Yes, the Galileo programme is important for Europe.

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le Chef d'escadron Lilian MAÎTRE

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There are more and more satellites in space every day and their use has become a daily occurrence in a wide variety of applications and fields such as Earth and space observation, cartography and mobile telephony, but also geolocation and positioning, in particular with the Galileo system. The author shows us that the latter, which is entirely European, will bring significant added value to civilian users as well as security and defence actors.

Galileo is the name of the future European positioning system. This ambitious space programme was first mentioned in a 2001 European Union (EU) Transport White Paper. It has gone through several delicate phases. It was originally intended to be a public-private project. However, after several years of prevarication over its cost and financing, and due to differing objectives among the different contributors, it was decided toIn 2007, it was finally decided that the EU would be designated as the sole financier and responsible for the programme in order to avoid possible blockages due to differences of opinion between States.

With Galileo, Europe could thus emancipate itself, or even free itself if necessary, from the American Global Positioning System (GPS). Its objective is to have its own satellite positioning and dating system, since this would make it possible to achieve both accuracy and consistency in the data provided. Currently, the revision of the Galileo project envisages that it will render its first services by 2016 and be fully operational in 2020.

The establishment of the Galileo system

The Galileo project is a constellation of 30 satellites, 24 active and six in reserve to immediately compensate for possible failures. It must be functional over the entire globe,

including at latitudes above 75°. Its orbit is 23 222 kilometres and the operation of the satellites is the responsibility of the European Space Agency (ESA). The first four satellites, built by Astrium, were launched in 2011 and 2012 from Kourou, French Guiana, with Soyuz rockets. They made it possible to validate the orbit achieved and confirm measurement results to an accuracy of three metres, but over a still very limited area of the globe. The next 14 satellites should make it possible to provide the first real services. They were due to be launched in 2014, but the poor orbital positioning of the first two of this series launched in August 2014, due to a fuel freeze problem on one stage of the Soyuz rocket, has pushed this date back to 2016. The successful launch of two new satellites on 27 March 2015 re-launched the programme. Four more satellites are expected to be launched by the end of this year, with the others to be launched in early 2016, using Ariane 5 rockets that will carry four satellites at a time, instead of two for Soyuz.

For its part, the GPS III implemented by the United States offers data with a standard average accuracy of around three metres, compared with 15 to 30 metres in 2000. The accuracy of a position is the result of a calculation of the signal travel time between transmitting satellites and a receiving device. To do this, Galileo will use four satellites whereas the GPS system uses three. It will therefore be more accurate. Accuracy is also related to the quality of the internal atomic clocks in each satellite, which will give precise time data. The clocks in the Galileo constellation are accurate to less than a nanosecond (one billionth of a second). Knowing that the movement is at the speed of light, this gives an accuracy of less than 30 centimetres. If the clock were only accurate to the microsecond (one millionth of a second), the positioning accuracy would be only about 300 metres. In addition, Galileo uses two separate frequencies for passing through the ionosphere, which degrades the transmitted signals, as opposed to a single frequency for GPS. The resistance is therefore better for the European system, and the switch from three to four satellites, combined with the multi-frequency, which limits signal reflection problems, improves accuracy, particularly in terms of altitude, which makes it possible to be much more accurate in urban areas.

Why Europe continues

Despite higher-than-expected costs (the initial project was valued at EUR 3.3 billion, but EUR 5 billion has already been deducted from the budget), the project is still on schedule.5 billion has already been allocated and the total cost is expected to reach 12 billion in 2020), deadlines that have been largely exceeded (already eight years behind schedule), Galileo has always been supported by the EU. One of the explanations is that the economic impact is always considered positive and this programme will provide the EU with undeniable strategic independence. The EU estimates that 7% of its Gross Domestic Product (GDP) is linked to applications of the system in air, sea and road transport management, civil protection, mobile telephony, etc. The EU is also the world's biggest user of the system, with a market share of more than 10%. Moreover, Europe's commitment to this project enables it to maintain a high level of research and development. It is therefore inconceivable that the EU, through its European Space Agency, should launch and manage countless satellites and at the same time not be able to have an autonomous and accurate positioning system. On the other hand, it is unacceptable that 7% of its GDP should depend on a system over which the governments of the Member States would have no control.

The success of this project is also necessary for the EU's overall credibility in the space field. The Galileo system shows that it is one of the world leaders in this field.

