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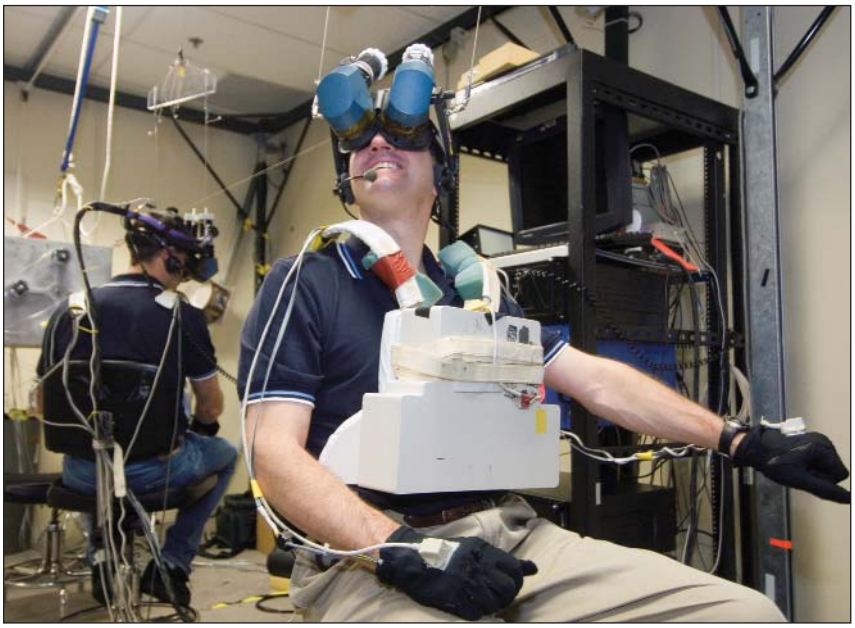
Astronaut Selection and Training

History of Astronaut Selection

Man's scope of space exploration has broadened since the first U.S. manned space flight in 1961. But the nation will never forget the original seven pilots who focused our vision on the stars. In 1959, NASA asked the military services to list their members who met specific qualifications. In seeking its first astronauts, NASA required jet aircraft flight experience and engineering training. Height could be no more than 5 feet 11 inches because of limited cabin space available in the Mercury space capsule being designed. After many intense physical and psychological screenings, NASA selected seven men from an original field of 500 candidates. They were Air Force Captains L. Gordon Cooper, Jr., Virgil "Gus" Grissom, and Donald K. "Deke" Slayton; Marine Lieutenant Colonel John H. Glenn, Jr., Navy Lieutenant M. Scott Carpenter, and Navy Lieutenant Commanders Walter M. Schirra, Jr., and Alan B. Shepard, Jr.

By 1964, prime emphasis had shifted away from flight experience and toward superior academic qualifications. Applicants were invited on the basis of educational background alone. These were the scientist astronauts, so called because, as a minimum, applicants were required to have a doctorate level degree or equivalent experience in the natural sciences, medicine or engineering.

Since the selection of the first class of astronauts, many men and women have pursued and realized their dreams of flying in space. They all began by submitting their applications to become astronauts.



Basic Qualification Requirements

The Astronaut Candidate selection process was developed to select highly qualified individuals for human space programs. Astronaut Candidates are selected on an as needed basis. Both civilian and military personnel are considered for the program. Applicants, all of whom must be citizens of the United States, must meet a series of minimum requirements.

The requirements for Astronaut Candidates are a bachelor's degree from an accredited institution in engineering, biological science, physical science, or mathematics. Quality of academic preparation is important. Degree must be followed by at least 3 years of related, progressively responsible, professional experience or at least 1,000 hours of pilot-in-command time in jet aircraft. An advanced degree is desirable and may be substituted for experience as follows: master's degree = 1 year of experience, doctoral degree = 3 years of experience. Teaching experience, including experience at the K - 12 levels, is considered to be qualifying experience for the Astronaut Candidate position; therefore, educators are encouraged to apply.

