INTERNATIONAL CIVIL AVIATION ORGANISATION

AFI PLANNING AND IMPLEMENTATION REGIONAL GROUP
THIRTEENTH MEETING (APIRG/13)
(Sal, Cape Verde, 25-29 June 2001)

Agenda Item 4 : Air Navigation Issues

4.7 : Global Navigation Satellite System Procedures (GNSS)

GNSS IMPLEMENTATION ACTIVITIES THE SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC) REGION

(Presented by IATA)

INFORMATION PAPER

1. INTRODUCTION

1.1 IATA have in recent years encouraged the development of practical GPS/GNSS applications as part of the transition toward new CNS/ATM. In addition, requests have been received from time to time from airlines to encourage development of GPS procedures especially at aerodromes with limited navigation infrastructure.

1.2 In response to the above requirement, IATA has established a GNSS procedure implementation package, which would provide for the design and implementation of GNSS procedures for States. The product can be tailored to the specific needs of each State, but the full package would include:

- Development of GNSS non-precision approach procedures for agreed runways;
- WGS-84 surveys;
- Development of SIDs and STARs in conjunction with GNSS approach procedures;
- Modification of airspace structure design to meet GNSS requirements;
- Development and preparation for publication of all relevant charts;
- Flight verification (inspection) of the GNSS procedures:
- Drafting of essential national GNSS legislation (regulations)
- Training

2. BACKGROUND

2.1 IATA GNSS Package

2.1.1 The IATA GNSS package defines a Global CNS/ATM implementation objective and measures that could deliver early and long-term benefits for member airlines. It provides a cost-effective tool that aids decision-making and is responsive to future CNS/ATM development. Decision-making will be based on collaboration and cooperation between all stakeholders, including the users (members) through IATA.

2.1.2 The major objective of this GNSS package is to achieve harmonized Global Navigation Satellite System (GNSS) procedures in States, significantly improving the effective use of airspace and providing safety, operational and economic benefits to member airlines. This model can be adapted for use in different regions .

2.1.3 The Southern African Development Community (SADC) Region was identified as one which could greatly benefit from the system, and the SADC Civil Aviation Committee (CAC) endorsed a proposed IATA GNSS Procedures Project for States in the SADC Region during a meeting held in Mauritius, April 19. The CAC agreed that IATA recover the cost from airspace users and the SADC Senior Officials ratified the SADC CAC decisions during a meeting in mid June. Airlines through the African and Indian Ocean Region Regional Coordination Group (RCG) have also endorsed this Project and the User Charges Panel (UCP) the cost recovery methodology.

2.1.4 The SADC Project will be completed in two phases. The first phase was an introductory project in Namibia in July 2000 to demonstrate the viability of GNSS procedures. The second phase would be to implement GNSS procedures in 14 States of the SADC Region. The IATA GNSS Package is described in Annex A.

3. BENEFITS TO AIRLINES

3.1 GNSS was approved as primary navigational aid for the AFI Region during the last AFI RAN Meeting held in Nigeria. Early implementation of GNSS procedures in SADC States would result in the following benefits for airlines:

- Improved safety;
- Non-replacement of certain traditional navigational facilities envisaged for the next 5 years;
- Reliable approach procedures at 28 airports in the SADC Region;
- User preferred routes and optimum flight levels;
- Increased airspace capacity as result of reduced separation standards between suitably equipped aircraft; and
- Financial savings associated with above benefits.

4. MILESTONES

4.1 The GNSS Project for States in the SADC Region commenced with WGS-84 survey work in Namibia on March 19 and completion date scheduled for December 21 this year.

5. FUNDING

5.1 It was decided that IATA would finance this project and absent internal manpower resources IATA has appointed external resources (IATA Partner) to develop GNSS Procedures.

6. COOPERATION/PARTNERSHIP

6.1 The cooperation with States to improve air safety can be divided into two categories, namely cooperation to make large-scale improvements to infrastructure and cooperation to introduce a world wide navigation system.

