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LEGAL ISSUES RELATING TO CIVILIAN AND MILITARY DUAL USES OF GNSS

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Introduction

The Global Navigation Satellite System (GNSS) continues to be controversial, mostly because civilians and the military share the same system: it is dual use. This paper will focus on the dual use problems of the primary GNSS system, the U.S. Global Positioning System (GPS). Several of the current GPS controversies are abating. First, civilians and the military now get the same quality positioning and navigation service because of the recent elimination of Selective Availability (SA). 1/ Second, the civilian and military GPS radio signals will be separated; 2/ in a sense civilians will have their own system, separate from the military radio signals.

Several significant controversies continue to rage. First, international civilian GPS users are afraid that the U.S. military may discontinue GPS for U.S. national security reasons. This fear exists in spite of U.S. assurances that the service will be continued. However, none of these assurances have the status of international law. Second, international civilians users and States fear that they arbitrarily may be denied access to the GPS system. Third, there is concern that the GNSS may be vulnerable to interference and therefore unreliable. 3/ Interference may be in the form of terrorist attacks or in the form of scheduled maintenance of GPS. Fourth, the United States has declined to negotiate a GNSS liability treaty which would require the United States to pay compensation for defective GPS service. The U.S. argument is that GPS is provided free of charge. The United States pays $300 – 400 Mill. a year to maintain GPS in top condition and to make improvements. There is no wish to incur the additional cost of liability. Fifth, the United States GPS industry has a significant economic advantage in that the primary GNSS provider is the United States. The future GNSS market potential is estimated to be in the nature of 40 – 50 billion dollars, 4/ or even greater. Other countries, in particular the European countries, would like to compete for a share of the GNSS market and the GNSS industrial employment by establishing a competing civilian GNSS called Galileo.

 This paper refers to the Global Navigation Satellite System as GNSS. The U.S. GNSS provider is the Global Positioning System called GPS.

These are just some of the current GNSS issues.

I. Single System, Dual Use: Scope of Dual Use GNSS

The most tantalizing aspect of Global Navigation Satellite Systems is that virtually all GNSS users, whether military or civilian, whether inside or outside the United States, employ the U.S. Global Positioning System. 5/ GPS will remain the common primary radionavigation system for the foreseeable future. 6/ The U.S. military designed the GPS system for its global use, but civilian users are rapidly surpassing military users. The different users of this dual use system have managed to coexist surprisingly well. "All the users require services that are safe, readily available and easy to use," even though military requirements are more stringent than civilian requirements. 7/ Although GPS is a U.S. system, it is remarkable that it is the prevailing international GNSS system for both military and civilian users throughout the world .

The Russian GNSS provider, GLONASS, is also of military origin but now is dual use, just like GPS. The future European GNSS provider, Galileo, which is planned to be in operation in the year 2008, presently is intended to be for civilian use. Whether it will be used by the military appears at the present time to be undecided. The following discussion will be relevant to GLONASS and Galileo to the extent that they are dual use.

A. National Institutions

The US Presidential Decision Document of March 29, 1996 (PDD) 8/ characterized GPS as a dual use system. The U.S. President, as both civilian head of the Executive Branch and commander-in-chief of the military, established the Interagency GPS Executive Board (IGEB) which is chaired jointly by the Secretaries of Defense and Transportation. The IGEB "manages the dual civil/military use of GPS and U.S. Government augmentations, and supports the implementation of GPS national policy in accordance with the provisions of the PDD. The IGEB ensures that GPS and U.S. augmentation are operated in a manner that is consistent with national policy and that best serves the military and civil use communities. As directed by the PDD, the IGEB consults with the U.S. Government agencies, U.S. industries, and foreign governments involved in navigation and positioning system research, development, operation and use." 9/

