International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)

WORKING PAPER

ePPRC/03 — WP/09REV
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GREPECAS Programmes and Projects Committee (PPRC) Third Virtual Meeting (ePPRC/03)
Online, 22 – 23 July 2021

Agenda Item 3: Organizational and Administrative Activities of the GREPECAS
3.5 CAR/SAM Air Navigation Plan (ANP) Vol. III Planning

INSTRUCTIONS FOR USE OF THE TEMPLATE FOR VOLUME III OF THE REGIONAL AIR NAVIGATION PLAN – CAR/SAM ANP

(Presented by the Secretariat)

EXECUTIVE SUMMARY	
This working paper presents the proposal of the Instruction for the use of template of Air Navigation Regional Plan - Volume III, in order to facilitate the participation of States in the activities of development of Volume III and to standardize the application of the six-step approach to performance-based planning, as stipulated in the *Global Air Navigation Plan* (GANP).	
Action:	As indicated in Section 3.
Strategic Objectives:	• Air Navigation Capacity and Efficiency • Economic Development of Air Transport • Environmental Protection
References:	• Doc 9750 *Global Air Navigation Plan* (GANP) • Doc 9854 - *Global Air Traffic Management Operational Concept* • Doc. 9883 - *Manual on Global Performance of the Air Navigation System* • PPRC05 Meeting, Mexico City, 16-18 July 2019

1. Introduction

1.1 Recommendation 4.3/1 of the AN/Conf-13, item (d) states the following:

d) "*encourage the planning and implementation regional groups (PIRGs) to embrace a performance-based approach for implementation and adopt the six-step performance management process, as described in the Manual on Global Performance of the Air aviation System (Doc 9883), by reflecting the process in Volume III of all regional air navigation plans*"

1.2 PPRC/5 Meeting (Mexico City, 16-18 July 2019) was informed that ICAO Headquarters was working on a standardized template for Vol. III of the Regional Air Navigation Plans. Following the approval by headquarters of this template, regional and intra-regional requirements should be harmonized in order to lay the foundations for the future Volume III of the CAR/SAM Regional Air Navigation Plan.

1.3 In view of the above, PPRC/5 approved Conclusion PPRC/05/10 "Development of Volume III of the CAR/SAM GANP in preparation of National Air Navigation Plans" which is intended to coordinate efforts for the development of e-ANP CAR/SAM Vol. III and updates of the National Air Navigation Plans, as shown below;

DRAFT CONCLUSION **PPRC/5/10**	**DEVELOPMENT OF VOLUME III OF THE CAR/SAM GANP IN PREPARATION OF NATIONAL AIR NAVIGATION PLANS**
What: That, in Coordination with the NACC and SAM Regional Offices, a) the States support the Secretariat in the preparation of Vol. III of the CAR/SAM e-ANP and the revision of Vols. I and II of the aforementioned document to align it to the GANP - Sixth Edition, considering the catalogue of KPI contained in the GANP; b) the States, in coordination with the NACC and SAM Regional Offices, after completing the preparation and revision of the three CAR/SAM e-ANP Volumes, elaborate or, if applicable, update their NANP, in order to align them to the GANP initiatives, including the requirements of all the areas that involve air navigation services; c) the States forward the developed or updated NANP to the ICAO NACC and SAM Regional Offices by the second semester of 2021; d) ICAO process the approval of Vol. III of the CAR/SAM e-ANP by the third quarter of 2020; e) ICAO, once Vol. III is approved, replace the Regional Air Navigation Plans based on performance by Vol. III of the CAR/SAM e-ANP, and present it to the PPRC/6; and f) ICAO provide technical support to the States that request it for the development of their NANP and supervise the delivery of said plans to the ICAO NACC and SAM Regional Offices.	**Expected impact:** ☐ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Operational/Technical
Why: In order to align the Regional Air Navigation Plan (e-ANP CAR/SAM) to the GANP and support the preparation and updating of the National Air Navigation Plans.	
When: By 2021	**Status:** ☒ Valid / ☐ Superseded / ☐ Completed
Who: ☒ States ☒ ICAO ☐ Other:	

1.4 Consequently, the Secretariat is going to execute the "Assistance for the formulation and management of Vol III of the CAR/SAM ANP" under a process aligned to the GANP – Sixth Edition (2019). As part of the aforementioned activities, the Instructions for use of the Template for VOLUME III of the Regional air navigation plan – CAR/SAM ANP were drafted. (See in **Appendix A** of this paper, the description of planned activities)

2. Analysis

2.1 Vol. III contains the dynamic/flexible elements of the ANP CAR/SAM and provides guidance for the implementation for air navigation systems and their modernization taking into consideration the ASBU framework, as well as the GANP technology roadmaps. Vol. III may also include additional implementation guides, to supplement the material contained in Vol. I and Vol. II.

2.2 The CAR/SAM States may follow the Instructions for the use of the template of Air Navigation Regional Plan – ANP CAR/SAM, Volume III, during the activities of preparation of the Tables and texts of Volume III of the ANP CAR SAM, in accordance with the Template provided by the ICAO Headquarters. (See instructional proposal in the **Appendix B** to this working paper).

The Instructions cover the following purposes:

a. Standardize the understanding and practical application of the six-step approach to performance-based planning, as stipulated in the GANP, by air navigation specialists from the States of the CAR/SAM Regions, in the process of filling out the Tables of Vol. III.

b. Obtain a homogeneous application of the Template of Vol. III and simplify the formulation of the Tables and texts.

c. Complement the use of GANP tools; AN-SPA, performance dashboard, etc.

d. Make an orderly transition from the plans and activities framed in the RPBANIP and the SAM-PBIP to the ANP CAR SAM Vol. III.

2.3 The aforementioned Template is based on a printed format, which describes a sequence of tables that guide the introduction of planning data of each State /Territory, linked to designated airspaces and international airports. Following Tables contain the identification of the objectives of optimizing the performance of air navigation, to define solutions resulting from the ASBU framework or other regional initiatives. Later, this Template will be prepared in electronic format by ICAO, in order to get on line management and updating of data, also monitoring of implementation activities.

2.4 For the development of Vol. III and for its subsequent management, the six-step method of Doc. 9883 has been developed, which starts from the analysis of the gaps and expectations of improvement in the performance of air navigation systems and services, until the identification of solutions in the ASBU framework or NON-ASBU solutions that could be developed. Thus, an interactive process is configured after the implementation and the evaluation of the achievement of the expected performance objectives. The steps are described below:

In the development phase:

Step 1: Define/examine scope, context, and overall ambitions/expectations
Step 2: Identify opportunities, problems, and set (new) goals
Step 3: Quantify objectives
Step 4: Determine solutions to exploit opportunities and solve problems

In the management phase:

Step 5: Implement solutions
Step 6: Assess the achievement of the objectives.

Instructions are focused on the elaboration phase of Vol. III based on the Template provided.

2.5 The representatives of the GREPECAS States, assisted by the NACC and SAM Offices, will carry out the preparation of Vol. III. A number of teleconferences, seminars and other on-line activities must be scheduled for this purpose. State counterparts should have the authority to coordinate the development of Volume III with all parties involved in its administration.

2.6 Instructions detail the human and technological resource required for the preparation of Vol. III, as well as the data management processes to support the performance-based approach, leading to the management of Performance Key Indicators (KPIs).

2.7 Once Vol. III has been prepared, it must be approved by GREPECAS, starting the implementation phase, which should be supported by a programme/project aimed at developing and/or continuing the action plans for the implementation of the solutions identified in the ASBU framework.

2.8 Vol. III approved by GREPECAS shall have its corresponding amendment procedures, in according to the framework indicated in Volume I, Appendix A, Part C.

3. Suggested actions

3.1. The Meeting is invited to:

a) Take note of the information provided, including the activities planned by Secretariat, as shown in Appendix A;

b) analyze the proposed “Instructions for the use of template of air navigation regional plan – ANP CAR/SAM, Volume III; as presented in the Appendix B, indicating improvements if required; and

c) Consider the approval of the “Instructions for the use of template of air navigation regional plan – ANP CAR/SAM, Volume III ", endorsing the activities of the Secretariat through the following conclusion:

<table>
<tr><td colspan="2">Conclusion ePPRC/03/0X - Participation of States in activities for the elaboration of ANP CAR/SAM Volume III</td></tr>
<tr><td>That:

In order to diligently carry out activities for the development of the ANP CAR/SAM Volume III, and to implement the performance-based planning stipulated in the GANP, States are urged to:

a) Adopt the Instructions for the use of template of air navigation regional plan – ANP CAR/SAM, Volume III;

b) Appoint or ratify their focal points/task force to act as counterparts to the Secretariat and communicate such nomination no later than 10 September, 2021; and

c) Ensure the active participation of focal points/task forces in the activities assisted by the Secretariat for the development of Volume III.</td><td>☐ Political / Global
☒ Inter-regional
☐ Economic
☐ Environmental
☒ Operational/Technical</td></tr>
<tr><td colspan="2">Why:
Standardize the understanding and practical application of the six-step approach to performance-based planning by air navigation specialists from the States of the CAR/SAM Regions, in the process of filling out the Tables of Vol. III. Likewise, to obtain a homogeneous application of the Template of Vol. III and simplify the formulation of the Tables and texts.</td></tr>
<tr><td>When:
By 10 September 2021</td><td>Status:
Valid</td></tr>
<tr><td colspan="2">Who: ☐ Coordinators ☒ States ☒ ICAO Secretariat ☐ ICAO HQ ☐ OTHERS:</td></tr>
</table>

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APPENDIX A

ASSISTANCE FOR THE FORMULATION AND MANAGEMENT

OF VOL III OF THE CAR/SAM ANP

ASSISTANCE FOR THE FORMULATION AND MANAGEMENT OF VOLUME III OF THE CAR/SAM ANP (REV. 3)

OUTPUT > VOLUME III of the CAR/SAM ANP aligned with the GANP and the ASBU methodology.

OUTCOME > Implementation of ASBU elements/modules to improve air navigation performance in the CAR/SAM Region, applying a consistent, measurable and cost-effective process.

BENEFITS > Airspace and ANS services: operationally safe, effective and interoperable.
Main airports: with ACDM and/or demand/capacity management.
Environment: reduction of CO_2 emissions*

** To be defined: The proposal is to reduce CO_2 emissions by 150,000 tons between May 2024 - May 2028, through the implementation of GANP operational threads (APTA, ACDM, FRTO, NOPS, etc.). Calculations based on IFSET.*

Abbreviations:

NNV	NACC regional air navigation officers (MA, JC, RM, LS)
SNV	SAM regional air navigation officers (JA, RS, FS, FA)
ANB	Air Navigation Bureau / ANB Officer Olga de Frutos (ODF)
DRD	Regional deputy directors (OQ, JS)
STOs	States/Territories/Organisations
GV3	GREPECAS project for the management of Vol. III of the CAR/SAM ANP
ANIWG	CAR implementation group
SAMIG	SAM implementation group
COORD	Subproject coordinators - ATM/SAR officers (FH, EM)

See Explanatory Notes in the last Table

(6) ASSISTANCE FOR THE FORMULATION AND MANAGEMENT OF VOLUME III OF THE CAR/SAM ANP

Note. - Following the Secretariat's GANTT numbering.

