



Last mission for the ATV European space freighter

30 July 2014

Space freighter 'Georges Lemaître' launches to the ISS carrying a 6.6-ton load

So far, four European space freighters have carried supplies to the International Space Station (ISS). At 01:47 CEST on 30 July 2014, Georges Lemaître – the fifth and last European Space Agency (ESA) Automated Transfer Vehicle (ATV) – lifted off from the spaceport at Kourou in French Guiana carrying experiments such as an electromagnetic levitator (EML), a furnace, that the German ESA astronaut Alexander Gerst will install and commission. Also on board are items needed for everyday life in space such as coffee and snacks, and additional supplies to replenish the stocks of fuel, water and air. The freighter is scheduled to dock with the Space Station on 12 August 2014.

Volker Schmid, ATV Programme Manager at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) Space Administration, sees the end of an era with the mission of the Georges Lemaître: "All ATV missions so far have gone well; the complex transporters fulfilled their function, carrying supplies to the Station." Jules Verne – the first European space transporter – flew to the ISS in 2008. Since then, there have been three more: Johannes Kepler in 2011, Edoardo Amaldi in 2012 and Albert Einstein in 2013. Now, the programme is drawing to a close with the 20-ton ATV-5 Georges Lemaître. Instead of following up with an ATV-6, the Europeans will make their contribution to the ISS by developing the propulsion and resource module ESM (European Service Module), designed to support the NASA Orion spacecraft with four astronauts on board. "With end of the ATV programme, the international partners – the US Dragon and Cygnus transporters, the Russian Progress and the Japanese HTV – will compensate for the European part of the ISS resupply task," says Schmid. "The development of ATV technology for the Orion Multi-Purpose Crew Vehicle (MPCV) will allow Europe to also play a major role in manned missions to, for example, the Moon."

A furnace in microgravity

The last ATV will transport a payload of 6555 kilograms to the inhabitants of the Space Station. The EML – which weighs roughly 400 kilograms – is the heaviest individual item; its purpose is to melt and analyse a variety of metal alloys without the test material coming into contact with a container. Alexander Gerst is particularly looking forward to this experiment in materials physics; he will be responsible for installing the system in the European Columbus laboratory and conducting the initial test run.

A total of 18 specimens for research by DLR scientists are being transported to the Space Station together with this system and will deliver initial data from the microgravity environment once the installation is successfully completed. The effects of gravity prove disruptive when the tests are conducted on Earth, for instance using the EML ground model at the DLR Institute of Materials Physics in Space. These forces are not present on board the ISS, meaning that material properties such as density, viscosity, electrical conductivity and thermal expansion coefficient can be measured precisely and then incorporated in computer models. In turn, these models help to optimise industrial casting processes.

Experiments ranging from astrophysics to nutrition

Another experiment currently on its way to space is the DLR Magnetic Field Experiment (MFX) instrument: "The objective is to analyse the interaction between Earth's magnetic field and an electrical conductor – thus allowing us to simulate the interchange between the interplanetary magnetic field and objects within the Solar System", explains Volker Schmid. There are also some special items of clothing for Alexander Gerst's fitness programme on board; the Spacetex

experiment is designed to investigate new textiles that, after their use in space, will be analysed back on Earth to determine microbial contamination and the development of odours, helping the scientists expand their knowledge of the body's heat exchange mechanisms under extreme environmental conditions. Other experiments on board the ATV-5 are intended to provide information on how much energy the astronauts need (ENERGY) or to measure environmental conditions to transmit the data to a base station using a Wireless Sensor Network (WiSeNet).

Vital necessities for the space station and crew

The ATV is not only used to transport experiments. Almost 3000 kilograms of fuel are also being carried to the Station to replenish the Russian fuel tanks on the ISS and to conduct orbital corrections on the ISS; the ATV performs these regularly during the months when it is docked with the Space Station. There are also 855 kilograms of drinking water from a spring close to the Italian city of Turin. The spare parts in the cargo hold of the Georges Lemaître include a pump used on board the ISS to convert urine into drinking water. "Each ATV brings very different freight to the Space Station – depending on what is needed," explains Schmid.

The first unloading task falls to Alexander Gerst, who will also be responsible for monitoring the automatic docking procedure for the ATV in August 2014. He will transport the electromagnetic levitator from the cargo hold to the Columbus research module. Only then will the remaining freight be accessible, and that is bound to include the odd item that Gerst and his colleagues will see as welcome variety on their everyday menu. Georges Lemaître is carrying 'bonus food' – the astronauts' personal favourites. The German astronaut asked for his package to include Kässpätzle (cheese noodles), lentils, sausages and semolina. The arrival of the ATV will also replenish the stocks of coffee on board the ISS. Finally, a small 'Orbit Heart', no bigger than a golf ball, from the Stiftung KinderHerz (Children's Heart Foundation) charity rounds off the supplies. The charitable foundation funds the treatment of congenital heart defects among children, using technologies developed for aerospace, among them tiny saucer-like disks made of NiTiInol (a nickel-titanium shape memory alloy), a material first used for satellite components and now employed to close holes in children's hearts.

Scientific data to the end

The space transporter will remain docked with the Space Station for roughly six months. It will then be dispatched on its final journey towards Earth's atmosphere, filled with several tons of waste. A controlled re-entry will take place over the South Pacific and the ATV-5 will disintegrate and burn up – while sending important data back to Earth, helping the engineers acquire valuable insights for the end of the ISS and its eventual return to Earth's atmosphere.

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Launch of ATV-5



The European ATV-5 space transporter launched on 30 July 2014 at 1:47 CEST.

Credit: ESA.

Cargo compartment of the ATV-5



6555 kilograms of cargo were stowed on board the European space transporter ATV-5 'Georges Lemaître'. This included food for the astronauts, supplies of fuel, water and air, and scientific experiments. On 30 July 2014, the Automated Transfer Vehicle lifted off en route to the International Space Station.

Credit: ESA/CNES/Arianespace.

ATV-5 approaching the International Space Station



Artist's impression of the European space transporter ATV-5 'Georges Lemaître' automatically docking with the International Space Station. German ESA astronaut Alexander Gerst will monitor the manoeuvres and intervene if necessary.

Credit: ESA.

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