



## **International Civil Aviation Organization (ICAO)**

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### **Statement to the United States House of Representatives Subcommittee on Aviation**

#### **Hearing on "A Review of Issues Associated with Protecting and Improving our Nation's Aviation Satellite-based Global Positioning System Infrastructure"**

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Good morning Mr. Chairman, Ranking Member and Subcommittee members. It is an honour to be able to testify before this subcommittee and I would like to thank you for this opportunity. My name is Vincent Galotti and I am Deputy Director of the Air Navigation Bureau at the International Civil Aviation Organization (ICAO), which is a United Nations Specialized Agency. My testimony today will focus on the importance of the Global Navigation Satellite System or GNSS. The term GNSS is what we use to refer to the entire global satellite system and there are a few other systems.

Russia has its GLONASS which has had some reliability and maintenance problems over the years although that government has now committed to a next generation system. Europe has its Galileo which is not yet operational and China is in the process of launching its Compass system. Because of the reliability and continued upgrading of the GPS and the commitment of the

United States government, GPS is the most fundamental and important piece of supporting infrastructure of the global system.

By way of background, ICAO was established by the 1944 Convention on International Civil Aviation, also known as the Chicago Convention, and is a specialized agency of the United Nations. As the global forum for cooperation among its 192 Member States and with the world aviation community, ICAO sets standards for the safe and orderly development of international civil aviation. In fulfilling its mission, ICAO has established three Strategic Objectives:

1. Enhance global civil aviation safety;
2. Enhance global civil aviation security; and
3. Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment.

There are several hundred thousand commercial flights that take place around the globe each and every day in support of the world's social and economic infrastructure. The international standards established through ICAO as well as the global infrastructure put in place through the ICAO processes, enables those flights to operate seamlessly across international boundaries.

I would like to mention that the United States is one of the primary contributors to ICAO in terms of technical expertise and knowledge and in support of consensus-building and excellence in international standards and policy development, for which we are grateful. Most of the technical work that we do is accomplished through groups of experts nominated by Member States. The Federal Aviation Administration has been a major contributor to ICAO in this respect and I believe this has served U.S. interests extremely well.

ICAO's close involvement with satellite navigation systems goes back to the work of the ICAO Committee on Future Air Navigation Systems, more

commonly known as the FANS Committee. The United States was a major contributor and participant to that committee. In adopting the outcomes of the FANS Committee at the Tenth Air Navigation Conference in 1991, a conclusion was reached that "the exploitation of satellite technology appears to be the only viable solution to overcome the shortcomings of the present system and also fulfil the global needs and requirements of the foreseeable future... and that satellite based systems will be the key to worldwide improvements".

In recognition of this turning point and acknowledgement by the world community of the importance of global satellite navigation systems, which was highly dependent on the U.S. GPS, President Clinton formally offered the GPS standard positioning service or SPS, to the global aviation community, through ICAO, to support the needs of international civil aviation. The U.S. commitment was formally reaffirmed in 2007 under President Bush as follows: "The U.S. Government maintains its commitment to provide GPS SPS signals on a continuous worldwide basis, free of direct user fees, enabling worldwide civil space-based navigation services and to provide open, free access to information necessary to develop and build equipment to use these services."

For the record, I should point out that even before the work of the FANS Committee and the offers of both Presidents Clinton and Bush, the availability of GPS to civil aviation first came about, as I am sure you are aware, when President Reagan authorized its use for international civil aviation after Korean Air 007 was shot down in 1983 for straying into Soviet airspace because of a navigation error. So it is safe to say that every sitting President since Ronald Reagan has either formally affirmed or re-affirmed the use of the U.S. GPS system in support of a global satellite navigation system.

Following the initial U.S. offer, ICAO developed international Standards on a more generic approach to satellite navigation systems, under the GNSS programme. With the availability of ICAO Standards, the GPS system became globally recognized by the international civil aviation community as the central element of GNSS. ICAO and the entire international civil aviation community

are now completely reliant on the long-standing U.S. government policy and its international commitment to GNSS, as a key enabler of ICAO's strategic objectives. GNSS, and specifically GPS, has become the backbone of the global aviation infrastructure.

Today, the importance of GNSS to international civil aviation cannot be overstated as it has grown into the most critical piece of the global infrastructure in support of a seamless and interoperable global system. I will give a few practical examples.

