



Agenda Item 2: SAM airspace optimisation

- a) PBN en route
- b) PBN in terminal areas
- c) PBN procedures

CHECKLIST FOR ANALYSING PBN CONCEPT IMPLEMENTATION

(Presented by the Secretariat)

SUMMARY	
The purpose of this working paper is to present a checklist for the implementation of PBN concepts in the States. This list may be used by air traffic services as an internal assessment tool, or by the regulating authority to assess the implementation of the PBN concept.	
References:	
<ul style="list-style-type: none">- SAM/IG/17 meeting report- Safety oversight manual - Doc 9734- Performance-based navigation (PBN) manual - Doc 9613- Manual on the use of PBN in airspace design - Doc 9992- Annex 19 – Safety management	
ICAO strategic objectives:	<i>A - Safety</i> <i>B - Air navigation capacity and efficiency</i> <i>E - Environmental protection</i>

1. Background

1.1 The SAM/IG/17 meeting analysed the proposal submitted by Uruguay on the development of a list for assessing the implementation of PBN concepts in the States, based on the priority assigned to the implementation of performance-based navigation in the Global Air Navigation Plan (Doc 9750).

1.2 The implementation of the PBN concept is one of the main tasks in the SAM Region for improving efficiency and safety. The Declaration of Bogota established specific compliance goals based on Resolution A37-11 of the 37th ICAO Assembly. The level of implementation reached by the Region places it amongst the regions with highest PBN compliance.

1.3 As part of the implementation process, States have developed implementation plans in accordance with Doc 9613 and Doc 9992 and other reference documents, which clearly establish the steps to be taken and requirements to be met prior to the publication and implementation of PBN airspace concepts.

1.4 The SAM/IG/17 requested that the checklist submitted by Uruguay be analysed for better understanding, and that it be presented at the SAM/IG/18 meeting.

2. Discussion

2.1 The implementation of PBN airspace concepts entails a series of steps and requirements that must be met to ensure that the new airspace concept will preserve or improve the levels of safety. Likewise, for this implementation, consideration must be given to Annex 11, Item 2.27, which states that *“any significant change of the ATS system related to safety, including the implementation of reduced separation minima or a new procedure, will only become effective after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted. When applicable, the responsible authority will make sure that the appropriate measures are taken for post-implementation oversight to ensure that the defined level of safety is met”*.

2.2 In order to ensure compliance with the requirements, the regulatory authority must exercise safety oversight to ensure strict compliance with the safety standards and recommended practices (SARPS) contained in the Annexes, and the related procedures contained in ICAO associated documents.

2.3 Similarly, ATS service providers must perform the necessary tasks to make sure that all the requirements and recommended practices issued by ICAO and the appropriate authority of each State are fully met and that the evidence required for showing compliance is available.

2.4 For any of the two aforementioned activities to be carried out by the appropriate authority and by the ATS service provider, it is highly advisable to have a guide available that describes the requirements to be met and the evidence to be collected to show compliance with such requirements, and that makes assessment more efficient.

2.5 The checklist presented by Uruguay at the SAM/IG/17 meeting has been revised and other elements have been added to strengthen this tool. It should be noted that this tool could also be used as a model for States to develop their own assessment protocols.

2.6 **Appendix A** to this working paper contains the checklist that describes the steps and requirements taken from ICAO Doc 9613, Doc 9992, Annexes 19 and 11, which shall be taken into account when implementing the PBN airspace concept.

3. Suggested action:

3.1 The Meeting is invited to:

- a) analyse Appendix A to this working paper;
- b) make the modifications it may deem necessary to the checklist; and
- c) approve the checklist for the implementation of PBN in the airspaces considered by both the service provider and the regulator.

