

THE EUROPEAN INITIATIVES AND PROGRAMMES FOR SATELLITE NAVIGATION

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Abstract

Nowadays, space technology revolutionizes navigation and will become the method for any task of position, velocity, range determination and time distribution. Europe wants to play a key role in the field of navigation by satellite and three of its main governmental organizations, the European Space Agency (ESA), the European Community, through the Transport and Telematic initiatives of the European Commission, and the European Organisation for the safety of air navigation (EUROCONTROL) representing the interests of civil aviation authorities, have elaborated together an initiative for an early satellite navigation service, in view of a later Global Navigation Satellite System (GNSS), to become a worldwide new system for positioning and radio navigation *via* satellite. This initiative will provide a service on a European basis. In the long run, it might replace the current state-owned military navigation and positioning

systems GPS (US) and GLONASS (Russian Federation) by a fully civil controlled system, based on the orientations suggested at the level of the ICAO recently. Also further studies and demonstrations are now developed by ESA in Europe on GNSS-2 and Europe has now a longterm strategy for GNSS. In order to be able to be a valid actor in the worldwide arena, Europe has to focus on elaborating an adequate institutional framework of its own and at the same time a meaningful cooperation on satellite navigation issues with other Countries, starting point of larger technical, political and institutional collaboration on GNSS, based on the fundamental principles of the law of Outer Space.

Introduction

The GNSS will become a worldwide system for positioning and radio navigation *via* satellites, which will constitute a major innovation for all the potential users in the area of air, maritime

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and land transport. GNSS is indeed the answer to future civil applications of navigation satellite systems that neither the American GPS nor the Russian GLONASS can bring alone, because of their lack of accuracy.

Satellite navigation has to face nowadays a drastic multiplication of civilian and peaceful applications: air, sea and ground transport, wild animal migrations, efficiency of ambulance, police and fire department vehicles, search and rescue missions, recreation activities and precise timing of computers. In brief, positioning by satellite is nowadays recognised as a facility offered to civil users that will fundamentally affect all functions relating to positioning localisation, identification, navigation and timing.

Existing systems

The GPS and the GLONASS have been elaborated to answer military imperatives as sea and air positioning for military ships and aircraft, positioning for military troops in unknown areas and precision use of weapons.

GPS has been designed as a military positioning system to protect national security and defense interests. The progressive introduction of GPS receivers, at low prices, into the consumer electronics markets, has widely developed the civil use, well beyond initial expectations of the US DoD. But the US government cannot be insensitive to all of the available civil applications of GPS. US policy regarding GPS is now based on the right balance between US national security requirements and interests and the acceptance and integration of GPS into civil, commercial and scientific applications worldwide.

US policy follows two guidelines, summarised in October 1994 by the US FAA in a letter to the President of ICAO, reiterating an oral offer by the USA to provide GPS SPS signals to the world community at no charge for ten years and followed by the US President's declaration of

March 29, 1996: free of charge access to GPS C/A code to any civil user worldwide and remaining in place of the Selected Availability (SA) action at least until the year 2000. After this date, "an annual determination about whether also the civil users can have access to the more accurate (20 meters) military signal" would be made. However, this eventual annual determination on continued SA use will close in 2006 by which time the decade for the discontinuation of SA will have elapsed¹.

The Soviet Authorities started the development of the primarily military GLONASS in the mid-1970s, shortly after the US initiated the GPS programme. GLONASS is a military network based on a constellation of 24 satellites, operational since 1996. At present the GLONASS constellation is operating only 13 useable satellites. Because of a failure rate of about 4 spacecraft per year, the Russian authorities have not been able so far to sustain a continuous replacement.

Russian policy regarding GLONASS is based on the Russian offer, dated 1991, to guarantee free and universal access to GLONASS signals for at least 15 years. In July 1994, a governmental decree was signed that forms the legal basis for civilian use of GLONASS and stipulates that the responsibility for this resides with the Russian Space Agency, RKA. On March 7, 1995, another governmental decree "on executing works in use of the GLONASS for the sake of civil users" was signed which confirms the earlier commitments for use of the GLONASS system by national and foreign civil users. Nevertheless, GLONASS remains a military system, controlled by Russian defense authorities.

