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GALILEO



The European project on radio navigation by satellite

The GALILEO project, which is designed to establish the first satellite positioning and navigation system designed for civilian purposes, has applications which are already economic and which are likely to expand into very varied areas of genuine use to citizens and firms - starting with safe and efficient transport. With a small receiver (generally combined with a mobile phone), anybody can determine their exact location to within one metre.

GALILEO is not expensive: the investment required - to be shared between all the European countries - is, for example, less than the cost of building the new airport terminal at Heathrow or equal to the cost of 150 kilometres of semi-urban motorways; its funding will not require contributions from the national budgets, it will be entirely covered by the EU budget.

GALILEO is vital for the future of European high-tech industries which will benefit from the considerable markets which will result and from an essential technological advance in the context of tomorrow's world competition.

It is crucial for Europe and the world as a whole to have a choice and not to remain dependent on the current monopoly of the American GPS system which is less advanced, less efficient and less reliable.

GALILEO has finally been launched. While the cost of establishing GALILEO represents some EUR 3.2 to 3.4 billion, the cost of abandoning the project would have been immense: considering only the economic implications - 100 000 new jobs and an equipment and services market of some EUR 10 billion per annum by 2010 are at stake.

GALILEO, the first satellite positioning and navigation system designed for civilian purposes, will be more advanced, more efficient and more reliable than the American GPS which currently has a monopoly. The scale of radio navigation needs in years to come and the need for global coverage cannot be satisfied with a single and imperfect system.

Galileo is based on a constellation of 30 satellites placed in orbit at an altitude of 24 000 km and covering the entire surface of the Earth with a network of ground control stations.

Each satellite is equipped with an atomic clock providing extremely precise time measurements, making it possible to determine the location of any stationary or moving object to within one metre.

There are at present two radio navigation satellite networks: the American GPS and the Russian Glonass systems. Both were designed at the time of the Cold War for military purposes; however, the Russian system has ceased to be fully operational.

GPS can be used for civilian purposes - and is in fact used for such purposes to a large extent - but it does have several major shortcomings.

- A mediocre and changing degree of position according to place and time: sometimes being accurate to only several dozen metres.
- Reliability which leaves something to be desired. Coverage of regions in extreme latitudes (but crossed by many aviation routes) is not dependable; nor is signal penetration in dense areas and town centres. Furthermore, the predominantly military character of GPS means that there is always a risk of civilian users being cut off in the event of a crisis.

Whether intentional or otherwise, signal interruptions can have disastrous consequences - especially as there is no warning and no immediate information about errors which could result.

A Canadian research body has highlighted the case of a plane affected by an unannounced signal interruption of over 1h20, aggravated by an initial positioning error of 200 km when re-established; the Icelandic aviation authorities have reported several transatlantic flights disturbed in the same way in their control zone; in the United States itself, civilian aircraft have suffered 20-minute signal interruptions in three mid-American States; aeroplane captains have reported the same phenomenon over the Mediterranean, etc.

In August 2001, the report of the Volpe National Transportation Centre commissioned by the US Government clearly stressed a number of such shortcomings: and even the GPS III project to improve the system, which the United States is considering, would not resolve all of them.

- A total absence of guarantee and responsibility, this being incompatible with the military objectives of the system - with all the implications that can be imagined in the event of an aviation accident or the wreckage of an oil tanker near the coastline, for example.

For these reasons, among others, the EU wishes to develop, with Galileo, a system over which it has control, and which meets the need for accuracy, reliability and security.

- Galileo offers superior and constant accuracy thanks in particular to the structure of its satellite constellation and ground relay system; guaranteed accuracy to one metre is needed for certain applications: this can make it possible to avoid a collision on entering a port or the location of a stolen vehicle even if it is in a garage.
- It has superior reliability since it comprises an integrity message which immediately informs the user of errors which may occur - and it covers difficult areas such as Northern Europe.

- It ensures genuine continuity of public service which is essential liability in our modern societies, especially with regard to contractual responsibility.

Applications markets which are already economic and will expand.

Satellite transmission is now a fact of life in areas such as the telephone system, television, computer networks, aviation and shipping and also in many other less well-known areas. The applications of the Galileo system are extremely varied and their spin-offs immense.

