Journal of Air Law and Commerce

Volume 70 | Issue 4 Article 3

2005

Assessing a GPS-Based Global Navigation Satellite System within the Context of the 2004 U.S. Space-Based Positioning, Navigation, and Timing Policy

Bradley M. Orschel

ASSESSING A GPS-BASED GLOBAL NAVIGATION SATELLITE SYSTEM WITHIN THE CONTEXT OF THE 2004 U.S. SPACE-BASED POSITIONING, NAVIGATION, AND TIMING POLICY

BRADLEY M. ORSCHEL*

I. INTRODUCTION

IN DECEMBER of 2004, the Bush Administration issued a revised policy statement on the use and operation of the federal government's Global Positioning System (GPS).[1] As GPS is, and will continue to be, a critical component of the Global Navigation Satellite System (GNSS); a new policy has the potential to significantly impact the current functioning and future evolution of GNSS.

Dual-usage of GPS technology exists as a central tension that directly impacts the continued evolution of GNSS. GPS was created as a military positioning system, and, as such, its operations remain under the relatively tight control of the U.S. Department of Defense; however, GPS, as a component of GNSS, needs to provide global navigation to multiple forms of transport—for example, at sea, in the air, or on land—without restrictions on continuity or access.

Prior to December 2004, the U.S. government operated under a GPS policy issued in 1996.[2] The 1996 Policy, with its

---

* The author, a 2005 graduate of the Georgetown University Law Center, wishes to thank Professor Paul G. Larsen for his suggestions and comments during the drafting of this article.

1 *See* OFFICE OF SCIENCE & TECHNOLOGY POLICY, U.S. SPACE-BASED POSITIONING, NAVIGATION, AND TIMING POLICY: FACT SHEET (2004), http://www.ostp.gov/html/FactSheetSPACE-BASEDPOSITIONINGNAVIGATIONTIMING.pdf [hereinafter 2004 POLICY].

2 *See* OFFICE OF SCIENCE & TECHNOLOGY POLICY, FACT SHEET: U.S. SPACE-BASED POSITIONING SYSTEM POLICY (1996), http://www.ostp.gov/NST/html/pdd6.html [hereinafter 1996 POLICY]. The 2004 Policy "supersedes Presidential Decision Directive/National Science and Technology Council-6, U.S. Global Positioning System, dated March 28, 1996." 2004 POLICY, *supra* note 1, at 1.

emphasis on national security, raised several concerns—standardization of technology, continuity of service, user access, and interference—with regard to the use of GPS within the framework of GNSS. In the eight years following distribution of the 1996 policy, the U.S. took steps to address some of these concerns. By 2004, with the advent of new geo-political circumstances and new GPS technologies, the U.S. issued its revised GPS policy: the U.S. Space-Based Positioning, Navigation, and Timing Policy.[3]

The purpose of this paper is to explore the extent to which the 2004 Policy supports (or inhibits) the evolution of GPS as the sole or primary component of a global navigation satellite system (GNSS). To do this, the paper is divided into a number of sections: first, the paper provides an explanation of GNSS and its potential components. Second, the paper presents a brief technical overview of GPS before considering the national and international regulatory framework under which GPS operates. Third, the paper provides a short review of the 1996 Policy and identifies some of the problems this Policy created with respect to GPS as a GNSS component. Fourth, the paper reviews the 2004 Policy and analyzes some outstanding concerns generated by the 2004 Policy as they relate to a GPS-based GNSS. Finally, with the 2004 Policy as a backdrop, this paper considers the role of GPS within GNSS.

II. THE GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)

Navigation by satellite requires a network of Earth-orbiting satellites that transmit data to users' receivers.[4] Using radio waves, these navigation satellites communicate with each other and with ground stations in order to generate position information.[5] The satellites then transmit this position information to receivers located, for example, on a ship, a car or a plane. The receivers can use such data to provide users with their locations.[6]

---

[3] *See* 2004 POLICY, *supra* note 1.

[4] B.D.K. HENAKU, THE LAW ON GLOBAL AIR NAVIGATION BY SATELLITE 171 (1998).

[5] *Id.*

[6] When this technology is then used for navigation purposes, it is termed radionavigation. The U.S. Global Positioning System (GPS) is one example of an Earth-orbiting satellite system that can be used for radionavigation.

A. GNSS BACKGROUND

In 1991, recognizing that the World War II-era ground-based navigation network for global air navigation had begun to reach its technical limits, the International Civil Aviation Organization (ICAO) endorsed a new concept for global air navigation, termed Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM).[7] This new idea was to be based on the use of satellites, which would gradually replace the older ground-based navigation network. The key element of this approach was a concept called the Global Navigation Satellite System—that is, using satellites for radionavigation.[8] As ICAO envisioned it, using GNSS, pilots could determine the real-time location of their aircraft while air traffic controllers could rely on the technology to increase safety and efficiency.[9]

Since 1973, the United States has operated a satellite navigation system.[10] Russia, too, has operated a system similar to GPS—but launched at a later date—termed the Global Orbiting Navigation Satellite System (GLONASS).[11] In 1991, in response to ICAO's conceptual development of GNSS, the governments of both the United States and Russia individually offered their satellite networks to the international civil aviation community.[12] Over the next few years, these offers were formalized between ICAO and both countries, via an exchange of letters, and GPS and GLONASS became the core of an evolving GNSS.[13] The exchange of letters was done to provide "contracting States

---

7 Francis P. Schubert, *An International Convention on GNSS Liability: When Does Desirable Become Necessary?*, XXIV ANNALS OF AIR & SPACE L. 245, 246 (1999); *see also* Jiefang Huang, *Development of the Long-Term Legal Framework for the Global Navigation Satellite System*, XXII ANNALS OF AIR & SPACE L. 585, 586 (1997).

8 *See* Huang, *supra* note 7, at 586.

9 *Id.* GNSS can be used to support ground, sea, and air travel, and can also be used for environmental, public safety, recreation, and surveying matters. *See* Federal Aviation Administration, GPS Basics – User Segment, http://gps.faa.gov/gpsbasics/usersegment-text.htm (last visited Jan. 22, 2006).

10 *See* Federal Aviation Administration, Frequently Asked Questions – Miscellaneous, http://gps.faa.gov/FAQ/miscellaneous.htm (last visited Nov. 6, 2005). The Satellite system was initially designated Navstar Global Positioning System. *Id.*

11 Patrick A. Salin, *An Update on GNSS Before the Next ICAO Experts Meeting on the Legal and Technical Aspects of the Future Satellite Air Navigation Systems*, XXII ANNALS OF AIR & SPACE L. 505, 508 (1997). Both GPS and GLONASS were built and operated by each country's defense department, and were originally designed, therefore, as military positioning systems. *See* HENAKU, *supra* note 4, at 171.