International law value of these decisions.

Neither the US President's decision nor the Russian governmental decrees in their present state have binding force under international law: these decisions can be modified or cancelled whenever the authorities of the USA or of Russian Federation decide and there is no

expectation for the USA or the Russian Federation to complete these decision dispositions with some binding commitments towards users. The tolerated use of GPS and GLONASS by civil users is not a secured right for the international community, it only benefits from an acceptance granted to it by the USA and Russian Federation. Europe has no other guarantees than political ones, and is in a situation that obliges it to implement, for the time being, a navigation system based and depending on GPS and GLONASS.

ICAO Initiatives

Regarding the increasing limitations of the air navigation systems, the International Civil Aviation Organisation (ICAO) established a special committee on Future Air Navigation Systems (FANS) in the early 1980's, which developed a future system concept for Communication, Navigation and Surveillance (CNS) as well as Air Traffic Management (ATM) and which provided recommendations for the coordinated evolutionary development of the transition planning to future systems.

ICAO members are now fully aware of the considerable progress that Satellite Navigation can allow in the use of airspace. GNSS services can increase airspace capacity, provide substantive economies in flight operations and further enhance the regularity of air transport. The greatest advantage is the great contribution it can make to safety. In summary, for ICAO, the coherent and timely implementation of GNSS systems is the best guarantee that international civil aviation can grow in a safe and orderly environment well into the 21st century.

For this purpose and for evaluating the several implications, ICAO Council created on 6 December 1995 a GNSS Technical and Legal Experts Panel (LTEP) which concluded its work in February 1998². The Panel drafted and finalized a set of draft recommendations to Council which are useful to establish a future

GNSS legal framework and capabilities, affirming some essential principles :

- a) GNSS services to be considered as international service for public use.
- b) GNSS to be civilian-controlled using existing organisational structures and with a coordinating role of ICAO.
- c) Cooperation and mutual assistance between States (or regional operators on their behalf).
- d) A worldwide unique and centralized operating structure for GNSS is not needed, regional operating structures should be developed, coordination between regions can be achieved through agreements among regional organisations.
- e) Preventing abuse of monopoly powers on the part of GNSS signal providers.
- f) User charges for financing GNSS, including yearly subscription charges and license fees.
- g) Liability regime for GNSS, also defining whether the doctrine of sovereign immunity should apply.

In the same line of action, ICAO organized in Rio de Janeiro (11 to 15 May 1998), the first-ever worldwide Conference on CNS/ATM Implementation. The aim of the Conference was to bring together all partners in the worldwide implementation of CNS/ATM systems around two main issues, the financing mechanisms and the institutional frameworks required to move the projects forward. The agenda also included a review of technical cooperation, legal and training aspects of CNS/ATM systems implementation. The Conference produced, as a final act, a Declaration³ which includes the following recommendations and conclusions:

- Increase cooperation at all levels to ensure transparency and interoperability of CNS/ATM systems elements.
- The financing of CNS/ATM systems can be of common benefit to lenders, borrowers

and users alike.

- New initiatives for financing should continue to be studied.
- ICAO's planning and implementation regional groups to provide a platform for formal recognition of new air navigation facilities and services in concert with Global air plan for CNS/ATM systems.
- The draft Charter on the rights and obligations of States relating to GNSS services to be adopted as an interim framework for the short term (draft international convention for the long term).
- Further work on legal aspects of implementation of CNS/ATM systems should be carried out by ICAO.

From these substantive points it can be noted the orientation taken towards a global civil controlled system along the lines of the European positions expressed at the Conference⁴. Also this year, the ICAO Council decided to submit the draft Charter as a document for approval to the 32nd Session of the ICAO Assembly which is presently running from 22 September to 2 October 1998⁵. This Charter confirms the same fundamental principles applicable to the implementation and operation of GNSS.

European Initiatives

The perception of the need for a global civil satellite navigation system and the view of a role for Europe led ESA to develop a continuous programme of technical studies since 1982. These studies resulted in the definition of a navigation satellite system concept, earlier named NAVSAT, based on the broadcast to users, through simple transparent navigation transponders, of the ground-generated ranging signals.

