COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 19.9.2007
SEC(2007) 1210

COMMISSION STAFF WORKING DOCUMENT

Accompanying document to the

**COMMUNICATION FROM THE COMMISSION
TO THE EUROPEAN PARLIAMENT AND THE COUNCIL**

**PROGRESSING GALILEO:
RE-PROFILING THE EUROPEAN GNSS PROGRAMMES**

{COM(2007)534 final}

PROGRESSING GALILEO:

RE-PROFILING THE EUROPEAN GNSS PROGRAMMES

1. INTRODUCTION

Until recently, it was foreseen that the procurement, deployment, operations and exploitation of the European GNSS programmes, EGNOS and Galileo[1], would be based on a Public-Private-Partnership (PPP) concession contract between the EU and a private sector partner. As stated in its Communication and the Staff Working Paper of 16 May 2007[2], the Commission believes that such a PPP provides the best conditions to control costs, manage completion and technical risks, and optimise market exploitation. However, as concluded in the assessment set out in May, when negotiations for the transfer of relevant risks to the private sector cannot succeed due to a high price and/or unfavourable terms for such a transfer, then the basic requirements for a PPP are not met.

In this context, the Commission underlined that it is necessary to consider what alternatives are available that achieve similar results in the short term and enable a transfer of the remaining risks to the private sector at reasonable conditions at a later stage. Until such a transfer is possible, the public sector itself needs to show leadership and manage the European GNSS programmes on its own.

The European Parliament reiterated its support for the Galileo programme[3] and called for further proposals, notably as concerns financing. The Council, in its Resolution of 8 June 2007, re-affirmed the value of Galileo, concluded to stop the PPP concession negotiations, agreed[4] in principle to a re-profiling of the European GNSS programmes and recognised the need for additional public funding. The basic implementation approach for such re-profiling entails a public procurement of the infrastructure and, in parallel, a process of transition to a PPP for exploitation and operations.

At its meeting of 21-22 June 2007, the European Council re-affirmed the value of Galileo as a key project of the European Union and asked the Council to take an integrated decision on the implementation of Galileo in autumn 2007[5].

In order to allow it to take such an integrated decision on the implementation of Galileo, including public financing and the modalities of public procurement, the Council requested the Commission to submit:

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1 The objective of the EGNOS and Galileo programmes is to create the European elements of the Global Satellite Navigation System (GNSS). EGNOS is a regional system that re-uses GPS signals to provide, by means of added navigation signals, improved performance for satellite navigation users. Galileo consists of a global constellation of 30 satellites and related ground control infrastructure, owned by the European Union, providing 5 world-wide satellite navigation services. EGNOS and Galileo are developed as reliable space infrastructures which can be exploited and generate revenues in their own right. On the basis of the availability of their signals-in-space the private sector can develop the downstream markets for satellite navigation applications and services.

2 "Galileo at a cross-roads: the implementation of the European GNSS programmes" - COM(2007) 261, and SEC(2007) 624, 16.5.2007.

3 European Parliament, Resolution 20 June 2007, B6-0328/2007.

4 http://register.consilium.europa.eu/pdf/en/07/st10/st10126.en07.pdf

5 European Summit, 21-22 June 2007, 11177/1/07 Rev.1, paragraph 36.

- *detailed alternative proposals for the financing, including all possible options of public funding, based on additional thorough assessments of costs, risks, revenues and timetables;*
- *proposals for an implementation and procurement strategy by the public sector which will have to reflect progress made so far (relevant investments and agreements) as well as the need for competition and regular competitive tendering;*
- *concepts for the subsequent operation and exploitation phase of Galileo, involving the private sector where appropriate;*
- *proposals for a sound public sector management structure of the programme on the basis of a clear division of responsibilities between Commission, ESA, GSA, Member States and Council;*

Based on further analysis it has performed, the Commission has responded to this request through a Communication[6], a Modified Proposal for a Regulation with regard to the follow-up of the European GNSS programmes[7] and a Proposal for a revision of the financial framework[8].

This Commission staff working document complements the Communication and provides details on a number of elements.

2. THE SYSTEM INFRASTRUCTURE COSTS

The procurement and deployment of Galileo commenced on a basis of a two-phased approach. Under the In-Orbit-Validation (IOV) contract put in place by ESA in early 2006, the first 4 satellites and a substantial part of the ground infrastructure is procured. The financing of the IOV phase of 1500 M€ is based on a 50-50 sharing between ESA and the European Community.

The remainder of the constellation namely 26 satellites and of the ground infrastructure are subject of the deployment phase that brings Galileo to its Full Operational Capability (FOC). The Commission provided a first estimate of the costs of the procurement of the elements of this remainder of the Galileo infrastructure needed for FOC, as well as for initial operation of EGNOS, in its Communication of May 2007.

At the request of the Council, further analysis and the evaluation have now provided the necessary confidence that these cost estimates are indeed realistic and resilient[9].

The estimates for FOC include the management costs of the procurement agent, the costs for the exploitation and operation of EGNOS until 2013, and the costs of support to the programme manager, are estimated at 3 B€ nominal. Based on the assessment of design and

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6 Communication to the European Parliament and the Council on progressing Galileo: re-profiling the European GNSS programmes - COM(2007) 534, 19.9.2007.

7 Modified Proposal for a Regulation of the European Parliament and the Council concerning the putting into place of the European GNSS programmes - COM(2007) 535, 19.9.2007.

8 Communication concerning the Revision of the Multi-annual Financial Framework and Proposal for a Decision of the European Parliament and of the Council amending the Inter-institutional Agreement of 17 May 2006 on budgetary discipline and sound management as regards the multi-annual financial framework - COM(2007) 549, 19.9.2007.

9 Data from ESA, previous PPP concession bids, and the IOV contract; evaluation by ESA, GSA and independent consultants PriceWaterhouseCoopers and Satel Conseil International; and a verification meeting with experts from national space agencies.

deployment risks, a contingency reserve of around 14% of the nominal costs completes the estimation[10].

Item	Estimated costs in millions of Euros
Galileo FOC	
Satellites + launchers	1600
Ground control infrastructure	400
Operations	275
Systems Engineering	150
Procurement Agent management costs	195
EGNOS	
Exploitation and operations (2008-2013)	330
Support to the Commission	
Project management support and advisory services	27
Contingencies[11]	428
Grand Total	**3,405**

The estimated costs related to Galileo concern the procurement of:

- The completion of the constellation by means of 26 satellites and the necessary launchers, as well as 2 satellite ground spares and a spare launcher. 4 satellites and associated launchers are procured under the IOV contract;
- The completion of the ground infrastructure that has commenced under the IOV contract and concerns the completion of the control centres as well as the remaining uplink, tracking, and monitoring stations;
- Operations for the years 2011-2013, as operations for the period until the end of 2010 are procured under the IOV contract;
- System engineering services to ensure the integrated functioning of all the above elements with the foreseen technical baseline.