For the purpose of coordinating civilian and military GPS, the Departments of Transportation and Defense jointly issue the Federal Radionavigation Plan in an updated version every two years (the 1999 FRP appeared in the Spring 2000). The long delays in government publication of the FRP indicate that the civilian - military coordination is not only difficult but that civilian and military sides take the time necessary to work out their differences. The FRP emerges from open public meetings which provide GPS users opportunity to comment on U.S. radionavigation system policies. The 1999 FRP sets

forth dual use policies and plans, including the following: 10/

> Levels and types of navigation services are fixed to ensure interoperability with international users in accordance with international commitments. 11/
>
> Civilian GPS is established primarily for the safety of transportation, however GPS also provides significant benefits to other civil, commercial and scientific users. Therefore changes to GPS will also consider the needs of the other users. 12/

The US Department of Transportation (DOT) is the caretaker of civilian GPS requirements. 13/ DOT leads the promotion of GPS commercial applications and the acceptance of GPS as the standard in the domestic and international transportation system. 14/ DOT takes into consideration that each class of civilian users (aviation, marine, land transportation, space, geodesy, surveying, mapping, charting and geographic information systems, geophysical applications, meteorological, time and frequency applications) have different requirements. The Department of Defense 15/ insists that the military requirements are often more stringent than civilian requirements. Thus the FRP states that the military navigation system should:

- be capable of denying use to the enemy,
- be resistant to hostile attacks,
- be available for combined military operations with allies,
- use common grid of all users,
- maintain accuracy regardless of changes in altitude or seasons,
- maintain accuracy during violent maneuvers,
- be self-contained,
- be continuously reliable.

Conscious of the need for dual use coordination, the Departments of Transportation and Defense twice a year provide extensive briefings on civilian and military GNSS issues at the public meetings of the Civil GPS Service Interface Committee (CGSIC). 16/ The CGSIC provides an unusual opportunity to meet the actual GPS operators at the staff level and to bring issues of concern to their attention. DOT and DOD are anxious to hear about and to satisfy the needs of foreign as well as domestic users. Therefore the CGSIC includes international subcommittee meetings as well as domestic committee meetings that are open to the public. 17/

In reality the civilian sector (DOT) and the military sector (DOD) work jointly in maintaining and operating the GPS. They have agreed that representatives from the DOT will be located within the Master Control Station (MCS) and the GPS Joint Program Office to participate in the day-to-day system operations, system development, and future requirements definitions. 18/

The civilian-military (DOT-DOD) relationship is governed by a Memorandum of Agreement (MOA) 19/ between the two agencies. The two agencies agree to keep each other informed of GPS developments, to coordinate GPS planning activities, seek to use common systems, equipment and procedures, jointly publish the FRP, and coordinate GPS policies and procedures.

Much of the coordination takes places within the Interagency GPS Executive Board framework, described above. 20/

B. International Institutions

The international civilian GPS users coordinate to a large extent directly with the US GPS provider. 21/ However, active international coordination and discussion of GNSS operation and management also takes place in international organizations. The following discussion will focus on the International Civil Aviation Organization (ICAO) because ICAO has most actively sought to standardize and control GNSS internationally. ICAO's efforts exemplify similar activities in other international organizations (for example IMO, WMO etc). The ICAO efforts are in two areas: (1) international standardization, and (2) international regulation and control of GNSS

1. International GNSS Standardization

GNSS standardization is a high ICAO priority because the 1944 Chicago Convention, Article 37, 22/ creates ICAO for the purpose of establishing international minimum Standards and Recommended Practices (SARPs) for aircraft navigation. Art. 38 requires ICAO member states to give international notice of departures from the ICAO SARPs. Deviations from international standards are serious hazards to international air navigation. Article 44 gives the ICAO Council mandate to "promote safety of flight in international air navigation" 23/

The primary GNSS provider, the U.S. GPS, is committed to international levels and types of navigation services to ensure interoperability with international users. 24/ The U.S. GPS provider is not only agreeable to international GNSS standardization; but the United States actively participates in the process. The US policy was established in the 1996 White House policy statement (PDD) which advocated acceptance of GPS as the standard for international use; the White House statement specifically gives DOT the task of promoting application of GPS as the standard in domestic and international transportation systems. 25/

The coincidence of United States and ICAO policy objectives on GNSS standardization has enabled ICAO to make considerable progress towards establishing international GNSS standards and recommended practices. GNSS SARPs are an element of ICAO's Communication Navigation and Surveillance System (CNS) on the basis of which ICAO's Air Traffic Management (ATM) system operates. 26/ The Chicago Convention, Annex 10, states ICAO's GNSS standards. ICAO is establishing standards for basic GNSS as well as for augmented GNSS.