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Description of activities	*Start*	*End*	*Responsible party*	*Remarks*
(6.1) Regional planning concepts and methods contained in the GANP 6th ed.				
(6.1.1) Virtual meeting 1 • Review of GANP methodology and website • Gap analysis for managing KPIs and selecting ASBU elements	15 April 2021	15 April 2021	COORD NNV SNV	COMPLETED
(6.1.2) Virtual meeting 2 • Coordination for drafting and defining the contents of theInstructions to States on the implementation of the template for Volume III • Continue ASBU implementation in the CAR and SAM Regions	16 April 2021	16 April 2021	COORD NNV SNV	COMPLETED
(6.2) Drafting of Instructions on the use of the template for Volume III of the Regional air navigation plan				
(6.2.1) Development of DRAFT Instructions, including the implementation phase	15 April 2021	7 June 2021	COORD	COMPLETED
(6.2.2) Virtual meeting 3. DRAFT validation	8 June 2021	9 June 2021	COORD NNV SNV DRDS	COMPLETED
(6.2.3) DRAFT translation and editing	11 June 2021	25 June 2021	COORD	COMPLETED
(6.2.4) Instructions approved by GREPECAS/PPRC	16 August 2021	**18 August 2021**	E PPRC 03	

Description of activities	*Start*	*End*	*Responsible party*	*Remarks*
(6.3) Workshops with States/Territories/Organisations (STOs)				
(6.3.1) Promote / coordinate the creation of the work team in each STO, for its participation in workshops	23 August 2021	10 September 2021	DR DRD COORD	
(6.3.2) Deliver **CAR** workshop. Initial tables prepared by STOs.	27 September 2021	10 November 2021	NNV STOs	
(6.3.3) Deliver **SAM** workshop. Initial tables prepared by STOs.	27 September 2021	10 November 2021	SNV STOs	
(6.3.4) 1st feedback from industry / stakeholders IATA - CANSO – IFALPA – ACI LAC, etc.	15 November 2021	20 November 2021	DRD ANB COORD NNV SNV	
(6.3.5) Deliver **CAR/SAM** workshop with all STOs. Consolidation.	1 February 2022	18 February 2022	NNV SNV STOs	
(6.3.6) Follow-up to CAR/SAM workshop. Delivery of tables by STOs. Tables in **final draft** version prepared by STOs.	21 February 2022	11 March 2022	NNV SNV STOs	
(6.3.7) 2nd feedback from industry / stakeholders IATA - CANSO – IFALPA – ACI LAC, etc.	15 March 2022	18 March 2022	COORD NNV SNV	
(6.3.8) Final editing of tables and SP/EN translation.	21 March 2022	31 March 2022	COORD	
(6.4) Formulation of Volume III of the CAR/SAM ANP with the participation of STOs				
(6.4.1) Consolidation of draft 1.0 of Volume III of the CAR/SAM ANP. Validation by NACC RO and SAM RO.	4 April 2022	13 April 2022	COORD NNV SNV DRD	

Description of activities	*Start*	*End*	*Responsible party*	*Remarks*
(6.4.2) Submit to STOs for objections or feedback. Submit to GREPECAS for approval.	20 April 2022	13 May 2022	COORD STOs	
(6.4.3) Approval of Volume III by GREPECAS/PPRC. Submit the PfA to HQ Montreal.	**9 May 2022**	**6 June 2022**	GREPECAS/PPRC COORD	
(6.5) Formulation of the new programme/project "Management of Volume III of the CAR/SAM ANP – GV3"				
(6.5.1) Formulate the draft GV3 scheme	1 September 2021	10 September 2021	COORD NNV SNV	
(6.5.2) Consolidate the draft GV3. Edit and translate. Submit to GREPECAS	13 September 2021	8 October 2021	COORD	
(6.5.3) Approval of GV3 by GREPECAS/PPRC	27 October 2021	**29 October 2021**	GREPECAS 19	
(6.6) Updating or replacement of GREPECAS projects ABCDFGH				
(6.6.1) Analysis for the update **or** replacement of projects ABCDFGH**,** to be taken over by Regional Offices (with ANIWG and SAMIG)	2 November 2021	22 November 2021	COORD NNV SNV	
(6.6.2) Validation/approval of approaches. Definition of transition process with DRDs	29 November 2021	7 December 2021	COORD NNV SNV DRDS	
(6.6.3) Draft the revised projects for implementation of ASBU elements stipulated in Volume III	10 January 2022	8 April 2022	COORD NNV SNV ANIWG	

Description of activities	*Start*	*End*	*Responsible party*	*Remarks*
			SAMIG	
(6.6.4) Draft the new projects at the Regional Offices for the implementation of ASBU elements stipulated in Volume III	10 January 2022	8 April 2022	COORD NNV SNV ANIWG SAMIG	
(6.6.5) Approval by GREPECAS of revised or, where applicable, new projects ABCDFGH	**9 May 2022**	**6 June 2022**	GREPECAS	
(6.7) Preparation for deactivation of CAR /RPB-RPBANIP and SAM/PBIP				
(6.7.1) Analysis for CAR/RPBANIP deactivation. Define the approach.	10 January 2022	8 April 2022	COORD NNV	
(6.7.2) Analysis for SAM/PBIP deactivation. Define the approach.	10 January 2022	8 April 2022	COORD SNV	
(6.7.3) Validation /approval of approaches. Specify transition process with DRDs.	18 April 2022	29 April 2022	COORD DRDS	
(6.7.4) Approval by GREPECAS of RPBANIP and PBIP deactivation	**9 May 2022**	**6 June 2022**	GREPECAS	
(6.8) Start of implementation of Volume III and project modifications, and new GV3 management. Deactivation of RPBANIP and PBIP				
(6.8.1) Start of programme/project "Management of Volume III of the CAR/SAM ANP - GV3"	**1 August 2022**			
(6.8.2) Entry into force of Volume III of the CAR/SAM ANP	**1 August 2022**			
(6.8.3) Entry into force of revised or new projects ABCDFGH	**1 August 2022**			

Description of activities	*Start*	*End*	*Responsible party*	*Remarks*
(6.8.4) Deactivation of RPBANIP and PBIP	**1 August 2022**			

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MILESTONES

Activity	**Dates**	**Notes**
Tentative date of approval by GREPECAS/PPRC of the Instructions on the use of the template for Volume III of the Regional air navigation plan	**18 August 2021**	**Immediate application**
Tentative date of approval by GREPECAS/PPRC of the programme/project “Management of Volume III of the CAR/SAM ANP - GV3”	**29 October 2021**	**Date of application 1 August 2022**
Tentative date of approval by GREPECAS of Volume III of the CAR/SAM ANP. Formalities before ICAO.	**6 June 2022**	**Date of application 1 August 2022**
Tentative date of approval by GREPECAS of the revised or new projects ABCDFGH	**6 June 2022**	**Date of application 1 August 2022**
Tentative date of approval by GREPECAS of the deactivation of RPBANIP and PBIP	**6 June 2022**	**Date of application 1 August 2022**

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EXPLANATORY NOTES

(6.1) Regional planning concepts and methods contained in the GANP 6th Ed.	Define common denominators regarding regional planning and the GANP.
(6.2) Drafting of Instructions on the use of the template for Volume III of the Regional air navigation plan	Ensure homogeneous implementation by States of the template for Volume III aligned with the GANP.

(6.3) Workshops with States/Territories/Organisations (STOs)	CREATE STO TEAMS, CIRCULATE THE INSTRUCTIONS IN THE CAR AND SAM REGIONS. PROVIDE TRAINING IN THE USE OF TABLES AND BUILD CAPACITIES IN MEASUREMENT OF KPIS AND/OR REGIONAL METRICS
(6.4) Formulation of Volume III of the CAR/SAM ANP with participation of STOs	FORMULATE VOLUME III BASED ON THE DELIVERABLES OF CAR/SAM STATES/TERRITORIES/ORGANISATIONS
(6.5) Formulation of the new programme/project "Management of Volume III of the CAR/SAM ANP – GV3"	FORMULATE THE NEW GREPECAS PROJECT FOR MANAGEMENT OF VOLUME III IN ORDER TO FACILITE THE IMPLEMENTATION OF THE PRESCRIBED ASBU ELEMENTS AND MEASURE REGIONAL PERFORMANCE
(6.6) Update or replacement of GREPECAS projects ABCDFGH	UPDATE OR, WHERE APPLICABLE, REPLACE GREPECAS PROJECTS ABCDFGH, TO BE TAKEN OVER BY THE REGIONAL OFFICES
(6.7) Preparation for deactivation of the CAR/RPB-RPBANIP and the SAM/PBIP	PREPARE TO DEACTIVATE CAR /RPBANIP AND SAM/PBIP, COMPLETING ALIGNMENT WITH GANP
(6.8) Entry into force of Volume III and project modifications and new GV3 management. Deactivation of RPBANIP and PBIP.	ENTRY INTO FORCE OF VOL. III, DEACTIVATION OF CAR /RPBANIP AND SAM/PBIP. FULL ALIGNMENT OF CAR/SAM ANP WITH GANP 6TH ED.

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APPENDIX B

INSTRUCTIONS FOR USE OF THE TEMPLATE FOR VOLUME III OF THE REGIONAL AIR NAVIGATION PLAN – CAR/SAM ANP

INTERNATIONAL CIVIL AVIATION ORGANIZATION
SOUTH AMERICAN REGIONAL OFFICE

INSTRUCTIONS FOR USE OF THE TEMPLATE FOR VOLUME III OF THE REGIONAL AIR NAVIGATION PLAN – CAR/SAM ANP

Version	**Draft 1.1**
Date	**8 July 2021**

INSTRUCTIONS FOR USE OF THE TEMPLATE FOR VOLUME III OF THE REGIONAL AIR NAVIGATION PLAN - CAR/SAM ANP

CHANGE CONTROL

Version	Date	Change	Pages
Draft 1.0	30 June 2021	-----	-----
Draft 1.1	8 July 2021	Validation NACC/SAM	

Table of contents

1. INTRODUCTION

1.1 Reference documents

- Doc 9750, GANP, Sixth edition 2019 https://www4.icao.int/ganpportal/
- Doc 9854 Global air traffic management operational concept (GATMOC)
- Doc 9883 Manual on Global performance of the air navigation system
- Doc 9882 Manual on ATM system requirements

1.2 Definitions

Note: Sources and references are from Doc 9883

SWOT analysis. Strengths, weaknesses, opportunities and threats (SWOT) analysis is a business management term used to denote the analysis of a system or organization with the aim of developing an inventory of present and future strengths, weaknesses, opportunities and threats that may require performance management attention (Chapter 2, 2.3.2 and Appendix D, 3.2.7 refer).

Key performance area (KPA). KPAs are a way of categorizing performance subjects related to high-level ambitions and expectations. ICAO has defined 11 KPAs: safety, security, environmental impact, cost effectiveness, capacity, flight efficiency, flexibility, predictability, access and equity, participation and collaboration, interoperability (Chapter 2, 2.2.4, Appendix A, Figure I-A-2 and 3.3 refer).

Performance management process. This term refers to a repetitive or continuous process which applies the principles of the performance-based approach to manage (generally improve) selected performance aspects of an organization or system (*i.e.* the air navigation system). The process is executed through a sequence of well-defined steps, which are described in Chapter 2, Figure I-2-1.