12 HENAKU, *supra* note 4, at 171.

13 *See* Huang, *supra* note 7, at 587.

of ICAO with assurances of universal accessibility to . . . GPS and . . . GLONASS."[14] Additionally, in 1995, ICAO established a panel of legal and technical experts (LTEP) to consider the longer-term legal framework of the GNSS system.[15]

B. GNSS AND ITS POTENTIAL COMPONENTS

As noted above, there are two operational GNSS components: GPS and GLONASS. A third system, the European GALILEO system, is scheduled to be operational within the next decade.[16] These primary signal systems can be augmented with regional secondary systems.[17] Examples of augmentation include the U.S. Wide Area Augmentation System (WASS), the European Geostationary Navigation Overlay System (EGNOS), and the Japanese Multi-functional Transport Satellite-based Augmentation System (MSAS).[18]

1. GLONASS

GLONASS was designed to function as a global satellite system with a complement of twenty-four satellites; however, there are indications that it lacks appropriate funding and a full slate of satellites.[19] Currently, it operates with eleven functioning satellites. Additionally, while the system was designed to be interoperable with GPS, concerns remain over the system's time synchronization capabilities.[20] In fact, GLONASS may be best viewed as an augmentation to GPS and not as an equivalent substitute, notwithstanding recent agreements between the United States and Russia.[21]

2. EGNOS and GALILEO

The European Union (EU) and the European Space Agency (ESA) began to pursue their own satellite navigation system

---

[14] *Id.*

[15] *Id.*

[16] Paul B. Larsen, *Global Navigation Satellite Systems: Universal Technology under Divisive Legal Regimes*, XXVII ANNALS OF AIR & SPACE L. 387, 389 (2002).

[17] HENAKU, *supra* note 4, at 172-73.

[18] *Id.* at 173.

[19] Larsen, *supra* note 16.

[20] *Id.*

[21] *Id.* On recent cooperation between U.S. and Russia cooperation, see Press Statement, Richard Boucher, Spokesman, U.S. Dept. of State, United States – Russian Federation Joint Statement (Dec. 14, 2004), http://www.state.gov/r/pa/prs/ps/2004/39748.htm.

based on concerns that GPS and GLONASS, because they remained under the control of their individual governments, would "not give sufficient guarantees for the—often strategic—user applications in Europe."[22]

The European Commission proposed a two-phased approach to developing their own global satellite network. First, the Commission sought to create the European Geostationary Navigation Overlay Service (EGNOS). This system was designed to augment GPS and GLONASS, enhancing the performance of both of these existing systems.[23] EGNOS began initial operations in July 2005, and operational stability is expected during 2006.[24] Second, the EU and the ESA are designing a global-satellite navigation system—GALILEO—that will operate under European control, be an alternative to GPS and GLONASS, and serve as Europe's contribution to GNSS.[25] Scheduled to be operational by 2008, GALILEO is ultimately designed to consist of thirty satellites.[26]

3. *Augmentation*

A need to increase the accuracy and reliability of GNSS drives the requirement for augmentation—as, the development of EGNOS, noted above suggests.[27] The type of augmentation depends on the user.[28] For example, the Federal Aviation Administration (FAA) has two different types of augmentation—the Wide Area Augmentation System (WASS) and the Local Area Augmentation System Service (LAAS)—designed for different kinds of flight.[29] Additionally, for maritime vessels, the U.S. augments GPS with the Differential Global Positioning System (DGPS), which incorporates ground-based technology to enhance GPS accuracy and reliability.[30] DGPS can also be used for

---

[22] Comm'n of the European Cmtys., Commission Working Document: Towards a Coherent European Approach for Space, 17, SEC(1999)789, final (June 7, 1999) [hereinafter *Towards a Coherent European Approach for Space*].

[23] *Id.*

[24] *EGNOS for Professionals*, http://esamultimedia.esa.int/docs/egnos/estb/egnos_pro.htm (last visited Jan. 27, 2006).

[25] *See Towards a Coherent European Approach for Space*, *supra* note 22, at 17.

[26] Commission Directorate - General Energy and Transport, GALILEO – Introduction, http://europa.eu.int/comm/dgs/energy_transport/galileo/intro/steps_en.htm (last visited Nov. 8, 2005).

[27] Larsen, *supra* note 16, at 390.

[28] *Id.*

[29] *Id.*

[30] *Id.*

land-based transport.[31] And EGNOS, discussed above, is another augmentation system. Currently, the U.S. government is investing heavily in GPS augmentation.[32]

III. THE GLOBAL POSITIONING SYSTEM (GPS)

A. GPS Technology

Like GLONASS, and ultimately, GALILEO, GPS is a space-based radionavigation system.[33] As noted above, GPS was developed and is currently managed by the U.S. Department of Defense. The satellite component of the system consists of at least twenty-four satellites that operate in one of six (circular) medium earth orbits (MEO's). Each satellite circles the Earth every twelve hours and emits a continuous navigation signal on two different L-band frequencies: L1 and L2.[34]

1. *Communication Frequencies*

GPS provides two levels of service: a Standard Positioning Service (SPS), which uses the coarse acquisition (C/A) on the L1 frequency and a Precise Positioning Service (PPS) which uses the P(Y) code on both the L1 and L2 frequencies.[35] PPS access is "restricted to U.S. armed forces, U.S. Federal agencies, and selected allied armed forces and governments."[36] SPS access is available to all users on a continuous, worldwide basis, free of

---

31 *Id.*

32 J. Bates, *FAA Plans for Satellite-Based Air Traffic Control: Program Will Cost $11.5 Billion and Will Include Technology Developed by NASA*, SPACE NEWS, June 11, 2001, at 26. For further information on various GPS augmentation systems, see FED. AVIATION ADMIN., U.S. DEP'T OF TRANSP. & ARP CONSULTING, L.L.C., 2003 AVIATION CAPACITY ENHANCEMENT PLAN: BUILDING CAPACITY TODAY FOR THE SKIES OF TOMORROW 55-57 (2003), *available at* http://www.faa.gov/ats/asc/publications/03_ACE/CH_6.pdf; *see also* Federal Aviation Administration, Frequently Asked Questions, http://gps.faa.gov/FAQ/index.htm (last visited Dec. 19, 2005).

33 DEP'T OF DEFENSE & DEP'T OF TRANSP., 2001 FEDERAL RADIONAVIGATION PLAN 2-2 (2001) [hereinafter 2001 PLAN].

34 NAVSTAR Global Positioning System Joint Program Office, GPS Overview, http://gps.losangeles.af.mil/jpo/gpsoverview.htm (last visited Nov. 8, 2005). L1 = 1575.42 MHz, and L2 = 1227.6 MHz. NAVSTAR GPS Operations, U.S. Naval Observatory NAVASTAR Global Positioning System, http://tycho.usno.navy.mil/gpsinfo.html (last visited Nov. 8, 2005) [hereinafter NAVSTAR GPS Operations].

35 NAVSTAR GPS Operations, *supra* note 34. C/A code has a 1.023 MHz chip rate, a period of 1 millisecond, and is used primarily to acquire the P-code; the P-code has a 10.23 MHz rate, a period of 7 days, and is the principal navigation ranging code; the Y-code is used in place of the P-code whenever the anti-spoofing mode of operation is activated. *Id.*

36 2001 PLAN, *supra* note 33, at 2-2.

any direct user charge.[37] Because the system serves both military and civilian users, it is considered a dual-use technology.

