Preparing for launch: Ohio's foundational role in space exploration

DAYTON—Known as the birthplace of Astronauts, Ohio continues to play a critical role in training the nation's space explorers and testing the equipment that launches them into space.

Between Dayton and Cleveland, Ohio's unique role in space travel leverages facilities that allow both the astronaut and the equipment they use to simulate space, creating a unique environment for aerospace companies to thrive.

When the Air Force opened its research altitude chambers (RAC) in 2021, Acting Director of the Air Force Research Laboratory's Human Performance Wing, Darrell Phillipson, called Wright-Patterson Air Force Base "the DOD's epicenter of aerospace physiology research capability and expertise."

The altitude chambers allow astronauts experience rapid decompression and simulate the feel of 50,000 feet. Equipment can be tested up to a simulated 100,000 feet.

Phillipson said the four research altitude chambers provide, "an unprecedented capability to test and gather data, ensuring the continued longevity of flight equipment, and providing us a more complete set of tools to measure the effects of altitude on our pilots and air crews. This larger family of test facilities, along with its supporting labs and the world-class talent, establishes AFRL (in partnership with NAMRU-Dayton), as one of the most capable and functionally-equipped research centers in aerospace physiology in the world. These facilities ensure our air crews are ready now, and for whatever the future may bring."

That family of facilities includes AFRL's human-rated centrifuge and Naval Medical Research Unit-Dayton's spatial disorientation device, affectionally named the "Kraken". The facilities draw on the long history of the Air Force's study of how weightlessness, pressure, altitude, temperature, acceleration, and other factors affect astronauts and pilots.

When Space-X launched NASA Astronauts Dough Hurley and Bob Behnken into space in 2020, Wright-Patt announced they were two of 10 astronauts trained in the centrifuge, the DOD's only one rated for human testing. The centrifuge exerts up to nine Gs, or nine times the normal force of gravity, so they can practice counteracting the effects. The testing can also generate data that can guide cockpit design and operation for the Air Force and NASA.

In Cleveland, NASA's John H. Glenn Research Center adds to the vast research capabilities with two unique facilities, the Space Environments Complex (SEC) and the In-Space Propulsion Facility (ISP).

NASA calls the SEC, "the world's largest and most powerful space environment simulation facilities." The SEC includes the massive Space Simulation Vacuum Chamber, measuring 100 ft. in diameter by 122 ft. high, the Reverberant Acoustic Test Facility, the world's most powerful spacecraft acoustic test chamber, and the Mechanical Vibration Facility, the world's highest capacity and most powerful spacecraft shaker system, subjecting test articles to the rigorous conditions of launch.

As NASA plans for travel to Mars, ISP "offers the world's only facility capable of testing full-scale, upper-stage launch vehicles and rocket engines under simulated high-altitude conditions." According to NASA, "the engine or vehicle can be exposed for indefinite periods to low ambient pressures, low-background temperatures and dynamic solar heating to simulate the environment of orbital or interplanetary travel."

The 2022 Ohio Space Forum offered attendees an up-close look at Glenn's facilities. The first in-person forum since the inaugural event in 2020, this year's event featured several nationally recognized thought leaders in space intelligence, exploration, and defense, including NASA Deputy Administrator Retired Air Force Col. Pamela Melroy, Director of NASA's John H. Glenn Research Center Dr. Marla Pérez-Davis, and U.S. Air Force National Air and Space Intelligence Center Commander Col. Mauricio Calabrese.

Speakers addressed Ohio's role in leading space industrialization and how the work in Ohio enables life and operations in space, Ohio's federal aerospace and defense installations, and research and development entities. Panels discussed industry retention and attraction efforts, and the robust workforce needs that contribute the future of aviation and space exploration in our state.

Ohio is home to more than 550 private aviation and aerospace companies and ranks second in the nation for aerospace attractiveness, according to PwC. Companies' source much of their top talent from Ohio's many colleges and universities, which collectively graduate more than 13,000 engineers and engineering technicians each year. Ohio's renowned network of educational institutions includes Ohio University, the University of Cincinnati, the University of Dayton, Case Western Reserve University and The Ohio State University.

The Aerospace Industries Association (AIA) ranked Ohio 7th among states by percentage of aerospace and defense contribution to GDP (2.9 percent), and 7th in the nation for aerospace and defense jobs, with more than 82,000 aerospace and aviation professionals, many of whom work at Wright-Patt's AFRL, National Air and Space Intelligence Center, Battelle and the Ohio Unmanned Aircraft Systems Center.

Learn how the Dayton Region and Ohio can support your company's aerospace work here. (https://daytonregion.com/aerospace-defense-industry)