The estimated costs related to EGNOS comprise 6 years of operations and exploitation of EGNOS. Programme management support concerns technical support services and external advisory services to the maitre d'ouvrage.

These estimates are based on an immediate implementation of the procurement actions (preparation of industrial tenders, seamless integration with IOV procurement contracts) following an integrated EU political decision by the end of 2007.

Of course, all figures represent a best estimate of the expected procurement costs in a nominal case of competitive supply, effective contract negotiations, and adherence to the foreseen timetable. The prices offered by the private sector however, and therefore the costs to the Community, will only emerge during procurement negotiations. In order to ensure that the Community obtains the best value-for-money and that prices come down to costs, it will be necessary to put the Community (and its procurement agent) in a good negotiating position by means of a competitive bidding procedure based on appropriate principles agreed as part of the procurement policy.

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[10] Contingency reserves on space programmes are normally in the order of 10-20% depending on the purposes and risk of the programme concerned.

[11] Possible cost overruns of the IOV phase will be covered by the current financial arrangements and/or the Contingencies Reserve.

The choices made in the procurement policy are therefore expected to have considerable impact on the final costs to the Community. Moreover, in case of delays in political and programmatic decisions, extra costs are anticipated caused by a pro rata increase of costs of current contracts (the In-Orbit-Validation contracts[12]), and loss of market opportunity as a result of the arrival of competing systems.

3. GALILEO PROGRAMME RISKS AND THEIR MANAGEMENT

The EU, as owner of the system resulting from the Galileo programme, will need to identify and, in case they are accepted, eventually manage the risks associated with the European GNSS programmes. Below a summary is given of the currently identified risks, their likelihood, and their potential impact in case they materialise. A more extensive overview of the risks and their impact is provided in annex.

All identified risks will be subject to risk mitigation actions and a risk management approach. Once the identified risks have been subject to effective mitigation actions, the likelihood and severity of the risks should further decrease. Such mitigation actions themselves may imply further costs which would be financed from the foreseen contingency reserve.

risk category	causes	impact	likelihood	cost range per event
Procurement/Deployment phase				
Design risks	Atomic clocks, orbit behaviour, SOL service performance, implementation security requirements, scaling up from IOV to FOC	Re-design	Unlikely	~ 250 to 500 M€
Deployment risks	Technical, managerial, financing, political issues Launch risk	Delays	Unlikely	Up to 250 M€
Operations/Exploitation phase				
Market/revenues risks	Market underperformance or revenue impact of design/deployment risks	Revenue loss	Probable	Up to half of the annual baseline revenues
3rd party liability	Claims	Claims pay-out	Very remote	> 1 B€
Un-insurability	Insufficient market capacity	Direct financing	Remote	> 1 B€
Supervening events	Causes outside control of the programme	-	Remote	~ 250 to 500 M€

The design risks relate to Galileo not achieving its targeted performance as a result of eventual design problems. The most important design risks of Galileo identified at this stage concern the lifetime of its atomic clocks, the constellation orbit behaviour, the performance of the Safety-of-Life service, and integration of security requirements. These design risks and their likelihood are typical to a space programme. They need to be monitored and controlled closely but are not reason for particular concern at this stage.

Galileo programme delay risks are linked to technical, managerial, financial or political issues that cause schedule delays and cost overruns and, as a consequence, a late time-to-market. Examples are problems related to integration and testing, programme management, IOV

[12] Under the IOV contract are procured: 4 satellites and their launches, the first satellite control centre, and around the half of required uplink, tracking, and monitoring stations.

completion delays, launch failures, certification and accreditation. Most of these programme delays should be mitigated by specific actions, by the proposed public governance measures, by disciplined programme management and oversight decisions, and by timely political decisions. In addition to the specific one-off costs related to these risks, the largest impact of delays is the increase of deployment costs and a loss of exploitation revenues.

The third-party liability concerns claims to the EU as owner of the system in cases of non-contractual liability. Such claims may exceed the levels of insurability. The Commission is considering coming forward with a proposal to regulate civil liability and compensation for damages resulting from European GNSS services in order to mitigate this risk[13]. Un-insurability risks concerns further situations where there is insufficient insurance market capacity or a conscious strategy to rely on own resources rather than insurance. Both these risks are typically the result of the size of the programme and the markets addressed by the programme. Should they materialise in full, the financial impact is significant indeed but, given their remote likelihood, it is not a cause for particular concern.

The market risk is considerable and could be up to half of the foreseen annual revenue base. This is addressed in another section. However, exploitation revenues should develop positively in view of the expected market growth rates once public sector action is taken.

There is a specific, short-term risk as concerns the EGNOS deployment. The EGNOS deployment risk concerns an immediate financial problem that requires immediate action to make available the required budget for EGNOS operations (see chapter on financing). EGNOS technical performance is stable and of high quality and therefore no risk in relation to deployment.

In conclusion, with the exception of the risk of delays in political decisions and the exploitation revenue risk that require specific actions, the identified risks seem commensurate with the ambitions and scope of the European GNSS programmes. The foreseen contingency reserve for the procurement is set in relation to the cost impact and the likelihood of risk events linked to design and deployment. Other risks would only occur afterwards.

A further critical question is at what precise moment in the Galileo programme, and under which modalities, can the public sector successfully transfer any remaining programme risks at acceptable conditions to the private sector?

In order to achieve such a risk transfer it is necessary to ensure that there is clarity on all programme risks at any moment throughout the programme. Moreover, there is a need for an acceptance of the likely costs and other implications of a risk transfer, and acceptance that the public sector may not be able to transfer all risks. Some of these decisions will be taken at a later time.

A comprehensive programme risk management plan covering all phases, levels, and domains will need to be developed and implemented by the Programme Manager and imposed on all elements of the programme, in particular the procurement. It shall be accessible at any moment for scrutiny by the Budgetary Authorities.

Risk mitigation measures, an integrated programme risk management approach, and adequate and efficient management are structural measures that reduce and control risks, but however do not eliminate them. If any of these risks materialises, the European Union has the responsibility to accept either the consequences in terms of programme delays and costs, or

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[13] World-wide handling of this risk requires an International Convention, equivalent to e.g. the Warsaw Convention used in civil aviation, which is expected to take several years to put in place.

take a decision to terminate the programme. The substantive risks, in case that they materialise, may require additional budget if the contingency reserves are depleted.