Two additional civil frequencies are under development. One signal will be added to the L2 frequency at 1227.60 (termed "L2 civil") and a second signal will be added at 1176.45 MHz (termed "L5").[38] L2 civil is due to enter service with satellites launched in 2006, and L5 is scheduled to enter service at some point after 2010.[39] These signals are designed to improve the accuracy and reliability of GPS and "will enable the development of a broad range of new and improved GPS applications."[40] Additionally, a new military-only signal (M-code) transmitting on the L1 and L2 frequencies is slated for program completion by 2010.[41]

2. System Components

GPS consists of three major components: space, control, and user. The space component consists of satellites. Four generations of GPS satellites have operated within the network; the three later versions make up the existing network, with the most recent satellite launched in September 2005. A fifth generation of satellites is tentatively scheduled for launch in 2006.[42]

The control segment consists of six monitor stations and four ground antenna stations.[43] The monitor stations span the globe: Ascension Island, Diego Garcia, Kwajalein, Hawaii, Cape Canaveral, and Colorado Springs.[44] Theses stations continuously send data to the GPS Master Control Station (MCS), located at Schriever Air Force Base in Colorado, for processing.[45] Every fifteen minutes, after processing information on the satellites' orbits and clock status—accurate time is critical to providing accurate position information for the user—the MCS transmits the updated navigation data to the four ground antenna stations: at Ascension Island, Diego Garcia, Kwajalein, and

---

[37] *Id.*

[38] *Id.*; *see also* Federal Aviation Administration: Frequently Asked Questions – GPS Basics, http://gps.faa.gov/FAQ/faq-gps-text.htm (last visited Nov. 8, 2005).

[39] *See* Federal Aviation Administration, *supra* note 38.

[40] *Id.*

[41] NAVSTAR GPS Operations, *supra* note 34.

[42] *See id.*

[43] *Id.*

[44] *Id.*; *see also* Federal Aviation Administration, *supra* note 38.

[45] *Id.*

Cape Canaveral. The antennae then transmit the data to the satellites.[46]

The user segment—GPS receivers—collects and processes the L-band frequencies emitted by the satellites in order to calculate position, velocity, and time for the user.[47]

B. GPS Regulation

1. *Nationally*

Regulation of GPS occurs at both the national and international level. At the national level, the 1996 Policy created the Interagency Global Positioning System Executive Board (IGEB), a board chaired jointly by the Secretaries of Defense and Transportation and tasked with managing civilian and military GPS coordination—that is, dual-usage.[48] The IGEB was supported by an Executive Secretariat, which handled administrative duties, and a Senior Steering Group, which handled routine decisions that did not require involvement of the principals.[49]

The 2004 Policy replaces the IGEB with a permanent National Space-Based Positioning, Navigation and Timing Executive Committee.[50] This Committee is to be co-chaired by the Deputy Secretaries of the Department of Defense (DOD) and the Department of Transportation (DOT).[51] Additionally, the Executive Committee is to establish a National Space-Based Positioning, Navigation, and Timing Coordination Office, which is to serve as the Secretariat for the Executive Committee.[52] Like the IGEB, the Committee will make recommendations to federal departments and agencies and to the President on matters of federal radionavigation policy—which includes GPS policy.[53]

To coordinate civilian and military radionavigation policy (dual-use issues), DOD and DOT jointly issue a Federal Radionavigation Plan (FRP).[54] The FRP functions "as the planning and

---

46 *See* NAVSTAR GPS Operations, *supra* note 34.

47 *See* Federal Aviation Administration, *supra* note 38.

48 1996 Policy, *supra* note 2.

49 *See* National Space - Based PNT Executive Committee, http://www.pnt.gov/org/igeb.shtml (last visited Nov. 8, 2005).

50 *See id.*

51 *See* 2004 Policy, *supra* note 1, at 4.

52 *Id.* at 5.

53 *Id.*

54 The FRP is required by 10 U.S.C. 2281(c) (2005). A Memorandum of Agreement between DOD and DOT provides for radionavigation planning as

policy document for all present and future [f]ederally provided common-use radionavigation systems."[55] On the basis of different statutory mandates, DOD and DOT, within the FRP, address different aspects of radionavigation policy. For example, pursuant to Title 49 U.S.C. 301, DOT is tasked with ensuring "efficient transportation" for which radionavigation is an important tool.[56] DOD "is responsible for developing, testing, evaluating, implementing, operating, and maintaining aids to navigation and user equipment required solely for national defense."[57] Additionally, 10 U.S.C. 2281(b) states that "[t]he Secretary of Defense shall provide for the sustainment and operation of the GPS Standard Positioning Service [SPS] for peaceful civil, commercial, and scientific uses on a continuous worldwide basis free of direct user fees."[58]

2. *Internationally*

At the level of international regulation, ICAO, international treaties, and the International Telecommunications Union all have the potential to affect GPS.

a. ICAO Regulation

Because GPS is a dual-use technology that serves not only civilian needs but also national security, the U.S. government is strongly adverse to relinquishing control over any aspect of the system. In 1998, however, ICAO adopted a Charter on Rights and Obligations of States Relating to GNSS Services which can be viewed as an attempt to assert ICAO control over any future GNSS.

The Charter is based on Article 44 of the Chicago Convention.[59] Via the Charter, ICAO indicated that the following guidelines should apply to international GNSS services:

---

well as for the development and publication of the FRP. According to *DOT's Research, Development and Technology Plan for FY 2006*, a FRP for 2005 is the next scheduled report. U.S. DEP'T OF TRANSP., RESEARCH, DEVELOPMENT, AND TECHNOLOGY PLAN 4-65 (6th ed. 2005).

55 *See* 2001 PLAN, *supra* note 33, at 1-1.

56 49 U.S.C. 301(2)(2005); *see also* 2001 PLAN, *supra* note 33, at 2-1.

57 *See* 2001 PLAN, *supra* note 33, at 1-3.

58 *See* 10 U.S.C. 2281(b)(2005); *see also* 2001 PLAN, *supra* note 33, at 1-1 (providing details on agency roles and responsibilities).

59 Article 44 states that an ICAO objective is "to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport." *See* Convention on International Civil Aviation, art. 44, Dec. 7, 1944, 61 Stat. 1180, 16 U.N.T.S. 295.

