



Information

Columbus: Europe's principal contribution to the International Space Station

- It enables research under zero gravity conditions

Cape Canaveral, 3 December 2007 – Following NASA's confirmation, Columbus, the European space laboratory, is now scheduled to be launched on 6 December 2007 at 22.31 CET (21.31 GMT) aboard the Atlantis space shuttle from the Kennedy Space Center in Florida. Columbus is Europe's principal contribution to the International Space Station (ISS). Docking with the ISS is scheduled for Saturday 8 December.

On board Columbus scientists will have the opportunity to conduct experiments in zero gravity – impossible to do on Earth. Astrium has developed and built the Columbus laboratory as industrial prime contractor on behalf of the European Space Agency ESA. Space engineers at Astrium across Europe and particularly in Bremen, Germany, have worked on the 13-tonne space station module for just under ten years. Ten European countries have been involved in the development and construction of Columbus. The major partners in this project were Germany (51%), Italy (23%) and France (18%).

The design of the Columbus module draws on the experience that Astrium gained during the development and construction of the Spacelab space laboratory begun in the late 1970s. Spacelab flew aboard a Space Shuttle 22 times in all up to 1998.

The Columbus laboratory is 8 m long, has a diameter of 4.50 m and at launch weighs almost 13 tonnes, which includes the 2.5-tonne payload. In the laboratory there are ten racks. These are internationally standardised payload cabinets in which the experimental systems can be accommodated.

Columbus, which cost €880 million, has been designed for a mission life of at least ten years. The module provides three crew members with sufficient space to carry out research under zero gravity conditions. In the laboratory, scientists will have the opportunity to carry out experiments in a variety of disciplines (e.g. biotechnology, medicine, material sciences, fluid sciences, human sciences) and also experiments in applied technology projects that would not be possible in the Earth's gravity. Materials and fluids behave differently under zero gravity conditions than they do on Earth. In space, for example, metal alloys merge, while under the influence of gravity they do not unite in an optimum manner. The same applies to fluids that blend in space but not on Earth.

Scientific equipment for Columbus

Various payloads have already been integrated in the racks of the Columbus laboratory in readiness for launch:

- the Biolab, which allows experiments to be conducted on cells, tissue cultures, micro-organisms, small plants and invertebrates.
- the European Physiology Module (EPM), which will assist in investigating the effects of weightlessness on the human organism. The focus will be on phenomena such as osteolysis, changes in the immune system and in the water balance in the human body.
- the Fluid Science Lab (FSL), in which the dynamic behaviour and other phenomena of fluids are examined.
- The European Drawer Rack (EDR), a universal cabinet in which any four small payloads can be connected up for data and video transmissions as well as mechanical and thermal control.

Astrium Friedrichshafen plays an important role in the payloads for Columbus. For decades, the engineers from Lake Constance have been the globally acknowledged experts in developing and constructing equipment for conducting experiments under zero gravity conditions. The Protein Crystallisation and Diagnostic Facility (PCDF) and the Advanced Protein Crystallisation Facility (APCF), which both originate from Friedrichshafen, and the Cardiolab (CL) are also destined for the Columbus laboratory, but will not be integrated until docking with the ISS has taken place.

The fresh air on board Columbus also 'comes' from Lake Constance: the Environmental Control and Life Support System (ECLS) was developed and built in Friedrichshafen. The ECLS monitors the atmospheric pressure, ensures cabin air replacement, detects fire and regulates the air conditioning system that controls the cabin temperature and humidity.

ESA and NASA originally certified that the Columbus laboratory was fit for flight in the summer of 2003. However, the problems with the Space Shuttle delayed further expansion of the ISS so that also the launch of Columbus is later than originally planned. The Astrium engineers in Bremen used the additional time until delivery of the laboratory for additional integration work and tests.

Astrium is also responsible for training the astronauts who will later conduct the experiments in the Columbus module. The training is taking place at the European Astronaut Centre (EAC) in Cologne. A simulation system provided by Astrium was installed in Cologne in

September 2002. A second training system of identical design was delivered to NASA's astronaut training centre at the Johnson Space Center in Houston in early 2003.

Astrium – a central industrial partner in the build-up of the ISS

Astrium is involved in further projects connected with the build-up and operation of the ISS. The company is, for example, the prime contractor for the unmanned space transporter Automated Transfer Vehicle (ATV), which will bring supplies and fuel to the ISS. In addition, after each docking the ATV will repeatedly raise the station a little by means of boost manoeuvres in order to compensate for the gradual loss of momentum and thus prevent the station from dropping out of its prescribed orbit.

Astrium is also the supplier of further experimental systems for ISS that will not be used in the Columbus laboratory but in other station modules. The company is also a participant in the European Robotic Arm (ERA), which is an aid to the astronauts in the assembly of the station and during maintenance tasks.

Furthermore, Astrium and Thales Alenia Space have founded the joint enterprise EURISS for the operation and utilisation of the European part of the ISS. EURISS is the 'mediator' between ESA and the companies involved in the operation and utilisation of the space station and is the sole contractual partner of ESA for all activities involving industrial operation and exploitation of the European part of the ISS.

Astrium, a wholly owned subsidiary of EADS, is dedicated to providing civil and defence space systems and services. In 2006, Astrium had a turnover of €3.2 billion and 12,000 employees in France, Germany, the United Kingdom, Spain and the Netherlands. Its three main areas of activity are: Astrium Space Transportation for launchers and orbital infrastructure, and Astrium Satellites for spacecraft and ground segment, and its wholly owned subsidiary Astrium Services for the development and delivery of satellite services.

EADS is a global leader in aerospace, defence and related services. In 2006, EADS generated revenues of €39.4 billion and employed a workforce of more than 116, 000.

TECHNICAL DATA

<u>Masses:</u>	
<u>Columbus system</u>	<u>10,300 kg</u>
<u>Payload mass</u>	<u>9,000 kg</u> <u>(maximum)</u>
<u>In-orbit mass</u>	<u>19,300 kg</u>

<u>Dimensions:</u>	
<u>Module length</u>	<u>8.00 m</u>
<u>Outer diameter</u>	<u>4.50 m</u>
<u>Total volume</u>	<u>75 m³</u>
<u>Payload volume</u>	<u>25 m³</u>