By progressively maturing its position, Europe has been taking an active role in the optimisation of existing satellite navigation and in the development of the next generation of satellite navigation systems, with the aim to

ensure reliable, efficient and highly accurate navigation and position-fixing services for European users.

Europe intends to provide three essential services: ranging, integrity monitoring and differential corrections. To this aim, Europe has developed its own contribution: the European Geostationary Navigation Overlay Service (EGNOS) concept, which is the first European contribution to a future GNSS. The European initiative is multi-modal and multi-sectorial in scope: the resulting navigation/positioning services will be available to all potential users, notably in the air, maritime and land transport sectors.

The EGNOS system is an augmentation of existing satellite-based radio navigation and positioning systems (GPS and GLONASS) using geostationary satellites that will enhance the performance of these systems firstly over Europe and more generally over the entire EGNOS geostationary broadcast area, which expands well beyond Western Europe. By using navigation transponders on geostationary satellites and processing data from a network of terrestrial monitoring stations, EGNOS will provide additional satellite ranging capability, service integrity and wide-area differential correction data. This European augmentation service of the existing military constellations GPS and GLONASS will meet the civilian user requirements (GNSS 1), in parallel with preparatory works for the design and implementation of the second generation system (GNSS 2), which is expected to be under civil control.

The "Tripartite"

In order to realise this new venture, a common approach has been agreed by three partner organisations. The European Space Agency, the European Community and EUROCONTROL, are working together as the European Tripartite Group to jointly develop the European component of GNSS, presently EGNOS and

later GNSS-2.

ESA Member States approved the ARTES Programme in 1993 and the specific Programme Proposal on ARTES 9 activities on satellite navigation the same year⁶. In addition, ESA's Council at Ministerial level in Toulouse in October 1995 invited the Director General to define programme proposals in close consultation with the European Union on a European contribution to a worldwide satellite navigation system⁷.

In December 1994 the Council of the European Union welcomed in a resolution the Commission's proposal to "initiate or support work needed for the design and organisation of a Global Navigation Satellite System (GNSS) for civil use"⁸.

The role of EUROCONTROL was also recognised by the decisions taken at the meeting of ECAC Ministers on the Air Traffic system in Europe (Copenhagen 10-11 June 1994) when the three organisations, together with the member states of ECAC, were invited to develop and jointly pursue proposals for a European component of an initial global satellite system for navigation and to take appropriate action to place Europe in a position to contribute to the next generation of global civil satellite navigation systems.

The scope of the cooperation between the three international organisations is set out in what is now called the "Tripartite Agreement"⁹.

The Tripartite Agreement

The Agreement covers the European Satellite Navigation Programme, which includes the implementation of EGNOS and preparatory work for GNSS 2. It covers the development and validation of an appropriate augmentation to fulfil user requirements, coordination of actions to attain a full operational capability of GNSS-1 and the definition of GNSS-2.

Each organisation has followed its internal procedures for approval of the Agreement, which has been lengthy in the EU system, under article 228 of the EC Treaty. The Council of the European Union approved the mandate to conclude an Agreement on June 17, 1996. The ESA Council unanimously approved the conclusion of the Agreement along with the draft text at its session of June 1997, authorising the General Director to sign it. The Agreement was signed in Luxembourg on 18 June 1998. The scope of this Agreement is the recognition at political level, by the Member States of the three organisations, of their cooperation and engagement in a responsible and coordinated approach to fulfil their separate activities within each organisation.

According to Article 1, "the purpose of this Agreement is to establish cooperation between the Parties with a view to providing a European contribution to the development of a Global Navigation Satellite System. This concerted effort is aimed at placing Europe in a position to allow provision for a satellite navigation service which shall, as far as practicable, satisfy the requirements of all civil users for operational use independently of other means of radio navigation and positioning". The purpose of the Agreement is indeed clearly to attain, through a binding form, a full operational capability GNSS 1 and to prepare GNSS 2 (definition and design) (Art.3).

According to the Article 5 of the Agreement, "to ensure progressive development of their cooperation, a Joint Tripartite Committee composed of the Parties is set up with the objective of monitoring the implementation of this Agreement and to formulate guidelines and coordinate common approaches toward the realisation of this Agreement".