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 - Part B Chapter 2.2 2.2.1	Was the airspace concept defined in sufficient detail to be identifiable and to be capable of supporting navigation functions?	Show inputs to Process 1, such as: <ul style="list-style-type: none"> • strategic objectives; • operational needs derived from airspace users; • environmental mitigation guidelines. 	Yes No Not applicable	
Doc 9992 - 2.1.1	Was a phased implementation plan prepared that includes the development and implementation of an airspace concept?	<ul style="list-style-type: none"> • Verify the implementation plan; • Verify that it contains, at least, the planning, design, validation, and implementation phases; • Check if plan implementation dates have been met and, if not, if there are revised versions of the plan. 	Yes No Not applicable	
Doc 9992 - 2.2.2.1 Doc 9613 - 2.3.1	Has a multidisciplinary team been established for the implementation of the airspace concept?	<ul style="list-style-type: none"> • Check if the establishment of the team has been documented; • Specify who was team leader; • Specify team composition; • Check if there are any records of work team meetings. 	Yes No Not applicable	
Doc 9992 - 2.3.2 Doc 9613 - 2.2.3	Were the PBN airspace concept objectives clearly defined, taking into account existing infrastructure and other inputs?	<ul style="list-style-type: none"> • Check if there are any records of the defined objectives; • Verify that the CNS structure was taken into account for the development of the concept. 	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 - 2.3.5.2.2	What reference scenario was used as the basis for the project?	<ul style="list-style-type: none"> • Show study on air traffic growth; • Show data collected on existing traffic; • Traffic flows and composition; • Assessment of surveillance, communication, and navigation infrastructure available in the airspace. 	Yes No Not applicable	
Doc 9613 - 2.3.5.5	Has an assessment been done of ATS surveillance infrastructure, communication infrastructure and ATM system?	<ul style="list-style-type: none"> • Verify if the CNS/ATM infrastructure assessment has been documented; • Verify if the assessment was taken into account when defining the navigation specification. 	Yes No Not applicable	
Doc 9613 - 2.3.5	Has a study of the fleet been conducted to determine and identify the navigation specification for the Region?	<ul style="list-style-type: none"> • Show fleet analysis; • Evidence of identification of approach types required according to the fleet 	Yes No Not applicable	
Doc 9613 - 2.3.5.5	Considering that an air traffic system is the summation of available CNS/ATM capabilities, has an availability assessment been conducted?	<ul style="list-style-type: none"> • Show evidence of assessment of availability of communications between the aircraft and the air traffic service provider; • Show evidence of assessment of ATS surveillance infrastructure available to support the operation. 	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 - 2.3.6	Was the PBN airspace concept developed following a logical order?	<ul style="list-style-type: none"> • Verify that the airspace concept was developed according to the following order: <ul style="list-style-type: none"> a) First, SID/STAR routes were developed; b) Next, the initial procedure of the proposed flows was designed; c) The overall airspace volume was designed next to protect IFR flight paths. 	Yes No Not applicable	
Doc 9613 - 3.2	Is a Safety plan in place, together with a safety policy of the authority, as a requirement for starting the validation phase?	<ul style="list-style-type: none"> • Verify that a safety plan has been documented, which describes in detail the way in which the safety assessment is to be performed for the implementation of RNAV or RNP. 	Yes No Not applicable	
Doc 9613 - 3.2	Was the airspace concept validated?	<ul style="list-style-type: none"> • Verify that the airspace concept validation was documented. 	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 - 3.3.1	Were the airspace concept validation objectives met?	<ul style="list-style-type: none"> • Verify if the following validation objectives were met: <ul style="list-style-type: none"> a) It has shown that airspace design has allowed efficient ATM operations to be conducted satisfactorily; b) It concluded that project objectives can be achieved with the implementation of airspace design and the airspace concept in general; c) Possible weak points of the concept were identified and mitigation measures developed; d) Proof that the design is safe was provided to support the safety assessment. 	Yes No Not applicable	
Doc 9613 - 3.3.1.4	Was an appropriate airspace concept validation method selected?	<ul style="list-style-type: none"> • Check evidence of: <ul style="list-style-type: none"> a) ATC participation (if any); • Review assessment documentation; • Review validation forms; • Review the validation report. 	Yes No Not applicable	
Doc 9613 - 3.3.2	What decision factors were taken into account to proceed with the validation process?	<ul style="list-style-type: none"> • Verify that the decision factors for the implementation of the airspace concept have been described in detail. 	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 3.3.4	Was the PBN airspace concept final validation conducted?	<ul style="list-style-type: none"> • Verify if ground and flight validation was conducted; • Check evidence of the analysis of procedure design stages and calculations; • Check evidence of ground validation; • Check evidence of flight validation. 	Yes No Not applicable	
Doc 9613 3.3.6	Did the new airspace concept require changes in interfaces and/or ATC system displays so that ATCs could have the required information available?	<ul style="list-style-type: none"> • Verify that the following modifications were made (if applicable): <ul style="list-style-type: none"> a) Flight data processor; b) Radar data processor; c) Flight progress strips; d) Video maps. 	Yes No Not applicable	
Doc 9613 3.3.7	Was the required training provided, including raising awareness of the airspace concept?	<ul style="list-style-type: none"> • Verify the existence of: <ul style="list-style-type: none"> a) Training records; b) Material used for training and raising awareness. 	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 3.3.8	Was the airspace concept properly implemented?	<ul style="list-style-type: none"> • Verify that at least the following action was taken: <ul style="list-style-type: none"> a) Meetings held prior to concept implementation b) Follow-up at least within seven days following implementation c) The required measures were taken to support the facility supervisor before and after the implementation d) The appropriate information was provided to pilots and controllers 	Yes No Not applicable	
Doc 9613 - 3.3.9	Has a post-implementation assessment process been established?	<ul style="list-style-type: none"> • Verify if the necessary measures have been taken for system monitoring, safety assurance, and to ensure that strategic objectives have been met. 	Yes No Not applicable	