For example, the benefits for aviation and shipping operators alone are put at some €15 billion between 2008 and 2020: benefits generated by more direct flights for aeroplanes which will no longer have to "slalom" from one radar control zone to the next, the enlargement of an airspace which is nowadays becoming increasingly congested, as a result of increased precision of positioning, more efficient ground control, fewer flight delays - and similarly, to a lesser extent, benefits for shipping which can expect to make savings on staff without compromising safety.

The benefits of future driving systems applications will also be of vital importance. At present road accidents, including 40 000 fatal ones, generate social and economic costs corresponding to between 1.5 and 2.5% of the gross national product (GNP) of the European Union. Road congestion entails additional cost estimates at around 2% of the European GNP. A significant reduction in these figures as a result of Galileo applications will therefore have enormous socio-economic benefits, quite apart from the number of lives which can be saved.

The inland transport applications are expanding. Motor vehicle makers have started to offer their customers devices combining satellite location and road network and traffic data to help drivers avoid traffic jams, reduce their travel time and fuel consumption while limiting emissions of pollutants. Road and rail transport operators will be able to monitor more efficiently the movement of their lorries, wagons or containers, and combat theft and fraud more effectively. Taxi companies have started to use these systems to ensure that their drivers avoid wasting time and to offer a faster and more reliable service to their customers.

The value of Galileo is not limited to the economy and firms: it will also clearly be a valuable tool for the emergency services (fire brigade, police, paramedics, sea and mountain rescue ...) which can intervene more rapidly in order to assist those in danger; Galileo can also be used to guide blind people, to monitor people suffering from Alzheimer's disease who have memory losses, and to guide explorers, hikers or sailing enthusiasts ...

Many other sectors can also benefit from Galileo: it can be used as a topographical surveillance tool for urban development and large public works, for geographical information systems, making it possible to manage agricultural land more efficiently, and help protect the environment; it can be a means of developing third-generation mobile phones with Internet-linked applications; and it can facilitate the interconnection of telecommunications, electricity and banking networks and systems which need the extreme precision of satellites' atomic clocks.

The development prospects are enormous; as with the microcomputer 20 years ago or the Internet 10 years ago, it is highly likely that at the moment we can only see the tip of the iceberg.

To meet all these demands, Galileo will offer several levels of service, with:

- A basic level which is free of charge, in particular for consumer applications and general interest services – like GPS which is free of charge for these applications but Galileo offers better quality and reliability.
- Restricted access service levels for commercial and professional applications requiring superior performances and generating value added developments – going up to a very restricted service for applications which must in no event be disturbed.

The services for which payment is made will contribute towards the income and economics of the system.

Crucial issues at stake for the future of Europe and European countries.

These issues can be measured:

- In technological terms: Galileo will enable Europe to acquire the technological independence that it wants in this area, as it did with other initiatives such as Ariane and Airbus.

It is vital that it should not be excluded from what is already looking like being one of the main industrial sectors of the 21st century, which is how the Americans consider it. Without Galileo, the development and even the survival of European new technology sectors would be under very serious threat; with Galileo, the technological advance that the participating European industries will obtain will give them a considerable competitive advantage in this sector and also as regards the numerous ensuing applications.

- In economic terms: according to various studies that have been conducted, the equipment and services market resulting from the programme is estimated at around €10 billion per annum, with the creation in Europe of over 100 000 highly-skilled jobs; conversely, if Europe misses out on these new developments, many jobs would ultimately disappear in the electronics and aerospace sectors.
- In strategic and political terms: a leading-edge technology and a strong economy are prime assets as regards Europe's influence and attractiveness in the world.

Another point that should be remembered is that the EU has clearly stated that it is willing to involve interested non-member countries in the research, development and industrial commissioning work of the Galileo project - which can only strengthen the links and common interest, with them - quite apart from the choice that will be offered to the entire world.

And last but not least, Galileo will underpin the common European defence policy that the Member States have decided to establish. There is no question here of coming into conflict with the United States which is and will remain our ally, but simply a question of putting an end to a situation of dependence. If the EU finds it necessary to undertake a security mission that the US does not consider to be in its interest, it will be impotent unless it has the satellite navigation technology that is now indispensable. Although designed primarily for civilian applications, Galileo will also give the EU a military capability.

A limited amount of investment, confirmed economic viability, funding which does not require contributions from national budgets.

It should be said - or repeated - in no uncertain terms that Galileo is not expensive.

Galileo's development and deployment cost, including the launching of 30 satellites and the installation of ground equipment, is between €3.2 and 3.4 billion.

