placed a small plastic beetle within view of the camera system that transmitted the image to the crew. Armstrong got in on the joke and reported that a 200-foot-high beetle was visible on the lunar surface. He then said the egress to the lunar surface would have to be aborted. When we asked why, he said he was not afraid of the insect, but the 10,000 foot creature that had placed it there was an unknown that he did not want to deal with.

Pete Conrad was the funniest Apollo astronaut. He and Alan Bean were Marines and had an inventory of very flowery expressions. Conrad in particular had expressions for technical terms and devices that I cannot reproduce here!

We saw more of Neil Armstrong and Buzz Aldrin than of any other crew. Both were test pilots like almost all Apollo astronauts and had a similar demeanor. However, they differed in their technical mastery of spaceflight. Aldrin had a doctorate from MIT. I was surprised one day when a technical question about orbital rendezvous came up that it was Armstrong who went to the blackboard and explained with chalk the mathematics of a particular section of the rendezvous orbit. To me, Neil and Buzz were the busiest. They were also the quietest. Once they came in at 8:00 AM and worked on a rendezvous, with not a word coming out of the cockpit for three hours. Around 11:00 AM, one of the instructors said, "Maybe we should go see if they're okay ." Yet the two were simply so well attuned to each other that no words were needed.

The first Moon landing is considered one of mankind's greatest achievements. Strangely enough, public interest quickly waned; the last Apollo missions attracted less attention than some television series. Was this perhaps because nothing useful was found on the Moon?

The scientific findings on the Moon were, and still are, important to planetary scientists and to anyone interested in the formation of the Earth-Moon system. I'm afraid the public in general doesn't have much interest in it. The Apollo program was primarily a reaction to the Cold War, and I don't think it would have come about in the short time span it did if the U.S. and the USSR had not been in competition. Having spent a lot of time in manned spaceflight, I believe that robotic exploration of the solar system should come first. It is odd that wealthy entrepreneurs, of all people, are pushing manned space exploration. I think this could happen, but not in the time frame envisioned.

What do you think about the future of space exploration?

I think that exploration of the solar system will be done by robots for the time being. I think exploration and even colonization of the solar system is possible in 300 years. Manned interstellar travel, on the other hand, seems to have a predictive horizon that cannot be estimated with the knowledge we have today.

Could special propulsion systems make interstellar flight possible?

Space pioneers such as Tsiolkovsky, Goddard, and Oberth wrote about this. With the invention of nuclear power, space experts began to consider interstellar flight again. It was soon discovered that nuclear energy, and even the use of antimatter, could not solve the mass ratio problem. Robert Bussard elegantly solved this problem in 1960: Siphon off the hydrogen of the interstellar medium and use proton-proton fusion to channel energy into propulsion. This is an analogue to the ramjet process in avionics, i.e., a kind of interstellar ramjet. The principle is simple and elegant, and it can be used to achieve relativistic speeds for manned interstellar flight. Bussard and Sagan proposed using a huge magnetic field as a "funnel" for this propulsion. Later, John Fishback investigated the technical details. His solution was considered secure, but we have recently been able to show that the source for the magnetic field requires enormous dimensions. In particular, the length of the funnel of several million kilometers is beyond any technical feasibility.

The interview was conducted by Peter Schattschneider.



Figure 1. The landing module simulator of the Apollo program, Jackson is sitting at the control panel on the left below the middle of the picture, recognizable by his tie and cardigan (Image: NASA).

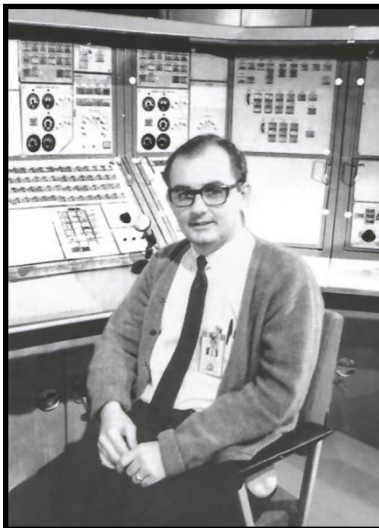


Figure 2. Albert Jackson, born in 1940, studied mathematics and physics. From 1966 to 1970 he worked for NASA, where he was awarded the Medal of Freedom for the successful rescue of the Apollo 13 astronauts. After receiving his doctorate in 1975, he worked as an aerospace engineer at McDonnell Douglas and until 2010 as scientific director at Lockheed.

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