



**Agenda Item 2: Review of air navigation matters**  
**2.3 Air navigation specific activities:**  
**2.3.1 Air Traffic Management (ATM)**

**IMPROVEMENTS TO RNAV ROUTE NETWORK**

(Presented by the Secretariat)

<b>SUMMARY</b>	
This working Paper proposes additional measures to increase the airspace capacity and to improve RNAV network route structure, according to aircraft capability and the Gate to Gate concept.	
<b>References:</b>	
<ul style="list-style-type: none"><li>ICAO Doc 9613- <i>Performance-Based Navigation Manual</i></li><li>Reports of GREPECAS/14 and 15 Meetings.</li></ul>	
<b><i>Strategic Objectives</i></b>	<i>This working paper is related to Strategic Objective E: Efficiency</i>

**1. Introduction**

1.1 ICAO Assembly resolution A36-23 resolves that States and planning and implementation regional groups (PIRGs) complete a PBN implementation plan by 2009 to achieve among others, implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS) for all instrument runway ends at international aerodromes.

1.2 GREPECAS, through Conclusions 14/51, 15/1 and 15/38 addressed PBN regional strategies and a model to develop national action plans by the end of December 2009. The PBN Roadmap approved by GREPECAS for international aerodromes indicates that the implementation stages will be:

- APV for all runway ends: 10% in 2008, 30% by 2010, 70% by 2014 and 100% by 2016. For domestic aerodromes only, those serving operations of aircraft of over 5700 kg;
- Only LNAV for all runway ends: 10% 2008, 30% by 2010, 70% by 2014 and 100% by 2016;

- LNAV for domestic aerodromes: 10% by 2010, 30% by 2012, 70% by 2016 and 100% by 2018; and
- APV for all runway ends: by 10% 2010, 30% by 2012, 70% by 2016 and 100% by 2018.

## 2 Discussion

2.1 PBN represents a framework for defining a navigation performance specification along a route, during a procedure, or in an airspace within which an aircraft must comply with specific operational performance requirements.

2.2 ICAO Doc 9613- *Performance-Based Navigation Manual* provides a basis for the development of automated flight paths, as well as for more efficient airspace design, aircraft separation and obstacle avoidance. PBN also facilitates the interoperability of the performance and operational capabilities necessary for the utilization of such paths and significant drop in CO<sub>2</sub> emissions.

2.3 It should be noted that many of the navigational advances enabled by PBN are compatible with the avionics technology currently installed in most of the world's major commercial aircraft fleets—meaning minimal or no new equipment requirements for major aircraft operators or Air Navigation Service Providers (ANSPs). So the technology on board is an additional functional element to the ground based infrastructure.

2.4 PBN helps to develop arrival and departure procedures that enhance service and safety, is environmentally friendly, and has a significant lower cost than available today. Performance-based Navigation leverages advances in aircraft systems, improvements in cockpit displays and modern aircraft auto-flight capabilities, and other potential improvements.

2.5 PBN precision and predictability can reduce route-structure track miles and can facilitate environmentally sound operations, such as continuous descent approaches (CDAs) and optimized departures.

2.6 Supporting regional activities, the ICAO NACC Regional Office coordinated a PBN Design Course to assist CAR States to aggressively pursue activities moving forward with the PBN implementation.

2.7 In the implementation of RNAV routes joining pairs of cities, difficulties for airspace organization and management have been found in the definition of ending points because most of the airports are located within Terminal Control Areas in which the real trajectories are determined tactically.

2.8 The improvement of the routes network continues and there are several RNAV routes that are in process of implementation. As a general input received from States with regard to restructuring ATS routes, various issues have been identified, among others:

- a) some of the routes have not complied with the expectations with regard to utilization by some of the operators; notwithstanding, they insisted in their implementation; and

- b) although they are duly implemented, some routes are barely used, and the operators prefer to use ATS routes which are not so direct, which increases operational costs and in some cases less airspace flexibility.

2.9 Several lessons were learnt from the WATRS Plus project. One of them was the implementation of RNAV routes with navigation specifications according to the user requirements to increase ATS capacity. To achieve this, it is necessary to review the ATS routes network and/or assign specific navigation specification values to the ones already implemented.

2.10 , it is expected that States complete their action plan based on the CAR/SAM PBN road map during 2009, as well as to issue regulations and procedures so as to allow operational enhancements to the airspace capacity and benefits for aircraft operators in the near term.

### 3 **Suggested action**

3.1 The Meeting is invited to:

- a) review the information provided in this working paper;
- b) urge States to develop a national action plan for PBN implementation in the short term; and
- c) review the C/CAR ATS route network to achieve improvements in the RNAV route network in the CAR Region.