

**ASIA/PAC Checklist for Introduction of GNSS based operations**

No.	Items to check	Reference	Remarks
1.	Establish GNSS Implementation Team (GIT); Establish a GNSS Office and designation of program/project officers –normally from regulator/service provider -Funding -Staffing  The Terms of Reference of GIT is provided in the Annex 1 to this Checklist.	ICAO Circular 267-AN/159 for GIT composition as mentioned in 6.10.2 Section of the Circular; Refers to draft appendix 1 to the GNSS manual for a sample TOR of the GIT.	GIT possible members include: -CAA; -Operations; -ATS; -Airworthiness; -Industry; -Airlines; -General Aviation; -Defense; -Maintenance provider; -Pilot training.
2.	State Plan – define and confirm State operational requirements and Regulation changes: - En-route, NPA/APV - PA at selected airports - Produce Orders, AIC, AIP SUPS, MATS amendments etc.	FAA Advisory Circular (AC) 90-94A, Guidelines for Operators using GPS equipment for IFR En Route and Terminal Operations and for NPA in the U.S. National Airspace System; FAA Order 7100.10A-Air Traffic Satellite Navigation Plan.	Draft and publish - Advisory Circulars - AIC - Aeronautical Information Circular; - AIP supplements.
3.	Define Operations and ATS requirements - Determine Operation Use Policy; - Separation Standard application; - Establish ATC GNSS Use Procedures;		
4.	Basic constellation augmentation requirements Determine Augmentation Policy.	SARPs for augmentation systems	ABAS; GRAS SBAS; GBAS.
5.	WGS-84 -Ensure WGS-84 compliant; -WGS-84 survey and publications; -Ensure database vendors provide WGS-84 data.	ICAO World Geodetic System-1984 (WGS-84) Manual Doc9674-AN/946	
6.	En route Domestic/Oceanic & Remote Standards - Define and publish borders between standards - Education on standards and differences		
7.	NPAs - Locations selection - Obstacle survey and database - Airfield status - Use NPA Procedure Design Criteria PANS/OPS; - Publish GNSS Arrival Procedures - Environmental considerations	Chapter 33 and its appendix of PANS/OPS Doc8168 Vol-II, for basic GNSS receivers	Instrument Approach Procedure
8.	Airport standard: - Upgrade to instrument runway; - Obstacle Limit Surface (OLS); - Maintenance of OLS; - Suitability for straight in approach; - Windsock and supporting requirements; - Altimeter setting availability; - Lighting.	Annex 14	

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9.	<p>Determine and Implement Receiver Standard</p> <ul style="list-style-type: none"> <li>- Equipment installation Policy –Supplemental Type Certificate or equivalent;</li> <li>- Conduct Airworthiness Training and approvals;</li> <li>- Establish rule for GPS for terrestrial navigation aid substitution;</li> <li>- Changes to equipment carriage requirements</li> <li>- Limitation of TSO C129 receivers</li> </ul>	<p>Rx Design Standard (Selection)</p> <p>TSO-C129; TSO-C145; TSO-C146 (Stand alone).</p>	<p>TSO C129 (FD Limitation): Alternate solution + Barometric aiding;</p>
10.	<p>Operation approval:</p> <ul style="list-style-type: none"> <li>-Primary means</li> <li>-Supplemental means</li> </ul>	<p>Regional strategies for implementation of GNSS air navigation capability and the provision of precision approach and landing guidance systems</p>	<p>GPS as a primary means of Navigation in Oceanic/remote Operations; -N8110-60; -AC20-138.</p>
11.	<p>Flight Inspection and validation;</p> <ul style="list-style-type: none"> <li>- Topography and obstacle assessment;</li> <li>- Flight Inspection;</li> <li>- Selection of suitable aircraft for inspection;</li> <li>- Transit times/low/slow flying capability;</li> <li>- Fuel reserves/Communications requirements;</li> <li>- Proper avionics</li> </ul>	<p>DRAFT Volume 2 Chapters 1 and 2 of DOC 8071.</p>	
12.	<p>Crew training and approval -Pilot Endorsement</p> <ul style="list-style-type: none"> <li>- Aircraft equipment endorsement</li> <li>- Validation training</li> <li>- GNSS training and approval</li> <li>- Operation familiarization</li> </ul>	<p>Australian GPS Non Precision Approaches Instructor Pack-GPSIP CASA; and GPSIP2 CASA</p>	
13.	<p>Licensing:</p> <p>Pilot instrument rating requirements;</p> <ul style="list-style-type: none"> <li>-En route use;</li> <li>- NPAs.</li> </ul>		
14.	<p>GNSS signal monitoring and recording facilities in place.</p>	<p>State that approves GNSS-based operations should ensure that GNSS data relevant to these operations are recorded. The requirement is specified in the Amendment 76 to Annex 10 Vol. II. This recording may be done by non-aviation agencies such as Geodetic Survey Organization.</p>	<p>For use in accident and incident investigations and may also support periodic confirmation that accuracy, integrity, continuity and availability are maintained.</p>
15.	<p>Establish procedures for ensuring database consistency:</p> <ul style="list-style-type: none"> <li>- Approach Publication;</li> <li>- Implementation;</li> <li>- Operational Testing;</li> <li>- Training;</li> <li>- Flight Operations Inspectors;</li> <li>- Air Traffic Controllers;</li> <li>- Airworthiness;</li> <li>- Pilots and check pilots</li> </ul>		<p>Data Cards – to be integrated in Receivers. Responsibility for the correct data made by Jeppesen , Alternately can be got through Internet.</p>
16.	<p>Operational Training:</p> <ul style="list-style-type: none"> <li>- Procedure design</li> <li>- Air traffic controller</li> </ul>	<p>8168 Vol II Chapter 3</p>	