> States recognize that . . . the safety of international civil aviation shall be the paramount principle in the provision and use of GNSS.
>
> [States] and aircraft . . . shall have access, on a non-discriminatory basis under uniform conditions, to the use of GNNS services . . .
>
> Every State preserves its authority and responsibility to control operations of aircraft and to enforce safety and other regulations within its sovereign airspace; GNSS [providers] shall [not restrict] States' [control over their sovereign air space].
>
> [GNSS providers] shall ensure the continuity, availability, integrity, accuracy and reliability of such services, including effective arrangements to minimize the operational impact of the system malfunctions or failure, and to achieve the expeditious service recovery. Such States shall ensure that the services are in accordance with ICAO Standards.
>
> States shall co-operate to secure the highest practicable degree of uniformity . . . of the GNSS services.
>
> [GNSS] charges . . . shall [comply] with Chicago Convention, Article 15.
>
> States shall be guided by the principle of co-operation and mutual assistance [in planning and providing GNSS].
>
> Every state shall conduct its GNNS activities with due regard for the interests of other States.
>
> [States may provide GNSS services jointly with other States].[60]

Language in the 1996 and 2004 Policies,[61] recent U.S. agreements with other countries on satellite navigation,[62] and the government's commitment to ICAO to provide universal accessibility to GPS,[63] all suggest that the U.S. has a strong interest in interoperability. While the Charter does not bind mem-

---

[60] *A32-19 Charter on the Rights and Obligations of States Relating to GNSS Services*, 64, 65, http://mdc.com/commercial/noise/resolutions.pdf (last visited Nov. 8, 2005).

[61] One of the goals of the 1996 Policy is to "[e]ncourage acceptance and integration of GPS into peaceful . . . applications worldwide." 1996 POLICY, *supra* note 2. The 2004 Policy also seeks to ensure foreign interoperability and compatibility with GPS. *See* 2004 POLICY, *supra* note 1.

[62] *See* Press Release, Richard Boucher, Dep't of State Spokesman, United States – Russian Federation Joint Statement (Dec. 14, 2004), http://www.state.gov/r/pa/prs/ps/2004/39784.htm; *see also* Press Release, Adam Ereli, Dep't of State Spokesman, Joint Statement of united States of America and Japan on Global Positioning System Cooperation (Nov. 22, 2004), http://www.state.gov/r/pa/prs/ps/2004/38773.htm; *see also* Press Release, U.S. White House, Fact Sheet: U.S.-EU Summit: Agreement on GPS-Galileo Cooperation (June 26, 2004), http://www.whitehouse.gov/news/releases2004/06/20040626-8.html [hereinafter U.S.-EU].

[63] *See* Huang, *supra* note 7.

ber states,[64] the U.S. nevertheless has reason to adhere to its spirit because the charter appears to further international standardization and interoperability.

b. Treaties

At the level of international law, three international treaties, in various ways, impact GPS. These treaties are the (1) Treaty of Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty);[65] (2) Convention on International Liability for Damage Caused by Space Objects (the Liability Convention);[66] and (3) Convention on Registration of Objects Launched into Outer Space (the Registration Convention).[67]

i. Outer Space Treaty

As the United States is a signatory to the Outer Space Treaty, Article I of the Treaty would appear to affect GPS operations. In pertinent part, Article I, paragraph 1 indicates that "the use of outer space . . . shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."[68] Article I, paragraph 1 of the Treaty "has its roots in an earlier agreement, the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, which was adopted by the [U.N.] General Assembly in . . . 1963."[69] This Declaration reflected the "belief that the exploration and use of outer space should be carried out for the betterment of mankind and . . . [that] States [in conducting their outer space activities] should be guided by the principle of

---

64 Paul Larsen, *Issues Relating to Civilian and Military Dual Uses of GNSS*, 17 SPACE POLICY 111, 114 (2001).

65 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

66 Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention]. .

67 Convention on Registration of Objects Launched into Outer Space, Jan 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

68 *See* Outer Space Treaty, *supra* note 65, art. I.

69 N. Jasentuliyana, *Article I of the Outer Space Treaty Revisited*, 17 J. SPACE L. 129, 139 (1989).

co-operation and mutual assistance . . . ."[70] Article I legally incorporates the Declaration's objective of "[requiring] States to co-operate internationally in their space ventures."[71]

A literal interpretation of Article I, paragraph 1, therefore, could suggest that the U.S. Government violates the Treaty if it limits GPS access to U.S. or allied forces because such a limitation could be characterized as a failure to cooperate with other states. However, a closer look at State Department comments prepared for the Senate hearings prior to approval of the Treaty suggests otherwise.

During the hearings, in response to a question as to whether, under Article I, the United States would be required to make its communication satellites (including those for defense communications) available for the benefit of all countries, the U.S. negotiator stated that Article I establishes general goals and that separate international agreements would be required to cover the use of particular satellites.[72] In other words, the Treaty reflects broad objectives and, in order for the U.S. to be in violation of provisions mandating access to GPS, the U.S. would need to have entered into additional agreements with other countries specifically addressing access to its satellites. Because this has not occurred, it appears unlikely that the U.S. violates the Outer Space Treaty by placing restrictions on access to GPS.

This view is further supported by State Department legal opinions submitted in conjunction with Treaty hearings. Specifically, the State Department indicated that "Article I, paragraph 1 does not undertake to set any terms or conditions on which international cooperation would take place."[73] Senate Committee language, adopted during the hearings, also reflects a belief

[70] *Id.* The Declaration goes on to state that States "should conduct all their activities in outer space with due regard for the corresponding interests of other States." *Id.* This language is incorporated in Article IX of the Outer Space Treaty: "In the . . . use of outer space . . . States Parties to the Treaty shall be guided by the principle of co-operation and mutual assistance and shall conduct all their activities in outer space . . . with due regard to the corresponding interests of all other States Parties to the Treaty." Outer Space Treaty, *supra* note 65, art. IX. Some scholars have suggested that Article IX's "due regard" language implies that there may be a "legal obligation on the [part of] GNSS providers to consider the interests of the international civilian users." *See* Larsen, *supra* note 64, at 115.

[71] Jasentuliyana, *supra* note 69, at 139.

[72] *Treaty on Outer Space: Hearings Before the S. Comm. on Foreign Relations*, 90th Cong. 33 (1967).

[73] *Id.* at 53.

that the Treaty does not limit the way in which the U.S. might conduct space activities under Article I. Specifically, the Committee noted that "it is the understanding of the Committee on Foreign Relations that nothing in Article I, paragraph 1 [of the Treaty] diminishes or alters the right of the United States to determine how . . . it shares the benefits and use of its outer space activities."[74]

In summary, it appears that, under Article I of the Outer Space Treaty, the U.S. does not have a legal obligation to provide unrestricted GPS access to other Treaty signatories. However, in keeping with the cooperative spirit of the Treaty, an argument can be made that the U.S. has some obligation—and perhaps by now it is a *de facto* obligation—to provide relatively unrestricted GPS access.[75]

ii. Liability Convention

Generally speaking, GPS is not considered subject to the Liability Convention; however, ICAO has sought to develop a liability regime that would apply to GNSS providers. The Liability Convention can hold a launching state responsible for personal injury and property damages—either absolutely or based on fault—caused by incidents from the space object it launched.[76] Generally, however, the Convention is not interpreted to apply to indirect damages, under which most GNSS-related damages would fall.[77]

For a number of years, ICAO has been working on developing a liability regime that could make GNSS providers liable for negligently providing GNSS services to civilian aviation.[78] In response, the U.S. has argued that because GPS service is provided free of charge, it is inappropriate to hold the U.S. government liable for negligence.[79] Additionally, the U.S. government feels that national law, which governs aviation negligence, is capable

---

[74] *Id.* at 74.

