



The ISS turns 15 – from a ‘heavenly’ construction site to a research laboratory in the sky

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Floating water droplets, a Canadian astronaut singing his own version of David Bowie's ‘Major Tom’, spacewalks, or beautiful views of Earth from the Cupola – the images that reach Earth from the International Space Station (ISS) never cease to surprise. Things were different 15 years ago; on this very day, 20 November 1998, the first component of the ISS was launched. This ‘heavenly’ construction began with the Russian Zarya module, a cargo and control module. Today, six astronauts live and work 365 days a year in the space research laboratory. Also on board are numerous experiments supported by scientists at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) or funded by the DLR Space Administration.

The largest artificial object in Earth orbit, which is at present the size of a football pitch, started out small; once, it was just the 12.6-metre long and 4.10-metre-diameter, Zarya module, which has a mass of 19,323 kilograms. Zarya was actually designed for the successor to the Russian MIR space station. However, with the decision to have an international space station, Zarya was designated as the first component of the ISS, which would be set up jointly by the United States, Russia, Japan, Canada and the European Space Agency. A short time later, on 4 December 1998, Zarya was followed by the Unity connecting module; now, the ISS had two components.

First experiments in the new space station

“Back then, it was obviously not permanently crewed,” says Peter Preu, responsible for ‘Research under Space Conditions’ at the DLR Space Administration. The first residents of the ISS ‘moved in’ almost two years later, on 2 November 2000. Constant research in microgravity at about 400 kilometres up could finally begin. “And Germany was involved from the beginning,” says Preu.

Gregor Morfill, of the Max Planck Institute for Extraterrestrial Physics, had already received support from the DLR Space Administration for his research into liquid and crystalline plasmas – now it was time to test his experiment for the first time on the newly commissioned International Space Station. “We were in the control room and had video contact. There was tension in the air. I had the impression that the whole room was crackling,” says Morfill. The scientist still remembers the exact moment when his experiment was performed for the very first time. “When the first data appeared on the screen and looked somewhat as we had expected, we all cheered spontaneously.”

Instead of mere seconds or minutes of weightlessness, the space laboratory enabled observations of the behaviour of the plasma systems to be performed for around 90 minutes without gravitational disturbances. The astronauts were in continuous contact with the scientists on the ground. “When faced with a startling discovery – which happens in practically every experiment, as everything is new territory – the astronauts are often asked to conduct the experiments entirely manually, just as would be done in the laboratory on Earth.” On the ground, the analysis and scientific evaluation followed. It was discovered that the work with ‘cold plasma’ had medical applications, for example, and it has been the subject of research into disinfection. “Acquiring the technological expertise to work with cold plasmas, which was done in space, was the basis for the transfer into hygiene and medicine.”

From physics to biology

Since the beginning, more than 60 German experiments with various durations have been performed – including biological experiments on radiation exposure, experiments on the origin of life, from medicine to the cardiovascular system, but also physics and the physics of

materials. “The experiments need, in particular, adequate preparation on the ground or initial testing, for example, on parabolic flights,” says Peter Preu. “The leap from Earth laboratory to the Space Station is very large.”

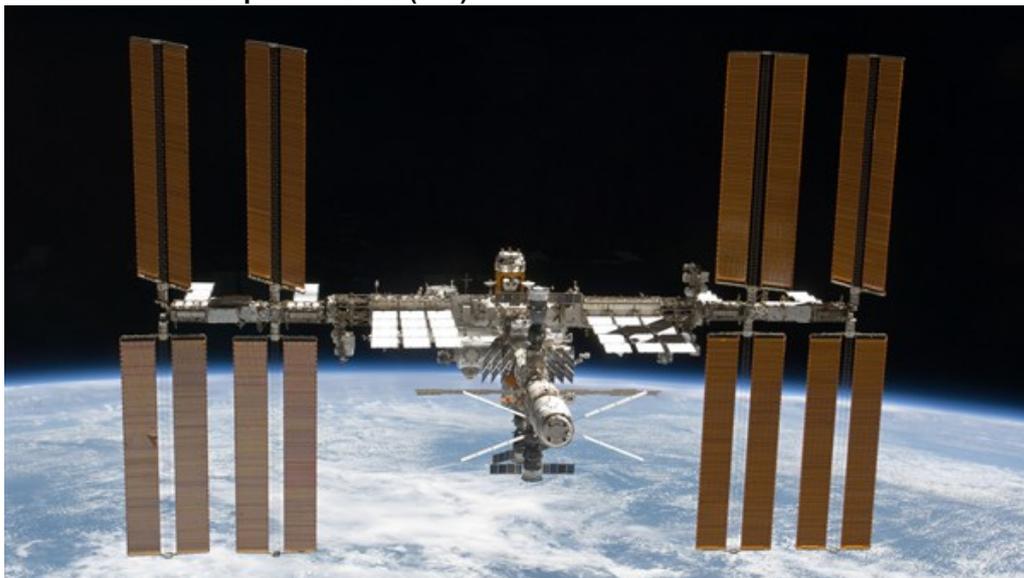
With time, the Space Station has grown from a single module to a complex research laboratory. The Zarya cargo module and the Unity connecting module were followed by residential and laboratory modules; robot arms were installed and the European Columbus research module was added in 2008. About 90 Russian space vehicles and 37 US Space Shuttles have docked with the ISS, and space transportation vehicles such as the European Automated Transfer Vehicle (ATV) supply the team in the ISS with food, equipment, oxygen and fuel.

“With the ISS, thousands of engineers and scientists, astronauts and cosmonauts, have pursued humankind’s quest for knowledge and urge to satisfy curiosity, while also creating a new monument,” says Johann-Dietrich Wörner, Chairman of the DLR Executive Board. “The docking of the European Columbus module in 2008 marked the beginning of intensive scientific utilisation of the ISS. In the coming years, at least until 2020, we will be able to operate some of the most advanced scientific equipment in orbit and make intensive use of microgravity as a working environment,” Wörner explains.

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The International Space Station (ISS)



The International Space Station (ISS) is the largest artificial object in Earth orbit and is jointly operated by the United States, Russia, Japan, Canada and the European Space Agency.

Credit: NASA.

Working in space



The International Space Station (ISS) consists of several accommodation and laboratory modules. On the exterior, robotic arms are installed to facilitate extravehicular activities by the astronauts. Currently, six astronauts are living and working in the orbiting research laboratory.

Credit: NASA.

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