Examples of performance management processes are safety management, security management, and capacity management.

1.3 Acronyms

A-CDM	Airport collaborative decision-making
AN-SPA	Air navigation system performance assessment
ASBU	Aviation system block upgrades
PPRC	GREPECAS programmes and projects review committee
DCB	Demand-capacity balancing
FUA	Flexible use of airspace
GANP	Global air navigation plan (Doc 9750)
GASP	Global aviation safety plan (Doc 1004)
KPI	Key performance indicator

KPA	Key performance area
PBA	Performance-based approach
PBN	Performance-based navigation
RPBANIP	CAR Regional performance-based air navigation implementation plan
SAMPBIP	SAM performance-based air navigation system implementation plan
TBD	To be determined
Vol.	Volume

1.4 ICAO-driven planning

The International Civil Aviation Organization (ICAO) has developed Doc 9854 "Global ATM operational concept", which describes the ICAO vision of a globally applicable ATM.

It also developed the global "Aviation System Block Upgrade" (ASBU) framework as a programmatic framework that presents a set of air traffic management (ATM) solutions or upgrades that builds on existing equipment and establishes an implementation framework to achieve global interoperability within given timelines.

The Sixth edition of the Global Air Navigation Plan (GANP - Doc 9750) enables members of the aviation community to participate together to achieve an agile, safe, secure, sustainable, high-performance and interoperable global air navigation system.

At the same time, new demands on the aviation system, emerging technologies, innovative ways of doing business and the changing human role pose challenges and also offer opportunities that call for an urgent transformation of the air navigation system so that aviation continues to drive social well-being in the CAR and SAM Regions.

1.5 References for developing Vol. III

Conclusion PPRC/05-10 – Development of Volume III of the CAR/SAM e-ANP and preparation of national air navigation plans (NANPs), the main purpose of which is to coordinate efforts for the development of Vol. III of the CAR/SAM e-ANP and update the national air navigation plans.

AN/Conf-13 recommendation 4.3/1, item d) "encourage the planning and implementation regional groups (PIRGs) to embrace a performance-based approach for implementation and adopt the six-step performance management process, as described in the *Manual on Global Performance of the Air Navigation System* (Doc 9883), by reflecting the process in Volume III of all regional air navigation plans".

1.6 Purpose

The Instructions will be used by CAR/SAM States when preparing the tables and texts of Volume III of the CAR/SAM ANP, in accordance with the template provided by ICAO Headquarters (see the Attachment at the end of this document).

These Instructions address the following objectives:

a. Standardise the understanding and practical application of the six-step approach to performance-based planning, as stipulated in the GANP, by area navigation specialists of CAR/SAM States in the process of filling in the Tables of Vol. III.

b. Achieve a homogeneous application of the Vol. III template and simplify the development of tables and texts.

c. Complement the use of the GANP tools (AN-SPA, performance dashboard, etc.).

d. Carry out an orderly transition of the plans and activities under the RPBANIP and the SAM-PBIP to the CAR/SAM ANP Vol. III.

The cited template is based on a printed format, which describes a sequence of tables that guide the insertion of planning data of each State/Territory, linked to designated airspaces and international airports, following the identification of air navigation performance optimisation objectives, leading to the definition of solutions derived from the ASBU framework or other regional initiatives. In the future, this template will be prepared in electronic format by ICAO, with a view to automating the management and updating of data and the monitoring of implementation activities.

1.7 Scope

1.7.1 Vol. III contains the dynamic/flexible elements of the CAR/SAM ANP and provides guidance for the implementation of air navigation systems and their upgrading, taking into account the ASBU framework as well as GANP technology roadmaps. Vol. III may also include additional implementation guides to supplement the material contained in Vol. I and Vol. II.

1.7.2 The six-step method of Doc 9883 is applied for the **drafting** and subsequent **management** of Vol. III, as follows:

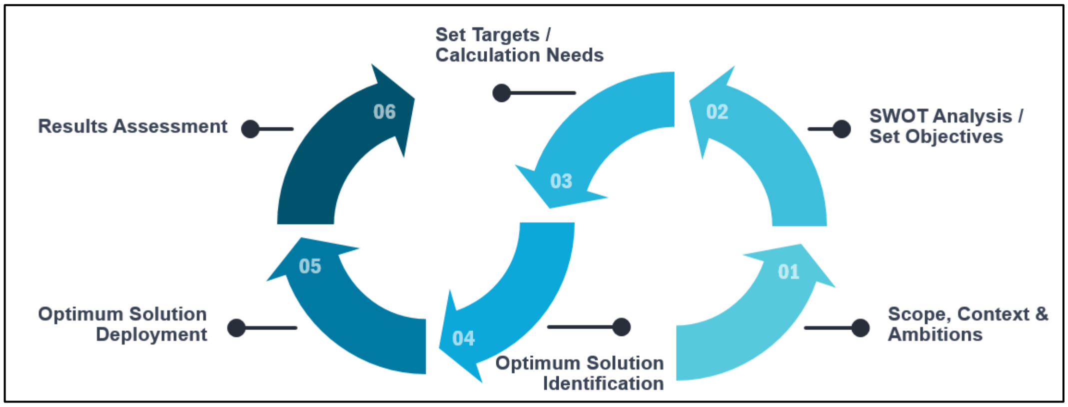
In the drafting phase:

Step 1: Define/review scope, context and general ambitions/expectations
Step 2: Identify opportunities, issues and set (new) objectives
Step 3: Quantify objectives
Step 4: Select solutions to exploit opportunities and resolve issues

In the management phase:

Step 5: Implement solutions
Step 6: Assess achievement of objectives

These instructions focus on the drafting phase of Vol. III based on the template provided. See Graph 1 below.



Graph 1.- Six-step performance management process

1.7.3 Once Vol. III has been developed, it must be approved by GREPECAS/PPRC and the implementation phase will start, which should be supported by a programme/project aimed at developing and/or continuing the action plans for the implementation of the solutions identified from the ASBU framework. These solutions, if applicable, will be supplemented with regional initiatives (also called non-ASBU solutions) as outlined in Step 4 of the method. This entails managing indicators and metrics to make sure that the process is delivering the expected performance results.

1.7.4 Vol. III, as approved by GREPECAS, shall have its respective amendment procedures, in accordance with the framework set forth in Volume I, Appendix A, Part C.

2. GENERAL ASPECTS AND REQUIREMENTS

2.1 Personnel and data requirements

2.1.1 The drafting of Volume III is done by GREPECAS State representatives, assisted by officers of the NACC and SAM Regional Offices. State counterparts should have the authority and/or designate a working group (WG) within their Administration to coordinate the drafting of Volume III with all the stakeholders. Such a group should be multidisciplinary in nature and have a coordinator to act as focal point (POC) for this Regional Office and, at the same time, to be the spokesperson for the State, supported by the following human and technological resources:

a. Specialists and technicians from:

- ✓ the CAA;
- ✓ the air navigation service providers (ATS, ATFM, CNS, MET, AIM, SAR areas) and airports;
- ✓ the State environmental agency;
- ✓ the industry;
- ✓ the users

b. IT technicians and statisticians with expertise in business intelligence (BI) tools

c. IT tools for efficient collection, analysis and management of air traffic data

d. Collaborative arrangements with data originators to meet data quality requirements

2.1.2 Data management

Data management is the process of data collection, processing (including quality assurance), storage and reporting in support of the performance-based approach. In practical terms, data management is about:

a. how to set up the data acquisition process needed for performance monitoring;

b. how to aggregate performance data and exchange the data among States and planning groups;

c. how groups can best manage their information base in which performance data are stored; and

d. how to organise performance evaluations.

The entities that will act, in each State, as performance data providers must be defined. Appendix A describes the KPIs and identifies, for reference, the required data and data providers for each KPI.

3. BASIC CONCEPTS

3.1 Performance-based approach (PBA)

The performance-based approach is a decision-making method based on three principles: strong focus on desired/required results; informed decision-making, driven by those desired/required results; and reliance on facts and data for decision-making. The PBA is a way of organising the performance management process.

3.2 Key performance area (KPA)

KPAs are a way of categorising performance subjects related to high-level ambitions and expectations (see the summary below).

ICAO has defined eleven KPAs: safety, security (cybersecurity), environmental impact, cost effectiveness, capacity, flight efficiency, flexibility, predictability, access and equity, participation and collaboration, interoperability.

Summary of GANP efficiency ambitions

KPA	Ambition
ACCESS AND EQUITY	No aviation community member excluded or treated unfairly.
CAPACITY	Nominal capacity easily scalable with demand.
	Disruptive events do not interrupt service provision and do not significantly affect the performance of the system.
COST-EFFECTIVENESS	No increase of total direct ANS cost while maintaining the safety and quality of service.
	Significant increase of ANS productivity, irrespective of demand.
EFFICIENCY	Reduction of the gap between the flight efficiency achieved and the desired optimum trajectory of airspace users.
ENVIRONMENT	ANS-induced inefficiencies to be progressively removed to contribute to the global ICAO aspirational goals for CO_2 emissions.
	To benefit from achieved flight efficiency gains.
FLEXIBILITY	To absorb required changes to individual business and operational trajectories.
INTEROPERABILITY	Essential at an operational and technical level.
PARTICIPATION BY THE ATM COMMUNITY	Pre-agreed level of participation to make the maximum shared use of the air navigation resources.
PREDICTABILITY	No increase in ANS delivery variability including asset availability.
SAFETY	Zero ANS-related accidents and a significant (50%) reduction of ANS-related serious incidents.
SECURITY	Zero significant disruptions due to cyber incidents

3.3 Key performance indicator (KPI) and metrics

3.3.1 Current/past performance, expected future performance (estimated as part of forecasting and performance modelling), as well as actual progress in achieving performance objectives is quantitatively expressed by means of indicators, in this case called key performance indicators, or KPIs.

3.3.2 To be relevant, indicators need to correctly express the intention of the associated performance objective. Since indicators support objectives, they should be defined having a specific performance objective in mind.
Indicators are not often directly measured. They are calculated from supporting metrics according to clearly defined formulas, *e.g.* cost-per-flight indicator = sum (costs)/sum (flights).

Performance measurement is therefore done through the collection of data for the supporting metrics.

3.3.3 The tables and forms of the current regional air navigation implementation documents do not always reflect qualitatively the benefits of an ASBU module/element implementation in terms of performance, as metrics of a quantitative nature are applied.

3.3.4 Measuring implementation through the GANP KPIs will enable States to:

a. organise the preparation of the ASBU modules/elements for their implementation; and
b. measure and document the efficiency benefits of the modules/elements implemented.

3.4 ASBU Framework

The ASBU framework furthers the evolution of the global air navigation system towards the achievement of the identified performance ambitions by defining operational improvements and associated performance benefits derived from the specific operational concepts defined in the different evolutionary stages of the conceptual roadmap.

Once validated and available for introduction, these operational improvements will support the adoption of a holistic, performance-based approach to modernising the air navigation system in a cost-effective manner.

The adoption of a globally harmonised performance management process for upgrading the air navigation system is needed in order to achieve consistency of global, regional and national plans.

For the purpose of these instructions, the adoption of Block 0 (2013) and Block 1 (2019) modules/elements will be analysed first and foremost. However, if the necessary conditions and enablers are in place, planning for Block 2 (2025) could be undertaken, for example, for issues related to system-wide information management (SWIM).