[75] Note, however, that there is no standard against which to measure whether a country would be violating the spirit of the Treaty.

[76] *See* Liability Convention, *supra* note 66, arts. II-III.

[77] Kevin K. Spralding, *The International Liability Ramifications of the U.S. Navstar Global Positioning System*, PROCEEDINGS OF THE THIRTY-THIRD COLLOQUIUM ON THE LAW OF OUTER SPACE 93, 98 (1990).

[78] Larsen, *supra* note 61, at 115.

[79] *Id.* at 117.

of addressing any negligence issues arising from satellite navigation.[80]

iii. Registration Convention

Finally, GPS is subject to the Registration Convention. Article I of the Convention requires the launching state to register, with the United Nations, space objects launched into earth orbit, and Article IV details what registration information must be provided.[81]

c. The International Telecommunications Union

The International Telecommunications Union (ITU) is a specialized United Nations organization that coordinates access to geosynchronous orbital slots and radio frequencies for satellite communications.[82] The origins of the organization date back to the 1840's and to agreements among European States to coordinate electric telegraph communications.[83] As technology evolved, the organization's precursor began to coordinate not only telegraph but also international telephone communications.[84] In the middle of the twentieth century, the organization adopted methods to coordinate international access to the radiospectrum.[85]

A constitution, which "defines the roles of the various organs of the ITU,"[86] and a Convention, which "sets forth the procedures for the organization's operation,"[87] govern the ITU. The ITU is funded via voluntary contributions from both its state and private-entity membership.[88]

For purposes of administering the radiospectrum, the "ITU has categorized radio [frequencies] according to their broader functions" and "has divided the world into three regions for the

---

80 ICAO Doc. SSG-CSN/2-WP/6, p10.

81 *See* Registration Convention, *supra* note 67, arts. I, IV.

82 Lawrence D. Roberts, *A Lost Connection: Geostationary Satellite Networks and the International Telecommunication Union*, 15 BERKELEY TECH. L.J. 1095, 1105 (2000); *see also* Jannat C. Thompson, *Space for Rent: The International Telecommunications Union, Space Law, and Orbit/Spectrum Leasing*, 62 J. AIR L. & COM. 279, 286 (1996).

83 For a general history of the ITU, see Joseph Wilson, *The International Telecommunication Union and the Geostationary Satellite Orbit: An Overview*, XXIII ANNALS OF AIR AND SPACE LAW 241 (1998).

84 *Id.* at 244.

85 *Id.* at 245.

86 Roberts, *supra* note 82, at 1111.

87 *Id.*

88 Wilson, *supra* note 83, at 246.

purpose of allocating frequencies."[89] The Radiocommunication Sector (or Service)—one of the three ITU units that handles the substantive work of the organization—manages the radiofrequency spectrum.[90]

A satellite operator interested in building a satellite contacts an ITU member state which then tells the ITU that the state is going to "assign a particular set of frequencies . . . to this [satellite] operator."[91] When the member state contacts the ITU, "the application is reviewed against [a] Table of Allocations to ensure that the frequencies employed by the proposed system have been allocated for the type of service contemplated."[92] Additionally, to avoid any interference problems, notice of the application is sent to other member states and checked against the Master International Frequency Register to make sure that the frequencies "have not already been designated for use in the same region by another operator."[93] Assuming that there are no problems, the ITU adds "the operator's notification to the frequency register."[94]

As suggested by the allocation process, the ITU does not actually distribute radiofrequencies. Rather, it serves "as an efficiency-enhancing resource through which sovereign states attempt to avoid potential [radiofrequency] usage conflicts."[95] In other words, to avoid interference issues, members use the ITU as a place to coordinate allocation of radio frequencies. Once a frequency has been allocated to a specific country, that country assumes responsibility for assigning the frequency and for ensuring that the frequency does not interfere with domestic or international systems.[96]

Given the global reliance on GPS, any interference (or potential for interference) with the system's portion of the radiospectrum could present a significant problem. Thus, regardless of

---

89 *Id.* at 259.

90 Roberts, *supra* note 82, at 1109. The other two units include the Telecommunication Standardization Sector, responsible "for questions concerning standardization of communication technologies, operations, and tariffs" and the Telecommunication Development Sector, "responsible [among other things] for coordinating the responsibilities of the ITU as a specialized agency of the United Nations." *Id.*

91 *Id.* at 1112.

92 *Id.*

93 *Id.*

94 *Id.*

95 *Id.* at 1111.

96 Wilson, *supra* note 83, at 259.

the direction of the 2004 Policy, to ensure the present and future effectiveness of GPS, the U.S. must remain engaged in working with the ITU. This cooperation may further strengthen the credibility of the ITU as the place for radiospectrum coordination. Additionally, the U.S. must remain vigilant in policing domestic and international interference with the frequencies assigned to GPS.[97]

IV. THE 1996 U.S. GLOBAL POSITIONING SYSTEM POLICY

On March 29, 1996, the White House Office of Science and Technology Policy issued a "fact sheet" entitled, "U.S. Global Positioning System Policy."[98] As noted on the "fact sheet," the document detailed "a comprehensive national policy on the future management and use of the U.S. Global Positioning System (GPS) and related U.S. Government augmentations."[99] The policy established six goals, identified a number of guidelines for operation and management of GPS, and summarized agency roles and responsibilities with respect to GPS.[100]

Underlying the entire Policy is the goal of "support[ing] and enhanc[ing U.S.] economic competitiveness and productivity while protecting U.S. national security and foreign policy interests."[101] More specifically, the Policy identified its six goals as follows:

(1) Strengthen and maintain U.S. national security.
(2) Encourage acceptance and integration of GPS into peaceful civil, commercial and scientific applications worldwide.
(3) Encourage private sector investment in and use of U.S. GPS technologies and services.
(4) Promote safety and efficiency in transportation and other fields.
(5) Promote international cooperation in using GPS for peaceful purposes.
(6) Advance U.S. scientific and technical capabilities.[102]

The Policy then identified a number of guidelines for GPS operation and management. These guidelines stated that:

---

97 A discussion of the U.S. response to interference issues is considered in the last section of this paper.

98 1996 POLICY, *supra* note 2.