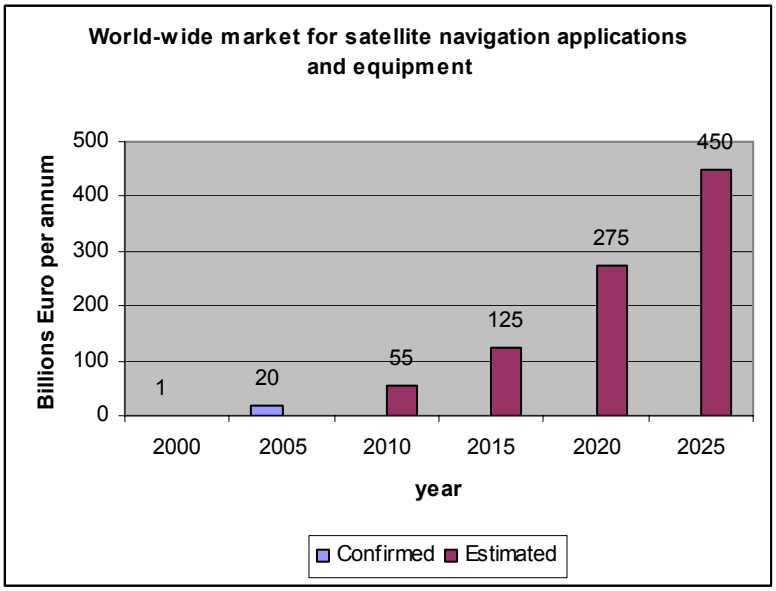
An integrated programme risk management approach shall be implemented and structural measures taken to identify, control, mitigate and monitor risks, as well as regular reporting to the Budgetary Authority. For that purpose, outside expertise will need to be engaged and a risk management strategy will need to be developed. The risk management approach shall be imposed on all actors of the European GNSS programmes.

4. GALILEO ECONOMIC BENEFITS AND EXPLOITATION REVENUES IN THE WORLD-WIDE SATELLITE NAVIGATION MARKET

4.1. World-wide, downstream markets for satellite navigation services

Overall, the world-wide market for satellite navigation has grown spectacularly over the last ten years. The value of this market in terms of applications and equipment is considerable and it is one the fastest growing high technology markets. This year there is an expected sale of 10 million GNSS receiver units in the EU alone. The world-wide compounded annual growth rates in GNSS receiver units and in GNSS products and service revenues are currently estimated at 40% and 23% respectively and the annual market should reach around 230 million units and 70 billion Euros respectively in the year 2011[14]. As set out in the graph below, further predictions foresee that the world-wide GNSS product and services market would reach around 450 B€ per annum in 2025[15].

These figures confirm the early market predictions which were carried out in the definition phase of Galileo in 1999 and 2004[16].



This considerable growth is even more visible in Europe, where the current sales of GPS equipped personal navigation devices in Europe are more than 3.5 times higher than in the US. To the extent that the sales of GNSS receiver units are likely to be stimulated by the

14 Source: ABI Research 2006.
15 Source: based on ProDDAGE 2006.
16 COM(1999) 54, Annex IV, 10.2.1999 and COM(2004) 636, 6.10.2004.

availability of Galileo on the market, the derived taxes alone will then provide a certain level of compensation to government budgets for the procurement costs of Galileo and EGNOS infrastructure and their operations. In the year 2006 alone, a conservative assessment based only on the GNSS receiver units sold in the European Union shows that the related VAT income for EU Member States exceeded 400 M€ in 2006 and will exceed 500 M€ in 2007.

Based on the recently agreed, new and common characteristics[17] of the GPS-III Civil Signal and the Galileo Open Service signal, it is expected that for mass-market purposes there will only be common GPS-Galileo receivers and that the advantages of combined use of the systems will sustain high growth rates. For other Galileo services there will be dedicated, special purpose receivers which, independent from GPS, have their own markets.

The GNSS market will become a substantial driver in the global economy after 2010 and Europe can not afford to be absent as an important player in this field, hence the strategic importance of the European GNSS programmes. It is obvious that the GNSS system providers will have an important influence over all essential decisions affecting the GNSS users, such as defining or updating the standards, ensuring the continuity of access locally, defining industrial export control policy, serving the future needs of the users through system modernisation. The EU cannot rely solely on foreign policies for all these important decisions affecting an important share of the European economy. Completing Galileo is therefore an indispensable infrastructure investment for the EU.

Inevitably, the development of Galileo will also need to be accompanied by a specific effort to develop applications and services (see section on user needs), which helps European industry to achieve a strong position, develop know-how, and serve niche applications. This boosts the creation and the growth of SMEs and generates high-end employment. Galileo and EGNOS should therefore be seen as investments allowing Europe to penetrate, develop and maintain a substantial share of the GNSS market.

Beyond the direct exploitation revenues that can be expected (see next section), Galileo will have larger, indirect, macro-economic and broader public benefits and will:

- accelerate the overall development of the European GNSS industry;
- improve the position of European companies, particularly SMEs, in the worldwide GNSS industry;
- increase the public benefits that can be generated from GNSS, such as employment, environment (reduced road congestion, shorter and more direct routes reducing fuel consumption), social benefits (enhanced safety), increased efficiency of public services (in search-and-rescue, fire and ambulance services, security) and economic sectors (agriculture, fisheries, transport), and the management of scarce public resources (in aviation).

These additional benefits from Galileo will result from the European GNSS industry's ability to address the market better, based on intimate knowledge and experiences resulting and diffused from the European GNSS programmes.

A first exploratory evaluation indicates that there is a substantial, additional value of Galileo for the EU of 50-60 B€ over the 20 year period until 2027, over and above the benefits of the

[17] Multiplexed Binary Offset Code (MBOC) modulation, agreed in July 2007 between the EU and the US.

market created by GPS and the emerging other systems[18]. Firstly, the benefits to EU users (citizens, private sector, governments) as a result of increase of the EU market in terms of new services, increased performance, innovation etc., has been estimated at some 15-20 B€. Secondly, some 35-40 B€ benefits can be attributed to benefits (not turn-over) to the EU private sector as a result of the increase of their share of the global market for satellite navigation products and services directly resulting from the involvement in, and the access to know-how of, Galileo. Associated with this is a substantial creation of employment within the EU.

Based on these macro-economic and broader public benefits alone, Galileo is already more than worth being undertaken and a key project within the context of the Lisbon strategy.