2. International Regulation and Control of GNSS

It is a much easier for the primary GNSS provider, the United States, to participate in international standardization than it is to cede control over GPS to ICAO or to other organizations. The difficulty in ceding control is in the dual use of GPS. The military visualizes GPS as <u>its</u> navigation and positioning system. Sharing control over GPS with the Department of

Transportation within the Executive Branch may be tolerated by DOD, but to relinquish control outside of the US Government is very difficult. This reluctance is motivated by DOD's duty to protect national security. " The USA ... has made it clear that, for military reasons, they do not consider sharing the operation and control of the American GPS or its successor." As a consequence, " the fact that GPS is under the sole control of the U.S. Air Force... was recently cited by the European Commission as the major reason the European Union should develop its own satellite based navigation system." 27/

The U.S. aversion to sharing control has not deterred ICAO from seeking control, because the future of air navigation depends on GNSS. In 1998 the ICAO Assembly adopted a Charter on Rights and Obligations of States Relating to GNSS Services. 28/ The Charter is based on the Chicago Convention, Article 44, which states ICAO's objective "to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport." In the Charter the ICAO Assembly agreed that the following principles should apply to international GNSS services:

1. States recognize that the safety of international civil aviation shall be the paramount principle in the provision and use of GNSS.

2. States and aircraft "shall have access, on a non-discriminatory basis under uniform conditions, to the use of GNSS services,"

3. (a) States preserve the sovereignty of their own airspace and the right to control aircraft operation in their sovereign airspace; (b) GNSS providers shall not restrict States' control over their sovereign air space.

4. GNSS providers "shall ensure the continuity, availability, integrity, accuracy and reliability of such services, including effective arrangements to minimize the operational impact of system malfunctions or failure, and to achieve expeditious service recovery. Such State shall ensure that the services are in-accordance with ICAO Standards."

5. States shall co-operate to secure the highest practicable degree of uniformity of GNSS services.

6. GNSS charges shall comply with the Chicago Convention, Art 15. 29/

7. States shall be guided by the principle of cooperation and mutual assistance in planning and providing GNSS.

8. In providing GNSS States shall give due regard to interests of other States
.

9. States may provide GNSS services jointly with other States.

Legally, the Charter on Rights and Obligations, as an ICAO Resolution, does not bind ICAO member states like a treaty. In that sense the principles of the ICAO Resolution are much like the United Nations General Assembly Resolution on Remote Sensing of the Earth from Outer Space. 30/ In addition to the Charter, the ICAO Assembly placed the issue of a comprehensive binding GNSS legal

framework at the top of the ICAO Legal Committee's active agenda. The Assembly contemplates that such a legal framework should include GNSS air navigation, GNSS institutions, as well as liability and related issues. 31/ Specifically, the Assembly instructed the Council to consider the elaboration of an appropriate long-term framework to govern the operation of GNSS systems, including consideration of an international Convention for this purpose, and to present proposals for such a framework in time for their consideration by the next ordinary session of the Assembly.

The ICAO Assembly Resolution is actively debated by States and users because it includes the issue of the legal liability of the GNSS provider for negligent GNSS operation. The US GPS operator could become the party primarily liable. This is a difficult area for ICAO because a comprehensive legal framework on GNSS, including liability, is of little value if the primary GNSS provider is not willing to become a party to the treaty; 32/ the United States objects to guaranteeing the quality of service which is currently free to users.