See the list of GANP ASBU modules/elements in Appendix B.

4. PROCEDURES

4.1 Planning and implementation in progress

GANP and GASP Implementation

4.1.1 The development of Vol. III shall take into account that ICAO Assembly Resolution A40-1 stipulates that the GASP and GANP be implemented and maintained current in close cooperation and coordination with all stakeholders, and that these plans serve as a framework for the development and implementation of regional, sub-regional and national plans, thereby ensuring consistency, harmonisation and coordination of efforts to enhance the safety, capacity and efficiency of international civil aviation.

Technology and information threads

4.1.2 For the drafting of Vol. III, it must be noted that several ASBU modules/elements of the Technology (see note below) and Information thread are currently in the process of implementation through GREPECAS programmes. These modules/elements constitute the essential platform to ensure safety, efficiency and proper use of airspace capacity and services, in the context of the implementation of the operational thread.

Note. - The GANP contains technology roadmaps, which can be found at:

https://www4.icao.int/ganpportal/ASBU/Roadmap/Technology

4.1.3 The GANP does not specifically define the linkage of technology and information modules/elements with specific KPIs. However, in some cases, the GANP recognises the KPA that may be associated to these modules/elements.

4.1.4 Therefore, in order to give continuity to the implementation of the technology and information threads, list 1 and list 2 below show the technology and information modules/elements associated to Block 0 and Block 1, which are to be considered in the planning scheme for Vol. III. As discussed in 4.1.9 below, these modules/elements must be analysed and included in Table 11.

4.1.5 It must be recognised that the implementation of the technology and information threads meet certain performance objectives in various KPAs, *i.e.* interoperability, efficiency, capacity, safety, security, and cost-effectiveness. The ASUR and DAIM modules associated to GASP safety improvement initiatives are noteworthy.

4.1.6 The above would offer the possibility of measuring the implementation performance within a KPI; otherwise, a quantitative metric could be applied.

List 1.- Technology modules/elements essential for the CAR/SAM Regions

ASBU - Block/element	*Description*	*Thread*
ASUR	**Alternative surveillance** Initial ground surveillance capability	**Technology**
ASUR-B0/1	Automatic dependent surveillance - broadcast (ADS-B)	
ASUR-B0/2	Multilateration cooperative surveillance systems (MLAT)	
ASUR-B0/3	Cooperative surveillance radar downlink of aircraft parameters (SSR-DAPS)	
ASUR-B1/1	Reception of aircraft ADS-B signals from space (SB ADS-B)	
COMI	**Communication infrastructure** Improvement of AMS and AFS telecommunication infrastructure	**Technology**
COMI-B0/1	Aircraft communication addressing and reporting system (ACARS)	
COMI-B0/2	Aeronautical telecommunication network / Open systems interconnection (ATN/OSI)	
COMI-B0/3	VHF data link (VDL) Mode 0/A	
COMI-B0/4	VHF data link (VDL) Mode 2 Basic	

ASBU - Block/element	*Description*	*Thread*
COMI-B0/5	Satellite communications (SATCOM) Class C data	
COMI-B0/6	High frequency data link (HFDL)	
COMI-B0/7	ATS message handling system (AMHS)	
COMI-B1/1	Ground-ground aeronautical telecommunication network / Internet protocol suite (ATN/IPS)	
COMI-B1/2	VHF data link (VDL) Mode 2 Multi-frequency	
COMI-B1/3	SATCOM Class B Voice and data	
COMI-B1/4	Aeronautical mobile airport communication system (AeroMACS) – ground-ground	
COMS	**Communication services/systems** Improvement of AMS and AFS communication services and systems	**Technology**
COMS-B0/1	CPDLC (FANS 1/A & ATN B1) for domestic and procedural airspace	
COMS-B0/2	ADS-C (FANS 1/A) for procedural airspace	
COMS-B1/1	PBCS approved CPDLC (FANS 1/A+) for domestic and procedural airspace	
COMS-B1/2	PBCS approved ADS-C (FANS 1/A+) for procedural airspace	
COMS-B1/3	SATVOICE (incl. routine communications) for procedural airspace	
NAVS	**Navigation systems** Improvement of air navigation systems	**Technology**
NAVS-B0/1	Ground-based augmentation system (GBAS)	
NAVS-B0/2	Satellite-based augmentation system (SBAS)	
NAVS-B0/3	Aircraft-based augmentation system (ABAS)	
NAVS-B0/4	Navigation minimal operating networks (Nav MON)	
NAVS-B1/1	Extended GBAS	

List 2.- Information modules/elements essential for the CAR/SAM Regions

ASBU - Block/element	*Description*	*Thread*
AMET	**Advanced meteorological information** Meteorological information to improve efficiency and safety	**Information**
AMET-B0/1	Meteorological observations products	
AMET-B0/2	Meteorological forecast and warning products	
AMET-B0/3	Climatological and historical meteorological products	
AMET-B0/4	Dissemination of meteorological products	
AMET-B1/1	Meteorological observations information	
AMET-B1/2	Meteorological forecast and warning information	

ASBU - Block/element	*Description*	*Thread*
AMET-B1/3	Climatological and historical meteorological information	
AMET-B1/4	Dissemination of meteorological information	
DAIM	**Digital aeronautical information management** Optimise the provision of digital aeronautical information	**Information**
DAIM-B1/1	Provision of quality-assured aeronautical data and information	
DAIM-B1/2	Provision of digital Aeronautical Information Publication (AIP) data sets	
DAIM-B1/3	Provision of digital terrain data sets	
DAIM-B1/4	Provision of digital obstacle data sets	
DAIM-B1/5	Provision of digital aerodrome mapping data sets	
DAIM-B1/6	Provision of digital instrument flight procedure data sets	
DAIM-B1/7	NOTAM improvements	
FICE	**Flight and flow information for a collaborative environment** Increased interoperability, efficiency and capacity through ground-ground data integration	**Information**
FICE-B0/1	Automated basic inter facility data exchange (AIDC)	
SWIM **See Note***	**System-wide information management** Improvement of information management performance through the application of SWIM	**Information**
SWIM-B2/1	Information service provision	
SWIM-B2/2	Information service consumption	
SWIM-B2/3	SWIM registry	
SWIM-B2/4	Air/ground SWIM for non-safety critical information	
SWIM-B2/5	Global SWIM processes	
SWIM-B3/1	Air/ground SWIM for safety-critical information	
*Note: The SWIM thread is planned for block 2 (year 2025) and block 3. However, procedure and infrastructure enablers for the exchange of information are currently being implemented.		

<u>*Operational threads*</u>

4.1.7 GREPECAS must maintain and enhance the results of its programmes and projects related to PBN implementation, based on the APTA module, which is associated to the mandate of ICAO Assembly Resolution A37-11, as well as the improvement of DCB, which involves the implementation of ATFM, FUA, FRTO and A-CDM (in airspace or airports that require it). Likewise, there are operational modules associated to GASP safety improvement initiatives, including APTA and SNET.

4.1.8 In this regard, list 3 below shows the modules/elements in the **Operational** category (Blocks 0 and 1) that are essential for planning in the CAR/SAM Regions, as reflected in Vol. III.

Note. - Planning for the GADS operational module, associated to SAR optimisation, is discussed further below.

4.1.9 The modules/elements analysed and selected from list 3 must be included in Table 11, indicating the appropriate KPI for measuring implementation performance. If this KPI is not contained in Table 8, it shall be included according to the references contained in Appendix D, and a baseline analysis will be conducted and annual improvement goals will be defined using Table 9 and Table 10 respectively.

List 3.- Essential modules/elements of the operational category

ASBU - Block/element	*Description*	*Thread*
ACDM	**Airport collaborative decision-making** Improved airport operations through airport CDM	**Operational**
ACDM-0/1	Aiport collaborative decision-making information sharing (ACIS)	
ACDM-0/2	Integration with ATM network function	
ACDM-1/1	Airport operations plan (AOP)	
ACDM-B1/2	Airport operations centre (APOC)	
APTA	**Airport accessibility** Optimisation of PBN-based instrument approach procedures	**Operational**
APTA-B0/1	PBN approaches (with basic capabilities)	
APTA-B0/2	PBN SID and STAR procedures (with basic capabilities)	
APTA-B0/3	SBAS/GBAS CAT I precision approach procedures	
APTA-B0/4	CDO (Basic)	
APTA-B0/5	CCO (Basic)	
APTA-B0/6	PBN helicopter point-in-space (PinS) operations	
APTA-B0/7	Performance-based aerodrome operating minima - Advanced aircraft	
APTA-B0/8	Performance-based aerodrome operating minima - Basic aircraft	
APTA-B1/1	PBN approaches (with advanced capabilities)	
APTA-B1/2	PBN SID and STAR procedures (with advanced capabilities)	
APTA-B1/3	Performance-based aerodrome operating minima - Advanced aircraft with SVGS	
APTA-B1/4	CDO (Advanced)	
APTA-B1/5	CCO (Advanced)	
FRTO	**Improved operations through enhanced trajectories** Capacity optimisation and flexible flights through enhanced en-route trajectories	**Operational**

ASBU - Block/element	*Description*	*Thread*
FRTO-B0/1	Direct routing (DCT)	
FRTO-B0/2	Airspace planning and flexible use of airspace (FUA)	
FRTO-B0/3	Pre-validated and coordinated ATS routes to support flight and flow	
FRTO-B0/4	Basic conflict detection and conformance monitoring	
FRTO-B1/1	Free route airspace (FRA)	
FRTO-B1/2	Required navigation performance (RNP) routes	
FRTO-B1/3	Advanced flexible use of airspace (FUA) and management of real-time airspace data	
FRTO-B1/4	Dynamic sectorisation	
FRTO-B1/5	Enhanced conflict detection tools and conformance monitoring	
FRTO-B1/6	Multi-sector planning	
FRTO-B1/7	Trajectory options set (TOS)	
NOPS	**Network operations** Optimise air traffic flow management	**Operational**
NOPS-B0/1	Initial integration of collaborative airspace management with air traffic flow management	
NOPS-B0/2	Collaborative network flight updates	
NOPS-B0/3	Network operation planning basic features	
NOPS-B0/4	Initial airport/ATFM slots and A-ACDM network interface	
NOPS-B0/5	Dynamic ATFM slot allocation	
NOPS-B1/1	Short-term ATFM measures	
NOPS-B1/10	Collaborative trajectory options program (CTOP)	
NOPS-B1/2	Enhanced network operations planning	
NOPS-B1/3	Enhanced integration of airport operations planning with network operations planning	
NOPS-B1/4	Dynamic traffic complexity management	
NOPS-B1/5	Full integration of airspace management with air traffic flow management	
NOPS-B1/6	Initial dynamic airspace configurations	
NOPS-B1/7	Enhanced ATFM slot swapping	
NOPS-B1/8	Extended arrival management supported by the ATM network function	
NOPS-B1/9	Target times for ATFM purposes	
NOPS-B2/1	Optimised ATM network services in the initial TBO context	
NOPS-B2/2	Enhanced dynamic airspace configuration	
NOPS-B2/3	Collaborative network operation planning	
NOPS-B2/4	Multi ATFM slot swapping and airspace user priorities	
NOPS-B2/5	Further airport integration within network operation planning	
NOPS-B2/6	ATFM adapted to cross-border free-route airspace (FRA)	
NOPS-B2/7	UTM network operations	
NOPS-B2/8	Upper airspace network operations	
NOPS-B3/1	ATM network services in full TBO context	
NOPS-B3/2	Cooperative network operations planning	
NOPS-B3/3	Innovative airspace architecture	

ASBU - Block/element	*Description*	*Thread*
SNET	**Ground-based safety networks** Improved efficiency of ground-based safety networks	**Operational**
SNET-B0/1	Short-term conflict alert (STCA)	
SNET-B0/2	Minimum safe altitude warning (MSAW)	
SNET-B0/3	Area proximity warning (APW)	
SNET-B0/4	Approach path monitoring (APM)	
SNET-B1/1	Enhanced STCA with aircraft parameters	
SNET-B1/2	Enhanced STCA in complex TMAs	

Search and rescue (SAR) service and GADSS

4.1.10 The implementation of the GANP GADSS (Global Aeronautical Distress and Safety System) module improves the performance of the SAR service, as its purpose is to optimise the warning service to ATS by improving aircraft management in abnormal or distress situations. See Appendix B.