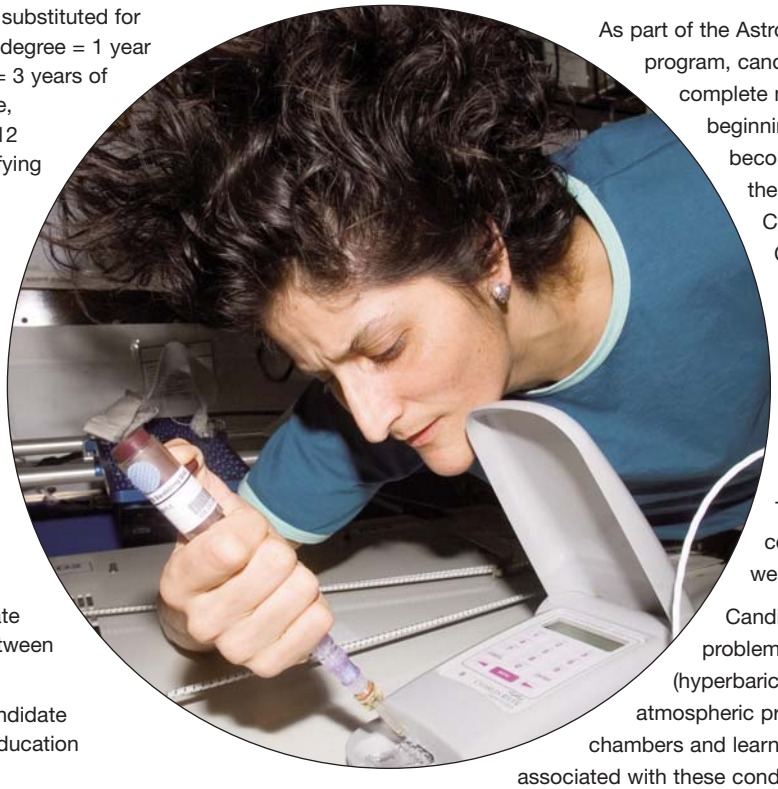
Additional requirements include the ability to pass the NASA long-duration space flight physical, which includes the following specific requirements: Distant and near visual acuity must be correctable to 20/20 in each eye, blood pressure not to exceed 140/90 measured in a sitting position, and the candidate must have a standing height between 62 and 75 inches.

Applicants for the Astronaut Candidate Program must meet the basic education requirements for NASA engineering and scientific positions, specifically, successful completion of standard professional curriculum in an accredited college or university leading to at least a bachelor's degree with major study in an appropriate field of engineering, biological science, physical science, or mathematics. The following degree fields, while related to engineering and the sciences, are not considered qualifying: degrees in technology (engineering technology, aviation technology, medical technology, etc.); degrees in psychology (except for clinical psychology, physiological psychology, or experimental psychology, which are qualifying); degrees in nursing; degrees in exercise physiology or similar fields; degrees in social sciences (geography, anthropology, archaeology, etc.); and degrees in aviation, aviation management or similar fields.

Astronaut Selection and Training

Following the preliminary screening of applications, a week-long process of personal interviews, medical screening, and orientation are required for both civilian and military applicants under final consideration. Once final selections have been made, all applicants are notified of the outcome.

Selected applicants are designated Astronaut Candidates and are assigned to the Astronaut Office at the Johnson Space Center (JSC) in Houston, Texas. The Astronaut Candidates undergo a training and evaluation period lasting approximately 2 years. During this time they will participate in the basic Astronaut Candidate training program, which is designated to develop the knowledge and skills required for formal mission training upon selection for a flight. Military Astronaut Candidates with a jet piloting background maintain proficiency in NASA aircraft during their candidate period.



As part of the Astronaut Candidate training program, candidates are required to complete military water survival before beginning their flying syllabus, and become SCUBA qualified to prepare them for spacewalk training. Consequently, all Astronaut Candidates are required to pass a swimming test during their first month of training. They must swim 3 lengths of a 25-meter pool without stopping, and then swim 3 lengths of the pool in a flight suit and tennis shoes with no time limit. They must also tread water continuously for 10 minutes wearing a flight suit.

Candidates are also exposed to the problems associated with high (hyperbaric) and low (hypobaric) atmospheric pressures in the altitude chambers and learn to deal with emergencies associated with these conditions. In addition, Astronaut

Candidates are given exposure to the microgravity of space flight during flights in a modified jet aircraft as it performs parabolic maneuvers that produce periods of weightlessness for about 20 seconds. The aircraft then returns to the original altitude and the sequence is repeated up to 40 times in a day.

Final selection as an astronaut will depend upon satisfactory completion of the training and evaluation period. Graduation from the Astronaut Candidate Program will require successful completion of the following: International Space Station systems training, Extravehicular Activity skills training, Robotics skills training, Russian Language training, and aircraft flight readiness training. Civilian candidates who successfully complete the training and evaluation and are selected as astronauts become permanent Federal employees. Civilian candidates who are not selected as astronauts may be placed in other positions within NASA, depending upon agency requirements and workforce constraints at that time. Equal opportunity in employment means opportunity not just for some but for all. NASA provides equal opportunity in Federal employment regardless of race, color, gender, national origin, religion, age, non-disqualifying physical or mental disability, genetic information, sexual orientation, status as a parent, or gender identity.

Pay and Benefits

Salaries for civilian Astronaut Candidates are based on the Federal Government's General Schedule pay scales for grades GS11 through GS14, and are set in accordance with each individual's academic achievements and work experience. Selected military personnel will be detailed to JSC, but will remain in an active duty status for pay, benefits, leave, and other similar military matters.

