IJGlobal
A Green Street Company

GALILEO Satellite Navigation System

05/03/2003

Just like several other major European projects such as Airbus and Ariane, the GALILEO Programme could significantly change people's lives by fostering the development of a new generation of valuable services and bringing considerable advantages to many sectors of the economy.

GALILEO will offer a number of additional benefits over the other existing satellite navigation networks in the world, as it is being designed to have a higher degree of signal precision and availability, to be more reliable with the ability to inform the user immediately of any errors and to guarantee the continuity of service provision for specific applications.

Moreover, GALILEO could create more than 100,000 jobs and generate service and equipment contracts estimated at approximately Euro9 billion per annum. The forthcoming PPP will be the culmination of almost a decade of continuous work on the various aspects of this remarkable project.

Background

GALILEO is a Global Navigation Satellite System (GNSS) promoted by the European Commission (EC) and the European Space Agency (ESA) and is a major technological, economic and political project for Europe.

The system is the tailor made solution responding to the European Commission's "White Paper" on European transport policy for 2010, which stated that "the European Union needs an independent satellite navigation system".

It is based on a constellation of 30 satellites and ground stations that will be capable of providing positioning information to users in many sectors such as transport (traffic control, vehicle location, route guidance, speed control), social services (aid for the disabled or elderly), the justice system and customs (location of suspects, border controls), public works (geographical information systems), search and rescue systems, or leisure (direction-finding at sea or in the mountains).

The rationale for the development of GALILEO is in fact threefold. Strategically, it will protect European economies from dependency on other states' systems, which could deny access to civil users at any time, and to enhance safety and reliability.

Commercially, although GALILEO will not be able to charge for the use of its basic service as users need to have free open access, it could become a commercially viable business by providing value-added services which will establish a position in the market in a complementary fashion to GPS.

And from an economic standpoint, it will secure an increased share of business for the European space industry, deliver efficiency savings for industry, create related social benefits through cheaper transport and congestion and pollution reductions and stimulate employment.

The GALILEO programme comprises three major phases – system definition, development and operation. During the Definition Phase, the European Commission and ESA made full use of the European space industry as well as a large number of potential service providers with a view to defining the basic elements of the system. A number of projects and

comprehensive studies have already contributed to this phase, including:

- GALA for the overall architecture definition
- GEMINUS to support the GALILEO service definition
- INTEG for EGNOS (European Geo-stationary Overlay Service) integration into Galileo
- GUST related to GALILEO receivers pre-specification and certification

Based on the outcome of the definition phase, the GALILEO Mission High Level Definition (HLD) document was produced and consolidated through a consultation process, involving EU Members States, ESA, technical advisers and potential private investors. It presents a picture of the main characteristics and performance of the GALILEO System and will be used as framework for the GALILEO development programme.

Currently, two main activities related to the definition phase are close to completion:

- Phase B2 of the GalileoSat study led by ESA focuses on the consolidation of mission and system requirements, system architecture and finalisation of phase B activities leading to the Preliminary System Design Review (PSDR)
- GALILEI which is an activity funded by the EC and has the purpose of defining the overall service and user approach for GALILEO, complementing the studies performed by ESA during the GALILEO definition phase

The System Development phase is itself broken into two components: the development phase and the deployment phase.

The Development Phase covers the detailed development of various system components including satellites, ground components and receivers. It will include the launch and validation of the first four prototype satellites from 2004 and creation of an initial terrestrial infrastructure. The work is being led by ESA and is funded jointly by the EC and ESA. The Deployment Phase will consist of launching the remaining 26 operational satellites into orbit from 2006 and ensuring the full deployment of remaining ground infrastructure so as to be able to offer an operational service from 2008 onwards.

Finally, Commercial Operations Phase is expected to commence in 2008. At this point the Galileo Operating Company will have a signal-in-space that fulfils the performance standards set by the Commission, providing users the signal in earnest.

Market opportunity

As previously mentioned, the core GALILEO infrastructure will consist of a satellite constellation and ground control stations. These will be built, launched and operated by a single operator, the Galileo Operating Company (GOC) that will be the entity eventually awarded a concession contract at the end of a Public Private Partnership (PPP) procurement process. Its successful exploitation of the system will largely depend on the success of other activities in the Galileo value chain. The GOC concessionaire will therefore need to stimulate the provision of services by other companies to establish a commercially viable operation well in advance of the proposed operations starting date.

The Galileo system is expected to offer up to five different types of service to give the GOC opportunities to turn the project into a viable commercial business. These services are briefly defined as follows:

- An Open Access Service free to all users and providing basic positioning navigation and timing signals as a new universal service
- Commercial Services based on additional encrypted data, permitting a charge to be made
- Safety of Life Services which will provide greater accuracy and integrity, allowing the user to know within a few seconds if the positioning information has become corrupted
- A Search and Rescue Service which identifies a user's location to civilian emergency services
- A Public Regulated Service based on a robust signal, resistant to interference or jamming and restricted to public sector, e.g., police, fire and ambulance

It will be up to the GOC to exploit these services in the most efficient manner possible, and bidders in the PPP

procurement process will be required to try to establish the markets for these services during the bidding process.

It is anticipated that revenues will be generated for the GOC in the form of:

- Royalties on chipset sales, paid by chipset manufacturers
- Income from Service Providers who want to use the specialised Galileo signal to offer other value-added services

In addition, the GOC will receive periodic payments from the public sector for the provision of services.