The Tripartite Committee has no legal personality in itself, apart from the legal personality of its three member organisations, which are each a treaty-based international organisation with wide membership of

European States and each having its own field of competence linked to GNSS.

Inside the Tripartite the responsibilities of EC, ESA and EUROCONTROL reflect the roles of each member.

The European Commission is responsible for institutional and policy matters, ensuring that views of all potential users are taken into consideration in the framework of the overall programme. It is also responsible for the coordination of the implementation of a Trans-European navigation and positioning network.

The European Commission provides the political support and complementary financial support for projects through its Transport Infrastructure policy and its Telematics and Transport R&D. The European Parliament and Council have also adopted community guidelines for the development of Trans-European Networks (TEN) in June 1996 and have recognised the need for a community action in the navigation sector.

The European Commission has set up a High Level Coordination Group of representatives of its Member States, ESA and EUROCONTROL, to draft an Action Plan, the final goal of which is to remove organisational and institutional barriers regarding "the operational implementation in Europe and throughout the world of a seamless multi-modal satellite-based radio navigation/positioning system".

A communication from the Commission covering the period 1996-2005 is now finalised and in particular is suggesting proposals for institutional arrangements, the definition of a legal and regulatory framework, the configuration and implementation of a fully operational and capability schedule and the conclusion of agreements with other countries or regions¹⁰. It includes as Annex I an Action Plan with separate actions assigned by lead responsibility¹¹.

ESA is responsible for the management of all EGNOS development, deployment and technical validation activities and will make its contribution through its Advanced Research in Telecommunications Systems (ARTES) programme. It will implement the ground segment and will operate EGNOS during the testing and technical validation phase. ESA is acting as procurement agent in developing and acquiring all facilities and equipment necessary for the programme. Therefore, ESA's contribution to European GNSS activities is being implemented in the framework of its ARTES 9 programme which foresees substantial funding (310 MEURO) raised with Member States for the development, deployment and testing of the EGNOS - Advanced Operational Capability (AOC) system, and system definition as well as some early development work relating to GNSS 2 (40 MEURO).

EUROCONTROL is defining the mission requirements for civil aviation and plays a major role in the test and validation phase of system deployment, leading to an operational service. EUROCONTROL's work is carried out in cooperation with the relevant national and supranational aviation authorities, in close cooperation with the Joint Aviation Authorities (JAA) which have responsibility for airworthiness certification. The main responsibility of EUROCONTROL is to develop certification requirements based on extensive data collection and analyses¹².

Institutional Issues

The main impediments to reaping the majority of benefits that accrue from satellite navigation technology might be the institutional concerns, rather than technical considerations. The largest difficulties and complications of the future GNSS derive more from the institutional and regulatory framework than from purely technical issues. These institutional concerns can be summarised as the set-up of operating structures, sovereignty, control, ownership,

liability, safety regulation and certification, funding and recovery, international cooperation.

The most immediate concern is that the core element of the near and medium term systems, GPS, is controlled and owned by the United States (with the parallel system, GLONASS being owned and controlled by the Russian Government). Currently there is no formal mechanism for non-US civil parties' actions (particularly European voice) into GPS. Some consultations are organised by US government (State Department, DoD, FAA) with the European Tripartite or with Japan. There is yet no legal link or negotiation towards the establishment of an Agreement on a common system. European aims regarding satellite navigation are however precise: unlimited, clear liability regulation, traceable and stable pricing policy service. Therefore, some fundamental issues underline the political issues regarding GNSS : future policy and control of the GNSS and the eventual necessity of a GNSS institutional settlement.

On the regulating side, under the present state of international aviation law, before GNSS signals can become part of an air traffic service, they must be approved against operational safety standards. In fact the use of GNSS (or earlier EGNOS for Europe) for air navigation must be approved by the national competent authority in each State. All aspects of EGNOS (including technical design, operations and management) will need to obtain national approval pursuant to Article 28 of the Chicago Convention and since this is intended to be one single process in Europe, it is fair to conclude that some responsibility for control over territorial boundaries will be exercised by States possibly through a delegation of powers to one European level authority. The signals are generated in outer space and therefore extra-territorial by legal nature. However, a complex ground infrastructure is also necessary whose components are widely dispersed, of varied ownership and diverse control under several jurisdictions. An institutional framework is

therefore necessary to provide sufficient guarantees on these issues so that States may approve the incorporation of the signals in their air traffic services.