Moreover, the additional, direct benefits of Galileo are numerous. Not only will satellite navigation availability in larger cities increase significantly by combined use of GPS and Galileo, but Galileo's system design also foresees indoor positioning capabilities. Satellite navigation accuracy will increase and the 'competition' between GPS and Galileo will bring about further innovations in satellite navigation for users worldwide e.g improved accuracy and indoor positioning capability of Galileo over GPS-II, and improved mass-market signals common to both GPS-III and Galileo. Galileo is furthermore optimised for civilian use by means of 5 functional services. This provides a basis for addressing new market needs in the road, maritime, and aviation markets that are not served by existing technology. Galileo furthermore ensures that any risks from single source dependencies are mitigated. This is of importance in, for example, the use of timing signals for the synchronisation of electronic communication networks and of electricity grids. Lastly, the legal framework within which Galileo is being built provides a clear and unambiguous liability scheme. Liability is of key importance for operators, whether public or private, when implementing new services to citizens and/or commercial customers. There are therefore substantive arguments for users to use Galileo.

As the users of satellite navigation are not yet fully aware of the above benefits, raising awareness is an important action to undertake (see section on user needs).

4.2. Exploitation revenues and direct benefits of the European GNSS programmes

Galileo exploitation revenues represent a tiny portion of the Member States returns and an even tinier portion of the worldwide and European GNSS markets. The Galileo exploitation revenue operator (via either a concession holder or an exploitation service contract) is one of literally hundreds of players in the GNSS industry value chain. The Galileo exploitation revenue stream that is expected to be generated is large and well diversified but is however subject to uncertainties.

Based on previous studies, data provided in the various bids of the previous phase, independent verifications, analysis performed for the GJU and, over the last time, by the GSA, the following, direct Galileo exploitation revenue estimates (including uncertainties)[19] are now available for the provision of the EGNOS and Galileo signals-in-space.

In the few years before FOC, some initial revenues are likely as a result of IPR licences, pre-operational engagements, initial EGNOS revenues, and alike. After FOC, studies expect that there will be considerable, initial growth of the Galileo exploitation revenues after which the compounded actual growth rate is estimated at around 4%.

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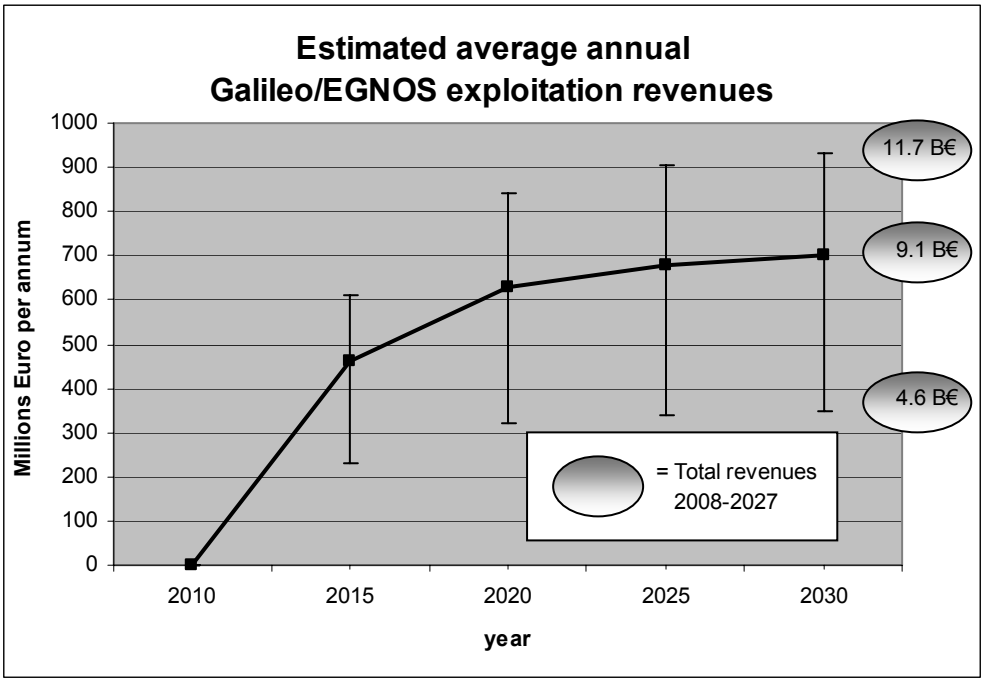
[18] The GSA has commenced detailed studies on this topic.

[19] Sources: GSA based on Ovum 2006, ABI Research 2006, Berg Insight 2006, ESYS 2006.

The expected aggregate exploitation revenues for the period 2008-2027 (an equivalent time period to the original PPP concession duration) account for a total of some 9.1 billion Euro in the baseline case. Original estimates for the PPP concession period were for 10 B€.



The uncertainty of the exploitation revenues[20] are estimated at plus one-third and minus half of the base case, thereby providing a range between 4.6 and 11.7 B€ over the 20 years period. Risk mitigation actions and creation of revenues opportunities however will have a positive impact.

Based on the expected baseline scenario for the period until 2027, products and services that cater to Open Service receivers will generate most of the revenues (4.9 B€), despite the basic signals being provided free of charge for users and manufacturers. This can be explained by special use of the Open Service signals such as for authentication purposes[21], public alert services, and Digital Rights Management fees, as well as by the large number of receivers (3 billion) that drive revenue streams such as royalties and IPR licence fees. PRS is expected to provide a significant contribution to revenues (2.6 B€), despite the relatively small number of receivers expected. The Safety-Of-Life service will also provide a significant contribution (0.9 B€) as will the Commercial Service (0.6 B€).

The estimated split of these exploitation revenues[22] is as follows:

Split of Galileo/EGNOS exploitation revenues		
per service	per charging mechanism	per sector

[20] It was this uncertainty that did not allow the private sector to accept the market risk in the PPP concession negotiations.

[21] Authentication of reception of Galileo signals is important for applications that require certainty as to the source of reliability of the signal source, notably to verify that the source has not been an illegal signal transmitter that 'imitates' the Galileo signal but effectively lets the receiver believe that it is at a different location. Such authentication is therefore important in applications such a road-tolling. This authentication will be based on the use of the Open Service signals, the Open Service itself being free-of-charge.

[22] Sources: Ovum 2006, bids during the PPP negotiation phase.