Astronaut Responsibilities

Astronauts are involved in all aspects of on-orbit operations of the International Space Station (ISS). This includes extravehicular activities (spacewalks), robotics operations using the remote manipulator system, experiment operations, and onboard maintenance tasks. Astronauts are required to have a detailed knowledge of the space station systems, as well as detailed knowledge of the operational characteristics, mission requirements and objectives, and supporting systems and equipment for each experiment on their assigned missions. Long-duration missions aboard the space station generally last from 3 to 6 months. Training for long-duration missions is arduous and takes approximately 2 to 3 years beyond the initial training and evaluation period. This training requires extensive travel, including long periods in other countries training with our international partners. Trips to and from the space station will initially be aboard the Russian Soyuz vehicle and potentially aboard other future spacecraft presently being developed.

Astronaut Formal Training

The astronauts begin their formal training program during their year of candidacy by reading training manuals and by taking computer-based training lessons on the various vehicle systems.

The next step in the training process involves the spacecraft systems trainers. The astronauts are trained to operate each system, to recognize malfunctions, and to perform corrective actions if needed.

The Sonny Carter Training Facility, or Neutral Buoyancy Laboratory (NBL), provides controlled neutral buoyancy operations in the facility water tank to simulate the zero-g or weightless condition that is experienced by the crew during space flight. It is an essential tool for the design, testing, and development of the International Space Station and future NASA programs. For the astronaut, the facility provides important preflight training in becoming familiar with planned crew activities and with the dynamics of body motion under weightless conditions in order to perform spacewalks.

Several full-scale mockups and trainers are also used to train astronauts. These mockups and trainers are used for onboard systems orientation and habitability training. Astronauts practice meal preparation, equipment stowage, trash management, use of cameras, and experiment operations.

Astronauts, who are pilots maintain flying proficiency by flying 15 hours per month in NASA's fleet of two-seat T38 jets. Non-pilot astronauts fly a minimum of 4 hours per month. The T38 is used for flight readiness training to help the astronauts become adjusted to the flight environment, including the g-forces experienced on launch.

The astronaut training is designed to prepare personnel for space flight on the International Space Station, Russian Soyuz spacecraft, NASA's Orion vehicle, and future spacecraft.

International Space Station Program Description

The International Space Station is the largest international scientific and technological endeavor ever undertaken. The space station is a permanent scientific laboratory in which gravity, temperature and atmospheric pressure can be manipulated for scientific and engineering pursuits impossible in ground-based laboratories.

The International Space Station marked its 10th anniversary of continuous human occupation on Nov. 2, 2010. Since Expedition 1, which launched in October 2000, the space station has been visited by more than 200 individuals, travelled more than 1.5 billion miles (equivalent to eight trips to the Sun) and orbited the Earth more than 60,000 times.

NASA and the world have learned much about building in space and about how humans and spacecraft systems function on orbit. But there is much more to do and learn. The voyage of research and discovery is just beginning as NASA shifts its focus from assembly to scientific research, technology development, exploration, commerce, and education.

Aboard the orbiting laboratory, crew members pursue novel avenues of research and development that impact medical research, advance materials and processes to benefit industries on Earth, and can accelerate breakthroughs in technology and engineering that have proven themselves as practical applications for life on Earth.

The station continues to expand the boundaries of space research. The unique capabilities of its laboratories will lead to discoveries that will benefit missions farther into outer space. Using the station to study human endurance in space and test new technologies and techniques, NASA will prepare for longer journeys to other destinations, such as Mars and beyond.

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FS-2011-11-057-JSC

21st Century Astronauts

The astronauts of the 21st century will continue to work aboard the International Space Station in cooperation with our international partners; help to build and fly a new NASA vehicle, the Orion Multi-Purpose Crew Vehicle (MPCV) designed for human deep space exploration; and further NASA's efforts to partner with industry to provide a commercial capability for space transportation to the space station.

The Orion MPCV draws from more than 50 years of spaceflight experience and is designed to meet the evolving needs of our nation's future human space exploration program. Orion features dozens of technology advancements and innovations that have been incorporated into the spacecraft's subsystem and component design and includes both crew and service modules, a spacecraft adaptor, and a revolutionary launch abort system that will significantly increase crew safety. Its life support, propulsion, thermal protection, and avionics systems, in combination with other deep space elements, will enable extended duration deep space missions. These systems have been developed to make possible the integration of new technical innovations as they become available.

Orion will be capable of carrying astronauts on diverse expeditions beyond Earth's orbit –ushering in a new era of human space exploration.

NASA is in the process of identifying possible near-Earth asteroids to explore with the goal of visiting an asteroid in 2025. With that goal, and keeping in mind that the plan is to send a robotic precursor mission to the asteroid approximately five years before humans arrive, NASA will need to select the first set of targets to explore within the next decade.

For additional information about the Astronaut Candidate Program, please go to the Astronaut Selection site www.nasa.gov/flynasa.