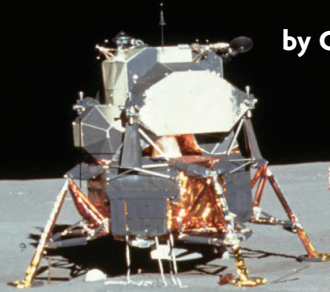


The *Eagle* Has Landed

by Charles Fulco



The *Eagle* was the name of the Lunar Module that brought the first astronauts to the Moon's surface.

I wonder what the Moon's surface feels like?



For eight days in 1969, the journey of the *Apollo 11* astronauts to the Moon captured Americans' attention. It is remembered today as one of the most historic and amazing events in history.

The *Apollo* program was the brainchild of space scientist Dr. Wernher von Braun. Von Braun's specialty was rocket physics. He began working in the field in Germany in the late 1920s. After he was captured toward the end of World War II (1939–1945), he worked for the U.S. Army and then the National Aeronautics and Space Administration (NASA).

Von Braun guided the work on U.S. rocket development, creating the largest rocket launch vehicle in the world—the Saturn V. Any spacecraft attempting to escape Earth's gravity needs to *accelerate* to a *velocity* of about 24,500 miles per hour (mph). That is known as “escape velocity.” The Saturn V was the first rocket powerful enough to do that.

Once the Saturn V was determined to be safe to carry humans, the race to the Moon began in earnest. The rocket launched *Apollo 8* into

Accelerate means to increase the speed of something.

Velocity is speed with a direction.

CAPCOM, shorthand for “capsule communicator,” was a role given to a fellow astronaut at Mission Control Center, who often was the sole communicator with astronauts during their mission.

Astronaut Aldrin deploys the Passive Seismic Experiment Package (PSEP) on the lunar surface.

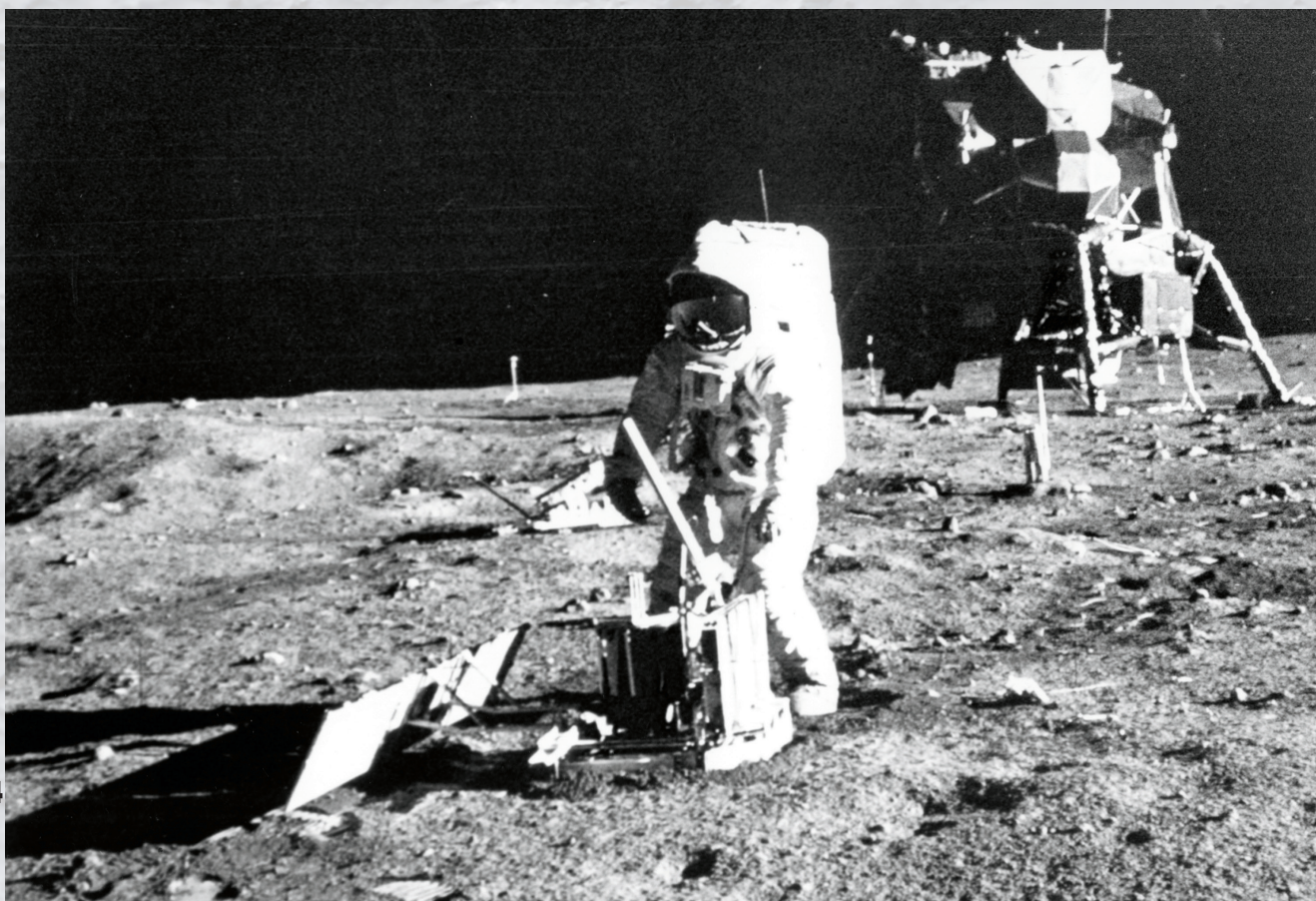
lunar orbit in December 1968. It was the first time any humans had escaped the pull of Earth’s gravity to be captured by the gravity of another celestial object. Then, in May 1969, *Apollo 10* went a little further. It traveled to the Moon and brought its Lunar Module (LM) to within 70 miles of the Moon’s surface. *Apollo 10*’s mission was to double-check all the procedures needed for the next mission: *Apollo 11*. That mission would attempt to land the first humans on the Moon.