99 *Id.*

100 *Id.*

101 *Id.*

102 *Id.*

> [The U.S.] will continue to provide GPS Standard Positioning Service for peaceful civil, commercial and scientific use on a continuous, worldwide basis, free of direct user fees.
> [The U.S. will] discontinue the use of Selective Availability (SA) within a decade in a manner that allows adequate time and resources for the U.S. military to prepare fully for operations without SA . . . .
> GPS and U.S. Government augmentations will remain responsive to the National Command Authorities.
> The U.S. will cooperate with other governments and international organizations to ensure an appropriate balance between the requirements of international civil, commercial, and scientific users and international security interests.
> [The U.S. will push for] GPS and U.S. Government augmentations [to be the international standard].
> [The U.S.] will not conduct activities that preclude or deter commercial (civil) GPS activities, except for national security or public safety reasons.
> A permanent interagency GPS Executive Board, jointly chaired by the Departments of Defense and Transportation, will manage GPS . . . and [its] augmentations.[103]

With respect to agency roles and responsibilities, the 1996 Policy indicated that the Defense Department would continue to acquire, operate and maintain GPS and handle all military and security aspects of the system; that the Transportation Department would take the lead in all civil and/or commercial matters; and that the State Department would handle GPS matters as they relate to foreign governments and international organizations.[104]

The 1996 Policy raised a number of concerns. The first had to do with Selective Availability (SA).[105] Under normal GPS operations, civilians have access to the Standard Positioning Service (SPS), while U.S. and allied military users have access to the more accurate Precise Positioning Service (PPS). With SA activated, SPS only guaranteed accuracy to within 100 meters.[106]

---

[103] *Id.* This intra-agency GPS Executive Board became the Interagency GPS Executive Board (IGEB), as discussed under "GPS Regulation."

[104] 1996 POLICY, *supra* note 2.

[105] Federal Aviation Administration, Frequently Asked Questions – GPS, http://gps.faa.gov./FAQ/index.htm (last visited Dec. 19, 2005).

[106] According to the Federal Aviation Administration, "[w]ith Selective Availability (SA), SPS provides predictable accuracies of 100m (2drms, 95%) in the horizontal plane and 156m (05%) in the vertical plane. UTC (USNO) time dissemination accuracy is within 340 nanoseconds (95%) referenced to the time kept at the U.S. Naval Observatory." *Id.*

Second, in its agreement of service memorandum with ICAO, the U.S. promised to make GPS "available for the foreseeable future on a continuous world-wide basis."[107] However, because the memorandum did not create a legal treaty obligation and because the 1996 Policy indicated that GPS was to "remain responsive to the National Command Authorities," a rational basis existed for user concern about control issues (for example, continuity of service and/or user access).[108] If GPS service were abruptly discontinued by DOD, the impact on civilian air navigation could be dramatic.[109] As indicated by the European Commission, control concerns were fundamental to the Commission's decision to move forward with GALILEO.[110]

Third, and as a corollary to the control concern, the fact that both military and civilian frequencies operated on the same GPS signal bandwidth could have raised concerns that the civilian frequency could be disturbed by the military frequencies.[111]

Fourth, by pushing GPS as the international standard, the U.S. was clearly seeking to dominate the market for satellite navigation technologies. This approach appeared to coincide with ICAO's desire for standardization, as implied above under "GPS Regulation: ICAO Regulation," but it could have raised concerns about compatibility with other GNSS systems—for example, GLONASS.

To summarize, then, after the 1996 Policy was issued, it created concerns related to Selective Availability of the SPS signal; control of civilian signals, in general; the impact of military frequencies on civilian frequencies; and technological compatibility (or interoperability).

Following issuance of the 1996 Policy, but prior to issuance of the 2004 Policy, a number of changes occurred with respect to GPS that addressed some of the concerns raised in the 1996 Policy. First, on May 1, 2000, President Clinton ended selective availability.[112] Second, and as referred to previously under "GPS

---

107 Larsen, *supra* note 16, at 396.

108 As was observed following the 1996 Policy, "the fact that the majority of user States do not have control over the space segments of the [GNSS] system gives rise to the need for ensuring accessibility." *See* Huang, *supra* note 7, at 589.

109 "[T]heoretically [this could] mean a shutdown of the entire air transport system using such GNSS services." *See* Huang, *supra* note 7, at 589.

110 *See Towards a Coherent European Approach for Space*, *supra* note 22, at 17.

111 Larsen, *supra* note 64, at 116.

112 *See* Press Release, Statement By the President Regarding the United States' Decision to Stop Degrading Global Positioning System Accuracy (May 1, 2000), *available at* http://www.ostp.gov/html/0053_2.html.

Technology," the U.S. government decided to add two additional civil frequencies to GPS service.[113] The decision to enhance civilian frequencies helped to separate civilian and military users of the system.[114]

Thus, leading up to the 2004 Policy, some problems with the 1996 Policy had been wholly or partially resolved—for example, selective availability and increased separation of military and civilian usage of GPS; however, a number of issues with respect to GPS policy, remained unresolved—including control (continuity of service and user access), interference and interoperability.

V. THE 2004 U.S. SPACE-BASED POSITIONING, NAVIGATION AND TIMING POLICY

In order for the 2004 Policy to support the development of a world-wide, comprehensive GNSS, the Policy needs to adequately address the issues of control and interference. (Interoperability is discussed later.) However, before considering these issues, it is useful to review the new Policy's goals.

As the 2004 Policy notes,

"[T]he fundamental goal of this policy is to ensure that the United States maintains space-based positioning, navigation, and timing services, augmentation, back-up, and service denial capabilities that:

(1) provide uninterrupted availability of positioning, navigation, and timing services;
(2) meet growing national, homeland, economic security, and civil requirements, and scientific and commercial demands;
(3) remain the pre-eminent military space-based positioning, navigation, and timing service;
(4) continue to provide civil services that exceed or are competitive with foreign civil space-based positioning, navigation, and timing services and augmentation systems;
(5) remain essential components of internationally accepted positioning, navigation, and timing services; and
(6) promote U.S. technological leadership in applications involving space-based positioning, navigation, and timing services.[115]

[113] *See* 2001 PLAN, *supra* note 33; *see also* Larsen, *supra* note 64, at 116.
[114] Larsen, *supra* note 64, at 116.
[115] 2004 POLICY, *supra* note 1.

The above list suggests a slight change in emphasis, compared to the 1996 Policy, on a number of fronts. First, national security matters appear to be one of a number of important issues for which GPS technology is now to be used. Whereas the 1996 Policy began by identifying U.S. national security issues as the Policy's first goal, the 2004 document appears to reflect a broader use of GPS technology—that is, not only for national security matters, but also for economic security, scientific and commercial interests. Perhaps these additional uses were implicit in the 1996 Policy, but the broader focus of the 2004 document may also reflect the significant increase in non-military usage of GPS technology. Additionally, the administration's decision to emphasize various uses of the technology (for example, economic security, civil, and scientific uses) may be an attempt to lessen concern about user access issues.[116]

Second, the 2004 Policy appears to acknowledge the fact that GPS may no longer be the only viable provider of global satellite navigation coverage for civilian and/or commercial users. Whereas the 1996 Policy sought to integrate GPS technology into civil and commercial applications worldwide—suggesting, by implication, that GPS should be the worldwide provider of civilian satellite navigation—the 2004 Policy appears to suggest that GPS technology should simply be competitive with other foreign civil space-based navigation systems. This very well may reflect the United States' acknowledgment of an adequately functioning GLONASS and an inevitably viable GALILEO.