The commercial case for establishing GALILEO alongside GPS is that GALILEO can offer greater accuracy and integrity than the current GNSS services. Also, research implies that users will be willing to pay for better coverage and reliability through being able to receive signals from both systems.

Cost of the system

In order to provide a full range of reliable services the GALILEO system will require global, regional and local components of hardware and software. Whilst responsibility for funding the regional and local components will be with service providers, the global component will be the responsibility of the chosen PPP concessionaire and will include:

- A constellation of 30 Medium Earth Orbit satellites
- A ground segment to control the satellites, distribute information and provide service centres for interface with users

GALILEO global component Development and Deployment costs, have been estimated at Euro 3.4 billion (2001 prices) - equivalent to constructing 150 kilometres of semi-urban motorway or the cost of just one track of the main tunnel for the future high-speed rail link between Lyon and Turin. The PPP process should permit the private sector to support the majority of that cost, introducing procurement and operating efficiencies to the programme.

During the Operating phase, the operating costs are expected to be Euro100-120 million (2001 prices). In addition, it is envisaged that the system infrastructure will require replenishment between 2016 and 2022. Taking operating and replenishment costs together, the average annual costs are expected to be in the region of Euro220 million per annum.

Public-Private Partnership concession rationale and model

The principal objective of a PPP is to achieve value for money for the public sector by transferring appropriate risk and responsibility to the private sector in a way that creates incentives to optimise the technical aspects and minimise the project costs. Any GALILEO PPP also needs to ensure that operations commence around 2008 in order to meet the market opportunity and to optimise the benefits arising from ESA expertise in the Development phase.

The proposed GALILEO PPP model involves a concession, which would give a clear separation between public and private sectors. The Joint Undertaking (JU) – founded jointly by the EC and ESA - is the public sector procurement authority and will launch a tender process for the selection of the GOC concessionaire for Deployment and Operation of the GALILEO system.

The GOC itself will be a privately owned entity formed by a winning bidder who would build, finance, operate and maintain the system. Its shareholders could include satellite industry, service providers, telecom operators and financial institutions.

The GOC is expected to finance its activities from a combination of equity and debt. It will contract with the EC to provide a level of service in return for an availability payment, and will propose a mechanism through which market revenues can be split between the GOC and the public sector in a way that incentivises the GOC to generate revenues.

The creation of a separate public regulatory function is also foreseen to govern aspects such as safety standards, intellectual property rights and pricing for certain services

GALILEO PPP concession structure

The key characteristics of the proposed GALILEO Concession are likely to include:

- A term of 20 years, under which the public sector counterparty would pay the concessionaire an availability payment from commencement of commercial operations around 2008
- The availability payment is intended to supplement market revenue to give the GOC enough expected income to cover operating costs, debt service payments and taxes as well as provide a degree of adequate shareholder return. However, the GOC would only deliver an appropriate return if it earns its projected commercial revenue by achieving the expected market penetration and meeting relevant performance requirements
- There would be a revenue-sharing mechanism with the public sector. This could partially offset the public sector availability payment
- A special break mechanism in the concession contract could allow for re-negotiation of terms or termination of the contract when the original satellite constellation needs to be replaced
- The public sector will provide cover for product liability risks above the level which could be insured commercially

GOC concessionaire award process

The Concessionaire selection process will be officially launched during the Galileo Industry Day in Brussels around the end of this year. This will give an opportunity for the EC to promote the Programme and explain how the procurement process will be carried out.

In addition, it is presently expected that, in order to offer the resources and the range and depth of skills required to bid for the Concession, companies will need to collaborate to form consortia with the participation of both industry and financial investors.

GOC Concession award process is presently being developed as a two-stage qualification process to achieve maximum effectiveness and credibility of decision-making:

Bidder Selection Stage

After the Concession tender notice publication in the “Official Journal of the European Communities” all interested parties would need to send their expressions of interest to the JU within a given period of time.

The JU would then release to them an “Invitation To Tender” together with an Information Memorandum, which would give potential bidders an overview of the GALILEO Programme, including major technical, financial and legal details, the structure of the Concession and bidding requirements.

Potential bidders will be given approximately 6 weeks for due diligence of the opportunity and diligent bid preparation. Their bids will be thoroughly evaluated by the JU and two shortlisted winners will be selected. The JU expects the first stage selection process to conclude in approximately 8 months.

Business Plan Development Stage

Two shortlisted bidders will be given a period of nine months in which to develop a bid for the Concession. They will also need to perform technical due diligence on ESA’s Development Phase work (including reliability/performance assessment, overall system design and cost assessments), as well as an assessment of the potential for the operating company to generate market revenue.

On the basis of this analysis bidders will be required to submit their formal bids for procuring, launching and operating the GOC concession.

The bids will be evaluated by the JU and, following final negotiations, a preferred bidder will be selected. The whole process is anticipated to conclude in the second half of 2004.

The timing of the PPP concession award should coincide with the Critical Design Review in the ESA Development Programme and this will allow the concessionaire to influence the output of the ESA work stream and therefore, ensure a smooth transition from development to deployment of the system.

Conclusion

Through the creative development of a Public-Private Partnership structure GALILEO will be able to provide state-of-the-art GNSS services while maximising the private sector capital and expertise. ij

Authors: Brian Lerner & Nick Flitterman

The authors acknowledge the help of Ivan Loktev at the London office