



Choreography with the ISS robot arm

15 July 2014

At 12:39 CEST on 16 July 2014, the Cygnus Orbital-2 transport vehicle will approach the International Space Station (ISS), closing to a separation of just 12 metres. At this moment, astronaut Alexander Gerst and his colleague Steve Swanson will be called on to capture the transporter and dock it with the Space Station. While Swanson operates the robot arm, Gerst's tasks will include controlling its cameras. The German ESA astronaut trained for this manoeuvre long before journeying into space, and has been repeating the exercises over the course of the past week on board the ISS. "There is an elaborate choreography that the team follows," says astronaut coach Norbert Illmer from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR).

"Like a cobra waiting for its prey," is how Alexander Gerst describes the over 17 metre-long robot arm Canadarm-2, which can move along the outside of the ISS using its seven joints. When the orbiter arrives, having set off for the ISS at 18:52 CEST on 13 July 2014, Alexander Gerst and Steve Swanson will be waiting in the cupola. "Gerst will assume the role of assistant in this capture manoeuvre, acting as 'wingman' for the operator, Swanson," explains Illmer. The astronauts are trained for both functions – and could switch roles at any time if necessary.

Before the robot arm can perform the capture, Gerst must check that both the Space Station and the transporter are floating freely and not being manoeuvred. Only then will Swanson be able to control the robot arm and reach out for the spacecraft. To ensure that he has the best view of what is happening outside the ISS, his assistant Alexander Gerst will, among other things, adjust camera angles and zoom settings to suit the situation. "Swanson will concentrate on control, while Alexander keeps an eye on the big picture," says Illmer. "The manoeuvre cannot be executed without this teamwork." The 'hot' phase, that is when the robot arm is used to capture the transporter, lasts 20 minutes. Then comes a final check, before, over the course of one or two hours, the Cygnus Orbital-2 is docked with the US Harmony node of the ISS..

Equipment, experiments and food

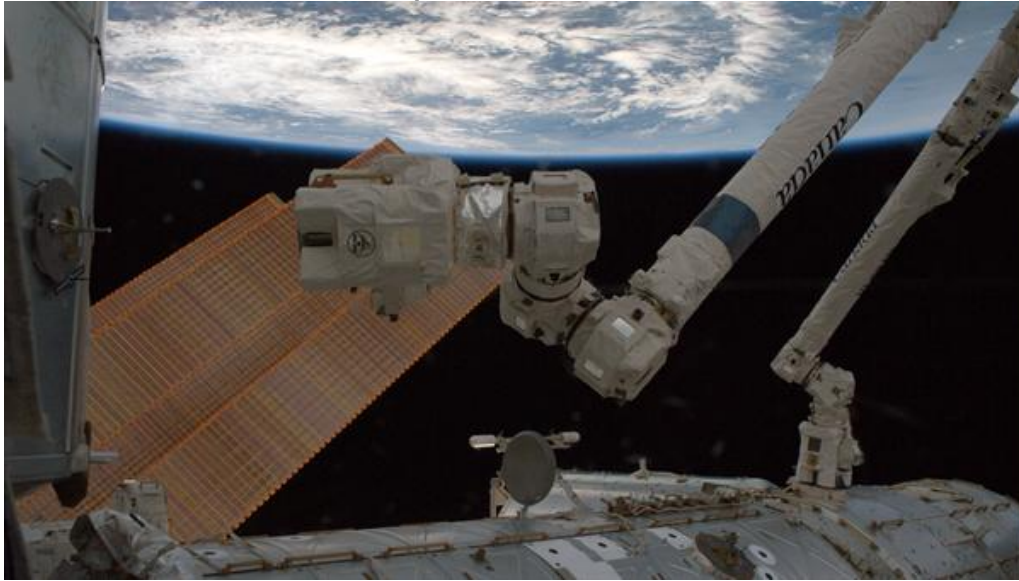
One day later, the hatch between the Space Station and the transporter will be opened. The transporter is bringing almost 1500 kilograms of freight to the ISS. In addition to a swarm of small satellites known as CubeSats, the delivery includes a variety of US student experiments, parts for the Space Station and equipment for spacewalks. The astronauts are likely to enjoy the 764.2 kilograms of food supplies and crew packages that will also arrive on board the Cygnus Orbital-2. The transporter will start its return flight in roughly one month, filled with waste and performing a re-entry above the South Pacific.

Alexander Gerst will also play a role in the arrival of the European space transporter ATV-5, expected on 12 August 2014, when he will monitor the automatic docking process, aborting the procedure if necessary. This time the freight reaching the ISS will weigh 6500 kilograms, including a furnace (Electromagnetic Levitator; EML) intended for materials science experiments.

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Robot arm on the International Space Station



The robot arm Canadarm-2 on the outside of the International Space Station is almost 17 metres long and fitted with seven joints.

Credit: ESA/NASA.

Training for the grappling manoeuvre



During his astronaut training, Alexander Gerst was also qualified to capture and dock space transporters. On board the ISS, he trained on the procedure involving grappling manoeuvres in a microgravity environment in preparation for the arrival of the Cygnus Orbital 2.

Credit: ESA/NASA.

Teamwork on the ISS



The astronauts have plenty to do when transporters arrive at the International Space Station ISS carrying freight – it takes teamwork to execute and monitor the manoeuvres.

Credit: ESA/NASA.

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