



Astronaut Training



Fig. 1-1 Columbus takes the plunge (Image: ESA)



Fig. 1-2 Astronaut Training in the Columbus mock-up at the European Astronaut Center (EAC) (Image: ESA/ P. Sebirot)

Astronaut Training

Training astronauts for space flight missions has always been a key competence and skill of DLR Space Operations and Astronaut Training. DLR has a long history in instructing astronauts on what they need to know for their time in space. At DLR, astronauts were trained for the German D-1 and D-2 missions flown in 1985 and 1993, for flights to the Russian MIR-Station, namely the missions MIR-92 and MIR-97, and later on, in close collaboration with ESA, the Spacelab mission IML-2 in 1994 and the MIR missions EUROMIR-94 and EUROMIR-95.

Astronaut training starts with a phase of basic training since all astronaut candidates typically come with a different professional background, language skills and work-related experience. It continues with space system related and experiment infrastructure training as well as, once assigned for a specific mission, experiment content related training. Nowadays, the DLR astronaut training team together with specialists from other European space agencies have jointly been integrated into the "European Astronaut Centre (EAC) Integrated Team". As such, DLR Astronaut Training has been involved in the preparation and implementation of more than 25 short- and long-duration missions of ESA astronauts during the past 20 years: As member of the EAC Integrated Team, DLR is involved in the systematic analysis of task related astronaut training requirements, the development of training materials and schedules and the implementation of training for astronauts and ground personnel. Trained ground personnel support operations of the missions at various centers across Europe, including EAC in Cologne and Col-CC mission control in Oberpfaffenhofen. In addition to training, the Astronaut Training department ensures the smooth implementation of the training programme and maintains the training infrastructure at EAC.

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Fig. 1-3 Inside European Astronaut Center (EAC) (Image: ESA)



Fig. 1-4 Neutral Buoyancy Facility (NBF) (Image: ESA)



Fig. 1-5 EUROCOM console support (Image: ESA)

At the European Astronaut Centre EAC, the following infrastructure is used for astronaut and ground controller training:

- The Neutral Buoyancy Facility (NBF), a ten meter deep scuba diving pool to prepare astronauts for subsequent EVA (Extra-Vehicular-Activity)-training at NASA's Neutral Buoyancy Laboratory (NBL),
- several Columbus Module mock-ups,
- Columbus experiment rack training infrastructure and experiment training models.

Well-established interfaces to survival-training providers, language and piloting schools in the area as well as a close contact to DLR's Flight Medicine Clinic for physical and physiological testing complement the services provided by the DLR Astronaut Training department. Additionally, EAC hosts several classrooms as well as a library of astronaut training material.

▶ At EAC, astronaut training is just one aspect. DLR also brings significant expertise in astronaut support and medical operations.

Astronaut support comprises spaceflight mission or, nowadays for the ISS, increment oversight, launch campaign support, space food coordination, as well as the coordination of an astronaut's post-flight direct return to EAC. The team also provides support to the astronauts' families, on crew discretion organizes crew inflight events with celebrities or VIPs, plans and organizes family in-flight calls, so called "Private Family Conferences (PFC)", and coordinates the installation of software on the astronaut's personal on-board devices.

Publisher
German Aerospace Center (DLR)
Spacecraft Operations and Astronaut Training
Muenchener Str. 20, 82234 Wessling

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Astronaut medical operations comprise the medical certification of astronauts according to the established international standards for human spaceflight. Astronaut annual medicals are organized and the respective astronaut medical record is maintained. Documentation required for the respective medical commissions granting “Readiness for flight” is prepared and presented.

During the mission, in-flight medical supervision is meticulously planned and executed. While it always involves regular in-flight calls between the astronaut and the Earth-based Flight Surgeon, other medical activities, such as physical exercise sessions, medical examinations, nutritional monitoring, and radiation assessments, may vary in scope depending on the mission and the astronaut’s needs.

Additionally, medical support encompasses pre-flight and post-flight measures, including medical screenings and infectious disease prevention programs initiated 14 days prior to launch, and extending through to full medical rehabilitation after the mission. We also prepare ESA astronauts by informing them about the expected physiological impacts resulting from the new environment they will encounter, as well as the available countermeasures during their mission. This comprehensive approach ensures continuous health monitoring and preparedness, ultimately safeguarding the well-being of astronauts at every stage of their space journey.

Extensive training of astronauts and ground personnel, in-depth care and medical support for astronauts on the ground and in space, are essential for mission success, safety and health of astronauts. Particularly in view of increasing commercialisation, this range of capabilities is becoming more important and ensures the success of the missions in an expanding field of private human space flight.



Fig. 1-6 European Astronaut Center (EAC), Cologne (Image: ESA/S. Corvaja)