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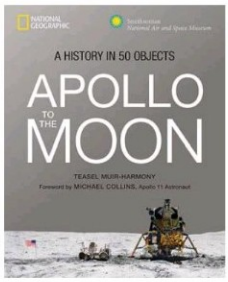
PIECES OF APOLLO

A NEW BOOK USES 50 OBJECTS TO TELL THE STORY OF AMERICA'S GREATEST ADVENTURE. BY TEASEL MUIR-HARMONY

NEIL ARMSTRONG brought pieces of the Wright *Flyer* with him aboard the lunar module *Eagle*, when he landed on the moon in July 1969. For Armstrong, bringing along these artifacts with his limited personal belongings honored pioneering aviators. It also bound together two events separated by many decades. Pieces of wood and fabric connected the first lunar landing with the first airplane flight, drawing a thread between two critical moments in aerospace history.



Like Armstrong, *Apollo to the Moon: A History in 50 Objects* recognizes the significance and power of artifacts. Tangible, real objects can connect the past to our present. Fifty years from the first lunar landing, the 50 objects in this book let us revisit a remarkable moment in American history, when grand ambitions overcame grand obstacles, and allow us to not only understand the moment anew but to make it part of our lives. They help tell the full story of spaceflight by revealing the tangle of technological, political, cultural, and social dimensions of the Apollo missions.

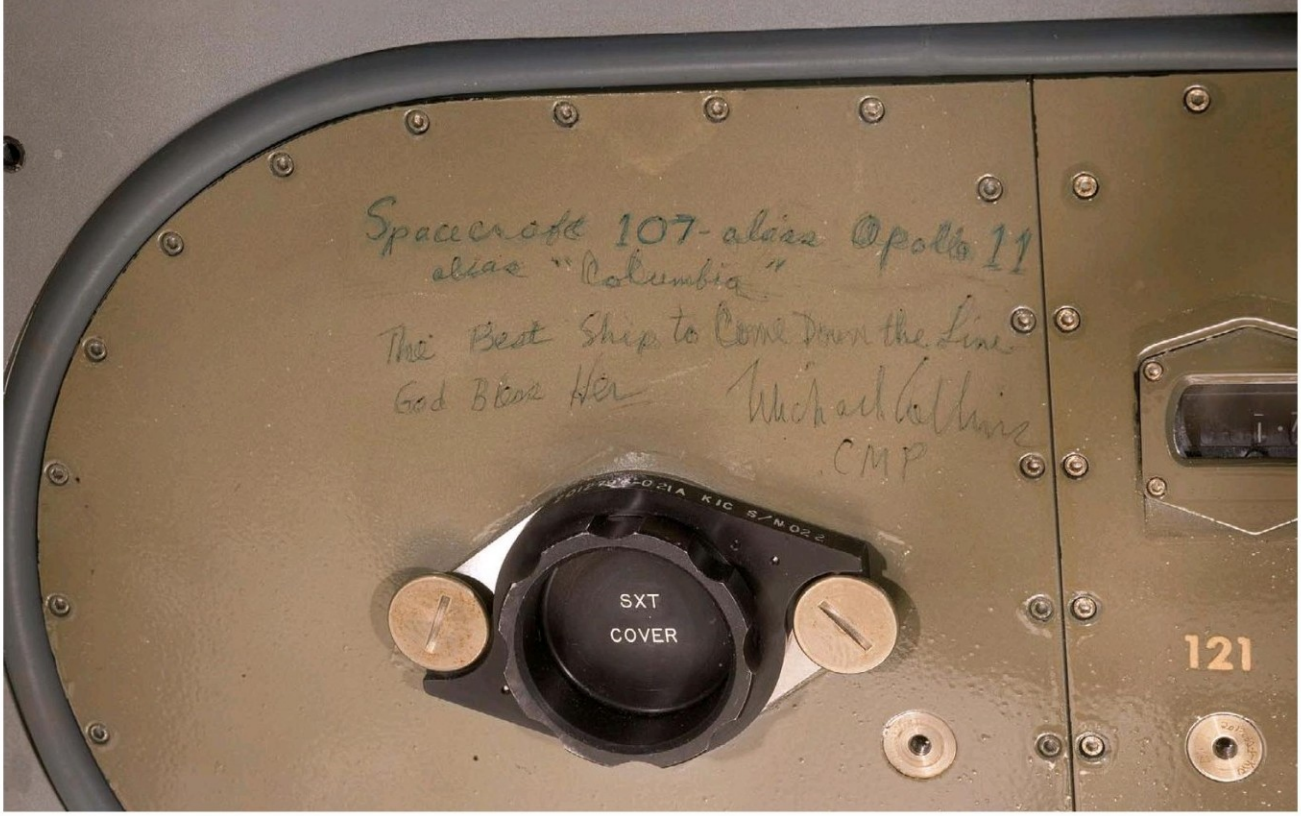
The material legacy of Apollo is immense. From capsules to space suits to the ephemera of life aboard a spacecraft, the Smithsonian Institution national collection comprises thousands of artifacts. This excerpt is from a carefully curated selection of 50 of these objects, which reveal how Project Apollo touched people's lives, both within the space program and around the world.

