



Two more satellites for the Galileo system

11 October 2012

Update: On 12 October 2012 at 20:15 CEST, a Soyuz ST-B launcher carrying two more satellites for the European Galileo navigation system lifted off from the European Spaceport in French Guiana.

The first two satellites for the European Galileo navigation system have been orbiting Earth since 21 October 2011. Now, two more are about to follow; on 12 October 2012 at 20:15 CEST, a Soyuz rocket will launch satellites three and four into their position in space. Four satellites will then be flying in their orbits at an altitude of 23,000 kilometres. For Walter Päßgen, Director of the DLR Space Applications Company (Gesellschaft für Raumfahrtanwendungen; GfR), this is a highpoint of the programme thus far: "With signals from four Galileo satellites, we can determine a location on Earth for the first time." The satellites are controlled from the Galileo Control Centre at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) site in Oberpfaffenhofen.

To be well prepared for the next challenging phase of implementing the satellite navigation system, during the last few weeks his staff were put to the test with simulated failures during rehearsals for satellite operations. "Everyone needs to be trained to respond quickly and safely in an emergency." Additional intensive training programmes were also part of the work of the crew in the control room. The compatibility of the two satellites – named David and Sif after two children from the Czech Republic and Denmark – has also been tested at the Control Centre while they were on the ground.

Precise placement in orbit

It will take close to four hours for David and Sif to arrive at their destination and separate from the upper stage of the launcher. Several control centres around the world will be participating in the mission during launch and commissioning of the Galileo satellites. The local control centre will carry out the launch from Europe's Spaceport in French Guiana. Then, the French space agency (CNES) control centre in Toulouse will take over and make the initial contact with the new satellites. After seven days, on behalf of the European Commission and the European Space Agency, the team in Oberpfaffenhofen will be responsible for the two additional satellites and position them in the correct orbit. Then the navigation systems will be put into operation; the Galileo Control Centre in Oberpfaffenhofen will activate the atomic clocks on board the satellites, the signal generators and the radio equipment for transmitting and receiving signals. During the subsequent operational phase, the German control centre will monitor the status of the satellites and their on-board instruments, as well as their orbits. The Italian control centre in Fucino is responsible for the synchronisation of the atomic clocks and the production of navigation data; a Belgian antenna station in Redu will support the German Galileo Control Centre during a test phase lasting several months.

First positioning with Galileo satellites

It is expected that position determinations using a Galileo receiver will be performed for the first time in the spring of 2013. "Each time that the four satellites are within range of the receiver, it will be possible to calculate your location on the ground from the transit time of the signal and the position of the satellites in space," explains Päßgen. The European navigation system will only be complete when a total of 30 satellites are circling Earth in three orbital planes. The atomic clocks on board the satellites, which provide the transmission time of the signals to an accuracy of billionths of a second, are so precise that after a million years they will have gained or lost only one second. Other atomic clocks, including those at the Galileo control centres in

Oberpfaffenhofen and Fucino, act as the reference time source. "This level of precision has never been reached before," stresses Päßgen. "This makes the Galileo navigation system more accurate than the current United States GPS system."

Päßgen is satisfied with the progress of the system so far; the operational phase is proceeding without serious incidents and the satellites are very reliable. Each satellite sends at least 20,000 signals concerning its status to Earth – data that is continuously analysed in the control centre in Oberpfaffenhofen. The Galileo control centre staff are looking forward to working with two additional satellites: "We have now established a routine from the flight of the two almost identical first satellites."

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The 'upper composite'



The 'upper composite' of the launch system, made up of the launcher's fourth stage, Fregat-MT, the two Galileo satellites and the fairing.

Credit: ESA–S. Corvaja, 2012.

Soyuz launch site



The lower three stages of the Soyuz launcher were rolled out to the launch complex (Ensemble de Lancement Soyuz; ELS) from the launcher assembly and test building (монтажно-испытательный корпус; montazhno-ispytatelnyy korpus; MIK) at Europe's Spaceport in French Guiana on 8 October 2012. After the launcher was erected, the 'upper composite', consisting of the launcher's fourth stage (Fregat-MT) and the two satellites was connected to the lower stages.

Credit: ESA–S. Corvaja, 2012.

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