4.1.11 Planning for the implementation of the GADS module shall take into account the planning and implementation of activities to improve and maintain SAR in CAR/SAM States, *inter alia*:

a. Support States in establishing an entity to provide 24-hour SAR services within their territory and areas where the State has accepted responsibility for providing SAR to ensure that assistance is provided to persons in distress;
b. Promote the harmonisation of aeronautical/maritime SAR policies, regulations, practices and procedures in accordance with ICAO and IMO provisions;
c. Develop and update SAR agreements between rescue coordination centres (RCCs) of adjacent States and international SAR service agencies, as appropriate;
d. Promote the establishment of joint aeronautical/maritime SAR committees, including voluntary SAR organisations, and the formulation of agreements among all national SAR service stakeholders; and
e. Develop a human resource planning and training strategy in line with ICAO SAR provisions.

4.2 Formulation of the planning tables in Vol. III

The **AN-SPA (air navigation system performance assessment)** tool guides the user in the application of the six-step method described in Doc 9883, leading to an understanding and the identification of relevant improvements within the ASBU framework based on the description of problems, limitations or gaps affecting the operational scenario of a State or region, focusing on aerodromes, TMAs or en-route airspace.

It is highly recommended to carry out practices and exercises with this tool in multidisciplinary groups of the ANS community. To use it, you must register and login at:

https://www4.icao.int/ganpportal/Account/Login?ReturnUrl=%2Fganpportal%2FANSPA%2FReports

The planning procedure based on ICAO Doc 9883 and the six-step method are shown below.

STEP 1: DEFINE/REVIEW SCOPE, CONTEXT AND GENERAL AMBITIONS/EXPECTATIONS

Scope

- Time period: Immediate planning of achievements that can support aviation recovery in the CAR/SAM Regions in the short term (2021 - 2024) is foreseen, with a changing scenario expected in that period, depending on the evolution of the pandemic.
- Key performance areas: The **11 KPAs** of the GANP are analysed.
- Geographically: CAR/SAM airspace, within the scope of airports, terminal control areas (TMAs) and en-route segments.
- Operations under consideration: Air traffic operating under IFR.

Context

Ambitions and expectations

The general expectation of States, industry, ANSP providers, airports, and the ATM community at large is to improve the system, aiming to support the initiatives deployed for the reactivation and recovery of regional aviation in face of COVID 19.

The area navigation system must also be strengthened in order to show resilience to temporary disruptions or loss of capacity, and environmental protection aspects must be analysed.

Procedure: The following table allows for the identification of the scope of airspace: ALL FIRs and TMAs to be covered by State planning must be included:

Table 1

State	FIR(s)	TMA(s)		NOTES
		ICAO Indicator	Name	

STEP 2: IDENTIFY OPPORTUNITIES, ISSUES AND SET (NEW) OBJECTIVES

2.1 Develop a list of present and future opportunities and issues that require performance management attention

Procedure: Based on the scope, context and general ambitions/expectations which were agreed upon during the previous step, the system should be analysed in order to develop an inventory of present and future opportunities and issues (weaknesses, threats) that may require performance management attention. See graph below:

This part of the process is generally known as strengths, weaknesses, opportunities and threats (SWOT) analysis:

- Strengths are (internal) attributes of a system or an organisation that help in the realisation of ambitions or in meeting expectations.

- Weaknesses are (internal) attributes of a system or an organisation that are a detriment to realising ambitions or meeting expectations.

- Opportunities are external conditions that help in the realisation of ambitions or in meeting expectations.

- Threats are external conditions that are a detriment or harmful to realising ambitions or meeting expectations.

Appendix C contains an example of a SWOT analysis.

CAR/SAM REGIONAL SWOT ANALYSIS

Table 2

STRENGTHS	Notes

<<<<

Table 3

WEAKNESSES	Notes

<<<

Table 4

OPPORTUNITIES	Notes

<<<

Table 5

THREATS	Notes

Based on the above SWOT analysis, in the following Table it is recommended to identify the main key performance areas (KPAs) that can help moderate or reverse the weaknesses (internal front), as well as mitigate the threats (external front).

Table 6

Related KPAs	**Weaknesses**	**Threats**
Safety		
Access and equity		
Participation of the ATM community		
Cost effectiveness		
Capacity		
Predictability		
Interoperability		
Security (cybersecurity)		
Flexibility		
Efficiency		
Environmental impact		

2.2 Define performance objectives

IMPORTANT

For analysis and development of Tables 7 to 11, please refer to Appendix D, which contains the list "ASBU Elements - Expected Performance Impact on KPAs and specific KPIs", the purpose of which is to summarise the information presented in the GANP and provide a functional description of each operational ASBU element (Blocks 0 and 1). The cited Appendix has the following layout:

ASBU Element	KPA	Focus Areas	Performance objective	KPI

List of performance objectives for KPAs and selected KPIs

Table 7

(Examples)

Note.- The performance objective is selected from Appendix D. Also, refer to the GANP Catalogue of performance objectives.

KPA	**Focus areas**	**Performance objective**	**Notes**
Capacity	Capacity, performance and utilisation	Reduce approach minima (ceiling and visibility)	
Capacity	Capacity, performance and utilisation	Increase arrival rate	

STEP 3: QUANTIFY OBJECTIVES, SET GOALS AND CALCULATE REQUIREMENTS

3.1 Link key performance areas, performance objectives and indicators

List of KPIs and KPAs

Table 8
(Examples)

KPA	**Performance objective**	**KPI**	**Definition**
Capacity	Reduce approach minima (ceiling and visibility)	KPI10 Airport peak throughput	The 95th percentile of the hourly number of operations recorded at an airport, in the “rolling” hours sorted from the least busy to the busiest hour.

KPA	Performance objective	KPI	Definition
			Can be computed for arrivals, departures or arrivals+departures.
Capacity	Increase arrival rate	KPI10 Airport peak throughput	

3.2 Define the desired speed of progress in terms of baseline and target performance

Baseline performance for the selected KPIs

Table 9

(Examples)

FIR /TMA/AIRPORT	B A S E L I N E KPIs (2019)						Operations measured [units]
	KPI10	KPIxx					
Airport XYZA	12 ACFT/ h						

Annual performance targets and requirements

Table 10

(Examples)

FIR /TMA/AIRPORT	TARGETS [KPIs]					Notes
	KPI10	KPIxx	KPIxx	KPIxx	KPIxx	
Airport XYZA	18 ACFT/ h					KPI10 increase "x" ACFT / hour or % annual improvement

STEP 4: SELECT SOLUTIONS TO EXPLOIT OPPORTUNITIES AND RESOLVE ISSUES

Solutions based on ASBU elements/modules or regional initiatives to exploit opportunities (associated to the KPI)

Note 1 .- The ASBU elements are selected from Appendix D. Also refer to the GANP performance dashboard.

Note 2.- Other improvements outside the ASBU framework *(non-ASBU), developed in the form of Regional Initiatives, may be included, which could address identified gaps or opportunities, thus contributing to the achievement of the expected level of performance.*

Table 11

(Examples)

FIR /TMA/AIRPORT	KPI or metric	ASBU elements / Regional initiatives	Start	End	Notes
TMA	Metric: ADS B system installed	ASUR-B0/1 Automatic dependent surveillance - broadcast (ADS-B)	2021	2025	Essential technology element
Airport	Metric: Digital terrain data set available and published	DAIM-B1/3 Provision of digital terrain data sets	2021	2025	Essential information element
Airport	KPI10 Airport peak throughput	APTA-B0/1 PBN approaches (with basic capabilities)	2021	2023	Essential operational element
Airport	KPI10 Airport peak throughput	APTA-B0/2 PBN SID and STAR procedures (with basic capabilities)	2021	2023	Essential operational element
Airport	KPI10 Airport peak throughput	RSEQ-B0/1 Arrival management	2023	2025	Performance objective, Increase arrival rate

STEP 5: IMPLEMENT SOLUTIONS[1]

Step 5 is the implementation phase of the performance management process. This is where the changes and improvements selected during the previous step are organised into detailed plans that are implemented and begin to produce benefits.

Status of implementation of selected ASBU improvements or Regional Initiatives

Table 12

(Examples)

FIR/TMA /AIRPORT	**ASBU elements / Regional Initiatives**	**Start**	**End**	**Status of implementation**	**Notes**
Airport XYZA	APTA-B0/1 PBN approaches (with basic capabilities)	2021	2023	*In progress*	.
Airport XYZA	APTA-B0/2 PBN SID and STAR procedures (with basic capabilities)	2021	2023	*In progress*	
				100% completed *1% - 99% in progress* *0% planned* *Delayed**	**Delayed means that implementation is or will be delayed beyond end date*

[1] *For reference only, because Steps 5 and 6 will be deployed in the management phase*

STEP 6: ASSESS ACHIEVEMENT OF OBJECTIVES

The purpose of Step 6 is to continuously keep track of performance and monitor whether performance gaps are being closed as planned and expected.

First of all, this implies data collection to populate the supporting metrics with the data needed to calculate the performance indicators. These indicators are then compared with the targets defined in Step 3 in order to draw conclusions on the speed of progress in achieving the objectives.

This step includes monitoring the progress of implementation projects, particularly in those cases where the implementation of solutions takes several years, as well as checking periodically whether all assumptions are still valid and the planned performance of the solutions is still meeting the requirements.

With regard to the review of actually achieved performance, the output of Step 6 is simply an updated list of performance gaps and their causes. In practice, the scope of the activity is often interpreted as being much wider and includes recommendations to mitigate the gaps. This is then called performance monitoring and review, which in addition to Step 6 includes Steps 1, 2 and 3 of the performance management process.