Third, the 2004 Policy's fifth point from the list above—that GPS technologies should "[r]emain essential components of internationally accepted positioning, navigation, and timing services"—may reflect the biggest shift in focus when compared to the 1996 Policy. Specifically, the 1996 Policy sought to establish GPS as the international standard;[117] in the 2004 Policy, however, the document not only recognizes the development of foreign systems but also acknowledges that GPS may just be one of

[116] This discussion is not meant to suggest that the 2004 Policy de-emphasizes military uses of GPS; in fact, with new emphasis on homeland security and the addition of new frequencies, the Policy and the enhanced technologies suggest an increased role for GPS in matters of national security.

[117] Guideline 5 of the 1996 Policy states that the U.S. "will advocate the acceptance of GPS and U.S. government augmentations as standards for international use." 1996 POLICY, *supra* note 2.

a number of global navigation satellite systems.[118] However, whether the new Policy really supports the development of GPS-based GNSS depends on how the Policy addresses or does not address control (continuity of service and user access) and interference issues.

A. Control

The 1996 Policy indicated that GPS and its augmentations would remain "responsive to the National Command Authorities."[119] This strong language—which, in the 1996 Policy, may have served as the basis for rational concerns about continuity and access—is absent from the 2004 Policy.

Additionally, where as the 1996 Policy indicated that civil users would not be denied GPS access except on the basis of national security or public safety reasons, the 2004 Policy provides no such caveat. In fact, the language in the 2004 Policy is very explicit with respect to both continuity of service and user access. Specifically, the 2004 Policy states that the United States will:

> Provide on a continuous, worldwide basis civil space-based, positioning, navigation, and timing services free of direct user fees for civil, commercial, and scientific uses, and for homeland security through the Global Positioning System and its augmentations, and provide open, free access to information necessary to develop and build equipment to use these services . . . .[120]

But is the absence of National Command Authority language and more explicit assurances as to continuity and access enough to enable foreign users of the service to become comfortable with a GPS-based GNSS?

Even though the 2004 Policy is missing the explicit language of the 1996 document, language in the 2004 Policy could easily be interpreted as suggesting that military uses of GPS will always take priority. For example, the 2004 document indicates that the U.S. shall "[p]rovide uninterrupted access to U.S. space-based global, precise positioning, navigation, and timing ser-

---

[118] The 2004 Policy states that the U.S. should "continue to provide civil services that exceed or are competitive with foreign civil space-based positioning, navigation, and timing services and augmentation systems . . . ." *See* 2004 Policy, *supra* note 1. The Policy continues by stating that GPS capabilities need to "remain essential components of internationally accepted positioning, navigation, and timing services . . . ." *Id.*

[119] 1996 Policy, *supra* note 2.

[120] 2004 Policy, *supra* note 1.

vices for U.S. and allied national security systems and capabilities through the [GPS] . . . ."[121] Some could interpret the uninterrupted military access statement as a way of implying that the U.S. might interrupt civilian access in order to provide such military access. Assuming that remains an option under the 2004 Policy, continuity and user access will remain concerns of foreign GPS users. Certainly the European development of EGNOS and GALILEO reflects a long-term discomfort with a GNSS based solely on GPS.

However, while the 2004 Policy leaves open the theoretical possibility of the Defense Department temporarily (or permanently) eliminating civilian access to GPS, such an occurrence may be unrealistic given the extent to which GPS has become integrated into the world's infrastructure.[122] Internationally, Europe's construction of EGNOS (as a system to enhance GPS signals) and U.S. GPS agreements with Japan and India (which recognize GPS as a primary provider of satellite navigation technologies) reflect this integration.[123] Domestically, reliance on GPS extends from the air to the land and to the sea. Perhaps most significantly, as ICAO's plans for GNSS indicate, GPS is critical to air traffic controllers and pilots. This global and multi-level integration of GPS into the world's transportation, commercial, and security infrastructure, and the resulting paralysis that would result from discontinuing civilian access to GPS, suggest that a *de facto* commitment to continue GPS services may already exist.

---

121 *Id.*

122 Eliminating access might also conflict with assurances the U.S. gave to ICAO when the U.S. agreed to provide civilian access to GPS; this was the arrangement solidified by the exchange of letters discussed under "GNSS Background." *See* the earlier discussion on "GNSS Background" and on the 1996 Policy. However, it is unclear how these assurances should be interpreted in light of the 1996, and, now, 2004 Policies.

123 *See, e.g.*, Joint Statement of the United States of America and Japan on Global Positioning System Cooperation, *available at* http://www.state.gov/r/pa/prs/ps/2004/38773.htm (last visited Oct. 8, 2005) [hereinafter U.S.-Japan Statement]; *see also* India-United States Conference on Space and Science, Applications and Commerce – Strengthening and Expanding Cooperation, *available at* http://www.aiaa.org/indiaus2004/index.htm (last visited Oct. 8, 2005).

B. Interference

As the January 2004 Department of Transportation's report indicates, GPS is susceptible to various types of interference.[124] Intentional interference may result, for example, from government testing of signals, and unintentional interference may result, for example, from naturally occurring or man-made obstructions and, potentially, from terrorists.[125]

The 2004 Policy recognizes the interference problem and states that the U.S. government shall: "Improve the performance of space-based positioning, navigation, and timing services, including more robust resistance to interference for, and consistent with, U.S. and allied national security purposes, homeland security, and civil, commercial, and scientific users worldwide . . . ."[126]

One way in which the U.S. is working to address GPS interference is via augmentation. That is, the U.S. government heavily augments (and is continuing to develop augmentation options for) GPS.[127] GPS augmentation systems (existing or planned) include: (1) the Maritime Differential GPS Service (MDGPS), which increases the accuracy and integrity of GPS via land-based reference stations and provides, among other things, coastal coverage of the U.S.; (2) the Nationwide Differential GPS (NDGPS), which will expand MDGPS to cover all surface areas of the U.S.; (3) the Wide Area Augmentation System (WAAS), which, as a satellite-based GPS augmentation being developed by the FAA, is expected to provide the accuracy, availability, integrity, and continuity needed to support lateral and vertical navigation for all phases of flight in the U.S., including certain categories of approaches and landings; (4) the Local Area Augmentation System (LAAS), which will be similar to WAAS (except that it will apply to different categories of flight); and (5) Loran-C, which provides coverage for maritime navigation in U.S. coastal areas and also supports some air navigation.[128]

---

124 *See* Overlook Systems Technology, Inc., Radionavigation Systems: A Capabilities Instrument Strategy (2004), *available at* http://www.navcen.uscg.gov/notes_and_information/DOT_Radionavigation_Task_Force_Report_6_Feb_2004_FINAL.pdf [hereinafter Radionavigation Systems].

125 Larsen, *supra* note 64, at 117.

126 2004 Policy, *supra* note 1.

