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# Anxious months for Galileo project

**By the end of June,** satellites seven and eight of the European Commission's planned constellation of 30 Galileo navigation satellites are scheduled to go into service, according to the European Space Agency, which is testing and commissioning the satellites.

Next year will be crucial for Galileo and satnav services around the world. The constellation is supposed to be filled out enough by end of 2016 to provide more reliable coverage than U.S.-based GPS in high-rise cities and in northern Europe. The Galileo constellation will orbit at a higher altitude than GPS, giving each satellite a wider cone of coverage and increasing the number of satellites that smartphones or other devices can connect to.

Currently, the European Global Navigation Satellite Systems Agency says more than 60 percent of all receivers support a minimum of two constellations. More than 20 percent support all four — the United States' GPS, Europe's Galileo, Russia's GLOBal Navigation Satellite System and China's BeiDou network.

The European Commission wants to have 14 Galileo satellites deployed by 2016. That should clear the way for a range of initial services, including free public services for vehicle navigation and mobile-phone location services, an encrypted, publicly-regulated service for government users, and a search-and-rescue service. Two other services will follow: an encrypted, highly-accurate commercial service and a safety-of-life service for rail, marine and aviation network management. These services will guarantee users a minimum standard of availability and accuracy, making Galileo suitable, for instance, for air-traffic management.



A Soyuz rocket carrying the Galileo satellites lifts off in March from Europe's Spaceport in French Guiana.

According to the 2015 GNSS Market Report, about 6 percent of Europe's gross domestic product depends on satellite navigation services. Until now, those have been based on the U.S. Department of Defense's GPS. Galileo will guarantee Europe's governments and businesses a civilian-controlled satellite navigation system that will provide coverage at latitudes up to 75 degrees north, the most northerly tip of Europe, that GPS can't always cover. It will also open way for European companies to compete in market for chip sets and related software and hardware products now worth \$250 billion annually, ac-

ording to the Global Navigation Satellite Systems Agency.

"The program managers are under immense pressure to deliver this key European project," says David Gleave, an aviation safety technology expert in the U.K. "The longer that Europe relies on pure GPS, then the greater the foothold that U.S.-led companies will gain in the general satellite navigation and accurate timing business areas."

But the European Commission may have trouble meeting its 2016 timetable because of an errant launch last August. A Russian Fregat upper stage released satellites five and six into the wrong orbit. That left them in elliptical orbits where, at their high point, the satellites were flying 25,900 kilometers above Earth but at their low point, just 13,713 kilometers, instead of circular orbit at an altitude of 23,222 kilometers. The European Space Agency's ground staff have nudged them back into the target orbit by activating their hydrazine thrusters so that they no longer dip into the Van Allen radiation belt, which can damage sensitive on-board electronics.

With eight satellites in orbit and four more planned for launch during the rest of this year, program managers will have a much clearer understanding of how Galileo's satellite navigation network likely will perform.

"With more satellites in view, you will be able to derive a Galileo generated position for more hours of the day. This will make it possible to generate the statistics to prove how close the system performance is to the original design," says Philip Church, principal consultant with U.K. aviation consultants Helios.

**Philip Butterworth-Hayes**  
phayes@mistral.co.uk