



**WORKING PAPER**

**ASSEMBLY — 39TH SESSION**

**TECHNICAL COMMISSION**

**Agenda Item 36: Aviation safety and air navigation implementation support**

**IMPACTS OF PERFORMANCE-BASED NAVIGATION (PBN)  
INSTRUMENT APPROACH TITLE CHANGES**

(Presented by the International Coordinating Council of Aerospace Industries  
Associations (ICCAIA))

**EXECUTIVE SUMMARY**

Aircraft and avionics manufacturers strongly support the safety, efficiency and capacity benefits of Performance-Based Navigation (PBN). To that end, manufacturers believe that changes to ICAO Standards and Recommended Practices (SARPs) and Procedures for Air Navigation Services (PANS OPS) should have a strong business case to address the cost-benefit whilst improving or at least maintaining safety.

ICAO Doc 8168, *Procedures for Air Navigation – Operations (PANS OPS), Volume II*, Amendment 6 introduces changes to the titles of PBN approach charts. As the changes are beginning to be implemented, new information is surfacing concerning the impacts of the changes on flight deck human factors. Manufacturers' human factors experts believe these changes are likely to impact safety negatively. ICAO's initial assumption that no on-board equipment changes would be necessary has been found to be incorrect. Charting errors associated with the amendment indicate that States may not fully understand the changes introducing an additional negative safety impact.

**Action:** The Assembly is invited to:

- a) note the human factors concerns identified during the implementation of ICAO Doc 8168, Volume II, Amendment 6;
- b) acknowledge that implementation plans of initiatives related to aircraft operations should closely monitor human factors concerns that may arise;
- c) recommend that ICAO replace Circular 336 with an updated document that addresses many of the concerns identified in this paper and other lessons learned to date. At a minimum, this updated document should include:
  - 1) an updated hazard log;
  - 2) an updated transition plan based on regional coordination, including lessons learned from implementation to date; and
  - 3) acknowledgement and recognition of the cost implications of changes to on-board equipment;
- d) recommend closer cooperation between ICAO and Industry to improve understanding of proposed changes and to agree on realistic implementation plans; and
- e) recommend that ICAO closely coordinate roll-out activities with relevant stakeholders (States, ANSPs, industry, operators, ATM providers, etc.) to improve understanding of the changes in the amendment and review of implementation plans.

<sup>1</sup> English, Arabic, Chinese, French, Russian and Spanish versions provided by ICCAIA.

<i>Strategic Objectives:</i>	This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.
<i>Financial implications:</i>	Medium for ICAO and States, high for industry.
<i>References:</i>	ICAO Doc 9750, <i>Global Air Navigation Plan, Fourth Edition</i> ICAO Circular 336-AN/195, <i>Area Navigation (RNAV) to Required Navigation Performance (RNP) Instrument Approach Chart Depiction</i> ICAO Doc 8168, <i>Procedures for Air Navigation – Operations (PANS OPS) Volume II Amendment 6</i> ICAO Doc 9613, <i>Performance-Based Navigation Manual, Fourth Edition</i>

## 1. INTRODUCTION

1.1 The two leading ICAO Global Air Navigation Plan (GANP) strategic objectives are Safety and Air Navigation Capacity and Efficiency.<sup>2</sup> The GANP goes on to say, “The objective of the GANP is to increase capacity and improve efficiency of the global civil aviation system whilst improving or at least maintaining safety.”<sup>3</sup> The aircraft and avionics manufacturing industry, as represented by the International Coordinating Council of Aerospace Industries Associations (ICCAIA), strongly supports these objectives.

1.2 ICAO Doc 8168, *Procedures for Air Navigation – Operations (PANS OPS) Volume II Amendment 6* introduces several new and updated provisions, one of which changes the title of PBN approach charts from “RNAV” to “RNP”. This is a name only change and has no impact on the associated instrument design criteria or aircraft qualification criteria to conduct PBN approach operations. The benefits of the change are that it brings a correlation between the procedure title and the associated PBN Navigation Specification. PBN Navigation Specifications are defined in ICAO Doc 9613, *Performance-Based Navigation Manual*. There is a claim that the lack of name correlation has been a barrier to implementing PBN.

## 2. DISCUSSION

2.1 The adoption of the ICAO Doc 8168 Volume II Amendment 6 was followed by the publication of ICAO Circular 336-AN/195, *Area Navigation (RNAV) to Required Navigation Performance (RNP) Instrument Approach Chart Depiction*, which provides a detailed description of the change, the justification, a transition plan and a hazard log. The original ICAO Instrument Flight Procedures Panel (IFPP) amendment material recommended an all at once title change at a time many years in the future. This plan was recommended due to concerns about the ability of the on-board equipment to indicate the new chart titles and the time it would take to implement the changes in the equipment.

2.2 The amendment eventually adopted introduced the title change via an eight year transition period starting immediately (November 2014). ICAO Circular 336, which was published after the amendment was adopted, justifies the changes starting immediately via a transition period by claiming there is no expectation on-board equipment will change to reflect the new titles. The circular goes further

<sup>2</sup> ICAO Doc 9750, *Global Air Navigation Plan Fourth Edition*, page 3.

