

Robot maker

What does this plane need?

Goddard's moon treatise and more

AEROSPACE

★ ★ ★ AMERICA ★ ★ ★



YEAR IN REVIEW

 A circular inset image shows the Artemis lunar lander on the moon surface. The lander is white with a yellow flag and a circular antenna. The background is the dark, cratered surface of the moon.

Artemis
INCLUDING PAGES
16, 42, 45,
61-64, 67, 72, 75

50 years after Apollo 11, the world took note

BY BEN SARAO

The **History Committee** works to preserve the record of aerospace advances and recognize their impacts on modern society.

The major history event of 2019 was the **50th anniversary of the Apollo 11 lunar landing mission**. On July 20, 1969, the first crewed lunar landing was televised, and nearly 600 million people watched worldwide. The legacy of Apollo 11 was revisited this year in several new documentary films. PBS aired a three-part series, “Chasing the Moon,” a six-hour program highlighting the steps taken by the United States to accomplish the first crewed lunar mission and subsequent ones to explore the surface of the moon. This film included **never-before-broadcast material** found in archives or donated from personal collections of several astronauts.

CNN aired “Apollo 11,” which included film segments that had been stowed away in government archives for nearly half a century. The film is mostly made of **newly discovered 70-mm footage** that includes intimate personal moments of the Apollo 11 astronauts being suited up prior to the launch on July 16, 1969; a segment of astronaut Neil Armstrong stepping down on the lunar surface made by astronaut Buzz Aldrin from the doorway of the Lunar Excursion Module; and select sound bites from 11,000 hours of NASA audio files from the mission.

▼ **Neil Armstrong suits** up on the morning he and fellow astronauts Buzz Aldrin and Michael Collins were launched on a Saturn V rocket toward the moon.

NASA



Aviation and aerospace museums in the United States embarked on a series of new educational programs and immersive learning exhibits and held recognition events for living legends. Throughout May and June, the **National Museum of the U.S. Air Force** in Dayton, Ohio, commemorated the 75th anniversary of D-Day. Visitors could experience the reality of the D-Day airborne invasion using HistoPad, an immersive, interactive augmented-reality tablet.

France awarded the Legion of Honor medal to three World War II veterans from Washington state at the Museum of Flight in Seattle in May. Daniel F. McAllister, a former P-38 aircraft mechanic; Stanley L. Zemo, a former demolition squad leader; and Richard A. Nelms, a former B-17 pilot, received the medals.

Notable international historical aerospace events included the China National Space Administration's **Chang'e-4** lunar lander with rover landing on the far side of the moon in January for a three-month mission. The scientific payload of the Chang'e-4 lander was powered by a radioisotope thermoelectric generator. The lunar rover was equipped with a solar panel to power the vehicle during the lunar day. The rover was able to transmit data back to Earth, despite the lack of radio frequencies on the far side, via a dedicated satellite sent earlier to orbit the moon. The lunar landing and subsequent rover relay via satellite data transmission are considered a landmark achievement for space exploration.

In April, JAXA, the Japan Aerospace Exploration Agency, separated the small carry-on impactor that had been on the asteroid explorer **Hayabusa2** for deployment to Ryugu and put the impactor into operation creating a crater on the surface.

In July, India launched Chandrayaan-2, which has a 3,500-kilogram mass, carries 13 payloads and has three elements — lunar orbiter, lander and rover — all developed by ISRO, short for the Indian Space Research Organization. India is the fourth country to attempt a soft lunar landing on the moon. On Sept. 7, ISRO reported that it had lost contact with the lander. NASA's **Lunar Reconnaissance Orbiter** made recon passes of possible lander sites on Sept. 17 and Oct. 14 but couldn't find the lander. ISRO reported that the other payloads still aboard the **Chandrayaan-2** lunar orbiter, including the Imaging Infrared Spectrometer, are performing well. ★