This is equivalent to the cost of building 150 km of semi-urban motorway or a main tunnel for the future high-speed rail link between Lyon and Turin - assuming that the tunnel only has one track. This is less than the Øresund link between Denmark and Sweden or Terminal 5 which is now being built at Heathrow airport; It is almost one and a half times less than the high-speed rail link between Liège, Cologne and Frankfurt or the 160 km Betuwe rail infrastructure project for container transport in the Netherlands.

The various studies carried out show that the project is economically viable. The latest study by PricewaterhouseCoopers, based on updated projections over a period of 20 years, indicates a cost/benefit ratio of 4.6 - which is higher than for any other infrastructure project in Europe; and the PricewaterhouseCoopers report specifies that it made cautious estimates, and the benefits calculated only take into account aviation, shipping and to some extent road applications at present.

The funding of the project will not require contributions from the Member States' national budgets.

Except for the initial development phase funded by the European Space Agency (a technical body responsible for satellite launching in which the EU Member States plus Switzerland and Norway participate) - for which the contributions from the various countries have already been decided upon - the national budgets will not bear any of the public funding costs for the various phases of the project:

- For the development phase (2002-2005), the EU's contribution of €550 million is already provided for in the Community budget, and the European Space Agency already has a similar amount at its disposal.
- For the deployment phase (2006-2007), the Commission will also make provision for funding from the Community budget, and private funding will also be provided by firms participating in the project.
- For the operational phase starting in 2008, the PricewaterhouseCoopers study anticipates gradually decreasing public funding until 2015; this will be an advance from the Community budget and not a subsidy, since it may be offset by small fees for using the system.

An original and innovative legal structure which encourages public-private partnership and therefore involves firms.

To complete the development phase successfully and pave the way for the deployment phase, an original form of company provided for in Article 171 of the Treaty establishing the European Community is to be set up: a Joint Undertaking.

The founder members are the EU and the European Space Agency. In addition, firms subscribing a minimum of €20 million - €1 million for SMEs subscribing individually or collectively - can also become members.

Several firms have already expressed their willingness to participate in the programme by signing a Memorandum of Understanding in which they declare their intent to contribute €200 million.

Others are playing a waiting game. This structure is designed to encourage them to get involved right from the start of the project: on the one hand, to avoid subsequently attempting to board a moving train, and on the other because, to the Commission's way of thinking, it would be wrong for the industrial companies who will be the main beneficiaries of the enormous markets generated by Galileo to sit and wait for public contracts to fall into their laps.

In addition to the space sector, which is accustomed to benefiting from the EU's research programmes, the foundations for public-private partnership must be laid with a wide range of firms. By contributing to the capital of the Joint Undertaking, firms will take their share of the normal risks inherent in industrial activities. Public funds cannot be expected to cover all the costs involved.

While it is the responsibility of the public sector to carry out forward analyses, to detect future emerging markets, and encourage their development - as with Ariane and Airbus - it is also necessary for large firms, which in some cases have until recently been featherbedded by the public authorities, to themselves look beyond the short term if they want to survive in the face of world competition.

Unfounded American arguments

The United States, which preaches the gospel of free competition, is doing its utmost to avoid competition since it may lose its dominant position.

In a nutshell:

- The United States emphasises that the GPS is free of charge while Galileo's services will be against payment. This argument does not hold water: as with the GPS, Galileo will be free of charge for basic applications; the applications for which a charge will be made will be those which require a very high quality of service which the GPS cannot provide.

This argument is reminiscent of the early 1960s when the United States offered to launch European satellites free of charge. If it had accepted this "generous" offer, Europe would not have won over half the world satellite launching market with Ariane.

- The United States is showing surprising concern by "warning" their European friends that, in its view, Galileo is not economic. The credibility of such a message from a threatened competitor is obviously dubious. It simply shows to what extent the United States is afraid that a rival system will be successful.
- Frequencies have been earmarked by the International Telecommunications Union for all radio navigation systems. The United States is disputing the right of Europeans to use some of them which might, according to the United States, interfere with the GPS signal. The Europeans are aware of the need to avoid any risk of disturbing that system, and have come up with solutions which give every possible guarantee in this connection.

The United States claims the right to jam Galileo's PRS (Public Regulated Service) signal since it believes that it could be hijacked for hostile purposes. The purpose of this signal is to ensure continuity of service for governmental applications.

However, two years of research on this problem have resulted in technical solutions that have already been proposed to the Americans. The Europeans are quite open to joint consideration by equal partners of any problem of concern to them.