- In areas of the world where the conventional terrestrial navigation aid infrastructure is inadequate, GNSS may well be the only reliable source of navigation information for international air transport. In other words, GNSS may be even more critical to safety of U.S. citizens when flying outside the U.S. than within;
  
- Before GNSS, navigation in high seas airspace was crude and inaccurate. Separation distances between aircraft used by air traffic control were as much as 100 miles laterally and 15 to 20 minutes in trail. The superior accuracy of GNSS, especially when integrated with sophisticated flight management systems, has enabled a number of substantial navigation improvements, which are the foundation of the ICAO concept of performance based navigation or PBN. In PBN airspace, separation between aircraft is significantly reduced thereby increasing capacity while bringing safety, efficiency and environmental benefits. The United States provides air traffic control services over vast expanses of high seas airspace. In the North Atlantic alone, there are over 2000 crossings a day. The trans-Pacific passenger traffic is expected to grow by 4.2 per cent between 2009 and 2030. The intra Asia/Pacific traffic during that period is expected to grow by 5.1 per cent and at present, approximately 8,000 flights per year operate on trans- or cross-polar routes as they allow shorter, more direct long-haul routes, which save fuel and minimise environmental impact and are more convenient for passengers.

- Until very recently, all final approaches to land at major airports were accomplished by means of instrument landing systems. Such systems, while proven and reliable, are expensive to implement and maintain. In the U.S. and in other high density traffic countries, this may not be a critical issue. However, in many parts of the world, maintaining such systems is prohibitive because of cost and expertise. Using GNSS as the basis for PBN approach procedures, more and more approaches to land are accomplished by means of the equipment in the aircraft only, with little or no reliance on ground equipment, bringing enormous safety benefits at many airports. And airports that previously had no instrument approaches now have PBN approaches. Today, when U.S. airlines fly approaches into Lagos (Nigeria), Almaty (Kazakhstan), Ulan Bator (Mongolia), Dakar (Senegal), Quito (Ecuador) and Georgetown (Guyana) to name but a few out of hundreds, they are more assured of safe operations because of GNSS-based PBN;
- In more developed areas of the world, gradual decommissioning of conventional navigational aids is underway in favour of a GNSS-based navigation system. This will enable significant cost savings while enhancing safety;
- Globally, GNSS is the enabling technology for a host of performance and safety enhancements;
- GNSS is important for next generation aircraft surveillance and here I am referring to automatic dependent surveillance–broadcast or ADS-B. ADS-B is being introduced in many countries as a replacement of or in lieu of traditional and expensive radar systems. ADS systems use GNSS positioning information, which is relayed to the ground for air traffic control purposes. And ADS – Contract or ADS-C, also based on GNSS, is being used in high seas airspace for surveillance, where prior to this, surveillance was not possible;

- And finally, two of the most significant near term air traffic management improvements that have recently become available, and that GNSS supports, are continuous descent operations and continuous climb operations. Each of these have the benefit of, as the titles suggest, allowing aircraft to continuously descend or continuously climb when operating in and out of airports, avoiding the inefficient practice of air traffic control of levelling aircraft off several times during arrival and departure. Again, safety, efficiency and environmental benefits.

Finally, after highlighting the importance of GNSS, and in this case GPS, internationally, I would like to touch on a major issue that has as much, if not more, of an impact globally than domestically. I am referring to the protection of aviation frequency spectrum. Available radiofrequency spectrum is the lifeblood of aviation and the protection of spectrum used by aviation radio systems is absolutely essential for flight safety. In the case of GNSS systems where power of the received signal is extremely weak, spectrum protection is particularly important.

ICAO has been vehemently supporting the protection of GNSS spectrum for decades in all international fora, such as the World Radio Conferences held every three years as part of the International Telecommunication Union or ITU framework. To give you just a few historical examples, in 1997 and again in 2000, two ITU Conferences discussed proposals to allocate spectrum within the current GNSS L1 bands to different radio services. This of course was seen as a major threat of interference to GNSS signals. ICAO strongly opposed the proposal and we believe that our opposition had an important role in developing a broad international consensus that the proposal was unacceptable.

Against that background, I would urge you to consider that any decision by the United States that affects frequency spectrum which impacts on GNSS, will have a critical impact on, to name a few:

- The excellent aviation safety record;
- The GNSS investment by the entire international fleet of every airline;
- The international standards that I spoke about earlier; and
- New-equipment and/or re-certification of existing equipment which is a lengthy and expensive process.

I cannot overstate the serious concerns of ICAO with respect to any decisions that may negatively impact on the availability and protection of GNSS, and the U.S. GPS on the Global Navigation Satellite System upon which the international civil aviation community has placed such importance. This has a lot to do with the full faith of the U.S. government that the global aviation community has come to expect.

In summary Mr. Chairman, I would like to appeal to you and the Committee that ICAO and international civil aviation continue to benefit from U.S. leadership and cooperation in many ways including invaluable support through the sharing of technical information and expertise; support of consensus-building and excellence in international standard and policy development; and concrete projects to assist countries in need of strengthening their aviation programmes. GPS is among the most important ways that the U.S. provides technological, humanitarian and political leadership.

ICAO looks forward to further deepening and strengthening this important and timely relationship.

Thank you for this opportunity to share ICAO's views with this important Subcommittee.