



WORKING PAPER

TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

Agenda Item 6: Future Direction

6.1: Implementation plans and methodologies

**THE NEED FOR PERFORMANCE-BASED, FREE GNSS
WITHOUT SYSTEM SPECIFIC MANDATE**

(Presented by the United States)

EXECUTIVE SUMMARY

The introduction of global positioning system (GPS) and satellite-based augmentation system (SBAS) services has provided a means for performance-based navigation capability and automatic dependent surveillance, and supports essential elements for worldwide infrastructure. We are in a period of rapid ongoing deployments and modernization of States' global navigation satellite system (GNSS) constellations and regional augmentation systems to provide compatible, interoperable, multi-frequency services that will greatly enhance the world's aviation and infrastructure capabilities. This paper considers the needs of States for combined GNSS services and reaffirms the responsibility of all GNSS provider States to consider the needs of developing States by continuing to provide their GNSS services for aviation use free of direct user charges. This paper also recommends GNSS provider States consider the needs of aircraft operators by providing services without system-specific GNSS use or carriage requirements.

Action: The Conference is invited to agree to the recommendations in paragraph 3.

1. INTRODUCTION

1.1 At the ICAO Tenth Air Navigation Conference in 1991 and the 29th Session of the ICAO Assembly in 1992, the United States offered to make global positioning system (GPS) service available for the foreseeable future on a continuous, worldwide basis, free of direct user fees. The Russian Federation subsequently made a similar offer on behalf of their GLObal NAVigation Satellite System (GLONASS). In September 2007, the United States renewed its offer of GPS services and extended that offer to include wide area augmentation system (WAAS) satellite-based augmentation system (SBAS) services within its prescribed service volume.

1.2 The United States is currently deploying modernized satellites with L1C/A and L5 signals and improved military encrypted signals that will enable civil and authorized State aircraft with modernized equipment to remove ionosphere induced errors and take advantage of increased performance and robustness. In late 2011, the Russian Federation achieved GLONASS full operational capability and on 13 February 2012, the Ministry of Transportation issued order No 35, to implement a concept of joint use of the GLONASS and GPS constellations in Russian Federation manufactured civil aircraft and by

Russian Federation operators of foreign aircraft. Europe's Galileo and China's BeiDou/COMPASS global constellations are expected to provide worldwide GNSS services later this decade. Combined use of multiple constellations' signals as well as regional augmentation systems will enhance the robustness and capabilities of the world's aviation operations and its infrastructure.

1.3 Japan and Europe currently provide compatible and interoperable SBAS services as important augmentation services to GPS capabilities. India is preparing for GPS-Aided Geo Augmented Navigation (GAGAN) full operational capability. Additionally, the Russian Federation has started deployment of their system of differential correction and monitoring (SDCM) SBAS capability compatible and interoperable with existing aircraft standards.

1.4 Every State and aircraft of all States should have access, on a non-discriminatory basis and under uniform conditions, to the use of GNSS services, including regional augmentation systems for aeronautical use within the area of coverage of such systems. It is important that all providers of satellite navigation services take into account the needs of developing States, which could derive great benefit from these services but cannot afford to pay for them. It is also important to recognize that there are challenges associated with the use of multiple GNSS constellations.

2. DISCUSSION

2.1 Existing GNSS systems provide a range of air navigation capabilities from en-route navigation to instrument approaches with vertical guidance. There are many States that have very limited air navigation terrestrial infrastructure, no means of providing instrument approaches with vertical guidance, or difficulty maintaining existing terrestrial infrastructure. In such regions, especially where instrument meteorological conditions (IMC) are frequent, the continuity of air transportation can be severely impacted with a corresponding negative effect on economic development. For those States, GNSS offers the prospect of major improvements in air navigation services. Furthermore, there are many applications of GNSS outside of aviation that can have a beneficial effect on the economies of developing States. GNSS applications including: surveying, mining, agriculture and other transportation modes can all have significant positive economic impacts, particularly for developing countries.

