



Columbus research laboratory in microgravity for five years

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From the outside it resembles a shiny barrel; inside, however, it contains a myriad of possibilities for scientific work under microgravity conditions. The European Columbus research module has been flying through space for five years, attached to the International Space Station (ISS). It is operated and monitored from the Columbus Control Center at the German Aerospace Center's (Deutsches Zentrum für Luft- und Raumfahrt; DLR) German Space Operations Center (GSOC). On 7 February 2008 the flight directors were seated there at their consoles in an unusually heightened state of tension; at 20:45 CET, the Space Shuttle Atlantis was launched from the Kennedy Space Center with the research module on board, bound for the Space Station. "The pressure of expectation was incredibly high," recalls Gerd Söllner, the Flight Director in charge of the Columbus Mission 1E.

Initially, the patience of those involved was put to the test; the planned launch on 6 December 2007 was aborted because not all the fuel sensors on the shuttle were functioning. The astronauts travelled back home and returned to training and their families. By 7 February 2008 all the technical problems were resolved and the research module set off for its destination about 400 kilometres above Earth. "Needless to say, during the launch we were all seated at our consoles," says Söllner. "Barely two hours after the launch, we received the first telemetry data from the experiments to be installed on the external surface of the research module." Even during their flight to the Space Station, these experiments had to be heated to ensure that the sensitive instrumentation survived its time in transit. Columbus slumbered away all this time in the cargo hold of the shuttle.

Control room commands that vanished

Two days later – on 9 February – Columbus was lifted out of the shuttle by a robot arm and was attached to the Space Station. The European research module was now ready for commissioning. The engineers gradually switched on the most important functions – much like the sequence of events when moving into a new house: electrical power and heating were fully operational. "Everything important for the basic provision was in place, but thereafter no further commands reached the research module." In the Columbus Control Center and in Houston, a feverish search for the malfunction was initiated. Ever since 2001, engineers had been fine-tuning the mission sequence, drawing up plans in minute detail and devising specific procedures to contend with possible faults and malfunctions. Finally, the cause was tracked down: one of the main NASA computers on the ISS was not forwarding commands from Oberpfaffenhofen to Columbus. "This fault was not one we could have anticipated," says Gerd Söllner. "In the first instance, this effectively made a mess of the sequence of events we had been planning for such a long time."

The carefully devised timeline was delayed by one and a half days. While a team in the control room carried out current tasks on the console, the 'Anomaly Resolution Team' in the next room was busy considering the best possible way to reschedule things. "That is, after all, what a control room is there to do." The crew in space with German astronaut Hans Schlegel was first tasked with installation of the hardware. They installed the experiment racks and unfastened retaining bolts. For a total of 13 days, the whole Columbus team worked around the clock in the control room to get the research module and its experimental equipment into operational service.

From radiation biology to material physics

For five years now, experiments from a large number of fields have been running in the gleaming 'barrel', filled with a technological life of its own. Gravitation biology, radiation biology and astrobiology, human physiology and even material physics are among the research areas. What are the mechanisms driving the degradation of human bone and muscle tissue? How do plants behave in microgravity conditions? What properties do crystals possess? What are the characteristics of flow processes inside Earth? These experiments are run from various control centres in Europe – such as the MUSC, the user centre for space experiments at DLR in Cologne. From there, scientists conduct their experiments in the Biolab on board the Columbus research module. The control centre in Oberpfaffenhofen maintains the module and facilitates the conducting of experiments. "Even today, our control room continues to be manned around the clock," explains Söllner. "Admittedly with a smaller team, but nonetheless still 24 hours a day and seven days a week."