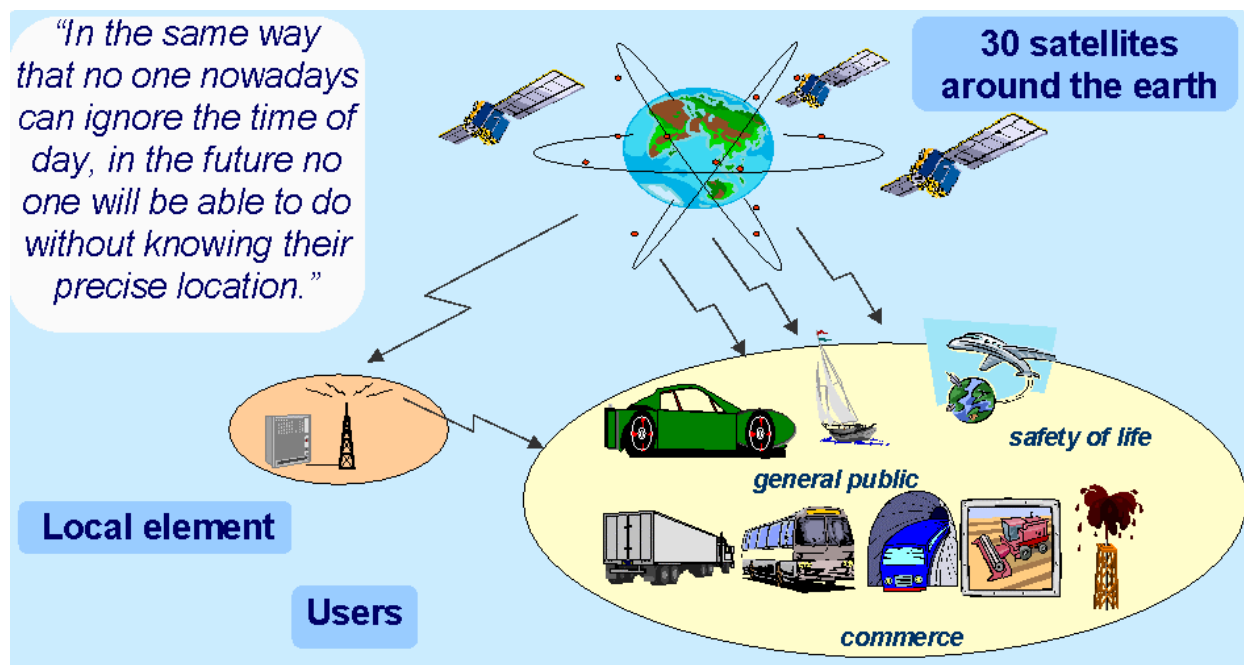
More generally, the Europeans do not intend in their turn to adopt a protectionist and monopolistic approach. They do not deny the value of the GPS, even though Galileo is superior; they recognise that an even greater level of security will be obtained as a result of the joint use of the two systems; they are designing their system in such a way as to ensure that the same receiver can be used by a dual user; and they are willing to co-operate actively in all areas with the United States, as well as with Russia or China.

The decision of Transport Ministers on 26 March 2002 was imperative.

It should be borne in mind:

- That the frequencies needed for Galileo, obtained following difficult negotiations at the last World Radio Communications Conference, will be lost unless the first operational satellites are launched before 13 February 2006 - which presupposes successful completion of the successive preliminary technical stages as part of a precise and tight timetable.
- That the private-sector companies interested in co-financing the project and which have mobilised numerous teams of engineers in the preliminary definition phase would have been likely to have to dissolve them for shortage of funding - especially as the budgetary coverage of the technical activities carried out by the European Space Agency would cease in April 2002.
- As stressed by the PriceWaterhouseCoopers study, it is vital that Galileo should come into operation in 2008 in order to be able to take up the market shares available before the possible arrival of the America GPS III - not to mention the fact that any project "which drags its feet" will become more expensive.
- Europe's credibility in the international negotiations that it has initiated with the United States and Russia to ensure the complementarity and interoperability of Galileo with the existing systems, and with non-member countries interested in becoming involved, would have been considerably weakened if the EU would have proved to be incapable of taking the necessary decision without an additional delay.

Annex



Information on GALILEO is also available under :
http://europa.eu.int/comm/energy_transport/en/gal_en.html.