



Johnson Space Center

Training for space

Astronaut training and mission preparation

Johnson Space Center is home to the nation's astronaut corps and is responsible for preparing explorers from both the U.S. and its international partners for the demands of living and working in space. The first U.S. astronauts were selected in 1959. Since then, 321 U.S. astronauts and more than 50 explorers from other nations have been trained at the center. About 240 men and women, including 130 international astronauts, with primarily engineering, scientific and military



Astronaut James M. Kelly, STS-114 pilot, assisted by divers, floats in a small life raft during an emergency egress training session in the Neutral Buoyancy Laboratory.

backgrounds make up NASA's astronaut corps today.

At Johnson Space Center, potential astronaut candidates undergo one of the world's most competitive selection processes. Selected candidates then complete approximately two years of intensive training before beginning specialized mission training. Only then do astronaut candidates become eligible for a flight assignment. During their classroom "boot camp," candidates are schooled in

shuttle and space station systems along with a variety of other disciplines, including Earth sciences, meteorology, space science and engineering. They also train in land and water survival, aircraft operations and scuba diving.

Once the candidate training period is complete, new astronauts are given their mission assignment and grouped with experienced astronauts to continue training. The two types of astronauts – pilots and mission specialists – perform different functions: pilot astronauts are assigned to fly the shuttle and command missions, and mission specialists are the flight engineers

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assigned to conduct spacewalks, perform robotics tasks and conduct scientific research.

A new group of astronauts, comprised of educators from all corners of the U.S., is undergoing training at Johnson Space Center for future missions. The educator astronauts will bring the excitement of human spaceflight to a new generation of explorers.

Training facilities

Designing a training program to prepare astronauts for the uniqueness of working in microgravity presents its own set of challenges. Trainers must not only familiarize astronauts with complex and highly specialized flight vehicles, equipment and suits, but must do it in a way that simulates a microgravity working environment.

Simulators

Highly realistic mockups, housed in both the Jake Garn Training Facility and the Space Vehicle Mockup Facility, are used to train astronauts in vehicle operations. Astronauts prepare for launch, landing, payload and International Space Station operations and rendezvous activities in the Garn Facility. A motion-based trainer simulates the vibrations, noise and views the astronauts experience during shuttle launch and landing. A fixed-base simulator is used for rendezvous and payload operations training, and a functional space station simulator is used to train astronauts in the use of the on-orbit laboratory's systems. The Space Vehicle Mockup Facility is home to full-sized mockups of the shuttle's flight deck and mid-deck and one full-sized shuttle mockup. Station mockups of the complex's different habitable elements help familiarize astronauts with the station's layout. Before their first mission, astronauts typically train for a combined total of 300 hours in these simulators.

Astronauts preparing for spacewalks or robotic arm operations test their skills in the Virtual Reality Laboratory, which immerses them in a computer-generated microgravity environment.

Sonny Carter Training Facility

The world's largest indoor pool, the Neutral Buoyancy Laboratory – housed within the Sonny Carter Training Facility – holds 6.2 million gallons of water and is more than 200 feet long and 40 feet deep. Deep within the pool, which simulates the weightless environment of space, astronauts train for spacewalks on full-sized replicas of space station modules. They spend approximately 10 hours under water for every hour they spend walking in space.

Aircraft training

Pilot astronauts train in a Gulfstream jet aircraft that has been specially modified to mimic the approach and landing of the space shuttle. This jet provides a unique training experience that helps prepare astronauts for the spacecraft's runway approach, which is nearly seven times steeper than that of a commercial airliner. Pilots will fly more than 1,000 approaches in this aircraft before ever landing the shuttle. All astronauts train in T-38 jets learning flight techniques and cockpit management.

To learn more about astronaut training and NASA Johnson Space Center's training facilities, visit us on the Web at www.nasa.gov/centers/johnson and

www.nasa.gov