Parachutes, Fashioned for Survival

American spacecraft were designed to land in the ocean. But slowing the capsule down proved challenging, even with highly engineered parachutes. The gaps in the ribbon, ring-sail main parachutes (opposite, bottom) used by Apollo 16, offered greater stability at high speeds. Opposite, top: During survival training in Reno, Nevada, astronauts (from left) Frank Borman, Neil Armstrong, John Young, and Deke Slayton fashioned protective clothing out of material—such as parachute fabric—that would be available in a crash landing.

ALL PHOTOGRAPHS FROM THE COLLECTION OF SMITHSONIAN NATIONAL AIR AND SPACE MUSEUM (EXCEPT AS NOTED); TOP RIGHT: NASA

Adapted from *Apollo to the Moon: A History in 50 Objects*, by Teasel Muir-Harmony (Smithsonian Institution and National Geographic, 2018). Printed with permission of the publisher.



Graffiti by Michael Collins

In the cramped confines of the command module, Apollo 11's astronauts frequently found it necessary to use whatever writing surface was available to take notes. Often, this meant they would turn to the walls of the craft itself. Command module pilot Michael Collins penned notes representing coordinates on a lunar surface map, relayed to him from Mission Control, as he attempted to locate his crewmates' landing site from orbit. One later note was a tribute: Collins crawled back into *Columbia* while aboard the USS *Hornet* to inscribe a message (above) on the navigational system reading "Spacecraft 107—alias Apollo 11—alias Columbia. The best ship to come down the line. God Bless Her. Michael Collins, CMP."

Buckle Your Seat Belt

Boeing Aerospace designed the lunar roving vehicle (LRV) to extend the astronauts' range; with the vehicle, crews could drive for 40 miles at a speed of up to 11 mph. Deployment of the vehicle took roughly 11 minutes, with an additional six minutes for navigational alignment and other checks. Apollo 15 astronaut Dave Scott compared it to deploying an "elaborate drawbridge." Engineers constructed the LRV wheels from a hand-woven mesh made of zinc-coated piano wire, which is lighter and more durable than inflated rubber tires. Scott would later describe the LRV ride as "a cross between a bucking bronco and a small boat in a heavy swell." The wheel pictured here is a spare from an LRV.

A Model for America's Most Famous Space Fan

In July 1969, 94 percent of American households tuned their television sets to coverage of Apollo 11. Of these 53 million homes, the vast majority—including the sets at the White House—set their dials to watch news anchor Walter Cronkite on CBS. As the Saturn V rocket lifted off from Cape Canaveral, the usually composed Cronkite spontaneously exclaimed, "Go, baby, go!" Cronkite stayed on air for 27 of the 32 hours of continuous CBS coverage, detailing each stage of the Apollo 11 mission. Because much of the flight was out of sight of film cameras, Cronkite used a small-scale model to explain various stages of the mission.

