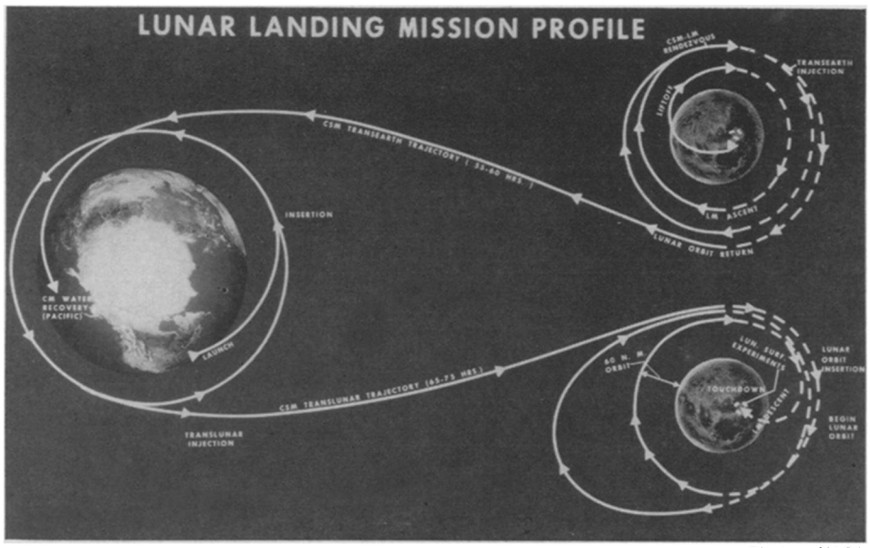
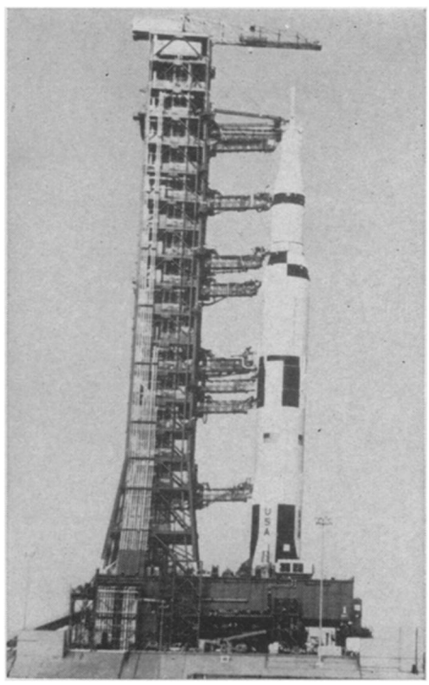


Photos: NASA

Apollo 11's mission is almost identical to 10's—except for one detail.



The threshold: Apollo 11 on pad 39A.

APOLLO 11

More than just a decade's work

The moon-landing mission is the culmination of man's need to reach his nearest other world

by Jonathan Eberhart

"Before this decade is out," said President Kennedy in 1961. Now, with less than six months to go, his mandate stands on the threshold of fulfillment. The threshold is pad 39A at Cape Kennedy, where the Apollo 11 spacecraft, looking strangely small and helpless atop its Saturn 5 booster, waits to carry the first men to the moon.

But the quest began long before President Kennedy, long before Goddard fired his crude rockets in the 1920's, before the Chinese invented skyrockets, even before man had evolved intelligence enough to take note of his milestones. When two pale blue disks on the Apollo lunar module light up to indicate "LUNAR CONTACT," they will signal the end of a road through millions of years in time as well as space.

At the same time, the moon landing is the beginning of another road, one whose end may never be reached. This is the road through the Space Age, formerly the province of science-fiction writers and hopeful speculators. Even to reach the beginning of this road has taken a virtually monomaniacal effort involving almost half a million people, enough to populate a small country. The cost has approached $24 billion, all spent within Kennedy's planned decade, easily enough to start that country going and keep it healthy for years.