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17.	NOTAMs - For GPS, use Status message from USA - RAIM Prediction System (RPS) (if applicable)	RAIM Prediction Service (Australia Airservices website)	(Convert Message into operational NOTAMs for meeting the requirement)
18.	GNSS Incident or Anomaly Report	GPS Outage Query Form provided on the website: <a href="http://www.navcen.uscg.gov/gps">www.navcen.uscg.gov/gps</a>	
19.	Post Implementation Review - Procedures compliance; - Revision of Documentation; - Incorporation of AIP Supplements into AIP; - Maintenance of approach Obstacle Limit Surfaces, Airfield status; - Conventional Navigation Aid Policy; - Consolidation Policy – navigation aid withdrawal.		

## GNSS IMPLEMENTATION TEAM TERMS OF REFERENCE

### 1.0 INTRODUCTION

This document sets out the Terms of Reference for the Global Navigation Satellite System (GNSS) Implementation Team, which includes members from regulatory and service provider organizations, and user representatives. It defines the roles of participants with respect to the implementation of GNSS operations.

A common goal of the regulator and service provider is to ensure that aircraft operators receive the benefits of GNSS technology in a timely and effective fashion while maintaining high standards of safety. The GNSS Implementation Team will support this goal by fostering a cooperative approach to developing the standards, systems, procedures and the terms and conditions of regulatory approvals that respond to the needs of the aviation community.

Regulating GNSS and providing GNSS related services require that various branches in the regulatory and service provider organizations allocate resources to specific tasks. A key goal of the GNSS Implementation Team is to identify resource requirements to allow managers to plan effectively. The GNSS related roles of branches and divisions in the two organizations are described in section 2.

Material developed by ICAO, including SARPs, Guidance Material and Manuals, form the basis for the actions taken by the GNSS Implementation Team. In the early stages, research sponsored by the Team will add to the body of knowledge needed to develop ICAO documentation. As GNSS evolves, the Team will be able to reply to a large extent on this documentation.

### 2.0 ROLES

#### 2.1 Service Provider

##### 2.1.1 Satellite Navigation Program Office (SNPO)

- a) act as the focal point for the development of satellite navigation technology for aviation purposes;
- b) complete trials and studies to prove GNSS concepts and test performance against safety standards;
- c) coordinate efforts internationally to avoid duplication of effort;
- d) provide guidance to the Member of the ICAO GNSS Panel, to ensure that international standards reflect national requirements, and participate in Panel working groups, as appropriate;
- e) coordinate the delivery of service based on satellite navigation technology to aircraft operators;
- f) develop performance requirements for GNSS augmentation systems, and specify augmentation system architecture to meet operational requirements;
- g) field and test prototype augmentation systems to minimize risk with operational systems;
- h) work with aircraft operators, aviation systems manufacturers, the academic community and users in other disciplines to ensure that augmentation systems meet requirements effectively and efficiently;

- i) maintain knowledge of aircraft, pilot and operator certification standards and work with certification staff to ensure approvals are consistent with GNSS performance;
- j) determine the economic viability of implementing augmentation systems, and develop appropriate strategies for fielding these systems and decommissioning traditional navigation aids;
- k) develop the necessary documents to obtain funding for operational augmentation systems;
- l) promote the use of satellite navigation technology, and assist aircraft operators to make informed decisions on equipage, through publications, presentations, other media and direct contact;
- m) encourage the safe use of GNSS by contributing to safety awareness programs;
- n) maintain detailed knowledge of satellite navigation avionics standards and performance, including pilot interface characteristics;
- o) recommend satellite navigation procedure design features to exploit the strengths of the technology while minimizing pilot workload and the possibility of pilot error;
- p) coordinate the development of survey standards to meet the accuracy requirements of satellite navigation approach procedures;
- q) participate in the development of GNSS equipment standards;

#### 2.1.2 National Flight Inspection Organization

- a) complete flight trials and system performance studies to support GNSS implementation;
- b) monitor GNSS performance;
- c) complete necessary flight inspections for non-precision and precision approaches