127 *See* 2001 Plan, *supra* note 33, ch. 2; *see also* Radionavigation Systems, *supra* note 124, ch. 2.

128 For additional descriptions and examples of GPS augmentation, see 2001 Plan, *supra* note 33, ch. 2, and Radionavigation Systems, *supra* note 124, ch. 2.

Heavy augmentation, however, raises two issues related to GPS and GNSS. First, such heavy augmentation may be an indication to foreign civilian users that GPS continuity and access issues are not fully resolved. GPS signals are relatively weak—hence the need for augmentation; aware of this problem foreign users may be well advised not to rely on GPS as the primary component of GNSS. Second, all U.S. augmentation systems and users of augmentation systems are dependent on their ability to receive the GPS SPS signal.[129] Assuming that augmentation is necessary to create the accuracy and precision required for global navigation and that such augmentation is only effective when the augmentation technology has access to GPS, if access to GPS is restricted, no amount of enhanced augmentation will matter.

VI. DOES THE 2004 POLICY SUPPORT THE EVOLUTION OF GPS AS THE SOLE—OR PRIMARY—PROVIDER OF A GLOBAL NAVIGATION SATELLITE SYSTEM?

The 2004 Policy does not appear to support the development of a world-wide GNSS that would be based solely—or even primarily—on GPS. While the elimination of selective availability and the development of additional civilian frequencies may increase user confidence in GPS as a worldwide provider of global satellite navigation, control and interference issues still implicit in the 2004 Policy would appear to prevent GPS from ultimately serving as the sole provider of GNSS.

Even though the 2004 Policy is much more explicit in indicating that continuity of service and user access should not be areas of concern, language remains suggesting that GPS will always be subject to national security requirements first. Of course, additional civilian frequencies may ultimately eliminate access concerns, but nothing in the 2004 Policy suggests that the U.S. will never discontinue service to certain countries in times of war.[130] This fact alone should provide countries with a strong incentive to develop alternatives to GPS—as the Europeans recognize.

---

[129] *See* 2001 PLAN, *supra* note 33, at 2-2.

[130] Control issues could arguably, be resolved by placing GPS under the control of an international entity, perhaps associated with ICAO. It seems unlikely, however, that the U.S. government would ever agree to an arrangement where it had to relinquish control over GPS. Additionally, although a *de facto* commitment to provide continued GPS access may provide some reassurance to a foreign GPS user, there remains no guarantee as to how the U.S. government would respond if there were a global and/or catastrophic U.S. military event that placed unusual demands on GPS.

And while interference is more a technological problem than a policy problem, the susceptibility of GPS and its augmentations to interference rationally supports the need for additional satellite technologies supporting, or incorporated into, the GNSS.

In some respects, the 2004 Policy recognizes its own limitations and, in doing so, situates GPS as one component of the GNSS. This fact may be the biggest difference between the 1996 Policy and the 2004 Policy. In other words, the 2004 Policy, acknowledging the reality that control and interference issues—as they relate to GPS—will remain matters of international concern, works to de-emphasize the role of GPS as the sole or primary component of GNSS.

Specifically, two statements in the 2004 Policy suggest that GPS should function as one of a number of components within the GNSS. First, as noted above, the Policy states that GPS technologies should "remain essential components of internationally accepted positioning, navigation, and timing services. . ."[131] Second, the Policy states that the U.S. should "[s]eek to ensure that foreign space-based positioning, navigation, and timing systems are interoperable with the civil services of the [GPS] and its augmentations in order to benefit civil, commercial, and scientific users worldwide."[132] Collectively, this language suggests that the U.S. now views GPS as one of a number of systems providing global satellite navigation; additionally, the second statement reflects what are probably the greatest hurdles to establishing a truly world-wide GNSS: compatibility and interoperability.

Within the last few years, the U.S. government has signed agreements with a number of foreign entities—Russia, Japan, and the European Union—seeking to address issues of compatibility and interoperability between GPS and each country's global satellite systems or augmentations.

In December 2004, the United States and the Russian Federation issued a joint statement on GPS and GLONASS.[133] In particular, the statement indicated that "both sides intend to work together to the maximum extent practicable to maintain radio frequency compatibility in spectrum use between each other's satellite navigation and timing signals."[134] The statement then

---

[131] 2004 POLICY, *supra* note 1.

[132] *Id.*

[133] *See* United States–Russian Federation Joint Statement, *available at* http://www.state.gov/r/pa/prs/ps/2004/39748.htm.

[134] *Id.*

went on to say that "[b]oth sides will work together [via the creation of a working group] . . . to maintain compatibility and promote interoperability of GPS and GLONASS for civil user benefits worldwide."[135]

In November 2004, the United States and Japan met to reconfirm the principles of their 1998 Joint Statement on Cooperation in the Use of the Global Positioning System.[136] At the 2004 meeting, the U.S. reconfirmed the principle, set out in the 1998 agreement, to "provide the GPS [SPS] for peaceful civil, commercial, and scientific use on a continuous, worldwide basis, free of direct user fees."[137] And Japan indicated its intent "to work cooperatively with the United States to ensure that a free and open [GNSS] benefits all civil users of GPS."[138] Finally, Japan briefed U.S. representatives on its upcoming launch of the "Multi-functional Transport Satellite (MTSAT) Satellite-based Augmentation System (MSAS)," a system designed to augment GPS as a component of a GNSS.[139]

Finally, and perhaps most significantly, in June 2004, the U.S. and the European Union agreed to establish a common civil signal among GPS and GALILEO which, when GALILEO becomes operational, should provide the first truly multi-component interoperable GNSS.[140]

VII. CONCLUSION

All of these agreements are promising steps towards establishing a multi-component GNSS that is both compatible and interoperable; however, neither the Russian nor the European Union arrangements have yet produced any concrete results, and may not for some time. Thus, while the 2004 Policy appears to be situating GPS simply as one component of the GNSS, the reality may be much different. In fact, until Russia and the European Union develop appropriately sized and reliable satellite systems, GPS—as evidenced by the U.S./Japan agreement—will most likely remain the centerpiece of the global navigation satellite system. Therefore, the centrality of GPS to GNSS suggests that foreign users of a GPS-based GNSS will need to accept

---

135 *Id.*

136 *See* U.S.-Japan Statement, *supra* note 123.

137 *Id.*

138 *Id.*

139 *Id.*

140 *See* U.S.-E.U. Summit, *supra* note 62.

GPS's continuity, access, and technological restrictions until such time as alternative systems are available.

Civilian users, globally, should take some comfort in the reality that there may exist a *de facto* commitment to provide continuous and/or uninterrupted civilian access to the Global Positioning System. Nonetheless, it should remain the goal of ICAO and all other countries reliant on global satellite navigation to create a multi-component, multi-country navigation satellite system that does not rely, exclusively, on a single satellite system. The 2004 Policy supports that goal.

SOUTHERN METHODIST UNIVERSITY

DALLAS, TEXAS

Comments

SOUTHERN METHODIST UNIVERSITY

DALLAS, TEXAS