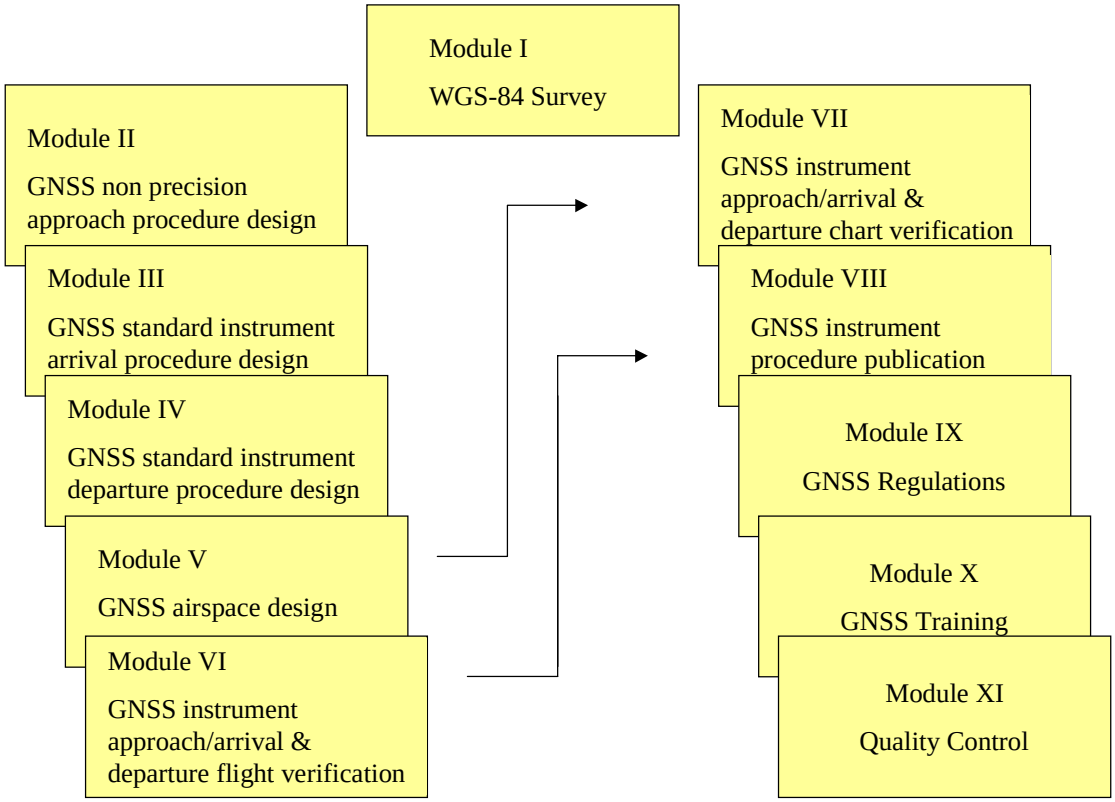
6.2 In case of the IATA GNSS Procedures Package no ground-based equipment is required to implement GNSS NPAs. Thus CAAs will benefit by not having to purchase, install and maintain new equipment, and it may be possible to de-commission certain older navigational equipment. Therefore, the GNSS Procedure package is of benefit not only to the recipient countries but also to airlines because it simplifies procedures while enhancing safety. The GNSS Procedures Package is an excellent example of cooperation between States (the service provider) and IATA (the airlines) to improve navigational procedures that will enhance air safety and result in cost savings for the airspace user.

6.3 The IATA GNSS Procedures Package is an integral part of a Global CNS/ATM implementation objective and measures that could deliver early and long-term benefits for member airlines. It provides a cost-effective tool that aids decision-making and is responsive to future CNS/ATM development. Decision making will be based on collaboration and cooperation between all stakeholders, including the airspace users through IATA.

4. ACTION BY THE MEETING

4.1 The meeting is invited to note the information above.

IATA GNSS PROCEDURES PACKAGE



IATA GNSS PROCEDURE PACKAGE

MODULES

· WGS-84 Survey

An airport survey establishing Primary and other airport survey control points in WGS-84 are needed before procedures can be developed. Included in this survey will be the runway threshold coordinates and an obstacle survey that will comply with the obstacle clearance areas identified in ICAO Annex 14. The survey shall also comply with the publication specifications given in ICAO 4 and Annex 15. Data received from this survey will be used to support the ongoing geographical analysis, procedure calculations and development.