It should also be pointed out that, although the American GPS is the best known and has been fully operational since 1995, international competition is greater today than at the beginning of the millennium, and it is no longer the only positioning system in the world. Today the Russian military has its own, called Glonass, which was launched during the Cold War and then mothballed. It was reactivated during the Galileo procrastination and has been fully operational worldwide since 2011. China's Beidou system, which has a regional focus, is to be extended internationally by 2020. In addition, other regional systems are being launched, with a few satellites already in orbit. For India, this is the Indian Regional Navigation Satellite System (IRNSS), and for Japan it is the Quazi-Zenith Satellite System (QZSS), although the latter is based on GPS.

Although competing with GPS, Galileo is also designed to be compatible with the American system. This will make it possible to cross-check information in certain circumstances (assessment of natural disasters) and also, possibly, to carry out joint actions (combating international terrorism, etc.). Given the wide spread of GPS, total incompatibility between the two systems would have been detrimental to European interests. Galileo will therefore be complementary to the other positioning systems, making it possible to continue to operate equipment if one of the other systems, including GPS, were to fail from time to time. There is, however, one particular area in which our European positioning system will remain fragile, and that is the fight against anti-satellite missiles. Europe today remains less equipped than the United States to deal with this threat.

Contribution to the military field

Galileo will be available on five service segments, including one called Public Regulate Service (PRS). This service is encrypted and will allow high-precision positioning, ranging from a maximum of ten centimetres to a metre. This secure system specific to Europeans will enable the various EU governments to guarantee their independence in the transfer and accuracy of data, for example for the transfer of information on energy, telecommunications or finance. In addition, the GPS system provides its results via US bases which can degrade the accuracy of the satellites, depending on the area of destination of the data. Finally, in view of the current tensions we are experiencing in Eastern Europe or the espionage scandals that have been leaking out for several months with the Snowden affair, among others, it is important for Europe to have its own reliable and independent information transmission network. This secures strategic sectors for defence such as telecommunications or geolocation.

It is obvious that better accuracy in locating friendly and enemy positions, combined with better data reliability, independence or confirmation of data, is essential.It is obvious that better accuracy in locating friendly and enemy positions, combined with better data reliability, independence or data confirmation, will give the military leader an additional advantage in terms of decision support thanks to an even more precise knowledge of the situation.

Secondly, it is highly likely that some of our current weapons, guided today solely by GPS, will in the future be guided by Galileo, which will give us more autonomy and independence in the use of some of them in the event of a crisis. It will also provide greater protection for our systems against deception and interference.

But there are also other areas that will necessarily use Galileo because it will obviously be

more efficient and provide better positioning values. It will make it possible to refine the referencing of geographical maps, but also maps based on satellite images, thanks to the use of Galileo.It will make it possible to improve the referencing of geographical maps, as well as maps produced from satellite images, by improving digital terrain or elevation models and thus also geographical information systems. This will also allow better cross-referencing of information and therefore a better understanding of certain aerial or satellite images. Lastly, Galileo will save time in data processing and therefore enable images to be displayed more quickly on the various screens.

The Search and Rescue segment offered by this satellite constellation will enable everyone to send a distress signal from a Galileo positioning system. However, it is obvious that a pilot or crew of an airplane or helicopter connected to the PRS[1] segment will also be more easily located and will be recovered more quickly and easily.

These better positions will quickly become vital for units in contact with the enemy, whether to avoid fratricidal fire between units on the ground or in air support, or simply to facilitate the rescue of wounded or victims and the evacuation of nationals. This precision will also benefit airdrops of personnel or equipment. Of course, in urban and semi-urban areas, where precise positioning is now more difficult to achieve, things will be much improved. Thus, the asymmetric nature of the current fighting should be better grasped with the arrival of Galileo, thus offering the prospect, or at least it is to be hoped, of a reduction in collateral and civilian losses.

1] Public Regulated Service with encrypted systems.

Trainee of the technical diploma, graduated from the Joint Military School (Italian Campaign class, 1999-2001), the MAî Squadron LeaderTRE served in the 1st Parachute Train Regiment, the 511th Parachute Train Regiment and the No. 3 Force Headquarters during the first part of his career. He is currently studying for a Master 2 in signal processing, images and applications at the Paul Sabatier University of Toulouse 3.

Title : le Chef d'escadron Lilian MAÎTRE

Author (s) : le Chef d'escadron Lilian MAÎTRE

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