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# Success of SpaceX's Demo-2 Mission

## The Future of Commercial Space

On May 30, NASA astronauts Robert Behnken and Douglas Hurley made history when they were launched from American soil in a commercially built and operated American spacecraft on its way to the International Space Station (ISS). SpaceX's Falcon 9 carrying the Crew Dragon "Endeavour" spacecraft lifted off from Launch Complex 39A (LC-39A) at Kennedy Space Center in Florida on NASA's second demonstration (Demo-2) mission marking the first time a crewed orbital spaceflight launched from the United States since the final Space Shuttle mission (STS-135).

Known as NASA's SpaceX Demo-2, the mission (branded as "Launch America" by NASA TV) is an end-to-end test flight to validate the SpaceX crew transportation system, including launch, in-orbit, docking, and landing operations. The goal of the Demo-2 was to complete the validation of crewed spaceflight operations using SpaceX hardware and receive human-rating certification for the spacecraft, including astronaut testing of Crew Dragon capabilities on orbit. Astronauts Hurley and Behnken safely reached orbit and docked with the International Space Station on May 31 and worked alongside the crew of Expedition 63. During their 62 days aboard the ISS, both astronauts contributed more than 100 hours supporting the orbiting laboratory's investigations, participated in public engagement events, conducted four spacewalks with fellow American astronaut Chris Cassidy to install new batteries in the station's power grid and upgrade other station hardware. Crew Dragon Endeavour autonomously undocked from the station on August 1, 2020, and splashed down off the coast of Pensacola, Florida, on August 2, 2020, returning the astronauts to Earth, in the first water landing by astronauts since 1975. These activities



## FUTURE TECH



are a part of NASA's Commercial Crew Program to launch astronauts on American rockets and spacecraft from American soil the International Space Station for the first time since 2011. With this test flight, SpaceX returned human spaceflight to the United States, ending NASA's dependency on Russia's

space agency Roscosmos' Soyuz capsules to deliver its astronauts to the ISS.

Aside from eliminating NASA's dependence on Russia to send astronauts into orbit, another significant reason for the SpaceX launch was the cost. Over the past two decades, 85 flights have transported 239 astronauts to the



International Space Station (ISS) on either a NASA Space Shuttle or a Roscosmos State Corporation for Space Activities (Roscosmos) Soyuz vehicle. However, following the Space Shuttle program's retirement in 2011, NASA no longer had a spacecraft system capable of sending humans to space, and the

Soyuz has served as the sole means of transporting astronauts to and from the ISS. Thus, NASA has launched its astronauts to the International Space Station on Russian spacecraft from the Baikonur Cosmodrome in Kazakhstan for the last nine years. According to the NASA Office of Inspector General (OIG)

report (November 14, 2019), as of July 2019, NASA had purchased 70 Soyuz seats worth \$3.9 billion in total (\$277 million in the first half of 2011, \$43.4 million in the second half of 2011, \$86 million in 2020) to ferry astronauts to and from the ISS. As an alternative, NASA contracted with private companies such as SpaceX for the Commercial Crew Program, which is expected to cost less than Soyuz.

## Commercial Crew Program (CCP)

Since the Mercury program in the early 1960s, NASA has used an almost identical operating model to achieve human spaceflight, including the Apollo rockets, Space Shuttle Program, and the American portions of the International Space Station. In the post-Shuttle era, NASA moved from its traditional approach of working with private aerospace companies to build launch vehicles that the government would own and fully control to a commercial program. Thus, in 2010, NASA's Commercial Crew Program (CCP) was formed to facilitate the development of a commercial crew space transportation capability to achieve safe, reliable, and cost-effective access to and

from the International Space Station and Low-Earth Orbit (LEO). With the new system, NASA pays private companies a fixed price to develop crew transportation options and provide crew transportation flights to the ISS as a service.

The Commercial Crew Program (CCP) is a human spaceflight program operated by NASA, in association with American aerospace manufacturers Boeing and SpaceX. The program conducts rotations between the International Space Station expeditions, transporting crews to and from the International Space Station (ISS) aboard Boeing Starliner and SpaceX Crew Dragon capsules, in the first crewed orbital spaceflights operated by private companies. The program succeeds NASA's involvement in the Soyuz program, upon which it was dependent on transporting its astronauts to the ISS following the retirement of the Space Shuttle program in 2011. The program's history goes back to the establishment of the Vision for Space Exploration (VSE), which was announced by President George W. Bush in 2004 as a response to the Space Shuttle Columbia disaster and as a way to regain public enthusiasm for space

exploration. The VSE sought to implement a sustained and affordable human and robotic program to explore the Solar System and beyond, extend human presence across the Solar System, and return to the Moon by 2020, in preparation for human exploration of Mars and other destinations. Following the NASA Authorization Act of 2005, the Constellation program was established, which envisioned crew rotation flights to the International Space Station (ISS) and lunar exploration goals. However, in 2009, the program's funding and resources were deemed insufficient to execute its goals without significant delays to its schedule, and NASA started considering alternatives to the program. The Constellation program was officially canceled in 2010, with NASA collaborating with commercial partners for ISS crew rotation and other crewed activities in low Earth orbit following the Space Shuttle's retirement in 2011.

Development of the Commercial Crew Program began in 2011 through a rescope of the Commercial Crew Development (CCDev) program. By investing in multiple American companies that are designing and developing transportation

capabilities to and from low-Earth orbit and the International Space Station, NASA aims to establish safe, reliable, and cost-effective access to space. To achieve its goals, NASA used Space Act Agreements to partner with domestic companies capable of contributing to the development of a U.S. human spaceflight capability. Throughout the process, NASA awarded more than \$8.2 billion in Space Act Agreements (SAAs) and contracts under two Commercial Crew Development (CCDev) phases, the Commercial Crew Integrated Capability (CCiCap) initiative, Certification Products Contract (CPC), and Commercial Crew Transportation Capability (CCtCap). As NASA retired the space shuttle, the private industry's ability to take on the task of providing routine access to space was of vital importance. Before NASA would begin using a commercially developed system to transport its astronauts to and from the Space Station, the system must be certified as meeting NASA's safety requirements throughout an entire mission cycle. NASA's Commercial Crew Development Round 1 (CCDev1) began in 2010 using American Recovery and Reinvestment Act (ARRA) funds.