

# Galileo Ground Network Laid



As Europe prepares for October 2011 launch of the first Galileo satellites, a worldwide ground network is being put in place. Contracts signed in June 2011 cover satellite control and the systems needed to generate Galileo services.

Europe's satellite navigation system will begin to take shape in space later this year, when the first two Galileo In-Orbit Validation satellites are launched by the first Soyuz flown from French Guiana.

Out of six Work Packages for Europe's satnav system to reach full operations, four are already in place. The remaining two were signed during the Paris Air & Space Show at Le Bourget.

The signing ceremony was introduced by Laurent Wauquiez, French Minister for Economic Affairs, and Jean-Jacques Dordain, ESA Director General. Work Package 2 was signed by Reynald Seznec, CEO of Thales Alenia Space France, and Didier Faivre, ESA Director for Galileo and Navigation-related Activities. Work Package 3 was signed by Colin Paynter, Managing Director of EADS Astrium, and Director Faivre.

Work Package 3 covers completion of the Ground Control Segment, the network to monitor and control the satellites and the ground elements. The current system can handle the constellation up to the eighteen satellites of the first operational phase, expected by mid-decade. The control segment already deployed for the first four satellites consists of a Galileo Control Centre in Oberpfaffenhofen, Germany and two Telemetry, Tracking and Command facilities in Kourou, French Guiana and Kiruna, Sweden. The control centre oversees the satellites and intervenes as needed, with routine 'housekeeping' commands generated automatically along with critical commands from human operators. In preparation for the first operational stage, the second control centre in Fucino, Italy will be added, as well as two further ground stations in Noumea, New Caledonia and St Denis, Reunion Island.

Work Package 2 covers completion of Galileo's Ground Mission Segment, which generates all the products for supporting navigation services and maintaining their accuracy. The current system can handle the constellation up to the first operational phase. Users derive their three-dimensional position and local time by measuring their range from four or more satellites. High levels of service accuracy are provided by extremely accurate onboard atomic clocks coupled with the precise position of each satellite. Both the clocks and the satellites themselves are subject to drift. A network of Ground Sensor Stations is to be set up to monitor the timing accuracy and orbital position of the satellites and their signal quality.

This information is passed to the control centre for updating the orbits and synchronising their time. The resulting corrections are then relayed to the satellites via a network of uplink stations to be disseminated as part of Galileo's navigation signal to users.

The Ground Mission Segment also forwards search and rescue signals detected by the constellation to the authorities and can disseminate commercial data as part of Galileo's Commercial Service. The current mission segment for the first four satellites consists of a control centre in Fucino, eight sensor stations around the world on European territory and five similarly distributed uplink stations. For the first operational phase, the mission segment will also be added to the Oberpfaffenhofen control centre, making the two control centres redundant, as well as eight more uplink stations.