

Galileo satellite set for new orbit

November 10 2014



Galileo satellites are placed in medium orbits, at 23 222 km altitude along three orbital planes so that a minimum of four satellites will be visible to user receivers at any point on Earth once the constellation is complete. The fifth and sixth Galileo satellites, launched together on 22 August 2014, ended up in an elongated orbit travelling out to 25 900 km above Earth and back down to 13 713 km. In addition, the orbits are angled relative to the equator less than originally planned. Credit: ESA-P. Carril

ESA's fifth Galileo navigation satellite, one of two left in the wrong orbit

this summer, will make a series of manoeuvres this month as a prelude to its health being confirmed.

The aim is to raise the lowest point of its orbit – its perigee – to reduce the radiation exposure from the Van Allen radiation belts surrounding Earth, as well as to put it into a more useful orbit for navigation purposes.

Should the two-week operation prove successful then the sixth Galileo satellite will follow the same route.

The Galileo pair, launched together on a Soyuz rocket on 22 August, ended up in an elongated orbit travelling out to 25 900 km above Earth and back down to 13 713 km.

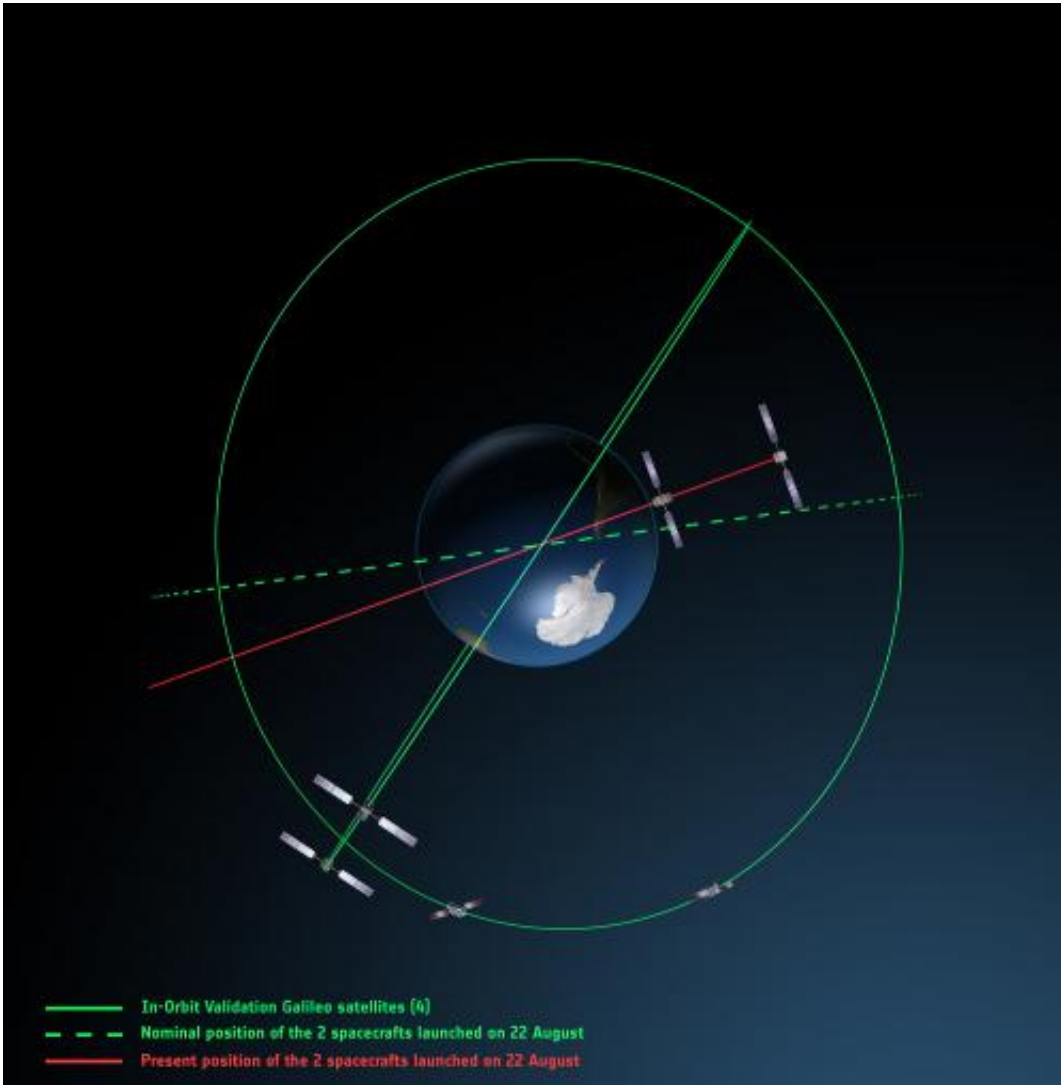
The target orbit was a purely circular one at an altitude of 23 222 km. In addition, the orbits are angled relative to the equator less than originally planned.