Open Service – normal use	0%	terminal manufacturing	46%	road transport	30%
– special use	54%	governmental clients	29%	PRS	29%
PRS	29%	service providers	14%	mobile telephony	17%
Safety of Life	10%	receiver manufacturing	7%	professional services	9%
Commercial Service	7%	end-users	4%	aviation	5%
Search and Rescue	0%			others	10%

The actual exploitation revenues will be highly dependent on the time-to-market of Galileo, the success of public sector action in preparing markets and putting into place a regulatory framework that takes away any barriers to market development, the take-up rate of the PRS service by the EU public authorities, the success of competing GNSS systems, and the EU's ability to find private sector partners that have the capacity to address global satellite navigation markets in a successful fashion. Particularly the high dependency of exploitation revenues on special uses of the Open Service, such as authentication services and public emergency services, requires careful consideration such as adaptations to the regulatory framework so that it foresees the use of authenticated signals for road-tolling applications.

Galileo exploitation revenues should therefore be seen as an additional benefit and not as the single driver of the European GNSS programmes. Namely, it is the promise of these exploitation revenues that may be of interest to the private sector. Hence, their importance for the EU public sector to be able to transfer risks to the private sector and to obtain the benefits of private sector participation in the programme.

In conclusion, there is a strong case for Galileo driven by its potential exploitation revenues but, to an even larger extent, by the impact of Galileo on the European GNSS industry and the economy in general.

5. MEETING USER NEEDS, PREPARING MARKETS, AND INCREASING REVENUE OPPORTUNITIES

As the ultimate purpose of EGNOS and Galileo is to provide global satellite navigation services that meet the requirements of users world-wide, it is essential to have both a good understanding of these requirements and to try and meet them through the continuous development and innovation of the systems.

The responses to the Green Paper on Satellite Navigation Applications that the Commission published last year have made it evident that the market is far from being aware, mature, and developed. In addition, potential users are surprised and concerned about the constant delays of the initial introduction of the systems and, as a result, have great hesitations investing in applications and services.

With a potential global market of some 450 B€ annually from the year 2025 onwards, and the stated intention of the European private sector to capture around one third of this market, it is important to develop this potential, to put enablers in place, to raise awareness, to provide adequate and up-to-date information on technical abilities and performances, and to ensure that all actions that the public sector can take in this respect are indeed initiated.

Businesses should be encouraged to commence development of applications making use of receivers compatible with Egnos and all currently available differential systems.

Following the consultation of the Green Paper, the Commission will publish an Action Plan in the near future of which the main objective is to put in place a framework that allows the development of applications and services based on EGNOS and Galileo by means of targeted action in each application and market domain.

The priority actions for fostering investments in applications and services are as follows:

(1) Stabilise the EGNOS and Galileo service characteristics such as service availability, detailed technical specifications, and pricing policy;

(2) Establish a communication policy that promotes the use of satellite navigation in general and the use of EGNOS and Galileo in particular, that provides all the required details of technical abilities and performances, and that provides up-to-date data on the progress of implementation of the programme;

(3) Develop a Galileo enterprise policy that encompasses an IPR licensing policy which targets private sector investments in satellite navigation products and services, standardisation policy and actions, establishes networks between researchers, developers, industrialists, and financers, particularly for SME's;

(4) Put in place a co-operation framework with GMES[23] for the benefit of numerous applications that will be based on the combined Galileo/GMES use, which together with an integrated use of electronic communication will provide new markets.

(5) Put in place a cooperation framework between the sector clusters in order to support market uptake and competitiveness.

The introduction of this Action Plan is of considerable importance as public sector action will also contribute towards a structural reduction of the market and revenues risk for the systems. This action is all the more important now that it is clear that private sector involvement in the very early phases of the programme, notably as concerns developing the business case and preparing the markets, is not forthcoming. This means that the public sector will have to act and help develop the market, at least until the private sector takes over, as a proxy for determining market needs and possibly longer.

"Space" being a lead market *par-excellence*, targeted actions in individual application and market domains need, according to the majority responses to the Green Paper, to be based on a policy that creates conditions that allows the market to thrive and determine the best solutions, rather than trying to regulate the use of satellite navigation in these markets. It is however obvious that in a number of areas, regulation can not be excluded if justified by the goals of European policies and may actually be helpful to the use of satellite navigation, like in areas such as aviation, transport of animals and dangerous goods, in maritime surveillance[24] and in safety and security related areas. Special attention is required in the area of privacy and data protection.

The GSA, in coordination with Commission services, should contribute to this important task, coordinating its activities also with public authorities at national, regional, and local levels, and working closely with all actors in all relevant sectors and markets.

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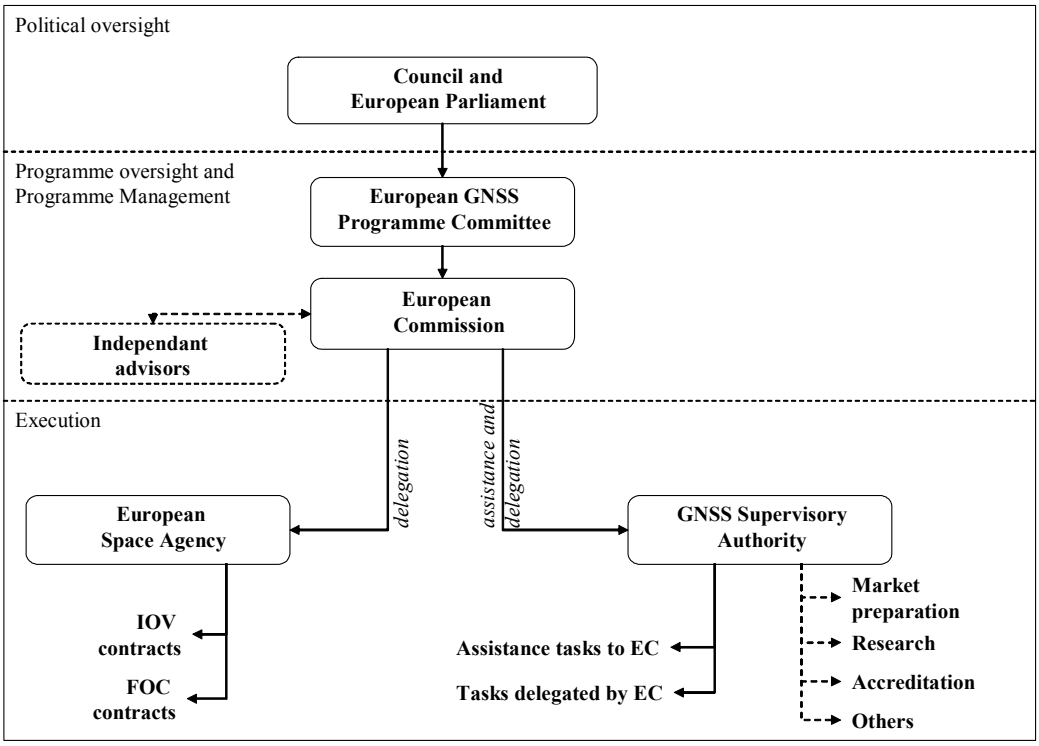
[23] The Global Monitoring for Environment and Security programme undertaken jointly by the EC and ESA, providing services based on observation data received from Earth Observation satellites and ground based information. These data will be coordinated, analysed and prepared for end-users. Positioning, navigation, and timing play an important role in these services.