· GNSS Instrument Approach Procedures

GNSS Non-Precision Approach (NPA) will be developed for all relevant runway ends and no ground infrastructure will be required. The NPA can be upgraded to a Precision Approach at a relative low cost when applicable ICAO criteria are approved. The GNSS Approach Procedure design will be optimised to the extent possible for efficiency, standardisation, airspace and international boundaries. The Approach procedure will be constructed in the standard ICAO PANS-OPS configuration.

· GNSS Standard Instrument Arrival (STAR) and Departure (SID) Procedures

All GNSS STARS and SIDs will be developed using ICAO PANS-OPS criteria.

- SIDs: A departure procedure will be developed for each identified runway and to accommodate as many aircraft categories possible These procedures will be development will take into consideration obstacle clearance, ATS, airspace structure, aircraft performance and noise abatement. RNVA departure procedures will be developed as a route to link the aerodrome with a specified point, normally to where the en-route phase of the flight commences;

- STARs will be developed for locations where application facilitates efficient air traffic routing and management . The results of an air traffic study and terminal configuration, along with local air traffic management preferences, will be used to determine and develop the STAR for each runway. The STAR will then be designed and implemented to be compatible with efficient traffic flow and ATM needs, connecting the en-route area with the NPA.

· GNSS Airspace

The current ATS airspace will be redefined in reference to WGS-84 coordinates. A study of the existing airspace will be done to ensure optimal development of GNSS. Existing airspace structure and coordination fixes will be used when possible, but not to the extent of compromising optimal air traffic flow or safety. An optimized airspace structure will be developed in coordination with local air traffic specialists.

· GNSS Instrument Approach, STAR and SID Procedure Charts

Jeppesen like Charts will be developed for all GNSS instrument Approaches, STARs and SIDs. These charts will be prepared in accordance with the ICAO Aeronautical Chart Manual. Documentation and revisions for inclusion to the AIPs will be provided. Geographical coordinates indicating latitude and longitude will be published in terms of WGS-84 geodetic reference system.

· GNSS Instrument Approach, STAR and SID Procedure Flight Verification

Flight verification/Validation of each GNSS Procedure is necessary both for safety and flyability purposes. It is a final process in the procedure design activity that provide quality checks prior to commissioning of the procedure.

- Safety: The true location of each waypoint defining the approach must be validated. The flight verification/ vaildation is required to confirm approach elements such as waypoint location, alignment, and obstacle clearance;

- Flyability: Flight verification/validation allows evaluation of descent gradients, waypoint sequence, turn radius, and cockpit workload. It also permits optimisation of the approach and insures the most efficient implementation.

· Training

Training will be provided to address the requirements of many different aviation professionals. To meet these requirements , IATA aims to target the training element to four different kinds of participants:

- Pilots and CAA staff requiring general knowledge of GNSS;
- ATC, CAA flying inspectors and other staff needing familiarity with GNSS Procedures; and
- Airworthiness staff responsible with airborne certification requirements;
- CAA staff responsible for approving GNSS Procedures

To address these training requirements, IATA has designed a suite of modular training courses that ensures that each training participant has access to the training that best suits his or her needs.

- GNSS Instrument Approach Procedure Design Course:
  This course is designed for aviation professionals who need a detailed understanding of aviation procedure design, so the may review, evaluate, authorise, inspect and approve GNSS Procedures using PANS-OPS criteria.

- Satellite Navigation Course
  This course is designed for aviation professionals who need a general level of familiarisation with use of GNSS. It is also intended to acquaint pilots using GNSS for en-route and approach procedure navigation.

· GNSS Legislation

All international and regional requirements and regulations that must be complied with to effect operational capability, interoperability and harmonization for approval of GNSS procedures, will be identified. GNSS legislation will then be developed to meet regional and national requirements.

· Quality Assurance (QA)

A Management approach centred on quality, based on participation of relevant parties aiming at long-term success through client satisfaction and benefits to the aviation society was adopted. The QA document set out the specific quality practises, resources and sequence of activities relevant GNSS Procedure development, WGS-84 Survey, Training and Legislation.