Performance benefits derived from the implementation of selected ASBU improvements or Regional Initiatives

Table 13

(Examples)

FIR/TMA/AIRPORT	ASBU elements / Regional Initiatives	KPI			Notes
		KPI10	KPIxx	KPIxx	
Airport XYZA	APTA-B0/1 PBN approaches (with basic capabilities)	15 ACFT/ h			2022: half of the expected improvement was achieved
	APTA-B0/2 PBN SID and STAR procedures (with basic capabilities)	15 ACFT/ h			2022: half of the expected improvement was achieved

ICAO GANP PORTAL

KPI OVERVIEW

KPI01	Departure punctuality
Definition	Percentage of flights departing from the gate on-time (compared to schedule).
Mesurement Units	% of scheduled flights
Operations Measured	IFR departures of scheduled airlines
Variants	Variant 1A – % of departures within ± 5 minutes of scheduled time of departure Variant 1B – % of departures delayed ≤ 5 minutes versus schedule Variant 2A – % of departures within ± 15 minutes of scheduled time of departure Variant 2B – % of departures delayed ≤ 15 minutes versus schedule
Objects Characterized	The KPI is typically computed for traffic flows, individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This is an airspace user and passenger focused KPI: departure punctuality gives an overall indication of the service quality experienced by passengers, and the ability of the airlines to execute their schedule at a given departure location.
Parameters	On-time threshold (maximum positive or negative deviation from scheduled departure time) which defines whether a flight is counted as on-time or not. Recommended values: 5 minutes and 15 minutes.
Data Requirement	For each departing scheduled flight: • Scheduled time of departure (STD) or Scheduled off-block time (SOBT) • Actual off-block time (AOBT)
Data Feed Providers	Schedule database(s), airports, airlines and/or ANSPs
Formula / Algorithm	At the level of individual flights: 1. Exclude non-scheduled departures 2. Categorize each scheduled departure as on-time or not At aggregated level: 3. Compute the KPI: number of on-time departures divided by total number of scheduled departures

References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • China / Europe benchmarking study (CAUC - EUROCONTROL, 2017)

KPI02	Taxi-out additional time
Definition	Actual taxi-out time compared to an unimpeded/reference taxi-out time.
Mesurement Units	Minutes/flight
Operations Measured	The duration of the taxi-out phase of departing flights
Variants	Variant 1 – basic (computed without departure gate and runway data) Variant 2 – advanced (computed with departure gate and runway data)
Objects Characterized	The KPI is typically computed for individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This KPI is intended to give an indication of the efficiency of the departure phase operations on the surface of an aerodrome. This may include the average queuing that is taking place in front of the departure runways, non-optimal taxi routing and intermediate aircraft stops during taxi-out. The KPI is also typically used to estimate excess taxi-out fuel consumption and associated emissions (for the Environment KPA). The KPI is designed to filter out the effect of physical airport layout while focusing on the responsibility of ATM to optimize the outbound traffic flow from gate to take-off.
Parameters	Unimpeded/reference taxi-out time: • Recommended approach for the basic variant of the KPI: a single value at airport level, e.g. the 20th percentile of actual taxi times recorded at an airport, sorted from the shortest to the longest. • Recommended approach for the advanced variant of the KPI: a separate value for each gate/runway combination, e.g. the average actual taxi-out time recorded during periods of non-congestion (needs to be periodically reassessed).
Data Requirement	For each departing flight: • Actual off-block time (AOBT) • Actual take-off time (ATOT) In addition, for the advanced KPI variant: • Departure gate ID • Take-off runway ID
Data Feed Providers	Airports (airport operations, A-CDM), airlines (OOOI data), ADS-B data providers and/or ANSPs

Formula / Algorithm	At the level of individual flights: 1. Select departing flights, exclude helicopters 2. Compute actual taxi-out duration: ATOT minus AOBT 3. Compute additional taxi-out time: actual taxi-out duration minus unimpeded taxi-out time At aggregated level: 4. Compute the KPI: sum of additional taxi-out times divided by number of IFR departures
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • Singapore / US / Europe benchmarking study (CAAS - FAA - EUROCONTROL, 2017) • China / Europe benchmarking study (CAUC - EUROCONTROL, 2017) • PRC Performance Review Report (EUROCONTROL 2017) • European ANS Performance Data Portal • Single European Sky Performance Scheme • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI03	ATFM slot adherence
Definition	Percentage of flights taking off within their assigned ATFM slot (Calculated Take-Off Time Compliance).
Mesurement Units	% of flights subject to flow restrictions
Operations Measured	The take-off of IFR flights subject to flow restrictions.
Variants	Variants are possible depending on the size of the ATFM slot window.
Objects Characterized	The KPI is typically computed for individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This KPI gives an indication of the capability of an airport to contribute to ATFM effectiveness by delivering outbound traffic in a predictable manner to the departure runway, in compliance with assigned ATFM slots.
Parameters	Size of the ATFM slot window. Variant 1: the period between 5 minutes before and 10 minutes after the CTOT. Variant 2: the period between 5 minutes before and 5 minutes after the CTOT.
Data Requirement	For each departing IFR flight subject to an ATFM regulation: • Calculated Take-Off Time (CTOT) • Actual take-off time (ATOT)
Data Feed Providers	Airports, ATFM service

Formula / Algorithm	At the level of individual flights: 1. Exclude flights not subject to an ATFM regulation 2. Categorize each departing flight as compliant with its ATFM slot window or not At aggregated level: 3. Compute the KPI: number of compliant departures divided by total number of departing flights subject to an ATFM regulation
References & Examples of Use	• PRC Performance Review Report (EUROCONTROL 2017) • European ANS Performance Data Portal • Slot Tolerance Window (STW) compliance (Single European Sky Performance Scheme) • EDCT Window compliance (US) • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI04	Filed flight plan en-route extension
Definition	Flight planned en-route distance compared to a reference ideal trajectory distance.
Mesurement Units	% excess distance
Operations Measured	The planned en-route distance, as selected during the preparation of flight plans.
Variants	Variant 1, using a 40 NM cylinder around the departure and destination airport as the start/end of en-route airspace. Variant 2, using a 40 NM cylinder around the departure airport and a 100 NM cylinder around the destination airport as the start/end of en-route airspace.
Objects Characterized	The KPI can be computed for any volume of en-route airspace; this implies that it can be computed at State level (covering the FIRs of a State).
Utility of the KPI	This KPI measures the en-route horizontal flight (in)efficiency contained in a set of filed flight plans crossing an airspace volume. Its value is influenced by route network design, route & airspace availability, airspace user choice (e.g. to ensure safety, to minimize cost and to take into account wind and weather) and airspace user constraints (e.g. overflight permits, aircraft limitations). A significant gap between this KPI and the Actual en-Route Extension KPI indicates that many flights are not flown along the planned route, which should trigger an analysis of why this is happening.
Parameters	A '*Measured area*' is defined for which the KPI is computed. For example, a State. A '*Reference area*' is defined as a (sub)regional boundary considered, containing all '*Measured areas*', for example States within the same ICAO Region. Departure terminal area proxy: a cylinder with 40 NM radius around the departure airport. Destination terminal area proxy: a cylinder with 40 NM radius around the destination airport (variant 1). For variant 2 the radius is 100 NM.

Data Requirement	For each flight plan: • Departure airport (Point A) • Destination airport (Point B) • Entry point in the '*Reference area'* (Point O) • Exit point from the '*Reference area'* (Point D) • Entry points in the '*Measured areas'* (Points N) • Exit points from the '*Measured areas'* (Points X) • Planned distance for each NX portion of the flight
Data Feed Providers	ANSPs
Formula / Algorithm	For the horizontal trajectory of each flight, different parts (trajectory portions) are considered (see Figure 1 for the example of a flight departing outside the '*Reference Area*' and overflying a measured State; Figure 2 for the example of a domestic flight within a measured State): 1. The part of the flight which is within the reference area (segment OD). If airports A and/or B are located within the reference area, the points O and/or D are placed on the airport reference point (ARP). 2. The part of the flight for which the State level indicator is computed (between points N and X). If points A and/or B (the airports) are located within the measured State, the points N and/or X are placed on the 40 NM circle (variant 1) around the airport reference point as shown in Figure 2, to exclude terminal route efficiency from the indicator. Between points N and X, three quantities can be computed: the planned distance (length of flight plan trajectory), the local direct distance (great circle distance between N and X, not required for this indicator), and the contribution of the trajectory between N and X to the completion of the great circle distance between O and D. This contribution is called the "achieved distance". The formula for computing this is based on four great circle distances interconnecting the points O, N, X and D: achieved distance = [(OX-ON)+(DN-DX)]/2. When a given flight traverses multiple States, the sum of the planned distance in each State equals the total planned distance from O to D. Likewise the sum of all achieved distances equals the direct distance from O to D. The extra distance for a portion NX of a given flight is the difference between the actual/flight planned distance and the achieved distance. The total extra distance observed within a measured area (e.g. a State) over a given time period is the sum of the planned distances across all traversing flights, minus the sum of the achieved distances across all traversing flights. The KPI is computed as the total extra distance divided by total achieved distance, expressed as a percentage.
References & Examples of Use	• ICAO EUR Doc 030 EUR Region Performance Framework Document (July 2013) • Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • PRC Performance Review Report (EUROCONTROL 2017) • European ANS Performance Data Portal • Single European Sky Performance Scheme • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

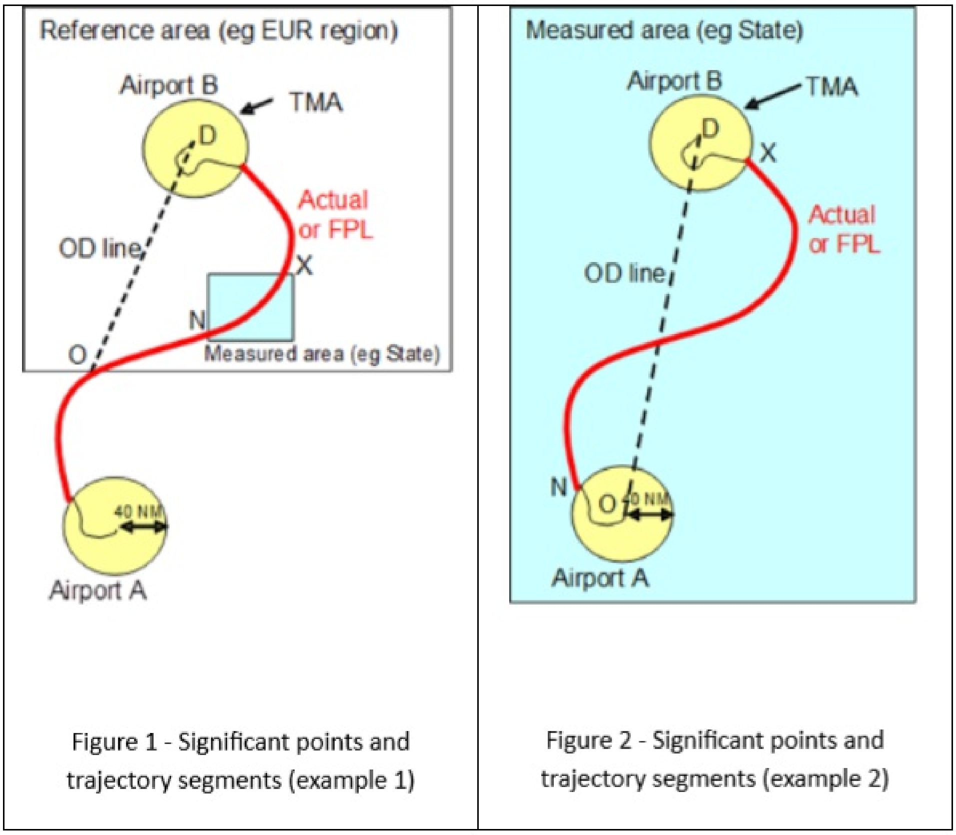


Figure 1 - Significant points and trajectory segments (example 1)

Figure 2 - Significant points and trajectory segments (example 2)

Significant points and trajectory segments (examples 1 and 2)

KPI05	Actual en-route extension
Definition	Actual en-route distance flown compared to a reference ideal distance.
Mesurement Units	% excess distance
Operations Measured	The actual distance flown by flights in en-route airspace.
Variants	Variant 1, using a 40 NM cylinder around the departure and destination airport as the start/end of en-route airspace. Variant 2, using a 40 NM cylinder around the departure airport and a 100 NM cylinder around the destination airport as the start/end of en-route airspace.
Objects Characterized	The KPI can be computed for a traffic flow or a volume of en-route airspace; this implies that it can be computed at State level (covering the FIRs of a State).
Utility of the KPI	This KPI measures the en-route horizontal flight (in)efficiency as actually flown, of a set of IFR flights crossing an airspace volume. Its value is influenced by route network design, route & airspace availability, airspace user choice (e.g. to ensure safety, to minimize cost and to take into account wind and weather) and airspace user constraints (e.g. overflight permits, aircraft limitations), and tactical ATC interventions modifying the trajectory (e.g. reroutings and 'direct to' clearances). The KPI is also typically used to estimate the excess fuel consumption and associated emissions (for the Environment KPA) attributed to horizontal flight inefficiency.