Other international organizations also have attempted and failed to gain some control over GPS. Among these are the European Union and the European Space Agency (ESA). 33/

3. International Treaty Regulation and Control of GNSS

The United States Government exchanged letters with ICAO assuring continuity of GPS; the ICAO Assembly Resolution adopted the Charter on the Rights and Obligations of States Relating to GNSS Services. 34/ These efforts at regulation and control fall short of legally binding treaty obligations. A search for international treaty regulations and controls of dual-used GNSS leads to the space law treaties which govern the operation of all satellites in outer space.

a. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. 35/

The United States and virtually all the ICAO member states are subject to the 1967 Outer Space Treaty. The treaty is so widely adopted that it often is considered to constitute customary international law. Art. 1 provides that " use of outer space ... shall be carried out for the benefit and in the interests of all countries." Article 1 also provides that outer space shall be free for "use by all States without discrimination of any kind, on the basis of equality and in accordance with international law." What is the meaning of this language? One eminent scholar who was present at the negotiations of the 1967 Treaty, Nandisiri Jasentuliyana, later Director of the U.N. Outer Space Affairs Division, states that "States' obligations towards international space co-operation under Article I of the Outer Space Treaty are difficult to enforce and constitute more a moral and philosophical obligation than a legal requirement." 36/ Jasentuliyana's view coincides with the statement of Ambassador Arthur Goldberg to the US Senate Foreign Relations Committee that Article 1 states a goal but that other international agreements would be necessary to regulate individual kinds of satellites.

37/ This view was accepted by the Senate.

Jasentuliyana concludes "it is commonly accepted, however, among the community of States which conduct space activities that they have a general obligation to co-operate in one way or another when carrying out their space activities." 39/ The principle of cooperation and mutual assistance is stated in Article IX of the Outer Space Treaty which requires all States to conduct their activities in outer space "with due regard to the corresponding interests of all other States Parties to the Treaty." - Analogies are often drawn between activities on the high seas and activities in outer space. Both the high seas and outer space are increasingly viewed as scarce resources. Thus it may be argued that the Art. IX obligation to have "due regard" to the interests of other states in carrying out their space activities is analogous to the decision of the International Court of Justice in the Icelandic Fisheries case stating that states must have due regard to the interests of other states in use of scarce resources. 39/ It follows that there is a legal obligation on the GNSS providers to consider the interests of the international civilian users.

b. Other Treaty Law

The United Nations Charter applies in outer space The Charter places limits on military uses. For example Art. 2 requires states to respect the sovereignty of Members, to settle disputes by peaceful means, to refrain from threats or use of force and from acting "in any other manner inconsistent with the Purposes of the United Nations." 40/ Other treaties restrict military uses, for example the 1967 Outer Space Treaty, Art. 4.

c. International Law on GNSS Liability

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The Convention on International Liability for Damage caused by Space Objects 41/ makes the launching state liable for injury or property damage. Liability is absolute or based on fault depending on whether the injury or damage takes places in outer space or on Earth. Claims must be brought by States. The Convention is generally interpreted to the effect that it does not apply to indirect damages. GNSS damages may be considered to be indirect damages. 42/

ICAO currently is discussing a possible liability regime that would make GNSS providers liable for negligently provided GNSS services to aviation. However, neither the ICAO Council nor the ICAO Legal Committee has reached consensus on the issue of whether GNSS presents a liability situation which is different from the situation of liability of existing air traffic control and other air navigation providers. 43/ The major GNSS provider, the United States, is of the view that "nothing about the implementation of satellite navigation, communication, and surveillance - including advent of additional participants in provision of air traffic control services- raises legal or factual issues that cannot be handled by current claims mechanisms." 44/ Current claims process looks to national law for compensation for defective air traffic control. 45/

II. Coexistence of Dual Use GNSS

Several recent developments have tended towards reducing the international civilian frustration with dual use GNSS. Several issues of contention remain, however. Finallly, there are some new developments on the horizon that may change the dual use situation.

A. Easing Tension over Dual-Use GNSS

Three GPS developments strongly favor the civilian GNSS users: International standardization of GNSS navigation and positioning service; the termination of Selective Availability; and the creation of additional civilian radio frequencies.

1. International standardization

The United States is committed to international standardization of the GPS navigation and positioning service. Because of active U. S. participation in ICAO's efforts to establish international standards and recommended services (SARPS), the process of establishing international standards is close to completion. ICAO will also establish standards for augmented GPS.