The Apollo effort, depending on the point of view, has either carried the rest of the U.S. space program along by keeping the National Aeronautics and Space Administration fat or squelched it by stealing all the funds. Either way, the Space Age has arrived, as more than 1,700 man-made objects circle the earth while others report on the moon, the sun, Mars, Venus, even the distant stars.

Beginning with Alan Shepard's 15-minute Mercury flight on May 5, 1961, U.S. astronauts have traveled more than 20 million miles through space and accumulated more than 3,648 man-hours of spaceflight time, 1,017 of them during round trips to the moon.

But not all the way to the moon. In a sense, Apollo 11 will merely be adding the last 50,000 feet—the final four one-thousandths of one percent—to the journey that Apollo 10 all but completed in May. That tiny difference, however, has scientists around the world waiting at least as nervously as expectant fathers, and should place Neil Armstrong and Edwin "Buzz" Aldrin in one of history's largest niches, as the first men to set foot on another world.

Armstrong, who will be commander of the mission and the first man on the moon, was a NASA test pilot before becoming an astronaut in September 1962. As commander of Gemini 8 in March, 1966, he piloted the first successful U.S. docking maneuvers, using an Agena target vehicle to simulate the Apollo lunar module for rendezvous practice.

It was while Gemini 8 and its Agena were coupled together, in fact, that Armstrong and his co-pilot, David Scott (later to become command module pilot of Apollo 9), experienced one of the most frightening incidents of the Gemini program: A short circuit caused erratic firing of the spacecraft's thrusters, producing uncontrolled tumbling and causing ground controllers to end the mission early for safety's sake.

Aldrin joined the astronaut program from the Air Force, and during Gemini 12 set a record for time in open space, when he spent more than two hours taking pictures and carrying out other activities during a spacewalk and twice stood up in the spacecraft with the hatch open, for a total elapsed time of five hours and 30 minutes of extra-vehicular activity.

Together, Armstrong and Aldrin will

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fly the LM down to the lunar landing. Meanwhile, circling 69 miles overhead in the command module, will be Gemini 10 veteran Michael Collins, with the most frustrating job ever given to an astronaut, short of staying on the ground: waiting on the sidelines while history is being made.

Most of the mission's flying has been done before. Apollo 10 was designed to be an exact duplicate of the lunar landing mission, except for the landing itself. The spacecraft will be carried aloft by the Saturn 5, placed in orbit around the earth and then, two hours and 44 minutes after launch, fired toward the moon by a final kick of the booster's third stage. Then the astronauts will detach the command and service modules from the booster, do a 180-degree turn in space, nose back in to couple with the lunar module and pull it free of the booster stage.

About 76 hours after leaving the launch pad, the main Apollo engine, housed in the service module, will be fired to slow the spacecraft down enough to let it fall into an orbit around the moon, ranging from 196 to 69 miles above the lunar surface. Two orbits later, a second firing will trim the orbit into a 69-mile-high circle.