The two satellites have only enough fuel to lift their altitude by about 4000 km – insufficient to correct their orbits entirely.

But the move will take the fifth satellite into a more circular orbit than before, with a higher perigee of 17 339 km.

"The new orbit will fly over the same location every 20 days," explains Daniel Navarro-Reyes, ESA Galileo mission analyst.

"The standard Galileo repeat pattern is every 10 days, so achieving this will synchronise the ground track with the rest of the Galileo satellites.



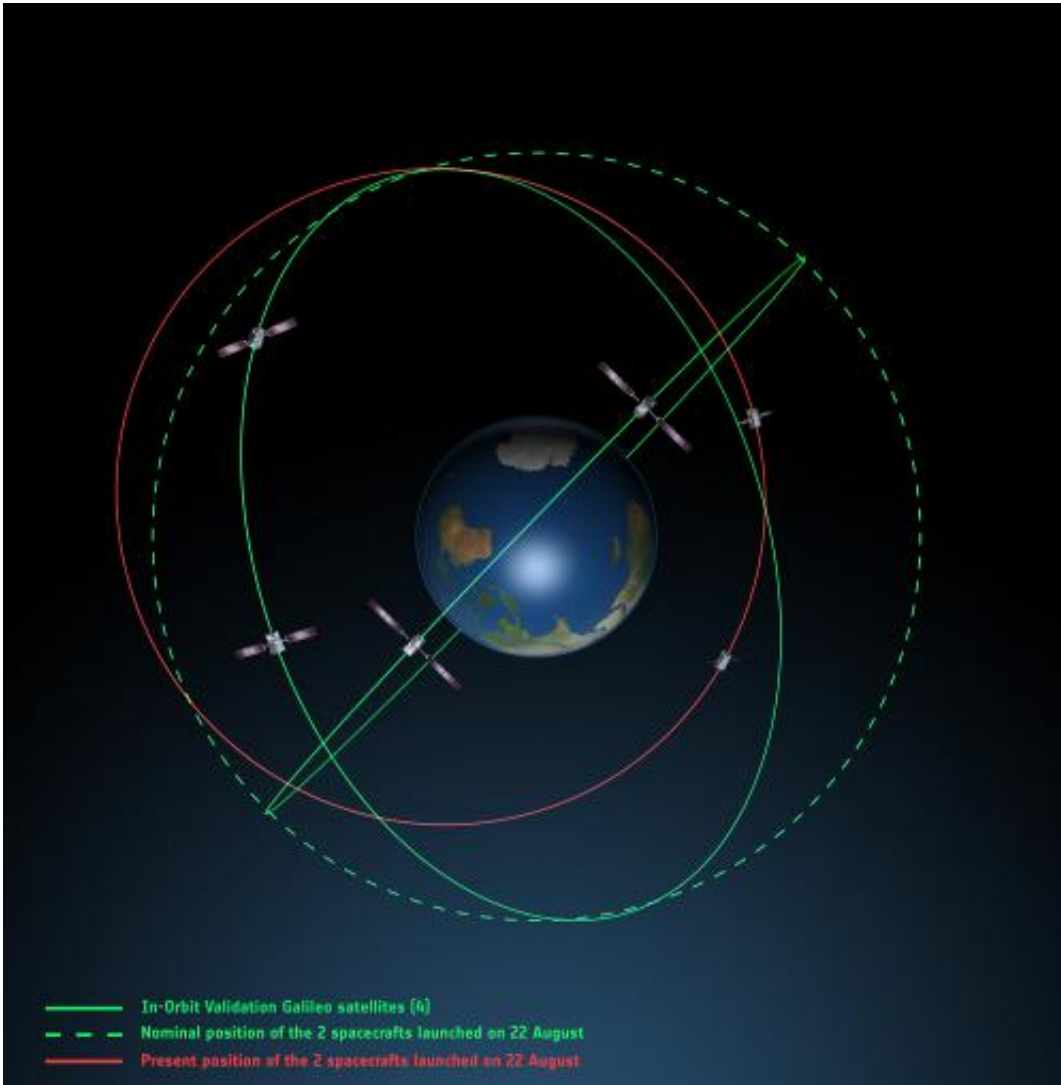
Orbits of the fifth and sixth Galileo satellites launched together by Soyuz on 22 August 2014, in red, compared to their intended position, in dashed green, and the position of the four satellites launched in 2011 and 2012 in solid green. This view looks down over Earth's South Pole, helping to illustrate how the two satellites' orbital inclination relative to the equator is less than was intended. In addition, the satellites are in an elliptical rather than circular orbit, with a maximum altitude of about 25 900 km and a minimum altitude of about 13 700 km. This compares to a planned circular orbit of 23 222 km. The satellites are in a safe state, correctly pointing towards the Sun, properly powered and fully under control. Credit: ESA