Early work undertaken in EUROCONTROL identified the need, at regional level, for a European entity to be mandated to organise and co-ordinate the installation and operation of satellite navigation infrastructure in Europe in support initially of EGNOS and thereafter in the development of future satellite navigation infrastructure¹³. The core of such an infrastructure would be to link the safe use of air traffic services to the operation of the overall system and its components by a series of contractual arrangements¹⁴.

This link is referred to as "the contractual chain". It would ensure that the overall infrastructure guarantees the delivery of a signal-in-space which satisfies the operational requirements of the air traffic services providers with regard to accuracy, integrity, availability and continuity of service. At each stage in the chain, contractual arrangements should provide performance guarantees, thereby identifying the extent of responsibility of the various actors. In this way, in the event of an accident, the responsibilities of the various actors would be clear and liability would eventually be traced to the actor or actors whose acts or omissions caused an accident. It is envisaged that there would be contractual arrangements between the primary signal providers and the augmentation signal providers; between GNSS service providers and user States which would provide for firm performance and service guarantees and determine liability.

However, it would be impractical for each air navigation service provider to sign a contract with each of the relevant players since the administrative burden would be enormous. The European approach has been to propose the establishment of an interface between the States, service providers and users on the one hand, and system operators on the other. At

European level, this interface would be covered by a GNSS entity. This entity would act as the focal point in the series of contractual arrangements concluding the necessary contracts with the relevant actors to ensure the operation of the overall system.

On a more general approach also, the European Commission, through its GNSS High Level Group, is suggesting the need for a GNSS organisational framework to be set up within Europe. It should play the central role of GNSS European regulator to harmonise requirements as far as possible and to regulate and certify the GNSS signal-in-space, without interfering with other existing regulatory regimes¹⁵.

In order to fulfill its role of safety regulator, the GNSS entity should include permanent safety functions which are vital to the functioning of the regulation of regional systems such as EGNOS and future GNSS.

GPS and GLONASS are systems developed, procured, deployed, operated and controlled by single States - the USA and Russia. Although they have given assurances about system availability to the international community, they could curtail or limit access to civil users if their military and political authorities considered it necessary. Establishing a complementary service *via* geostationary augmentation gives some measure of control over the use and reliability of the signals, although not over the primary signals themselves. In the USA, this does not pose a problem because the GPS operator, the DoD, and the augmentation provider, which is the FAA part of the DoT, are both US Government departments. Therefore, operation and control still reside in the same body (the US administration) which by definition pursues the same scope and has its own methods of taking decisions.

European Institutional Solutions

In Europe, the situation is considerably

different, once again because of the number of States, the disparate memberships of various European organisations and the lack of a single competent authority on space, aviation and general transport issues on behalf of Europe. It will be necessary, therefore, to identify or set up an organisation which can carry out a central role on behalf of Europe.

The main objective in establishing a European "GNSS Agency" is to embody legal personality in a formal framework, in order that the organisation can define and enforce the future GNSS policy, raise funding, conclude agreements, manage technical tasks and be subject to operational liabilities.

There are many international governmental organisations in existence with interest in GNSS (INMARSAT, ICAO, IMO¹⁶, EUROCONTROL, ESA, EC, etc.). Some of these organisations are being examined to assess their suitability for meeting the institutional requirements from the European perspective. The organisations are assessed against their objectives, ownership, control and operational aspects. From a first legal analysis of respective founding acts and mandates, it may be concluded that there is no existing organisation that can ideally and easily address all of the institutional and regulatory concerns and represent the collective European perspectives to the US and Russia, covering the interests of all users groups.

Furthermore, the European contribution to GNSS 1, the EGNOS system, will be developed, implemented and operated to initial operability capability (IOC) by the Tripartite Group. None of the members of the Tripartite Group have been originally constituted to be providers of an operational, multi-modal navigation service, hence the need for a new institutional solution, well suited for the long-term.