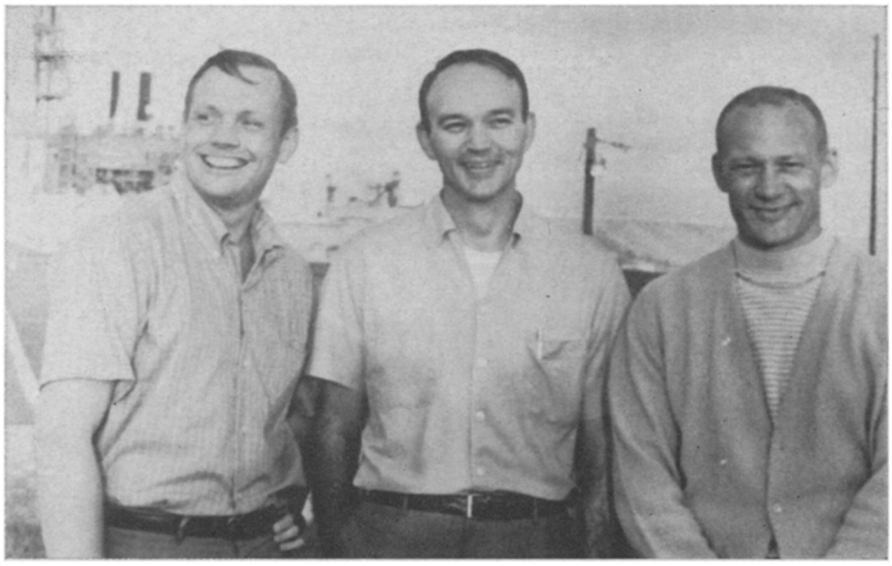
For the better part of a day, the astronauts in their coupled spacecraft will circle the moon. Armstrong and Aldrin will spend most of their time, except for eating and sleeping, in the LM itself, checking out the spidery vehicle as well as the three scientific experiments and other equipment that will be used on the lunar surface.

Finally, after checking the pressure in the tunnel formed between the hatches of the two docked spacecraft as an indication that both hatches are without leaks, Collins will push the button unlinking the LM from the command module. Checking the tunnel pressure offered some problems during Apollo 10, when the pressure-venting valve became clogged by fragments of insulation that had come loose from around the command module hatch; for Apollo 11, the offending, and apparently unnecessary, insulation has been eliminated.

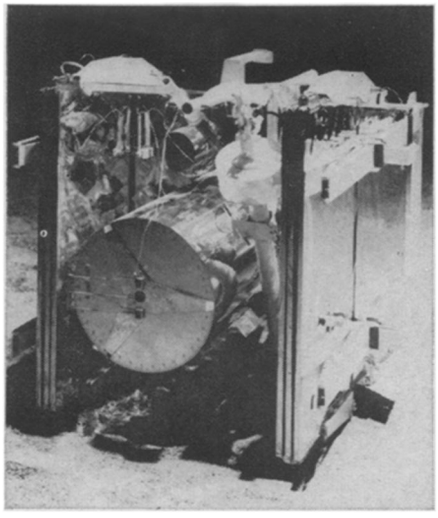
If the launch and the rest of the mission go as planned, the separation should take place at 1:50 p.m. EDT on July 20. It would have been two hours earlier, but about a month before the planned July 16 launch date, the space agency decided to add one extra orbit around the moon before the descent, in order to let the 210-foot-diameter antenna at Goldstone, Calif., lock onto the spacecraft. This insures that data can be sent to earth at a high rate during the descent, using the spacecraft's omnidirectional antenna, in the event that the more efficient high-gain antenna should fail.