"In addition, from a user receiver point of view, the revised orbit will reduce the variation in signal levels, reduce the Doppler shift of the signal, and increase the satellite's visibility.

"For the satellite, reducing its [radiation exposure](#) in the Van Allen radiation belts will protect it from further exposure to charged particles.

"The orbit will also allow Galileo's Earth Sensor to hold a stable direction for the satellite's main antenna to point at Earth.

"Right now, when the satellite dips to its lowest point, Earth appears so large that the sensor is unusable. The satellite relies on gyroscopes alone, degrading its attitude precision."



Present orbits of the fifth and sixth Galileo satellites launched together by Soyuz on 22 August 2014, in red, compared to their intended position, in dashed green, and the position of the four satellites launched in 2011 and 2012, in solid green. This view looks side on to the two satellites' orbital plane, which is off-centre relative to Earth. The targeted orbit was circular, inclined at 55° to the equator at an altitude of 23 222 km. The satellites are instead in an elliptical orbit, with a maximum altitude of around 25 900 km, a minimum altitude of around 13 700 km and a lower inclination. The satellites are in a safe state, correctly pointing towards the Sun, properly powered and fully under control. Credit: ESA

The recovery is being overseen from the Galileo Control Centre in Oberpfaffenhofen, Germany, with the assistance of ESA's Space Operations Centre, ESOC, in Darmstadt, Germany.

France's CNES space agency is providing additional ground stations so that contact can be maintained with the satellite as needed.

The two satellites were previously Sun-pointing. "On 3 November that changed for the fifth satellite, as it transitioned to normal Earth-pointing mode," adds Daniel.

During November, some 15 manoeuvres will take the satellite into its new orbit. Once there, it can formally begin in-[orbit](#) testing. The host [satellite](#)'s health is checked first, followed by more detailed navigation payload testing.

Provided by European Space Agency

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