Present trends conclude that a new body should be constituted to address the outstanding

institutional issues. This could be achieved by either:

- modifying the charter of one of the existing European organisations, for example EUTELSAT, EUMETSAT or EUROCONTROL;
- creating a European GNSS agency through the European Union or as a new treaty Organisation, drawing on the experience of the European Environment Agency or other specialised agencies;
- privatising the whole system. This solution does not seem feasible, despite the advantages of privatisation, such as profit-driven management, as far as the continuity of the service is concerned. Since the European States are reluctant to trust their navigation requirements to be fulfilled by GPS due to its foreign control, they may be equally reluctant to transfer the responsibility for their navigation needs to a private company outside State control.

The European GNSS Agency approach has three advantages:

- navigation will be the primary function of the organisation, as opposed to being an additional, secondary function within some other large organisation. It is essential that the provision of navigation services should be carried out with best professionalism as it has a direct impact on the safety of life;
- the organisations mentioned above are agencies operating in space or aviation, already specialised in limited sectors, rather than negotiating widely with user organisations from diverse fields. It may be difficult, therefore, for modified versions of them to negotiate agreements with several different parties deriving from the

multimodal character of GNSS;

- it may prove difficult and quite lengthy to modify by treaty revision and ratification the structures of existing organisations and such modification might lead to the creation of a separate or new body.

The European GNSS Agency could be created by Council Regulation/Decision based on Articles 129, 74 and 75 of the European Union Treaty¹⁷. In order to ensure operational or institutional relationships, other interested organisations, according to their constitutive Charters, can easily cooperate with such new GNSS Agency (ex. art. XIV of the Convention of the European Space Agency).

A new GNSS Agency based on EU law or treaty will automatically qualify under both international and national law. Firstly it will be subject to international law.

International Law

One of the main institutional concerns surrounding GNSS is sovereignty of the interested countries, in order to determine which law, national or international, will be used as a reference framework in the field of navigation satellite systems.

According to Article 1 of the Chicago Convention, it is a national requirement that the air traffic control services retain full control and authority over the radio-navigation aids on which their air traffic control is predicated. By their very nature, satellite navigation systems traverse national boundaries and it is difficult to envisage how they can be subject to the same considerations of sovereignty as traditional, terrestrial navigation systems.

The most evident applicable international law is therefore:

- The Chicago Convention, Article 1,

which recognises that States have exclusive sovereignty over the air space above their territory. General international law has always recognised that the relationship between a government and its own citizens is governed by national law;

- The Outer Space Treaty, Article I, which provides that outer space shall be used for the benefit, and in the interest of all countries; Article III which implies that navigation satellites in outer space must be operated in accordance with international law; and Article VI which provides that States, when operating GNSS, shall bear international responsibility for all national activities in outer space, whether those activities are carried out by public or private enterprises;
- The Convention on International Liability for Damage Caused by Space Objects.

If Europe establishes a GNSS Agency with responsibility for operating a satellite navigation system in outer space, then according to the Liability Convention we could have the case of an international organisation to agree voluntarily to be liable under this Convention¹⁸. Only where the organisation has not paid compensation within six months may the claimant State claim against the individual members of the navigation satellite organisation. If the organisation does not agree to the Liability Convention, the risk passes directly to the Member States.

Governments would be liable for their navigation satellites under the Outer Space Treaty and the Liability Convention, not only for injury and damage of their own navigation satellites but also for those operated by international organisations to which the governments are members and for privately

owned navigation satellite systems operated privately from their jurisdictions. However, the “damages” would need to be evidenced within the definition of Article 1 of the Liability Convention.

Conclusion : Towards International Cooperation

The main characteristic of the GNSS today is that in addition to existing military systems as GPS and GLONASS it is composed of several competitive augmentation systems: WAAS, EGNOS and MTSAT, which respectively belong to the USA, Europe and Japan. We can already note some competition among the different States or group of States regarding their future partners as well as a necessary cooperation and coordination. The political element and international relationships will play a decisive role in the evolutions.