Man in space: the box score

Spacecraft	Date	Crew	Orbits	Events
Vostok 1	Apr. 12, 1961	Yuri A. Gagarin	1	First manned flight in space
Mercury 3	May 5, 1961	Alan B. Shepard	suborbital	First U.S. manned space flight
Mercury 4	July 21, 1961	Virgil I. Grissom	suborbital	Spacecraft sank after splashdown
Vostok 2	Aug. 6, 1961	Gherman S. Titov	17	First flight to exceed one day
Mercury 6	Feb. 20, 1962	John H. Glenn, Jr.	3	First U.S. orbital flight
Mercury 7	May 24, 1962	M. Scott Carpenter	3	Missed landing area by 250 miles
Vostok 3	Aug. 11, 1962	Adrian G. Nikolayev	64	First manned space television
Vostok 4	Aug. 12, 1962	Pavel R. Popovich	48	Came within about 3 miles of Vostok 3
Mercury 8	Oct. 3, 1962	Walter M. Schirra, Jr.	6	Landed within 5 miles of target
Mercury 9	May 15-16	L. Gordon Cooper, Jr.	22	First U.S. flight to exceed one day
Vostok 5	June 14-19, 1963	Valery F. Bykovsky	81	Second dual flight, with Vostok 6
Vostok 6	June 16-19, 1963	Valentina V. Tereshkova	48	First woman to fly in space
Voskhod 1	Oct. 12, 1964	Vladimir M. Komarov Konstantin P. Feoktistov Dr. Boris G. Yegorov	16	First spacecraft with 3-man crew
Voskhod 2	Mar. 18-19, 1965	Alexei A. Leonov Pavel I. Belyayev	17	Leonov took first spacewalk, 10 min.
Gemini 3	Mar. 23, 1965	Virgil L. Grissom John W. Young	3	First U.S. 2-man flight; first spacecraft maneuvering in orbit
Gemini 4	June 3-7, 1965	James A. McDivitt Edward H. White II	62	First U.S. spacewalk: White, 21 min.
Gemini 5	Aug. 21-29, 1965	L. Gordon Cooper Charles Conrad, Jr.	120	Longest flight to date
Gemini 7	Dec. 4-18, 1965	Frank Borman James A. Lovell, Jr.	206	Longest flight through Apollo 10
Gemini 6	Dec. 15-16, 1965	Walter M. Schirra, Jr. Thomas P. Stafford	16	Came within 1 foot of Gemini 7
Gemini 8	Mar. 16-17, 1966	Neil A. Armstrong David R. Scott	7	First docking with Agena target; Gemini control troubles ended mission early
Gemini 9	June 3-6, 1966	Thomas P. Stafford Eugene A. Cernan	44	Spacewalk by Cernan, 2 hr. 7 min.
Gemini 10	July 18-21, 1966	John W. Young Michael Collins	43	Spacewalk and open-hatch spacestand, both by Collins, total 1 hr. 28 min.
Gemini 11	Sept. 12-15, 1966	Charles Conrad, Jr. Richard F. Gordon, Jr.	44	Highest-altitude orbit to date, reached 853 miles; Gordon spacewalk and stand
Gemini 12	Nov. 11-15, 1966	Edwin E. Aldrin, Jr. James A. Lovell, Jr.	59	Aldrin did 2 stands plus record walk of 2 hr. 6 min., for total of 5 hr. 30 min.
Soyuz 1	Apr. 23-24, 1967	Vladimir M. Komarov	17	Komarov killed in reentry crash
Apollo 7	Oct. 11-22, 1968	Walter M. Schirra, Jr. Donn E. Eisele R. Walter Cunningham	163	First U.S. 3-man flight
Soyuz 3	Oct. 26-30, 1968	Georgy Beregovoy	61	Maneuvered near unmanned Soyuz 2
Apollo 8	Dec. 21-27, 1968	Frank Borman James A. Lovell, Jr. William Anders		First manned flight to the moon; 10 lunar orbits
Soyuz 4	Jan. 14-17, 1969	Vladimir Shatalov	48	Docked with manned Soyuz 5
Soyuz 5	Jan. 15-18, 1969	Boris Volynov Yevgeni Khrunov Alexei Yeliseyev	49	Khrunov and Yeliseyev made external transfer to docked Soyuz 4, joined Shatalov inside for duration of flight
Apollo 9	Mar. 3-13, 1969	James A. McDivitt David R. Scott Russell L. Schweickart	151	First manned flight of lunar module; multi-spectral photography of earth terrain and natural resources
Apollo 10	May 18-26, 1969	Thomas P. Stafford John W. Young Eugene A. Cernan		First LM test in lunar orbit; provided tracking data on gravitational anomalies; approached to within 50,000 feet of moon



Armstrong, Collins and Aldrin: A place in one of history's largest niches.



Science on the moon: Seismometer.

The LM will descend, just as did Snoopy of Apollo 10, to 50,000 feet. From there on down, Armstrong and Aldrin will be blazing a new trail.