<sup>3</sup> ICAO Doc 9750, *Global Air Navigation Plan Fourth Edition*, Introduction, page 15.

to state, “It should also be noted that current flight management system (FMS) procedure labels seldom reflect the charted approach naming convention for both conventional and RNAV approaches. As well, FMS procedure labels vary among manufacturers. This problem causes confusion for pilots today when they attempt to retrieve the approach from the FMS. Pilots are already trained to find the required guidance to fly the correct procedure in the FMS.”<sup>4</sup>

2.2.1 The manufacturing community strongly disagrees with the statement that on-board equipment seldom reflects the charted approach naming. The circular rationalizes this statement because on-board equipment, due to limited display space, often abbreviates or truncates names, titles and labels. While there are clearly cases where the chart title and the on-board equipment do not match, aircraft manufacturers expend a lot of effort to minimize these cases. With respect to abbreviations and truncations, they are widely accepted and utilized via human factors airworthiness regulations and guidance. The manufacturing community sees a distinct difference between using an abbreviation and substituting one name for a different name.

2.3 The amendment became effective late in 2014 and the first state began retitling its PBN approach procedures in March 2015. Within the first few months of implementation, new concerns about the human factors aspects of the changes emerged. The first concern is the possibility of having both old and new PBN approach procedure titles in different states where pilots fly, but also in the same state, region and even aerodrome all at the same time. While the circular recommends against having mixed titling at a single aerodrome, that case has already occurred. This concern involves both the pilots as well as air traffic controllers. In fact, it is expected that in some regions a single air traffic controller will be required to use both old and new titles in controlling traffic at nearby aerodromes simultaneously.

2.4 Pre-amendment approach procedure titling only utilizes the term “RNP” within the parenthesis of the “RNAV (RNP)” title indicating the approach was an RNP AR procedure. Unofficially, “RNP” is used ubiquitously to indicate the procedure is an RNP AR procedure. The amendment changes the situation making RNP the title for all PBN approach procedures which is leading to flight deck confusion. ICCAIA was made aware of an operator reassigning specific aircraft equipment (aircraft model) from an airport that retitled its procedures (Hannover, Germany), because pilots were confused when they saw procedures titled “RNP”.

2.5 These human factors concerns are now amplified by a transition period. Whereas, the original recommendation from the IFPP was for an all at once change to help avoid transition type problems, the current situation invokes an eight year transition period. Several key states have now stated publically that they have no intention to implement the change, most notably is the United States. Other states, such as Canada and France are currently leaning towards not implementing the amendment. This means the transition period will effectively become permanent and there will always be two PBN approach procedure titling conventions.

2.6 Along with the airworthiness guidance that requires PBN procedures to be retrieved from the on-board equipment by name, the additional human factors concerns will begin to put significant regulatory and operational pressure on the manufacturing community to address the situation through on-board equipment changes. ICCAIA conducted a FMS manufacturer’s survey in early 2015. The results of the survey showed that there is no known, in or out of production, FMS which will be able to display the correct PBN approach procedure title without making changes to the certified operational FMS software. In some cases hardware changes will also be required. This is a significant change to the initial business case for the amendment and will impose a large cost for operators and manufacturers.

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<sup>4</sup> ICAO Circular 336-AN/195, Section 2.3.3, page 7.

2.7 These emerging concerns were brought to ICAO, by ICCAIA via the PBN Study Group (PBNSG), in July 2015. The PBNSG has taken the lead in investigating these concerns which includes several activities to investigate and document the issues. As of this time, no specific recommendations have been considered.

2.8 The IFPP did identify several of these concerns and issues during panel and working group deliberations. Many subject matter experts advised against changing PBN approach titles. At the time this change was being considered by ICAO, the United States Federal Aviation Administration enlisted the assistance of the Performance-Based Aviation Rulemaking Committee (PARC) to form an action team to investigate the subject of PBN approach titles. The action team included 66 international subject matter experts which recommended against making the change. Their report was published in 2011 and was presented to the IFPP. The PARC recommendations were ignored. The PARC report, IFPP recommendation and eventual amendment did include positive changes that are not at issue.

2.9 Some of the states and organizations now opposed or troubled by the PBN approach title change introduced by the amendment, did originally agree with the amendment when it was delivered to states via a State Letter in 2013. In retrospect, many stakeholders now realize that concerns were not properly addressed and that some of the newly realized concerns were not envisioned. ICCAIA strongly agrees with the following ICAO principle, “Human performance needs to be embedded both in the planning and design phases of new systems and technologies as well as during implementation. Early involvement of operational personnel is also essential.”<sup>5</sup> We believe that this principle was not given sufficient importance by ICAO.

2.10 Even though the amendment to change PBN approach titles from “RNAV” to “RNP” had the best of intentions, there are now several concerns about the unintended consequences and potential human factors impacts on safety. These concerns should be and are taken seriously by ICCAIA. With almost two years since the amendment was adopted and published, less than 1% of the global PBN approach procedures are titled “RNP”. As of early 2016 only nine states have published charts using the new title. This may provide an opportunity to address the concerns and issues with minimal impact to the majority of states.

### 3. CONCLUSIONS

3.1 PBN implementation is an important global strategic objective. Global harmonization of PBN is important, but changes to existing SARPs and PANS must be considered carefully. Pilot human factors and the related impacts on training, workload and safety should not be minimized. The low adoption rate may provide an opportunity to reassess the impacts and to address some of the concerns highlighted in this paper.

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<sup>5</sup> ICAO Doc 9750, *Global Air Navigation Plan Fourth Edition*, Chapter 2, page 26.