The success of the future GNSS 2 relies indeed on the willingness of nations to follow a common approach and to agree on international standards to create a seamless global service, although not on a single space system. In addition to the present policy of the USA, to promote worldwide acceptance of their GPS for civil applications as well, Europe has taken the initiative to promote a new GNSS concept composed of regional systems. This focuses on the necessity for the different actors to persuade their partners to adopt common systems and cooperate.

The right balance between competition and cooperation has been a constant theme in large space initiatives and is essential again for the success of a future worldwide GNSS.

As Europe develops a viable regional component of GNSS or close links with other potential partners for a worldwide GNSS, cooperation and coordination through binding agreements with due respect to institutional issues and international law will remain the best way forward for the benefit of all.

NOTES

¹ These elements are mentioned in H.R. 1702, Commercial space Act of 1997

² See "Final Report", Panel of Legal and Technical experts on the establishment of a legal framework with regard to GNSS (LTEP/3), ICAO, Montreal, 9 March 1998

³ See Declaration on Global Air Navigation systems for the 21st century, ICAO, Rio de Janeiro, 15 May 1998

⁴ See A European view on the legal and institutional issues relating to GNSS, ICAO, Rio de Janeiro, Agenda Item 5, WW/IMP WP/12, 11 May 1998

⁵ Two essential papers appear for decision on the 32nd Session of the ICAO Assembly under Agenda item 19: Legal and institutional issues relating to GNSS implementation (supported by the EC, Eurocontrol and ESA) and Draft Charter on the Rights and Obligations of States relating to GNSS services. ICAO Assembly, 32nd Session, 1998

⁶ ESA's first proposal for a work programme involving GNSS activities was submitted to its Member States in late 1993, as Element 9 of the Agency's programme for Advanced Research in Telecommunication Systems (ARTES), and was approved in December 1994, which allowed the start of the initial phase of GNSS 1. The ESA proposal to Member States and its work content have been updated several times to reflect technical and political evolutions. For the latest version see ESA/JCB(96)25, rev.8, dated 4 September 1998.

⁷ See Resolution on Directions for the Agency's policy and future programmes, ESA/C-M/CXXII/Res.2(Final), adopted on 20 October 1995.

⁸ See Council Resolution of 19 December 1994 on the European contribution to the development of a Global Navigation Satellite System, 94/C379/02.

⁹ See Agreement between the European Community, the European Space Agency and the European Organisation for the Safety of Air Navigation on a European contribution to the development of a Global Navigation Satellite System (GNSS) signed in Luxemburg on 18 June 1998.

¹⁰ See "Towards a Trans-European Positioning and Navigation Network" including a European Strategy for GNSS, COM(98)29 Final, 21 January 1998.

¹¹ The Commission's overall strategy and lines of the Action plan were welcomed and supported in substance by "Council's conclusions on a European Strategy for GNSS" on 17 March 1998, by which the Commission is invited to submit a detailed strategy for GNSS-2 in early 1999.

¹² See EUROCONTROL, Satellite Navigation Work Programme, 1998.

¹³ A position about the creation of a new GNSS Entity has been taken by EUROCONTROL IAR Task Force recommending in 1996 that an EGNOS Unit be established, named EUROCONTROL GNSS Unit. For

latest details see, EUROCONTROL, Update on the GNSS Unit- Agenda Item 9.2, Action Papers AP/ACG/2/3(Revised) and AP/ACG/2/7(Revised), 22/7/98.

¹⁴ For details of the institutional, liability and regulatory issues analysed from European civil aviation perspective, see documents in note 4 above.

¹⁵ For an interim position see, European Commission, GNSS-HLG, Draft Interim Report, Ad-Hoc Working Group for GNSS, August 1998.

¹⁶ See International Maritime Organisation, Resolution A.815(19) on World-Wide radionavigation system, adopted on 23 November 1995 and Resolution A.860(20) on Maritime policy for a future Global Navigation Satellite System (GNSS), adopted on 27 November 1997.

¹⁷ See Treaty on the European Union, signed in Maastricht on 7 February 1992: Articles 74 and 75 on a common transport policy, Articles 129b, 129c and 129d on Trans-European Networks.

¹⁸ This is presently the case of ESA and EUTELSAT who made Declarations accepting the obligations deriving from the Liability Convention.