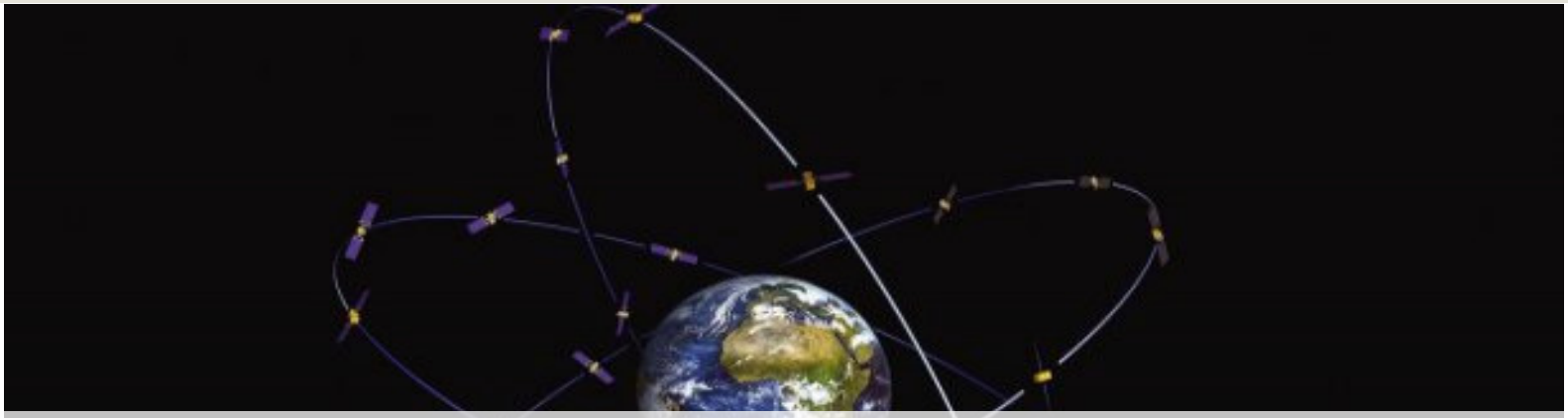

GALILEO, the European alternative to GPS

military-Earth thinking notebook

le capitaine Xavier BOULLARD

Published on 12/08/2018

Sciences & technologies

With GALILEO, a civilian alternative to the American GPS and Russian GLONASS, Europe gains its independence in terms of positioning and radionavigation.

It was in 2002 in Brussels, more precisely on 16 March 2002, that the Council of Transport Ministers of the European Union (EU) validated the development phase of the Galileo programme, the European satellite navigation system. The big difference with the US Global Positioning System (GPS) or Russia's GLONASS comes from its financing and control. Indeed, the GALILEO satellite radionavigation system is the European civilian alternative to GPS and GLONASS, both financed and controlled by military authorities. But this is not GALILEO's only asset. Drawing on the experience of the veterans of satellite positioning and benefiting from the latest technological prowess, GALILEO will enable users equipped with a suitable receiver to know their position in real time, with an accuracy of between 10 and 1 m. These two points make Galileo a significant alternative to the giants of the sector. But before going a little more into Galileo technology, let's make a little history before ending with the road ahead.

The European satellite navigation system came into being in 2002 and, in December 2004, the same Transport Council authorised the operational deployment of GALILEO and confirmed the five services that the system will offer, including the PRS (Public Regulated Service) for secure applications.

On 28 December 2005 the first satellite was launched. Giove-A is the first satellite in the GALILEO constellation, which will eventually comprise 30 satellites (six more than GPS).

It was not until November 2007 that public funding for the deployment of the system was authorised. In fact, it was following the end of the selection process for a private concession that the ministers decided on a method of public funding. This decision led to the launch of a second satellite, Giove-B, on 27 April 2008.

The launch of the first 4 operational satellites developed under the Galileo SAT programme should take place in 2010-2011. ESA Director General Jean-Jacques Dordain stated in June 2009 that the launch and deployment of the remaining 26 satellites is scheduled to start in September 2010, with launches in pairs. All are scheduled to be operational in 2012-2013. Thanks to its 30-satellite architecture, GALILEO is expected to be used for a wide range of applications in many sectors of activity such as air and road transport, maritime navigation, agriculture, etc.

The system operates on the principle of returning information from three main segments: space, control ground and mission ground. For space, Galileo is a constellation of thirty satellites placed in three circular orbits at an altitude of 23 616 kilometres. Each satellite weighs 700 kilograms and contains, among other things, several atomic clocks, solar panels providing a maximum power of 1 500 watts, a transmitter and a radio receiver. Each orbit has a back-up satellite. The control ground segment is responsible for controlling the satellites from two (or even three) centres located in Europe. In addition to these control centres there are five stations which maintain the remote control and telemetry links with the satellites. It should be noted that the GRC (Ground Receiver Chain) receivers processing PRS (Public Regulated Service) signals are developed by the company Thales. Finally, the mission ground segment is responsible for designing the navigation messages broadcast by the satellite, detecting any anomalies and notifying users, as well as measuring the system's performance. These mission centres are co-located with the control centres in order to carry out orbitography calculations and ensure the broadcasting of the various messages. The monitoring and performance measurement functions are performed by a dozen ground stations transmitting the navigation message to the satellites, and by more than forty stations receiving signals from Galileo SAT. The aim of this complex system is to improve the quality of the positioning signal in order to obtain hitherto unrivalled precision (GPS 20m, Galileo 1m). This precision could, for example, make it possible to automate the port movements of very large ships, or to improve the targeting of missiles.

Although the GALILEO programme dates from 2002, operational implementation is planned for 2013. Compared with the various space programmes such as Apollo and the International Space Station (ISS), which took more than 20 years to see the light of day, the 10 years it took to reach maturity is still a relatively short development period. As early as 7 May 2007, the first signals sent by Giove-A were received by the mission centres. One year later, Giove-B sent the positioning signals allowing the start of full-scale tests.

Since[1] October 2009, EGNOS (European geostationary navigation overlay system) is the first European satellite positioning system open to the general public. In the meantime, Giove-B, in cooperation with the GPS system, sends positioning messages to stations and centres on the Earth's surface. The latter refine the positioning by comparing their true position with the position given by the system. The resulting error is then stored and subtracted from the satellite positions. The nominal accuracy of the GPS, which is about 20 metres, is thus increased to a horizontal accuracy of 2 metres with EGNOS, with reliable signals. These tests have demonstrated that the principle of separating the different segments of the positioning system, with a ground part refining the information from the space part, is a winning bet. Thus, with the launch of two satellites per month from 2012, the 30 satellites in the GALILEO constellation should be operational from 2013. Those in a hurry can always equip themselves with an EGNOS-compatible system and thus benefit from near-perfect precision in relation to the 23 000 km that separate them from the satellite.

Called up from the contingent, which entered into service in December 1992 as a VSL, Captain BOULLARD, as soon as he leaves the

EOR at SAUMUR, joins the 5th RD stationed at VALDAHON as his first assignment. After 4 years as tank platoon leader on AMX30 B2, he joined the EMIA in 1997. On leaving, he chose ALAT, with two years of training, before joining the 3rd RHC. Patrol leader on the VIVIANE helicopter, then deputy and finally commander of this squadron from 2005 to 2007, he then served as chief of operations for the Air Force.riennes and finally as Deputy Senior Officer before joining the École des Transmissions, to follow a technical diploma course "Télécom-réseaux".

Title : le capitaine Xavier BOULLARD

Author (s) : le capitaine Xavier BOULLARD

Release date 06/08/2018