Parameters	Identical to the parameters of the 'Filed Flight Plan en-Route Extension' KPI.
Data Requirement	For each actual flight trajectory: • Departure airport (Point A) • Destination airport (Point B) • Entry point in the 'Reference Area' (Point O) • Exit point from the 'Reference Area' (Point D) • Entry points in the 'Measured Areas' (Points N) • Exit points from the 'Measured Areas' (Point X) • Distance flown for each NX portion of the actual flight trajectory, derived from surveillance data (radar, ADS-B…).
Data Feed Providers	ANSPs, ADS-B data providers
Formula / Algorithm	Identical to the formula/algorithm of the 'Filed Flight Plan en-Route Extension' KPI.
References & Examples of Use	• ICAO EUR Doc 030 EUR Region Performance Framework Document (July 2013) • Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • PRC Performance Review Report (EUROCONTROL 2017) • European ANS Performance Data Portal • Single European Sky Performance Scheme • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI06	En-route airspace capacity
Definition	The maximum volume of traffic an airspace volume will safely accept under normal conditions in a given time period.
Mesurement Units	Variant 1: Movements/hr Variant 2: Number of aircraft (occupancy count)
Operations Measured	The nominal capability of an ANSP to deliver ATM services to IFR traffic in a given volume of en-route airspace, as seen at a given planning horizon. For each horizon a different type of capacity is to be considered: • Planned capacity: expected values one or more years ahead for planning and investment purposes • Declared capacity: values used during the strategic and pre-tactical ATFM processes • Expected capacity: values as finalised at the end of the pre-tactical process • Actual capacity: values as actually used on the day of operation during tactical ATFM and ATC.
Variants	Variant 1: airspace throughput (entry flow rate) Variant 2: airspace occupancy count
Objects Characterized	The KPI is typically used at the level of individual sectors (sector capacity) or en-route facilities (ACC capacity).

Utility of the KPI	The KPI measures an upper bound on the allowable throughput or occupancy count of an en-route facility or sector. Planned capacities are primarily used for multi-year and investment planning. Declared, expected and actual capacities are used in traffic flow management as well as for measuring and monitoring service delivery and efficiency. Some ANSPs may prefer not to declare capacities, and only have these capacities established on a daily basis based on known/current operational factors. Establishing capacities at different planning horizons provides an important reference for understanding the total system performance under normal operating conditions and provides a basis to work from when determining the impact of operational factors limiting capacity. These factors include – but are not limited to – ATCO availability and workload.
Parameters	Variant 1: time interval at which the throughput declaration is made. Variant 2: time interval at which the average occupancy count declaration is made.
Data Requirement	The various capacities are determined by the ANSP, and are dependent on traffic pattern, sector configuration, ATCO and system capability, etc.
Data Feed Providers	ANSPs
Formula / Algorithm	At the level of an individual en-route facility: 1. Select highest value from the set of established capacities (the maximum configuration capacity). 2. Compute the KPI: for variant 1, convert the value to an hourly movement rate, if the declaration is at smaller time intervals.
References & Examples of Use	• Brazil / Europe benchmarking study (DECEA - EUROCONTROL, 2017) • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI07	En-route ATFM delay
Definition	ATFM delay attributed to flow restrictions in a given en-route airspace volume
Mesurement Units	Minutes/flight
Operations Measured	The management of (temporary) capacity shortfalls in en-route airspace due to high demand and/or capacity reductions for a variety of reasons, resulting in the allocation of ATFM delay
Variants	None
Objects Characterized	The KPI can be computed for any volume of en-route airspace which participates in the ATFM process.

Utility of the KPI	This KPI is a time aggregation of the ATFM delay generated by flow restrictions which are established to protect a given volume of en-route airspace against demand/capacity imbalances. These flow restrictions (also called ATFM regulations) normally have a delay cause associated with them. This allows the KPI to be disaggregated by cause, which allows better diagnosis of the reasons for demand/capacity imbalances. Typically, the KPI is used to check whether ANSPs provide the capacity needed to cope with demand.
Parameters	None
Data Requirement	For each IFR flight: - Estimated Take-off Time (ETOT) computed from the last filed flight plan - Calculated Take-off Time (CTOT) - ID of the flow restriction generating the ATFM delay - Airspace volume associated with the flow restriction - Delay code associated with the flow restriction
Data Feed Providers	ATFM
Formula / Algorithm	At the level of individual flights: 1. Select the flights crossing the volume of en-route airspace 2. Select the subset of flights which are affected by the flow restrictions in this airspace 3. Compute ATFM delay: CTOT minus ETOT At aggregated level: 4. Compute the KPI: sum of ATFM delays divided by number of IFR flights crossing the airspace
References & Examples of Use	• ICAO EUR Doc 030 EUR Region Performance Framework Document (July 2013) • Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • PRC Performance Review Report (EUROCONTROL 2017) • European ANS Performance Data Portal • Single European Sky Performance Scheme • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI08	Additional time in terminal airspace
Definition	Actual terminal airspace transit time compared to an unimpeded time. Actual trajectories are generally longer in time and distance due to path stretching and/or holding patterns. In the example below the unimpeded trajectories are shown in red, and the actual trajectories in green and blue. See Figure 1: Terminal trajectories.
Mesurement Units	Minutes/flight
Operations Measured	The terminal airspace transit time during the arrival flight phase.

Variants	Variants are possible depending on the chosen size of terminal airspace (40 NM or 100 NM cylinder) and the richness of the data feed: basic (without arrival runway ID) or advanced (with arrival runway ID) Variants with 100 NM cylinder are useful if airports have holding patterns outside the 40 NM cylinder. The use of generic cylinders abstracts local specifics in terms of approach airspace design (e.g. TMA) and ensures comparability across different airports. See table 1: Cylinder variants
Objects Characterized	The KPI is typically computed for individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This KPI is intended to give an indication of the average queuing that is taking place in terminal airspace. This queuing is the result of sequencing and metering. The KPI captures the extent to which arriving flights are subjected to speed reductions, path extensions and holding patterns to absorb the queuing time. The KPI is also typically used to estimate excess fuel consumption and associated emissions (for the Environment KPA) attributable to horizontal flight inefficiency in terminal airspace. The KPI is designed to filter out the operational variability of terminal airspace transit time (e.g. due to wind, aircraft speed and length of the approach procedure, such as the difference between a straight-in approach and a downwind arrival) while focusing on the responsibility of ATM to optimize the inbound traffic flow from terminal airspace entry to landing.
Parameters	Destination terminal area proxy (also called Arrival Sequencing and Metering Area – ASMA): a cylinder with 40 NM radius around the destination airport. For variants A100 and B100 the radius is 100 NM. For the advanced variants only: list of terminal airspace entry segments (used to group flights entering the cylinder from ± the same direction). Unimpeded terminal airspace transit time: • Recommended approach for the basic variants of the KPI: a single value at airport level = the 20th percentile of actual terminal airspace transit times recorded at an airport, sorted from the shortest to the longest. • Recommended approach for the advanced variants of the KPI: a separate value for each entry segment/landing runway combination = the average terminal airspace transit time recorded during periods of non-congestion (needs to be periodically reassessed).
Data Requirement	For each arriving flight: • Terminal airspace entry time, computed from surveillance data (radar, ADS-B…) • Actual landing time (ALDT) In addition, for the advanced KPI variants: • Terminal airspace entry segment, computed from surveillance data (radar, ADS-B…) • Landing runway ID
Data Feed Providers	Airlines (OOOI data), airports, ADS-B data providers and/or ANSPs

Formula / Algorithm	At the level of individual flights: 1. Select arrivals, exclude helicopters 2. Compute actual terminal airspace transit time: ALDT minus terminal airspace entry time 3. Compute additional terminal airspace transit time: actual terminal airspace transit time minus unimpeded terminal airspace transit time At aggregated level: 4. Compute the KPI: sum of additional terminal airspace transit times divided by number of IFR arrivals
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • Singapore / US / Europe benchmarking study (CAAS - FAA - EUROCONTROL, 2017) • PRC Performance Review Report (EUROCONTROL 2017) • European ANS Performance Data Portal • Single European Sky Performance Scheme • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