[24] Provision of a scheme for integrating Galileo with ships' (existing or under development) tracking and positioning systems as a means towards a better maritime surveillance, as addressed in the Green Paper "Towards a future Maritime Policy for the Union: A European vision for the oceans and seas" - COM(2006) 275, 7.6.2006.

On the basis of this work, and where appropriate, the Commission will to be in a position to make the necessary regulatory and other proposals that remove barriers to the development of community policies which may profit from the use of satellite navigation, notably in the areas of inter-operability of services and systems that foresee the use of satellite navigation, the inter-operability of road-tolling systems, emergency communications, safety operations, monitoring of critical infrastructure, transport of animals and dangerous goods, and others.

6. PUBLIC SECTOR GOVERNANCE

Programme oversight and management is an integral part of a programme like Galileo. Clear roles and responsibilities and efficient decision-making processes contribute to avoidance of cost-overruns and programme delays. A simplification is needed of the public governance structure and a structural division of roles on the basis of a clear separation of programme oversight and programme management, based on EU financing and rules.



The following is proposed:

(1) Role of the Council and the European Parliament:

The oversight role belongs to Council and Parliament and takes form of:

- political oversight, exercised directly by the Council and the European Parliament, and
- programme oversight in the form of a "European GNSS Programme Committee" in which representatives from the Member States provide overall guidance and take decisions on all important aspects of the programme.

This European GNSS Programme Committee, set up in the framework of the basic act for financing of the European GNSS programmes[25] as part of the EU comitology arrangements, follows all matters concerning the expenditure of the related budget and technical, programmatic, schedule, and financial issues of EGNOS and Galileo, and guarantees the coherence of the programme, rapid decision making, and equal access to information. The European Commission, as the Programme Manager (see below) reports programme progress and emerging issues to this Committee.

The European GNSS Programme Board shall associate to its work delegates of the GSA Administrative Board and, when appropriate, as experts delegates of the ESA Programme Board on Navigation (PB-Nav).

The Member States jointly have the competence for security matters. In order for the related work to be carried out within the timetable and priorities of the programmes, a close involvement of the Programme Manager (see below) will be needed. Therefore the Galileo Security Board will be continued in its existing form[26].

(2) Role of the European Commission

As the institution that is directly accountable to Council and Parliament, the European Commission needs to have overall programme management responsibility.

It is essential to have a single Programme Manager on the side of the public sector that is accountable for the entire Galileo programme, that has management and/or contractual control over all the subordinate implementation levels, that has access to both financial resources and to the political authorities, and that can provide the necessary arbitrage between all elements of the programme. A split responsibility with different reporting and accountability lines will cause fractures in the programme and have structural, negative impacts.

The European Commission, on behalf of the EU as the owner of the system, shall have the responsibility, in particular, to ensure that the EU's political and international commitments and vision are implemented, determine and agree on the overall specifications and requirements for the system; and to be able to monitor and control the strict adherence to such requirements throughout the construction, deployment, and exploitation phases. It is proposed that:

(1) The European Commission acts as the maître d'ouvrage (or "sponsor") of the programme, overseeing all development, procurement, operations and maintenance, and exploitation contracts related to the system infrastructure.

(2) The European Commission will be advised by an Advisory Board of senior professionals coming from disciplines such as project management, space engineering, financial, technology marketing, and which act as independent reviewers of the programme.

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[25] The Committee created by the Regulation of the European Parliament and the Council concerning the putting into place of the European GNSS programmes, as proposed in the Modified Proposal - COM(2007) 535, 19.9.2007.

[26] As set up per Article 7 of Council Regulation (EC) No 876/2002 (OJ L 138, 28.5.2002, p. 1).

(3) Lastly, the European Commission puts in place an appropriately structured and staffed Galileo team that provides the overall management, risk monitoring and management, reporting, and arbitrage of all the programme elements. The GSA and project management consultants, the latter put in place by means of (a) service contract(s), provide support to this effort;

Good programme management practice furthermore requires an integral overarching risk management approach at programme level that is enforces at all levels below, independent professional reviews, and agreed levels of autonomous decision-making. The latter means that at each level of the programme there are rules on the scope of the allowed autonomous decisions (both in financial terms and in terms of content) and that delegation and escalation procedures are put in place, including for escalation to Council and European Parliament, that ensure that the decisions are taken at the right levels. It will be the task of the European Commission to propose an overall Programme Management Plan that sets out the basic principles, objectives, procedures, and processes of programme management.

(3) The role of the GNSS Supervisory Authority (GSA)

It is to be noted that ending the PPP concession negotiations has caused a legal vacuum on the role of the GSA that, in accordance with the current Regulation[27] that sets it up, was based entirely on the putting into place of a concession holder.

It is therefore important that the GSA shall now be substantially strengthened in relation to all relevant actions with respect to the preparations of the markets that will be addressed by the Galileo services and applications, in order to allow the EU to step up its commitment to Galileo by means of appropriate market preparations.

It furthermore acts as the Accreditation Authority, and is responsible for organising the certification of the European GNSS programmes. In addition, the GSA advises and assists the Programme Manager on all aspects of the programme, in particular on the implementation and accreditation of security requirements, preparing the concepts for the operations and exploitation phases, operations of EGNOS, and the issuing of IPR licences.

In order to provide a coherent framework for public governance, it will be needed for the Commission to submit a proposal for a Revision of mentioned Regulation as soon as the EU's political decisions on the programme are taken.

(4) The role of the European Space Agency

The Framework Agreement between the European Community and the European Space Agency[28] foresees the possibility of the management by the ESA of European Community space-related activities in accordance with the rules of the European Community. As the co-initiator of the European GNSS programmes and the technical architect of these programmes, ESA is in an excellent position to take on the tasks of procurement agent and maître d'œuvre (or "prime contractor"). Moreover, the ESA technical expertise and experience accumulated over the last 10 years on the European GNSS programmes is unique and can not be reproduced without major delays, costs, and risks to the programme

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27 Council Regulation (EC) No 1321/2004 of 12 July 2004.