2.2 States' implementation of GNSS offers the fastest and most economical way for airspace users to realize the benefits of CNS/ATM technologies. Specifically, GNSS can significantly improve the effective use of airspace and provide operational and economic benefits to both the contracting States civil and state aircraft operators. GNSS has proven to significantly reduce the potential for controlled flight into terrain (CFIT). GNSS should be considered a global utility from which many useful applications can be derived. In many cases, States with developing economies have a great need for these applications and the provision of free GNSS should be continued to facilitate their access to these services.

2.3 The United States will continue to provide GPS and its augmentations free of direct charges to all users for the foreseeable future and other States have made similar commitments. This provision is very important for improving the safety and efficiency of States that have limited air navigation infrastructure. In addition, developing States may also achieve benefits from the improved capabilities provided by use of multi-GNSS services for essential business and infrastructure applications including aviation. Therefore, States should continue providing GNSS services free of direct charges to facilitate increased world-wide availability of GNSS aviation performance and safety benefits.

2.4 The obstacles in implementing many of the communications, navigation, and surveillance/air traffic management (CNS/ATM) technologies are varied; ranging from political and

financial, to technical and institutional. Many of the benefits of these technologies have therefore been delayed or not realized. Delayed implementation will result in the loss of opportunities for enhanced safety, increased airspace capacity, increased efficiency in aviation operations, and reductions in aircraft and passenger delays.

2.5 AN-Conf/12-WP/ 21 (presented by the Secretariat) states an ultimate goal is to establish an institutional and legal framework that would enable the unrestricted use of any GNSS element. Appendix B of that paper also states that the emergence of multi-constellation GNSS renews the need to define a specific GNSS international liability scheme.

2.6 The United States believes that Article 28 of the Chicago Convention provides an institutional and legal framework for provision of GNSS services. No new law is required or necessary to enable use of GNSS.

2.7 Some States could require, or prohibit, the use of specific GNSS elements in their sovereign airspace. Such a situation could result in significant costs for users in terms of additional cockpit controls and procedures, crew training and maintenance support or even become a safety issue due to human factors considerations.

2.8 AN-Conf/12-WP/ 21, Recommendation 6/x – Use of multiple constellations, paragraph c), requests the Conference recommend that States, when defining their air navigation strategic plans and introducing new operations “adopt a performance-based approach with regard to the use of global navigation satellite system (GNSS) constellations, considering in particular the difficulties arising from limiting or mandating the use of specific GNSS elements”. The United States endorses that recommendation. If not constrained, the challenges for international aviation operators to equip their aircraft for all possible combinations of the GNSS elements are potentially insurmountable. Operators of civil and state aircraft could be forced to incorporate multiple retrofits of increasingly complex and costly multi-GNSS avionics.

2.9 The United States also recognizes that some States may mandate equipage of aircraft with their State’s GNSS for national economic or internal security reasons. The United States recommends that any State mandating system-specific GNSS use limit their mandate to their State registered aircraft and not impose that mandate upon other States’ civil or state aircraft operators. Prohibition of the use of specific GNSS certified to internationally accepted equipment standards and compatible with ICAO standards and recommended practices (SARPS) for GNSS services or the mandated use of a States’ specific GNSS equipment when other GNSS can provide equivalent, performance-based capabilities are barriers to free trade if imposed upon foreign operators.

3. **RECOMMENDATIONS**

3.1 The Conference is invited to agree to:

- a) GNSS aviation services should continue to be provided free of direct user charges;
- b) Article 28 of the Chicago Convention provides the institutional and legal framework for provision of GNSS services and that no new law is required to enable use of GNSS;

- c) encourage States to adopt a performance-based approach and avoid limiting or prohibiting aircraft use of GNSS elements that are compliant with applicable ICAO SARPS;
- d) encourage States to avoid mandating aircraft use of a particular GNSS element or signals and allow the use of other GNSS elements and signals that are compliant with the ICAO SARPS; and
- e) any State electing to mandate use of a particular GNSS element, exempt other States' aircraft by limiting the mandate to aircraft registered in their State that are included in an operator's certificate (license).

— END —