Apollo 11 lifted off from NASA’s Launch Control Center in Florida on the morning of July 16, 1969. After launch, ground communications with *Apollo 11* transferred to NASA’s Mission Control Center in Houston, Texas. Someone was always working in the center during the mission. The astronauts kept in regular contact using devices that transferred sound waves into radio waves. The mission also had a designated **CAPCOM**.

The spacecraft experienced a nearly flawless launch and initial journey. On its way to the Moon, the Command and Service Module (CSM) *Columbia* separated from the Lunar Module (LM) Adapter. The CSM pilot, Michael Collins, slowly turned the spacecraft around in order to dock with and extract the LM, nicknamed the *Eagle*.

The docked-together CSM and LM reached lunar orbit on July 20. Running through Mission Control Center’s list, the astronauts checked all their systems in preparation for the next phase of their mission: landing on the Moon. Astronauts Neil A. Armstrong and Edwin E. “Buzz” Aldrin Jr. moved from the CSM to the LM.

At the appointed time, the LM undocked from the CSM to begin its powered descent to the lunar surface. Collins remained in the CSM, which maintained its flight path in lunar orbit. As Flight Director Eugene F. “Gene” Kranz told his





Lunar rocks collected by Armstrong and Aldrin

staff in Mission Control Center, one of three things would occur: The astronauts would land successfully, they would abort the mission, or they would crash. Things went fairly smoothly until midway through the descent. A master alarm began to sound. The LM's computer was warning that it was overloaded with tasks and was not processing anything further.

The alarm caught everyone off guard. Both the astronauts and the controllers in the center wondered what to do next. There was not much time to decide. At that stage, every second counted. One young controller named Steve Bales recognized the alarm code—1201. He had seen it in *simulation* only a couple months earlier. He told Kranz that they were “go” on that alarm. That meant it was okay to proceed with the descent.

Then, as the LM approached the lunar surface, there was another scare. Armstrong and Aldrin saw a sea of boulders instead of a flat plain below them. It was unexpected terrain. Armstrong quickly took over manual control. He guided the LM to touchdown with only 30 seconds of fuel remaining. At the same time, he uttered the now-famous phrase, “The *Eagle* has landed.” Charles M.

