



New 'room' for the ISS - ATV-3 now docked

29 March 2012

Rendezvousing at 28,000 kilometres per hour at an altitude of about 380 kilometres is hardly routine – even for experienced spaceflight engineers and astronauts, which is why applause broke out in the European Space Agency (ESA) Automated Transfer Vehicle (ATV) Control Centre in Toulouse when the third European space transporter, 'Edoardo Amaldi', docked with the International Space Station (ISS) at 00:31 CEST (22:31 UTC) on 29 March 2012.

"If everything goes to plan, ATV-3 will leave the ISS on 27 August 2012 and burn up during a controlled re-entry into Earth's atmosphere," explains Volker Schmid, Head of the ISS Division at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) Space Administration, who is responsible for coordinating the German contributions to the ESA ATV programme. The third model in the ATV series, named after Italian physicist and space flight pioneer Edoardo Amaldi, was launched six days ago, on 23 March 2012, from Europe's Spaceport in French Guiana. The 20-ton ATV 3 navigated autonomously and docked with the Space Station automatically. ESA astronaut André Kuipers monitored the process with his colleagues on the ISS.

ATV is the European supply and propulsion spacecraft for the ISS. Compared to its predecessors, 'Jules Verne' (2008) and 'Johannes Kepler' (2011), 'Edoardo Amaldi' has some 600 kilograms of additional payload on board. In total the ATV 3 is bringing almost seven tons of payload to the ISS. "Besides food and clothing, water and air, experiments and medical equipment, this mainly consists of fuel for the Russian Svezda module – which the ATV 3 is docked to – and for the nine planned ISS orbital corrections that will be carried out between now and August," says Schmid. These manoeuvres are necessary at regular intervals to compensate for the ISS being slowed by drag due to the residual atmosphere and the resulting loss of altitude.

From a scientific perspective, the valuable cargo includes a Re-entry Break-up Recorder (REBR). This device will record the accelerations experienced by the ATV 3 during re-entry and will not burn up. Says Volker Schmid: "The recorder will transmit data to a ground station via an Iridium communications satellite during the final flight phase. This will enable us to draw conclusions about the forces exerted on the ATV during re-entry." The ATV 3 has also brought nine experiments and hardware subsystems to the ISS, including two experiment modules for the US space agency, NASA, nine samples for ESA's ALTEA-Shield radiation dosimetry experiment, material for taking samples of human excreta for ESA's ENERGY experiment, replacement electronic components for the BIOLAB laboratory in the European Columbus ISS module and measuring equipment for the NASA VO2max experiment, which deals with changes in lung capacity during weightlessness. ATV 3 also carried a special fluid-management pump to the ISS, which is part of a system that the astronauts can use to convert urine into drinking water.

'Edoardo Amaldi' consists of a propulsion module with four main engines and 28 small thrusters for attitude control, an avionics module with the electronics required for the mission, and the integrated cargo space. It has docked directly with the Zvezda module and will gradually be emptied by the astronauts on board the space station over the coming months. The docking itself took around three and a half hours to complete, and was carried out using four optical sensors over the final 250 metres prior to docking. Laser pulses were directed at reflectors on the Zvezda module, in order to measure the distance, relative position and approach speed. ATV 3 first came to a halt some 40 kilometres behind the ISS before slowly approaching the Space Station.

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Artist's impression of the ATV 3-docking manoeuvre



Artist's impression of ATV 3, 'Edoardo Amaldi', approaching the Zvezda module on the International Space Station (ISS). The cargo carrier was assisted by a wireless link to the Russian module, referred to as the 'proxy link', and relative GPS measurements. For these, the satellite-based global navigation system position data obtained from the ISS and ATV on-board computers is evaluated and compared; the results are used for making fine adjustments to the position of ATV-3. The Russian KURS radar supports navigation from a distance of about 3.5 kilometres. Over the last 250 metres, an optical sensing system sent laser pulses to four reflectors on the Zvezda module and calculated distance, relative position and approach speed on the basis of the reflected signals. For the final 50 meters, ATV-3 navigated using a video system. The docking manoeuvre took a total of three and a half hours.

Credit: ESA.

'Edoardo Amaldi' will raise the ISS orbit on a regular basis



ATV 3 is expected to remain docked with the Zvezda module in the International Space Station (ISS) until 27 August 2012. Over the coming months, the space transporter will regularly raise the orbit of the ISS.

Credit: DLR.

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