

Salvaged Galileo Satellites to Start Broadcasting Signals



Europe's fifth and sixth Galileo satellites, which were salvaged from their faulty launch into working orbits, are set to begin broadcasting working navigation signals for test purposes. This activation will allow satnav-receiver manufacturers, service providers and scientific researchers to make use of these test signals. The European Commission is due to decide whether these satellites will become part of the operational Galileo constellation.

A malfunction in their Soyuz-Fregat upper stage during the 22 August 2014 launch placed Galileos 5 and 6 into highly elliptical – or elongated – orbits instead of their planned circular medium-Earth orbits. A team based at ESA's ESOC control centre in Darmstadt, Germany, then performed a complex series of manoeuvres to raise and circularise their orbits.

The satellites lacked sufficient fuel to reach their originally envisaged orbits, but the salvage meant that their navigation payloads could then be operated on an ongoing basis; their initial orbits dipped the satellites too close to Earth to keep their antennas properly locked on the planet.

In-orbit testing

Once their orbits were modified, their navigation payloads could be turned on and in-orbit testing could take place, explained Marco Falcone, head of the Galileo system office. The good news was their performance was excellent.

Now they will be tested on a more sustained basis, along with the rest of the Galileo satellites. A pair of 'Notice Advisory to Galileo Users' (NAGUs) informing the user community of their availability for testing purposes have been published on the European Global Navigation Satellite System Service Centre website. Users are welcome to provide feedback on their usage of GSAT0201 and GSAT0202 by contacting the [GSC helpdesk](#).

Navigation signals

Switching on their navigation signals allows ESA to evaluate the entire spectrum of performance of the satellites on an end-to-end basis. The navigation signals will include a signal health status reading that 'signal component currently in test' and its navigation data validity status will be 'working without guarantee'. In this way, these signals will not disturb the performance of any receivers using the Galileo signals coming from the other satellites, Falcone continued.

On the user community side, some application providers are interested in harnessing as many available satellites as possible for precision applications, he added.

Harder to locate

Because these satellites are not placed in nominal Galileo orbits, the orbital almanacs included in Galileo's navigation signal will leave out their orbital positions, making Galileos 5 and 6 harder for receivers to locate – although the GSA website will give acquisition details.

Their testing will take place in two phases: initially their navigation signal will be updated via the Galileo ground segment every 14 hours or so. Later on this year, the ground segment will be reconfigured to upgrade the update frequency more often, greatly enhancing their navigation precision – although they will remain outside the official Galileo constellation until decided otherwise.

The two satellites have not been idle since their in-orbit testing was completed. Instead, they are midway through an ambitious space experiment to test [Einstein's General Theory of Relativity](#) more precisely than ever before, by measuring how their onboard time varies in accordance with their altitude and therefore gravity, known as their 'gravitational redshift'.

This experiment uses only the carrier wave of the signals, so will be unaffected by the transmission of navigation messages by satellites 5 and 6.