Down to 7,600 feet, the primary task will be simply to slow down. At that point, known as "high gate", about 26,000 horizontal feet from the landing site in Mare Tranquillitatis just south of the lunar equator, the two astronauts will begin peering out the spacecraft windows to check the smoothness of the landing area and pick an actual touchdown spot; for the last 500 feet, the astronauts will take over the flying from their guidance computer.

The first pieces of Apollo hardware to touch the moon will be three long, thin probes, hanging down from three of the lander's feet. The first probe to hit ground will trigger the two lunar contact lights in the LM. About one second later, Armstrong will shut down the descent engine, letting the spacecraft drop the last two to four feet to minimize damage from rocks kicked up by the engine exhaust. The long-dreamed-of moment should be at about 4:23 p.m. EDT on July 20.

The first and most important task on the moon will be to make sure the LM is in condition to leave it. Following a two-hour checkout, a meal, four hours of rest and another meal, the astronauts will begin assembling and checking out the surface equipment.

Then Armstrong will back out of the cabin and begin to descend the ladder on the lander's front foot. Two steps from the ground, he will reach out and pull a ring that will automatically unfold an instrument package on the spacecraft's side, including a television camera aimed to show earthlings the first human step on the moon. That step is due at a hardly prime-time 2:17 a.m. EDT, July 21.

The first moon-man will spend his first five minutes doing exercises and checking his balance to get the feel of the moon's gravity, one-sixth that of the earth's.

Then, probably following the planting of the U.S. flag, will come the moment that scientists, even many critical of the expensive Apollo program, have been awaiting for years. Using a special scoop, Armstrong will gather a quick "contingency sample" of lunar rock, small and unselective, but potentially vital if a malfunction necessitates a hasty departure. After putting the sample in a plastic bag, he will store the specimen, scoop and all, in a shin-pocket of his spacesuit, as Aldrin photographs the episode from the lunar module. Next, Aldrin will join his commander on the moon. After Armstrong places the TV camera on a stand about 30 feet from the spacecraft, so that it can relay images of all that takes place, Aldrin will deploy the first of the scientific experiments, an aluminum foil screen, unrolled like a window shade to catch particles from the solar wind. Later, on earth, the foil will be vaporized and the freed particles studied and analyzed.

After Armstrong gathers a larger sample of lunar rocks, both men will inspect the outside of the LM. Then Aldrin will emplace the second experiment, a seismometer designed to report lunar tremors to earth by radio for two years. Researchers hope to cast some first-hand light on the controversy about whether the moon had a volcanic past, and may still be active. At the same time, Armstrong will place on the surface an array of corner reflectors, aimed at earth to bounce back laser beams in an effort to make super-accurate measurements of earth-moon distances. The last event on the lunar surface will be the gathering by both men of carefully documented rock samples photographed and labeled for type of terrain, orientation to the moon's axis and other characteristics. In addition, two core samples will be taken from perhaps 18 inches down, as well as a pair of samples to be kept in special gas-tight cans to see if any gases are given off by the samples.

All the samples will be placed in special, double-sealed rock boxes for return to the Lunar Receiving Laboratory in Houston. After two hours and 40 minutes on the lunar surface, the astronauts will reenter the LM, check it out a final time and blast off to rendezvous with Collins in the command module above them. They will leave behind on the moon their moon-walking overshoes, spacesuit life-support backpacks and other equipment, both to save weight and minimize the lunar contamination, if any, that gets back to earth. When they enter the command module, still more gear will be left behind in the LM. Back on earth, following splashdown in the Pacific at 12:52 p.m. EDT, will begin the controversial process of quarantine, both of the astronauts and of their samples. As recently as a month before the scheduled launch, the lunar lab was less than 100 percent ready for its job, although deficiencies were rapidly being resolved and officials claimed that the facility was likely to be functioning fully on time.

For two million years man has walked the earth. For less than a century he has flown over it, and for less than a decade, orbited around it. Now, in the blink of an eye, he is changing the limits of his universe. ◇