Simulation is the act or process of creating a model or example of something.

Rocket Science

Rockets use a lot of fuel and multiple stages to get a spacecraft into Earth orbit. Let's take a look at a Saturn V. It all begins at the bottom.

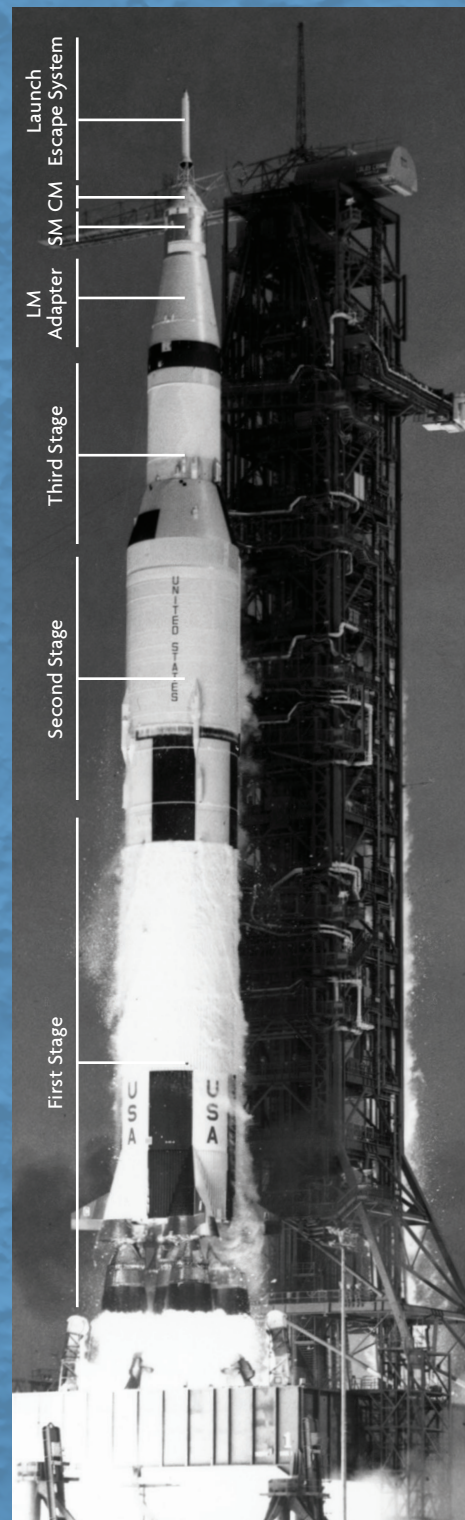
After the LM lands on the Moon and then returns the astronauts safely to the CSM, it is released and left behind. Eventually, the Service Module is released, too. Only the Command Module carrying the crew returns to Earth.

As the CSM approaches the Moon, it disconnects and turns around to dock with the LM. The adapter panels that hold the LM in place fall away.

The third stage carries liquid hydrogen fuel, liquid oxygen, and 1 engine. The engine boosts the Command Module (CM), Service Module (SM), and the Lunar Module (LM) Adapter (the portion that carries the protected LM) into Earth orbit. The engine also is used to send the CSM and LM Adapter into Moon orbit.

The second stage carries liquid hydrogen fuel, liquid oxygen, and 5 engines. These engines fire up after the first stage is spent. During this phase, the launch escape system is discarded. It is only useful at an altitude of about 19 miles. The second stage is discarded after about 9 minutes.

The first stage uses kerosene fuel, liquid oxygen, and 5 engines to launch the rocket. Less than 3 minutes later, the first stage is cut free. It falls into the Atlantic Ocean.





FAST FACT

While in lunar orbit, the *Apollo 11* CSM was out of communication when it was hidden from Earth by the Moon.

Duke Jr., the *Apollo 11* CAPCOM expressed relief. He said, “We copy you on the ground. You got a bunch of guys about to turn blue. We’re breathing again. Thanks a lot.”