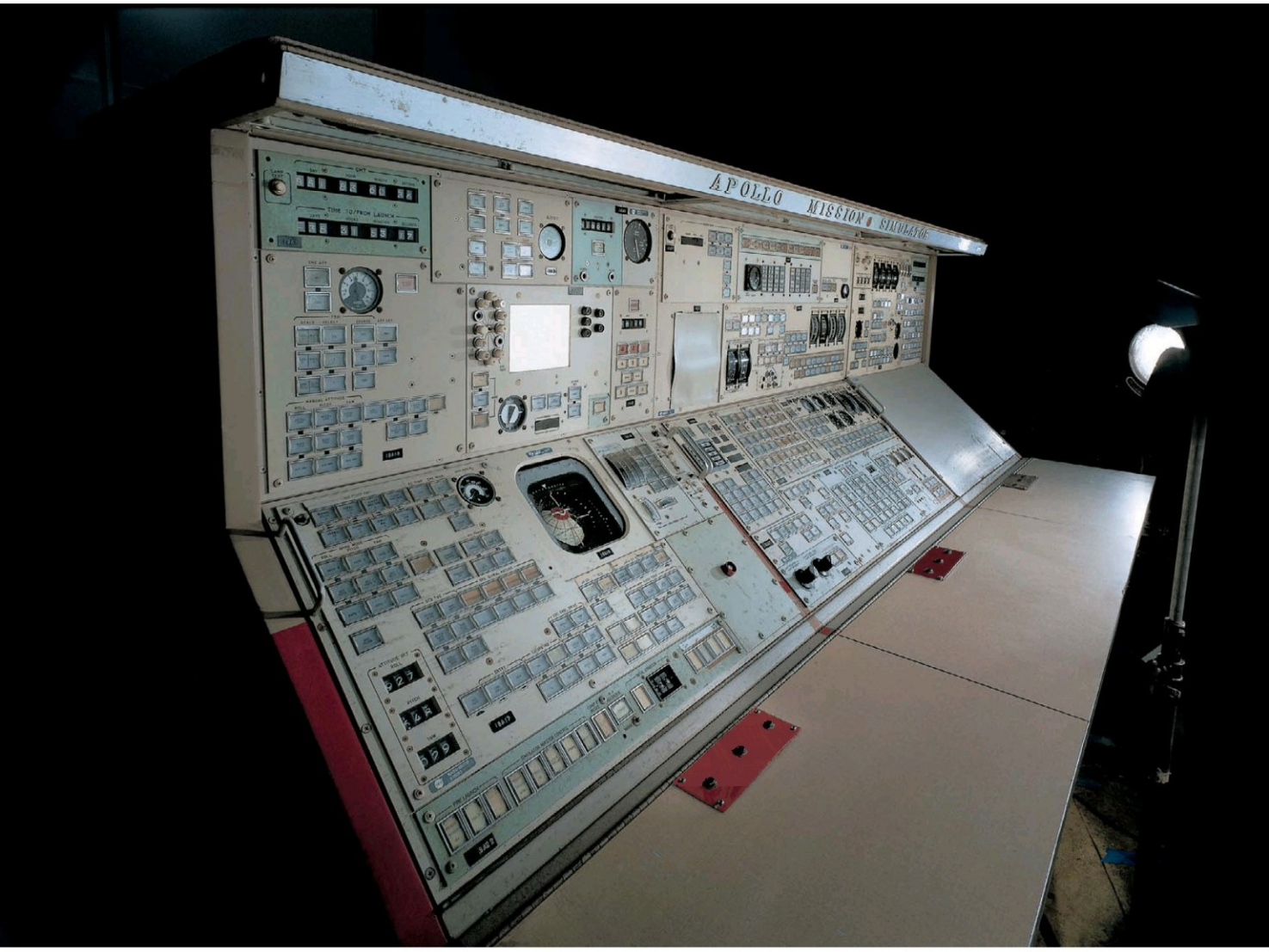
When the Eagle lunar module touched down in the lunar soil, Cronkite could only cry, "Oh, boy!" before asking retired Apollo 7 astronaut Walter Schirra to say something because he could not. He quickly recovered, however, grasping the moment's extraordinary significance: "Isn't this something! 240,000 miles out there on the moon and we're seeing this [on television]."

The model Cronkite used for his broadcast was commercially produced, most likely by the company Precise Models. The model was also available at the Grumman company store for $29.95. After the broadcast, CBS News associate producer Walter Lister "salvaged it to show [his] daughter and her classmates," eventually donating it to the Smithsonian Institution in 2009.

What Happened to the Whiskers?

"Things which were fun a couple days ago, like shaving in weightlessness, now seem to be a nuisance," lamented Michael Collins. Nine days into Apollo 11's flight, inside a spacecraft that had become increasingly smelly and messy, lunar exploration had lost some of its luster.

The first human spaceflight missions were brief, lasting for hours instead of days. On these short flights, concerns about personal hygiene—such as brushing teeth and shaving—were irrelevant. But as NASA started planning for longer durations, the agency faced questions about how to maintain the astronauts' health in space. Though shaving and other small rituals helped the astronauts maintain a sense of comfort and cleanliness en route to and from the moon, they also drew a sharp contrast with the counterculture movement of late 1960s America. This small razor and its accompanying shaving cream remind us how grooming sometimes represents more than just a style preference.