#### 2.1.3 Aeronautical Information Services

- a) develop approach and other GNSS procedures;
- b) complete in-flight checks of GNSS procedures to assess flyability and obstacles;
- c) coordinate airspace-related GNSS issues with ATS;
- d) verify GNSS instrument procedures submitted by designers;
- e) develop depiction standards for GNSS instrument procedures;
- f) develop standards for and control input to databases containing GNSS procedure coordinates, including participation in international standards bodies;
- g) provide aeronautical information on GNSS procedures to database suppliers and chart producers;
- i) incorporate GNSS information in the NOTAM system;

#### 2.1.4 Planning and International/Government Liaison

- a) incorporate GNSS material provided by SNPO in national and international planning documents;
- b) incorporate the level of service criteria and planned decommissioning of traditional navigation aids into national and international planning documents;

#### 2.1.5 Operational Requirements and Level of Service

- a) develop detailed operational requirements for decommissioning traditional navigation aids, based on strategy developed by the SNPO;
- b) complete aeronautical studies associated with decommissioning traditional navigation aids;

### 2.1.6 Engineering

- a) develop technical specifications for augmentation systems;
- b) procure and field GNSS augmentations, including related communications systems;
- c) perform life cycle management of augmentation systems;
- d) develop hardware and software to support GNSS flight inspections, trials and studies;
- e) complete studies and investigations on the frequency interference aspects of GNSS performance;
- f) provide spectrum management to protect GNSS frequencies
- g) participate in the ICAO GNSS Panel to contribute to the development of international standards, recommended practices and guidance material;

### 2.1.7 Air Traffic Services

- a) develop procedures to support GNSS operations;
- b) provide air traffic services to support satellite navigation operations;
- c) participate in the development of GNSS instrument procedures and in the development of the strategy and plans for decommissioning traditional navigation aids;

### 2.1.8 System Safety

- a) monitor the introduction of satellite navigation technology to identify potential hazards;

## 2.2 Regulator

### 2.2.1 ANS & Airspace

- a) Monitor the service provider's research and development of GNSS technology, and consider the service provider's recommendations for operational approvals based on this technology;
- b) Assist with development activities to maintain knowledge of technology and operational applications;
- c) Develop GNSS instrument procedure design standards;
- d) Oversee the certification of GNSS augmentation systems and related airspace procedures, and monitor compliance;
- e) Introduce airspace procedures appropriate to the capabilities of satellite navigation technology;
- f) Approve survey standards;
- g) Approve database integrity standards and monitor for compliance;
- h) Evaluate aeronautical studies completed by the service provider to assess the impact of decommissioning traditional aids;
- i) Publish GNSS information, provided by the SNPO and other GNSS Implementation Team members, in various publications;
- j) Conduct ongoing safety oversight of the service provider's Safety Management Program with respect to the introduction of satellite navigation technology;

### 2.2.2 Aircraft Certification

- a) develop national standards and guidance material for the certification of GNSS equipment and its installation and certification in nationally-registered aircraft. Where necessary the development of standards and guidance may be accomplished as a joint effort with other Airworthiness Authorities to minimize duplication of effort and maximize harmonization;
- b) certify or oversee the certification, as applicable, of GNSS avionics equipment designed and manufactured nationally as well as the installation of all GNSS equipment installed in nationally registered aircraft;

- c) participate in the development of GNSS avionics standards via bodies such as RTCA;
- 2.2.3 Commercial and Business Aviation
- a) develop crew training and certification standards for the use of GNSS avionics by commercial and business aircraft operators;
  - b) approve the operational use of GNSS technology by commercial and business aircraft operators;
- 2.2.4 General Aviation
- a) develop flight instructor guidelines & flight test standards for the use of GNSS avionics by general aviation aircraft operators;
  - b) in the course of Instrument Flight Tests and Commercial Pilot - Aeroplane Flight Tests, assess the ability of general aviation pilots to use GNSS avionics;
- 2.2.5 Aerodrome Safety
- a) develop standards for the physical characteristics and obstacle limitation requirements at aerodromes as they affect GNSS instrument approach operations;
  - b) assess the application of GNSS to Advanced Surface Movement Guidance and Control Systems (ASMGCS) at airports, and develop standards as appropriate, to support the “gate to gate” air traffic management concept;
- 2.3 Aircraft Services
- a) provide suitably-equipped aircraft and simulators to support GNSS trials and studies;
  - b) provide suitably-equipped aircraft and simulators to regulatory personnel to support their requirement for currency with GNSS operations;
- 2.4 System Safety
- a) monitor the introduction of GNSS technology to identify potential hazards;
- 2.5 User Representatives
- a) a wide cross section of users can provide strategic guidance and detailed recommendations on GNSS implementation;
  - b) specific users can participate in working groups assessing issues of significance to them.