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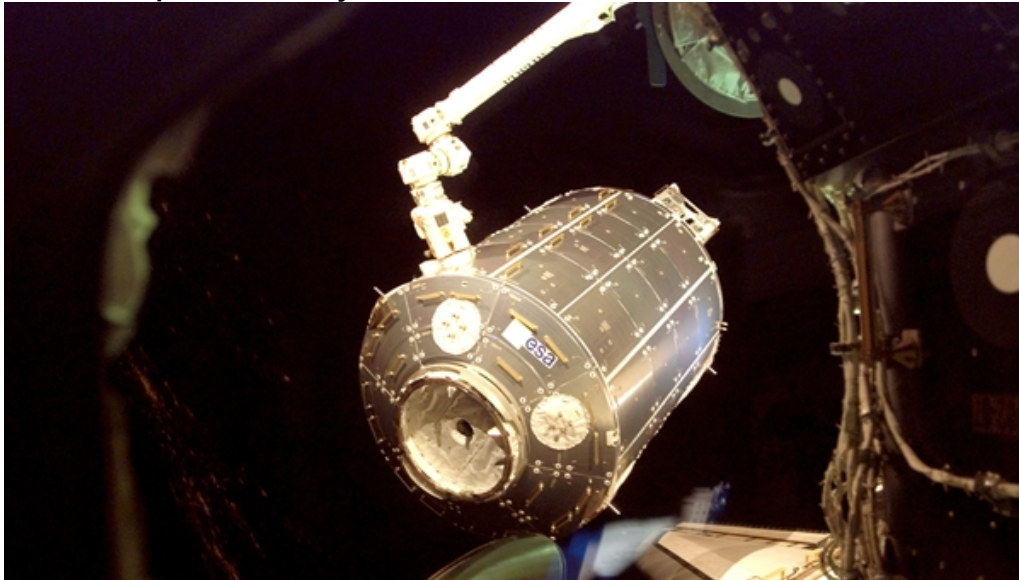
Hans Schlegel working on the Columbus European research module



On 7 February 2008, the European research module Columbus set off on board the Space Shuttle Atlantis en route to the International Space Station (ISS). German astronaut, Hans Schlegel, accompanied the mission and, in the course of a space walk, carried out work on the outer skin of the module.

Credit: NASA.

Columbus space laboratory on the robot arm of the ISS



On 11 February 2008, the Columbus space laboratory was lifted out of the cargo bay of Space Shuttle Atlantis by the robot arm on the ISS.

Credit: ESA/NASA.

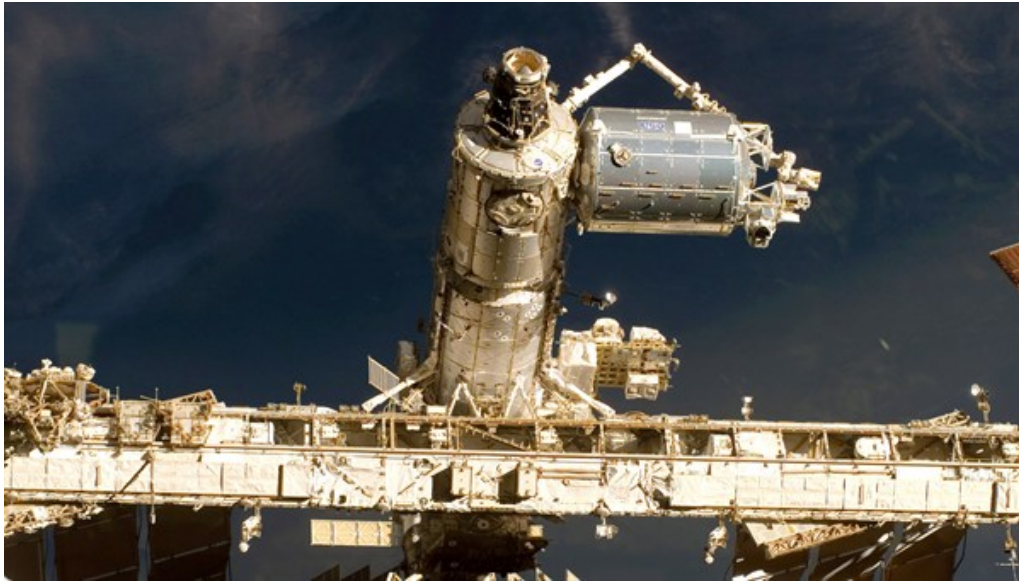
View into the Columbus Control Center



View into the Columbus Control Center.

Credit: DLR (CC-BY 3.0).

Columbus research module



In February 2008, the European research module, Columbus, was transported on board a space shuttle to the International Space Station (ISS).

Credit: NASA.

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