28 "Framework Agreement between the European Community and the European Space Agency" (OJ L 261, 6.8.2004, p. 64).

ESA will act on the basis of a detailed ESA-EC GNSS Agreement that will set out the respective obligations, the procurement policy, the reporting and interaction arrangements, the limits of ESA autonomous decision-making, and the procedures by which decisions are obtained from the Commission and, in appropriate cases, the Council and European Parliament. In addition, such an Agreement will set out, *inter alia*, the overall mission definition, a description of the objectives, a consolidated set of user requirements, a work plan, an appropriate management scheme, the role and financial implications of each party, budgetary aspects, rules of intellectual property rights, rules of ownership, liability in cases of delays or cost overruns, settlement of disputes, and risk management. In particular, the ESA-EC GNSS Agreement will put in place all necessary measures that ensure an optimum control of costs and on-time delivery, that political requirements determined by Council and the European Parliament are indeed implemented in detail. ESA will put in place an appropriate organisation. Synergies with ongoing work for the EC-ESA Agreement on the GMES Space Component will be explored.

As far as the role of design authority is concerned, it needs to be ensured that the European public sector, as owner of the systems, retains crucial knowledge of, and involvement in, the detailed technical definition of the European GNSS programmes. This is essential in the letting of future contracts for the European GNSS programmes. The ESA-EC GNSS Agreement will have to address this matter in detail.

It is needed to foresee regular and detailed reporting to the Council and the European Parliament, including on progress, risks, finances, the appropriateness of the governance arrangements, and all other relevant matters.

It is proposed that to seek agreement on the above package of proposals for public governance of the European GNSS programmes, in particular:

1) the creation of a European GNSS Programme Committee;

2) the role of the Commission as the European GNSS Programme Manager and maître d'ouvrage, assisted by an advisory board and relevant experts;

3) strengthen the role of the GSA in market preparation and the implementation of the Satellite Navigation Action Plan, in R&D management, as Accreditation Authority and organising system certification, and as advisor to the Commission and assist in programme management in particular EGNOS operations, concepts for the operations and exploitation of Galileo, and the issuing of IPR licences;

4) the role of ESA as the maître d'œuvre, acting on the basis of an ESA-EC GNSS Agreement;

5) regular and transparent reporting to Council and European Parliament.

7. CONCEPTS FOR THE OPERATIONS AND EXPLOITATION PHASES

The Commission has stated that it remains committed to the early involvement of the private sector in the European GNSS programmes, including in the operations and exploitation phases. In practice, a limited number of different options or a combination thereof, is available, such as various variants of PPP's, service contracts, or publicly owned corporate entities.

However, as long as the exploitation revenue risks do not change, there appears to be a substantial risk that too early an attempt to let a PPP concession contract for the subsequent phase may cause another failure. In such a case, a risk transfer can not be achieved on terms which represent a good deal for the public sector or that the value of the risk transfer would be relatively small.

As a consequence, it is appropriate to take the decisions on a PPP concession and the precise structure of that contract only at the appropriate time in the future as a later transfer of risks provides better value-for-money. Interim arrangements are therefore requires until then.

The optimum timing of such decisions depends on a number of parameters, notably the development of the initial exploitation revenues, the market portfolio that the public sector may have been able to develop (including successful certification, possible commitments for longer-term use of PRS, etc) and could transfer, the views of the markets (including financial markets) of the attractiveness to compete for a PPP contract, the technical performance and stability of the system, and the possible actions taken by competitors in the market. It is however unlikely that a decision on the final structure can be taken before 2013.

As concerns a public procurement of an IOC or a FOC configuration[29], there is a convincing case to procure the entire constellation of Galileo satellites. In an IOC public procurement there are potential conflicts of interests and scheduling with two different procurement contracts but concerning the same infrastructure. Furthermore, as already set out in the Communication of May, the IOC scenario is not attractive from a point of view of both timetable and costs. For those reasons, the IOC public procurement scenario is too risky and excluded. Hence, all evidence suggests that the public procurement shall encompass the entire constellation needed for FOC.

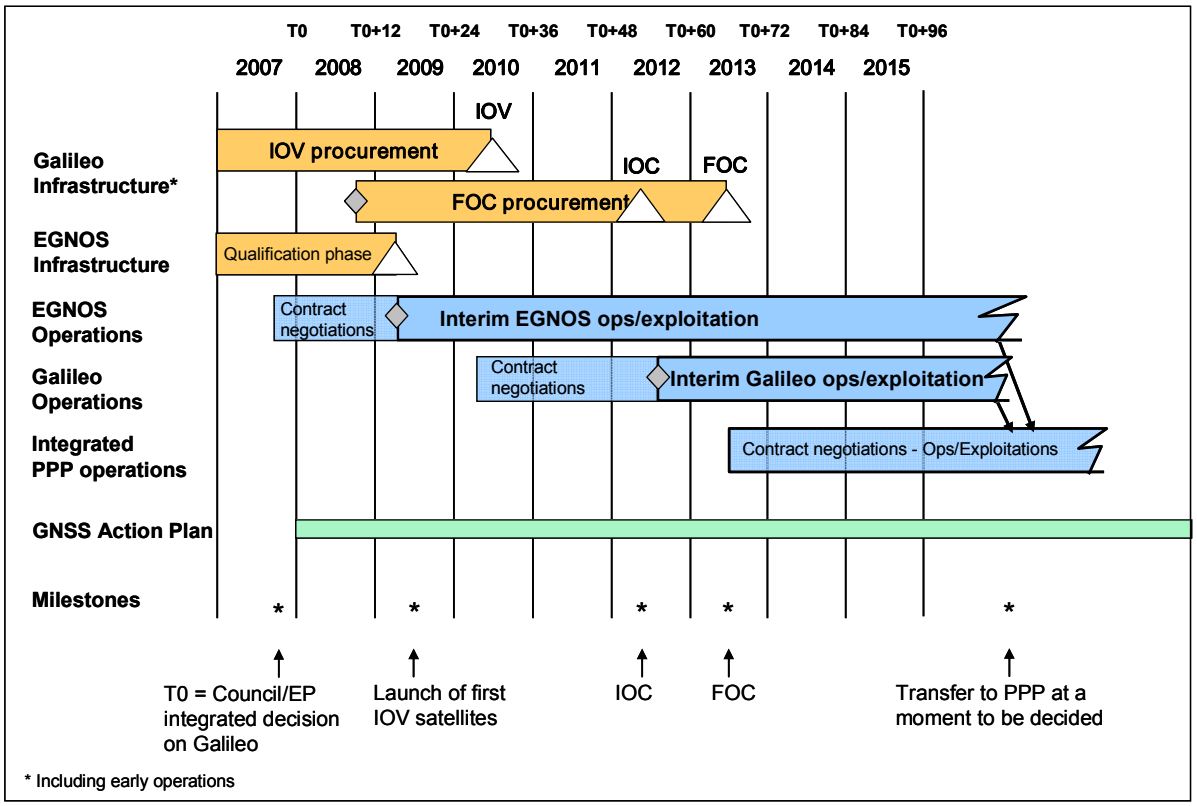
In conclusion, much more analysis will be required that the Commission has commenced already with assistance of the GSA. The timing of the decisions relative to the various steps is of importance in order to ensure the overall coherence of the programme approach.