2. Termination of GPS Selective Availability

The US Government terminated Selective Availability (SA) on May 1, 2000. Previous to May 1, GPS was available at two levels. Standard Positioning Service (SPS) was available to civilians, and the more accurate Precise Positioning Service (PPS) was available to US military and allied military users. The objective was to provide an advantage to the military users. The 1996 White House statement promised an end to SA at the latest in the year 2006, so termination in 2000 came sooner than generally expected. The end to SA is a significant recognition of civilian GPS users. It expresses the US Government's wish to treat the civilian users the same as the military users as much as at all possible. The improvement in accuracy caused by elimination of SA is not sufficient to land airplanes; only augmented GPS can accomplish that. So augmentation of GPS will still be necessary Elimination of SA means that civilian users can locate themselves on a map within 30 meters rather than within 100 meters. 46/ It also means that existing GPS receivers will perform better than before May 1, 2000, thus the GPS instrumentation will become more valuable, which is a boost to the GPS industry and will lead to its growth.

Selective availability of the GPS signal has been an irritant to the civilian international GNSS users. SA was a factor in the European plans to produce the European controlled GNSS operator called Galileo. It is uncertain whether the termination of SA will change the European plans. However, it does remove a significant irritant which constantly reminded GNSS users of US military control of GPS.

3. New Civilian GPS Radio Frequencies.

Basic GPS service for both civilian and military users utilize the entire bandwidth of the GPS signal at L1. 47/

> The US Government has determined that availability of not one, but two additional course/acquisition (C/A) coded

> signals is essential for many critical uses of GPS. The additional signals are planned to enhance the ability of GPS to support all civil users. A second no-safety-of life coded signal will be added at the GPS L2 Frequency (1227.60 MHz) on the satellites scheduled for launch beginning in 2005. A third civil signal that can meet the needs of critical safety-of life applications such as civil aviation will be added at 1176.45 MHz. The third signal will be implemented on the satellites scheduled for launch beginning in 2007. It is planned that both the second and third civil signals may become part of a civil GPS service. Until the second coded civil GPS signal is operational, the DOD will not intentionally reduce the current received minimum radio frequency signal strength of the P/Y-code signal on the L2 link... nor will DOT intentionally alter the modulation codes ... on the L2 link. 48/

The civilian users will appreciate the separation from military users through the establishment of exclusive civilian frequencies. This is yet another recognition of the importance of the civilian users. It also indicates that civilian users will not be lumped with military users. The increasing separateness of civilian and military users will enlarge the possibility for civilian GPS to continue functioning undisturbed by the military GPS activities. Separateness also will benefit military users who will be less anxious about sharing with the civilian users. The U. S. military also is planning to develop alternative technology for navigation in order to avoid total dependence on GPS. 49/

This division of GPS radio frequencies does not establish an entirely separate civilian GPS, independent of military GPS. GPS will continue to be dual use. But the civilian and the military users will be more secure from each other. Civilian users have greater assurance of the continuity of and access to the global GPS service. That will also give civilian GPS users greater confidence to augment the GPS signal, knowing that it is less likely to be disturbed.

B. Unresolved Dual-Use Issues

1. Continuity of GPS Service

International civilian users are concerned that GPS may be discontinued by the United States for national security reasons. That is the why the ICAO Charter, Fourth Principle, states that GNSS providers shall ensure continuity of GNSS services. 50/ Considering the GPS users' dependence on and economic investment in GNSS technology it is important to know that the service will continue to exist and will not be discontinued arbitrarily. Motivating the European thrust for a separate, independent GNSS service is the knowledge that US military control over GPS continues. Europeans feel that unless they obtain a share of control over GPS, they cannot be assured of the continued GPS service during military conflicts, regardless of whether the military conflicts are regional such as the Gulf War or global, such as World War II.

To accommodate concerns with continuity of GPS international civilian service the US President has promised to continue to provide basic GPS for civilian purposes "on a continuous, world-wide basis, free of direct user fees." 51/ Furthermore, the United States has assured ICAO that the United States intends to make GPS "available for the foreseeable future on a continuous worldwide basis." 52/ Despite these assurances, Europeans have adopted the view that continuity of GNSS is too important to be left under the control of the United States military. Therefore, they are planning their own separate global GNSS service, Galileo. An unanswered question in the Galileo venture is whether the remainder of the world can rely on Galileo to provide continuous service during European military emergencies.