With the LM safely on the lunar surface, the next task was to make sure all systems were safe for the extravehicular activity. Mission Control Center determined that all was “go.” Armstrong stepped out and made his way down the LM ladder. About 600 million people were watching as he stepped off the ladder and uttered these now famous words: “That’s one small step for a man, one giant leap for mankind.”

Aldrin joined Armstrong on the lunar surface about 20 minutes later. He proclaimed the view to be “magnificent desolation.” During the more than two hours on the Moon’s surface—including speaking with President Richard M. Nixon

by telephone—the men set up numerous experiments and collected rock samples. They



The PSEP deployed by the *Apollo 11* astronauts sent back readings to Earth. The data was used to learn more about the Moon’s core.

photographed the Moon, each other, and the LM. They saluted the U.S. flag that they had erected. They also left behind a plaque commemorating their presence.

The two astronauts re-entered the LM and prepared for their rendezvous with Collins in the *Columbia*. After the LM and the CSM docked

DID YOU KNOW?

When Neil A. Armstrong became the first human to set foot on the Moon, he made a historic statement. He said, “That’s one small step for a man, one giant leap for mankind.” But there was static, and people heard, “That’s one small step for man, one giant leap for mankind.” In 2006, the recording of Armstrong’s quote was analyzed. Researchers determined that he said “a man.” For Armstrong, “a man” fit with his intent—that a single step by one man would have an historic impact for all of mankind. You can hear Armstrong sending his message at www.nasa.gov/mission_pages/apollo/apollo11_audio.html.



The quarantined *Apollo 11* crew—Armstrong, Collins, and Aldrin (left to right)—talk to President Richard M. Nixon via intercom.

for a second time and Armstrong and Aldrin were back in the CSM, the LM was cut free to crash into the Moon. The crew had an uneventful journey home to a splashdown in the Pacific Ocean on July 24. A Navy ship was waiting to retrieve them. The astronauts were immediately **quarantined**. NASA wanted to be sure that the astronauts had not picked up any “space germs” while walking on the Moon.

The crew of the *Apollo 11* became the public faces of humankind’s remarkable achievement. They were welcomed home as heroes. Parades and dinners were given in their honor. Nixon awarded them the Presidential Medal of Freedom, the highest award that a civilian can receive. They were living proof that people could travel to the Moon and come back safely. Who knows where the exploration of space will take us? 🌙



Flight controllers celebrate the successful conclusion of the *Apollo 11* mission on July 24, 1969.

Quarantined means isolated for a period of time to make sure a person is not carrying any contagious diseases.

The Crew

Liftoff: July 16, 1969

Splashdown: July 24, 1969

Lunar Landing: July 20, 1969

Duration of Flight: 8 days, or 195 hours, 18 minutes, 35 seconds

Time on Moon (in the Lunar Module and walking on lunar surface): 21 hours, 36 minutes

Time Walking on Moon: more than 2 ½ hours

Commander

Neil A. Armstrong

Armstrong was born in 1930 in Wapakoneta, Ohio. He earned his pilot’s license when he was just 16 years old. After studying engineering at Purdue University, he became a test pilot for the U.S. Air Force. When NASA selected him in 1962, he became the first civilian astronaut in the corps. He commanded *Gemini 8* in 1966. After his death in 2012, the NASA Dryden Flight Research Center was renamed in his honor.

Command Module Pilot

Michael Collins

Collins was born in Rome, Italy, in 1930. He graduated from the U.S. Military Academy at West Point and then joined the U.S. Air Force. He joined NASA in 1963 as a member of the third group of astronauts. His first flight into space was as co-pilot on *Gemini 10* in 1966. He performed a space walk during that mission.

Lunar Module Pilot

Edwin E. “Buzz” Aldrin Jr.

Aldrin was born in 1930 in Glen Ridge, New Jersey. He graduated from the U.S. Military Academy at West Point and then joined the U.S. Air Force. He then earned a doctor of science degree from the Massachusetts Institute of Technology (MIT). Aldrin played a vital role in the *Gemini* program. His expertise of orbital mechanics and neutral buoyancy training procedures helped solve nagging problems of how to work outside a spacecraft in zero gravity.



Armstrong

Collins

Aldrin