8. TIMETABLE FOR THE DEPLOYMENT OF THE EUROPEAN GNSS PROGRAMMES

As set out in the documents the Commission submitted in May, the contract for the full deployment phase commences at the earliest one year after the EU political decision on the re-profiling is taken and under the assumption that the relevant legal decisions regarding budget and financing are taken within months afterwards. Subject to an early procurement of the long leads items at least 6 months beforehand, Full Operational Capability (FOC) can be reached 4 and half years after the start of this contract.

In view of the time needed for the decisions on the European GNSS programmes, if a positive political decision is taken by the end of 2007, the FOC can be realised by the middle of 2013. The above considerations lead to a timetable for the deployment of the European GNSS programmes as follows, of which a related list of key dates and milestones is in Annex 2.

[29] Initial Operational Capability (IOC) scenario: 18 satellites under public procurement foreseen to be completed by end 2011and the exploitation/operations phase under a PPP commencing in early 2010, or Full Operational Capability (FOC) scenario: all 30 satellites under public procurement foreseen to be completed by end 2012 and the exploitation/operations phase under a PPP commencing in early 2010.


T0
T0+12
T0+24
T0+36
T0+48
T0+60
T0+72
T0+84
T0+96
2007
2008
2009
2010
2011
2012
2013
2014
2015
IOV
IOV procurement
IOC
FOC
FOC procurement
Galileo Infrastructure*
EGNOS Infrastructure
Qualification phase
EGNOS Operations
Contract negotiations
Interim EGNOS ops/exploitation
Galileo Operations
Contract negotiations
Interim Galileo ops/exploitation
Integrated PPP operations
Contract negotiations - Ops/Exploitations
GNSS Action Plan
Milestones
T0 = Council/EP integrated decision on Galileo
Launch of first IOV satellites
IOC
FOC
Transfer to PPP at a moment to be decided
* Including early operations

Annex 1: Summary overview of the major Galileo programme risks

Category/Risk	Causes	Impact on costs, delays, revenues	L[1]	Financial impact due to delays and costs	Occurrence	Mitigation
Design risks						
Reduced satellite lifetime	atomic clocks lifetime/ MEO orbit behaviour	Revenue loss/additional launches/possible redesign	3	~ 250 to 500 M€	After FOC	
Scalability risk	Up-scaling from IOV to FOC causes problems	1-2 years delay, revenue loss/financing and operations costs	4*	~ 50 to 100 M€	Until FOC	stabilise technical baseline
Safety-of-Life performance risk	Safety-of-Life service performance not met	SoL revenue loss, possible redesign	7*	~ 25 to 50 M€	Until FOC	stabilise technical baseline
Security accreditation risks	accreditation of system at IOV or operator not achieved/PRS policy not ready in time and thus PRS implementation uncertainty	1-2 years delay in PRS service implementation, PRS/SoL revenue loss	6*	TBD	Until FOC	stabilise security baseline/ early political agreement on PRS access policy and concept of operations
Deployment risks						
Programme delays due to technical, managerial, financing, or political issues.	IOV completion delays/FOC completion delays/management problems/governance problems/technical delays/financing delays/ programme hand-over and interface problems	1-2 years delay, late time to market, additional private sector manpower requirement	6	~200 M€	After IOV	Efficient public sector programme management;
Launch risks	single source dependency/ launch failure and pad destruction	6 months delay/late to market/financial and operating costs	4	~ 100 to 250 M€	Until FOC	double sourcing, if possible, insurance, spares on ground
Market/revenue risk						
Underperformance	Underperforming revenues (from any cause)	Revenue loss	9	See the relevant section of document	After FOC	Public sector enabling actions:
Indirect revenue impacts	Due to occurrence of other risks (see above)	Revenue loss		0.5 to 2.5 B€ per event		
Third party liability risk	insufficient market capacity/ lack of control over jurisdiction of claims		2	> 1 B€	After FOC	Insurance market test/ EU Regulation (EU market)/ worldwide convention
Un-insurability	in-sufficient market capacity/ too expensive		3	> 1 B€	After FOC	TBD
Supervening Events	Causes outside control of the programme		3	~ 250 to 500 M€	After FOC	-

[1] Likelihood: 2=very remote, 3=remote, 4=very unlikely, 5=unlikely, 6=possible, 7=likely, 8=very likely, 9=probable

* for the correct evaluation of the likelihood values further analysis is needed

Annex 2: Milestones of the European GNSS programmes

Sequence of institutional decisions/milestones		
December 2007 (= T0) [30]	EU	Integrated Political Decision on GNSS Programmes
	Council/EP	Adoption of a Decision on the Revision of the Financial Framework 2007-2013
March 2008 (T0+3)	Council/EP	Adoption of Regulation on Financing of GNSS Programmes
March 2008 (T0+3)	ESA-COM	Signature ESA-EC Agreement
2nd quarter 2008	Council/EP	Adoption of Amended Regulation EC/1321/2004
2nd quarter 2008	Council/EP	Adoption of PRS access policy
Programme events		
March 2008	T0+4	Early procurement of the Long Lead Items[31] for Galileo FOC Release Requests-for-Proposals for Galileo FOC contracts.
Autumn 2008	T0+12	Start Galileo FOC procurement contracts
March 2009		Start EGNOS Interim Operations
Autumn 2009	T0+24	Launch first Galileo IOV satellites
First half 2012	T0+54	Galileo Initial Operational Capability (IOC) milestone
Middle 2013	T0+66	Galileo Full Operational Capability (FOC)

[30] This is called moment T-zero. A number of programme events are critically dependent on this date and mentioned with the addition of required months.

[31] Long-lead-items are especially produced, critical parts for the satellites.