2. Access to GNSS services.

During the Gulf War some states were denied access to remote sensing by satellite. The decision to do so was supported by UN resolutions. However, denial of remote sensing service raises the question of whether access to GNSS could be denied to some states but continued for others. The ICAO Charter, Second Principle, states that every State, and aircraft of all States, shall have access on a non-discriminatory basis under uniform conditions to GNSS services, including augmented GNSS services. The principle does not deny GNSS providers the right to charge for GNSS services, but all charges shall be uniform. 53/ The United States has assured ICAO that access to GPS shall be available "free of direct user charges." The United States continues to spend several hundred million dollars every year for GPS service and renewal. However, the US assurance to ICAO is not a treaty right.

The issue of access currently is in issue because the Europeans have indicated that they will charge for highly accurate GNSS services. 54/ Presumably such services will be accessible under uniform conditions. However, will the Galileo provider assure access under all conditions, including European military action such as the military action is Kosovo?

3. Interference with GNSS signal

The GNSS radio signals are weak and may be subject to interference. Interference with the GNSS signal may be intentional or unintentional. Intentional interference is necessary to test the quality of the signal. The 1996 PDD requires the GPS operator (DOD) to test the signal "without unduly disrupting or degrading civilian uses " of GPS. 55/ Notices to GPS users are distributed both through the FAA by Notices to Airmen, and through the US Coast Guard by Notices to Mariners. 56/ - It is possible that GPS navigational accuracy may experience unintentional, unwanted interference from terrestial and other sources so the GPS user cannot receive navigational or positioning information. Unintentional interference may come from UHF transmitters. Finally it is possible that terrorists may intentionally disrupt the rather weak GNSS radio signal.

Because the dual/use GPS signal may be tested by the military for military purposes, the global civilian users need

assurance that the civilian Governmental authorities are informed and provide notice of interference with the GNSS signal.

4. Liability

International Liability of the GPS provider for faulty GNSS remains an unresolved issue. Coverage by the International Liability Convention does not appear likely. Most GNSS is provided by the primary GNSS provider, the United States. The civilians users rely on and are dependent on GNSS service which they do not control. Most ICAO member states are of the view that they need quality assurance from the GPS provider that the service is virtually free of fault. In their view an international liability regime would provide assurance. On the other hand, if the United States refuses to join in such an international liability regime then an ICAO produced regime is without legal value. Underlying that view is the belief of the military provider that it is giving the GNSS service away without charge; therefore there should not be the additional expense of liability.

The European GNSS provider, Galileo, needs funding from its users, so it is tending towards a a fee for use of GNSS services, at least for high quality GNSS service. Thus the Galileo provider is more inclined to accept liability for its services.

5. Influence of Galileo on GPS Dual Use Provider

The motivation for Galileo is essentially to be found in the civilian frustration with the U.S. dual use GPS. That means that to the extent that the frustration grows, then the motivation for Galileo increases. On the other hand, to the extent that frustration decreases, as for example through termination of SA and separation of the civilian and military radio frequencies, the motivation decreases. Thus the unresolved issues of continuity, access, signal interference, liability, and others, tend to aggravate and motivate competing systems.

However other motivations exist for Galileo. The Europeans are motivated by the economic opportunities presented for obtaining a share of the market for GNSS satellites and receivers. /57 While the European Commission recognizes that "in principle, a joint development of the next generation GNSS is most likely to be the most cost-effective option," this option does not allow sufficient opportunity for European industry. /58 The European "challenge is to ensure that Europe can take a fair share of the global [GNSS] market and the related jobs". /59 The European Commission concludes that if Europe does not break into the GNSS market now then the further technical development of GPS "will reinforce the present EPS dominance and the market will have adopted GPS as the standard." /60

Two relevant analogies are illustrative. First the European Airbus challenge to the U.S. civilian airplane manufacturing industry. The Airbus developed European airplane manufacturing industry which in the year 2000 has achieved parity with the US airplane manufacturer Boeing in manufacture of civilian airplanes. The second analogy is to the satellite launch business in

which the European launch operator, Arianespace, successfully seized a very significant share of the satellite launch business when the United States terminated commercial satellite launchings by the Space Shuttle. Virtually all this launch business previously had been performed in the United States.