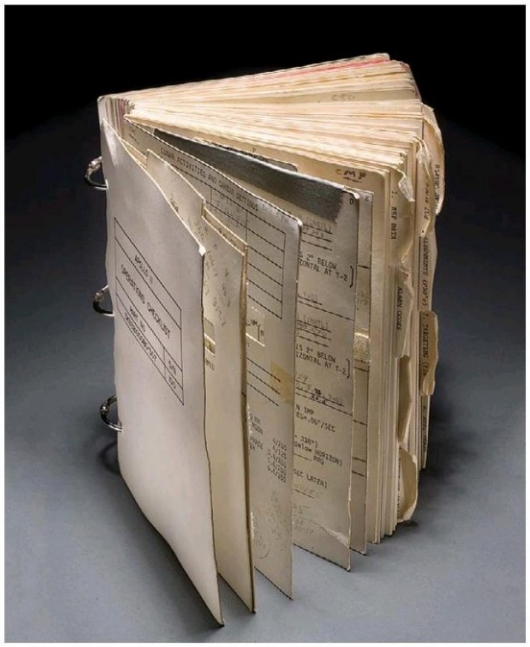


Dress Rehearsals

Michael Collins described simulation as the "heart and soul of NASA." Simulator supervisors (affectionately known as "Sim Sups") and their teams of instructors developed a clever series of challenging yet believable malfunctions to challenge Apollo flight crews to respond correctly in real-time situations. This highly realistic training was aimed at both the astronauts who would fly the missions and the flight controllers who would monitor spacecraft telemetry and assure that mission operations were conducted safely. Above is the control panel of the Apollo Mission Simulator, used to test the astronauts' response to both routine and extreme events.

Apollo astronauts spent hundreds of hours training in these simulators in the months leading up to their missions. During each of the lunar missions, the astronauts inevitably compared the real experience of flying to the moon to the virtual experience that they had encountered during training. The phrase "just like the simulator" can be found in the transcripts from every Apollo mission.

The mission simulators helped save the flight crew of Apollo 13 after an explosion disabled all major spacecraft functions. On the ground, as teams of astronauts, simulator instructors, and flight controllers developed the intricate procedures to operate the crippled spacecraft, the Apollo Mission Simulators worked around the clock to validate each corrective action. These included the complex procedures to power up the dormant Apollo command module just prior to reentry into Earth's atmosphere, a scenario that had never been contemplated by even the most devious simulation supervisors. The result was the safe return of Apollo 13 back to Earth, what some have called NASA's "finest hour."



Get Armstrong and Aldrin Back on Board? Check!

Largely prepared by the astronauts themselves, checklists provided necessary step-by-step and switch-by-switch procedures. Detailed instructions also included reminders like when to wash their hands or that they should remove watches from pressure suits before they were stowed. Astronaut Michael Collins used the checklist above on board Apollo 11 in July 1969. Its 216 pages are divided into 15 "chapters" or sections: reference data, guidance and navigation computer, navigation, pre-thrust, thrusting, alignments, targeting, extending verbs (for display and keyboard), stabilization and control system general actions, systems management, lunar module interface, contingency extravehicular activity, lunar-orbit insertion aborts, flight emergency, and crew logs. A Velcro lining allowed it to be stuck in a number of locations around the spacecraft. The paper is fireproof, a provision put into place after the Apollo 1 tragedy.

The Camera Left Behind

Apollo 16 was the first to carry a small astronomical telescope. Called the Far Ultraviolet Camera/Spectrograph, it was the creation of George R. Carruthers and his team at the Naval Research Laboratory. Carruthers' main goal was to get a first glimpse of what the universe looked like in the high-energy far ultraviolet region of the spectrum, which astronomers suspected held many answers to how stars and galaxies form. Astronauts on the moon could not see anything fainter than Earth in the sky because their eyes had to be protected by dense visors. So Carruthers designed the instrument to be easily handled. During three extravehicular activities, the astronauts photographed some 11 regions of the sky, including Earth. They captured over 500 stars, some nebulae and galaxies. The telescope still sits on the moon; only the film was returned to Earth. In 1981, two engineering models were transferred to the Museum; the one shown here was restored in 1992.