The GNSS market would be more likely to remain under US dominance if the Europeans do not proceed with Galileo. Thus ultimately the dual use issue is not only a national security issue for the DOD; it is also an economic issue for the US GPS industry.

Basically Galileo is intended for civilian uses but could in fact be used by any GNSS user, civilian or military. Availability of a competing GNSS service would apply considerable pressure on the existing primary GNSS provider, the United States. Galileo would provide competition in the marketplace. Galileo also would constitute a back-up for the GPS because the two services would be interoperable.

The chances of Europe joining GPS in some way are declining because of the failure of the United States and Europe to agree on the issue of shared use and control of the GPS and is aggravated by the European economic plans to develop a GNSS industry. A compromise does not appear to be imminent. On the other hand, as of the time of writing this paper, another fundamental question faces Galileo: Whether the European Union and the European private sector can agree to fund this expensive program which will cost 2-3 billion dollars. That is scheduled to be decided at the end of 2000. 61/

III. Conclusion

Pressure for a greater civilian role in establishing GPS policy appears to be recognized by the U.S. Government. Recently DOD recognized a need to coordinate and to "invite greater civil participation." That could result in moving the GPS program office out of the Pentagon. DOD hopes that a plan for greater civilian participation will be in place in May, 2001 There is currently no plan to move GPS operation and management out of DOD. 62/ DOT is also seeking to increase the civilian role, but is hampered by lack of money. 63/ However, these efforts to coordinate the dual uses of GPS are not of the magnitude sought by the Europeans.

In sum, multiple GNSS systems for all users, rather than single GNSS system, appear likely. Although these systems are planned to be interoperable, it will be difficult for ICAO to standardize and for GNSS users to coordinate several systems. ICAO's attempt to establish a comprehensive international legal GNSS regime is stymied.. The increased competition among GNSS systems will have adverse economic effects on US GPS industry because it will divert some GNSS economic activity and employment to Europe. Finally, the current situation compels the GNSS stakeholders seriously to consider GPS alternatives such as combination Loran C/GPS navigation system, or entirely new navigation and positioning technology.

FOOTNOTES

1. See discussion infra at footnote 46 infra.

2. See discussion infra at footnote 48 infra.

3. See discussion infra at note 55 infra.

4. The Global Positioning System: Charting the Future, National Academy of Public Administration, National Research Council, 1995, at XXVI; European Commission, Galileo, Involving Europe in a New Generation of Satellite Navigation Services, 9 February, 1999 (Hereinafter cited as Galileo Report).

5. 1999 Federal Radionavigation Plan (hereinafter cited as FRP) at 3-6 defines GPS as "a space-based positioning and navigation system designed to provide worldwide, all weather, passive, three-dimensional position, velocity and time data." " The GPS has three major segments: space, control, and user. The GPS Space Segment is composed of 24 satellites in six orbital planes. The satellites operate in circular 20,200 km (10900nm) orbits at an inclination angle of 55 degrees and with a 12 hour period." FRP A-4)

6. Id.

7. FRP at xvi.

8. March 30, 1996, U.S. Presidential Decision Document (PDD).

9. FRP at 1-2.

10. FRP at 1-8.

11. FRP at 1-7.

12. FRP at 1-8.

13. 49 USC 301 is statutory legal mandate for DOT to ensure safe transportation. GPS is within this mandate.

14. FRP at A-5

15. 10 USC 2281 is statutory legal mandate for GPS operation.

16. Contact SGSIC@smtp.navcen.uscg.mil for information.

17. FRP at 1-2, A-7.

18. FRP Appendix A.

19. FRP at A-9, A-10.

20. Supra at footnote 9.

21. Supra at footnote 17.

22. 1944 Convention on International Civil Aviation (Chicago Convention), ICAO Doc 8900. 61 Stat. 1180.

23. For discussion see Larsen, Should GNSS standards that are Uniform for all GNSS Users be Established, or are Unimodal Standards satisfactory? 42 Colloquium on the Law of Outer Space (1999))

24. FRP at 1-7

25. Id.

26. Chicago Convention, supra n. 22, Art 28 requires ICAO Members to provide air navigation facilities in accordance

with ICAO standards and recommended practices.

27. ICAO Doc. SSG-CNS2-WP/4 at 5 (1999). For discussion see Galileo Report supra n. 4.

28. ICAO Assembly Resolution A32-19 (1998).

29. Chicago Convention, supra n. 22, Art. 15 provides that air navigation charges shall be uniform for aircraft of all ICAO Member States.

30. Principles Relating to Remote Sensing of the Earth from Outer Space, International Instruments of the United Nations, at 305.

31. ICAO Assembly Resolution A32-20, ICAO Doc. C-CW/11026 (1998).

32. ICAO Doc. SSG-CNS/2WP/14 (1999).

33. Galileo Report supra n. 4, at 4.

34. Exchange of letters between ICAO and the United States dated 14 and 27 October, 1994. ICAO Assembly Resolution A34-19 (1999).

35. 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Celestial Bodies (hereinafter the Outer Space Treaty), International Instruments of the United Nations, at 288.

36. N. Jasentuliyana, Article 1 of the Outer Space Treaty, 17 J. of Space Law, at 130.

37. Treaty on Outer Space: Hearings before the Senate Committee on Foreign Relations, 90th Congr., 1st Sess. 1, 33 (1967).

38. Id. at 141.

39. U.K. v Iceland, 1974 ICJ 3 (1974).

40. United Nations Charter, 59 Stat. 1031; TS 993 (1945).

41. 1972 Convention on International Liability for Damage Caused by Space Objects, 24 UST 1973.

42. For discussion see Spradling, The international Liability Ramifications of the US Navistar Global Positioning System, 33 Colloquium on the Law of Outer Space.

43. ICAO Doc. SSG-CNS/2-WP/4, at 16.

44. ICAO Doc. SSG-CSN/2-WP/6, at 10

45. Federal Tort Claims Act, 28 USC 1346, 1402, 2401-2405, 2671-2680 permits waiver of sovereign immunity of the U.S. Government for torts.

46. Space News, May 22, 2000,at 16.

47. 1999 FRP at 1-8.

48. Id.

49. GPS for Air and Space Power, 19 June, 2000.

50. ICAO defines continuity of service as the ability of a navigation system to provide required services over a stated uninterrupted period of time. The

continuity level is stated in terms of the probability of maintaining the radiated signals. The average navigational reliability of GPS is stated as being 99.97%, see Larsen, Global Navigation Satellite System (GNSS) Interference Testing: Legal issues, 39 Colloquium on the Law of Outer Space, 1996.

51. White House Statement supra n. 8.

52. Huang, ICAO Panel of Experts Examining the Many Legal Issues Pertaining to GNSS, ICAO Journal, Vol. 52, No. 8, at 19 (Oct. 1997). Supra n. 34.

53. Compare Chicago Convention, supra n. 22, Art. 15.

54. Galileo Report, supra n. 4.

55. White House Statement, supra n. 8.

56. FRP at 3-9.

57. Galileo Report, supra n. 4

58. Id. at v.

59. Id. at 3. In the time period 2005 – 2023 the European Commission estimates European economic benefits of 39 billion Euros in value added services. and 43 billion Euros in equipment sales, id. at Annex IV, Market Analysis and Economic Benefits.

60. Id. at 4.

61. Considering it tight budget it is difficult for the European Union it is difficult to produce the $2 – 3 billion cost of Galileo. While the United States is ready to accept multiple GNSS systems, it clearly believes that GPS can satisfy the needs of the users. GPS World Newsletter, 10/13/2000.

62. Bates, Pentagon Seeks to Determine Civil GPS Needs, Space News at 10, October 9, 2000.

63. Id.