	40 NM cylinder	100 NM cylinder
Advanced data feed	Variant A40	Variant A100
Basic data feed	Variant B40	Variant B100

Table 1: Cylinder variants

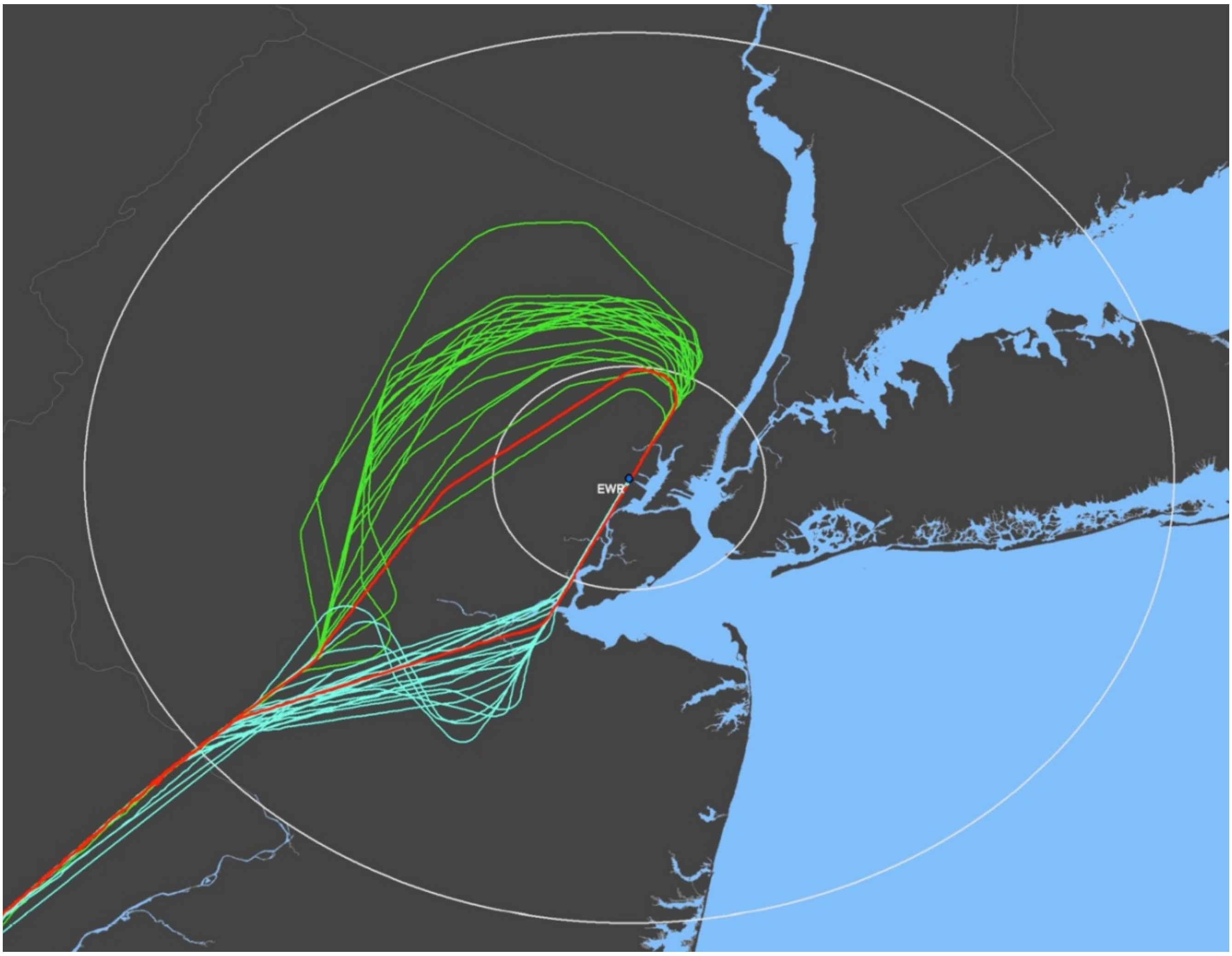


Figure 1: Terminal trajectories

KPI09	Airport peak capacity
Definition	The highest number of operations an airport can accept in a one-hour time frame (also called declared capacity). Can be computed for arrivals, departures or arrivals+departures.
Mesurement Units	Number of departures / hour, Number of landings / hour, Number of (departures+landings) / hour
Operations Measured	The capacity declaration of an airport.
Variants	Variant A: Airport peak arrival capacity Variant D: Airport peak departure capacity Variant AD: Airport peak movement capacity (departures + arrivals)
Objects Characterized	The KPI is computed for individual airports.

Utility of the KPI	This KPI indicates the highest number of operations that an airport will accept, using the most favorable runway configuration under optimum operational conditions. The runways may or may not be the most constraining factor for airport capacity: at some airports the most constraining factor may be the terminal airspace, the taxiways, the number of gates, passenger handling capacity etc. The KPI is typically used for scheduling and ATFM purposes, and to develop capacity investment plans.
Parameters	None
Data Requirement	Scheduling parameters for slot controlled airports Airport Acceptance Rates (AAR), Airport Departure Rates (ADR)
Data Feed Providers	Airports
Formula / Algorithm	At the level of an individual airport: 1. Select highest value from the set of declared capacities. 2. Compute the KPI: convert the value to an hourly rate, if the declaration is at smaller time intervals.
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • Brazil / Europe benchmarking study (DECEA - EUROCONTROL, 2017) • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI10	Airport peak throughput
Definition	The 95th percentile of the hourly number of operations recorded at an airport, in the "rolling" hours sorted from the least busy to the busiest hour. Can be computed for arrivals, departures or arrivals+departures.
Mesurement Units	Number of departures / hour, Number of landings / hour, Number of (departures+landings) / hour
Operations Measured	The actual number of operations at an airport.
Variants	Variant 1: IFR operations only Variant 2: IFR + VFR operations (relevant for airports with a high percentage of VFR traffic) To be combined with: Variant A: Airport peak arrival throughput Variant D: Airport peak departure throughput Variant AD: Airport peak movement throughput (departures + arrivals)
Objects Characterized	The KPI is computed for individual airports.
Utility of the KPI	This KPI gives an indication of "busy-hour" actual movement rates at an airport, as recorded during a given time period. For congested airports, this throughput is an indication of the effectively realized capacity; for uncongested airports it is a measure of demand.

Parameters	Time interval for “rolling” hours. Recommended value: 15 minutes. The percentile chosen to exclude outliers. Recommended value: 95th percentile.
Data Requirement	For each flight: • Actual landing time (ALDT) • Actual take-off time (ATOT).
Data Feed Providers	Airports
Formula / Algorithm	At the level of individual flights: 1. Select flights, exclude helicopters At the level of individual “rolling” hours: 2. Convert the set of flights to hourly landing rates and departure rates by “rolling” hour 3. Sort the “rolling” hours from the least busy to the busiest hour 4. Compute the KPI: it equals the rate value of the 95th percentile of the “rolling” hours
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • Singapore / US / Europe benchmarking study (CAAS - FAA - EUROCONTROL, 2017) • China / Europe benchmarking study (CAUC - EUROCONTROL, 2017) • Brazil / Europe benchmarking study (DECEA - EUROCONTROL, 2017)

KPI11	Airport throughput efficiency
Definition	Airport throughput (accommodated demand) compared to capacity or demand, whichever is lower. Can be computed for arrivals, departures or arrivals+departures.
Mesurement Units	Average Over/Under Delivery or % of accommodated operations.
Operations Measured	The number of unaccommodated operations at an airport.
Variants	Variant A: IFR arrivals Variant D: IFR departures Variant AD: IFR Operations (arrivals + departures)
Objects Characterized	The KPI is computed for individual airports.
Utility of the KPI	This KPI assesses how effectively capacity is managed by the ANSP. It is a measure of accommodated demand, compared to the available capacity of the airport, irrespective of the delay incurred by arriving traffic. Seen in another way, it captures the “missed” slots. At congested airports, the KPI relates the throughput to the declared capacity. At uncongested airports (or airports without declared capacity) the KPI relates the throughput to the unconstrained demand based on flight plans.
Parameters	Time interval at which to perform the most granular calculations. Recommended value: 15 minutes.

Data Requirement	For each arriving and/or departing flight: • Actual landing time (ALDT) and take-off time (ATOT) • Estimated landing time (ELDT) and take-off time (ETOT) (from flight plan) For each time interval: • Declared landing capacity of the airport • Declared departure capacity of the airport • Declared total capacity of the airport
Data Feed Providers	Airports
Formula / Algorithm	Example for arrivals: For each time interval: 1. Compute the throughput: count the number of actual landings based on ALDT 2. Compute the demand: count the number of estimated landings based on ELDT 3a. if demand >= capacity: efficiency = throughput / capacity 3b. if demand < capacity: efficiency = throughput / demand At aggregated level (longer time periods): 4. Compute the KPI: sum(efficiency*demand) / sum(demand) *Note: See Table 1: Example for arrivals. The average percentage weighted by actual arrivals is 96.1%. The average under-delivery of arrivals is -1.8. The same process can be used for departures or combined operations.*
References & Examples of Use	• Singapore / US / Europe benchmarking study (CAAS - FAA - EUROCONTROL, 2017) • Brazil / Europe benchmarking study (DECEA - EUROCONTROL, 2017) • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

Hour	15	16	17	18	19	20	21	22	23
Data									
Demand	41	58	59	70	67	59	63	72	66
Capacity	35	35	35	35	35	35	40	45	45
Throughput	30	38	36	36	36	32	35	37	44
Performance Score									
Throughput / Min (Demand, Capacity)	85.7%	108%	103%	103%	103%	91.4%	87.5%	82.2%	97.8%
Throughput minus Min (Demand, Capacity)	-5	3	1	1	1	-3	-5	-8	-1

Table 1: Example for arrivals

KPI12	Airport/Terminal ATFM delay
Definition	ATFM delay attributed to arrival flow restrictions at a given airport and/or associated terminal airspace volume.
Mesurement Units	Minutes/flight
Operations Measured	The management of (temporary) capacity shortfalls at and around destination airports due to high demand and/or capacity reductions for a variety of reasons, resulting in the allocation of ATFM delay.
Variants	None
Objects Characterized	The KPI is typically computed for individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This KPI is a time aggregation of the ATFM delay generated by flow restrictions which are established to protect a destination airport or its terminal area against demand/capacity imbalances. If a terminal area covers multiple airports, each individual flight delay is attributed to the corresponding destination airport. These flow restrictions (also called ATFM regulations) normally have a delay cause associated with them. This allows the KPI to be disaggregated by cause, which allows better diagnosis of the reasons for demand/capacity imbalances. Typically, the KPI is used as a proxy to check whether airports and ANSPs provide the capacity needed to cope with demand.
Parameters	None

Data Requirement	For each IFR flight: • Estimated Take-off Time (ETOT) computed from the last filed flight plan • Calculated Take-off Time (CTOT) • ID of the flow restriction generating the ATFM delay • Airport or terminal airspace volume associated with the flow restriction • Delay code associated with the flow restriction
Data Feed Providers	ATFM
Formula / Algorithm	At the level of individual flights: 1. Select the flights arriving at this airport 2. Select the subset of flights which are affected by the flow restrictions at this airport or its terminal airspace 3. Compute ATFM delay: CTOT minus ETOT At aggregated level: 4. Compute the KPI: sum of ATFM delays divided by number of arrivals at the airport
References & Examples of Use	• ICAO EUR Doc 030 EUR Region Performance Framework Document (July 2013) • PRC Performance Review Report (EUROCONTROL 2017) • European ANS Performance Data Portal • Single European Sky Performance Scheme • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI13	Taxi-in additional time
Definition	Actual taxi-in time compared to an unimpeded/reference taxi-in time
Mesurement Units	Minutes/flight
Operations Measured	The duration of the taxi-in phase of arriving flights
Variants	Variant 1 – basic (computed without landing runway and arrival gate data) Variant 2 – advanced (computed with landing runway and arrival gate data)
Objects Characterized	The KPI is typically computed for individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This KPI is intended to give an indication of the various taxi-in inefficiencies that occur after landing. Its value may be influenced by unavailability of the arrival gate and effects such as non-optimal taxi routing and intermediate aircraft stops during taxi-in. The KPI is also typically used to estimate excess taxi-in fuel consumption and associated emissions (for the Environment KPA). The KPI is designed to filter out the effect of physical airport layout while focusing on the responsibility of the airport to provide parking space and ATM to optimize the inbound traffic flow from landing to in-blocks.

Parameters	Unimpeded/reference taxi-in time: • Recommended approach for the basic variant of the KPI: a single value at airport level, e.g. the 20th percentile of actual taxi times recorded at an airport, sorted from the shortest to the longest • Recommended approach for the advanced variant of the KPI: a separate value for each runway/gate combination, e.g. the average actual taxi-in time recorded during periods of non-congestion (needs to be periodically reassessed)
Data Requirement	For each arriving flight: • Actual landing time (ALDT) • Actual in-block time (AIBT) In addition, for the advanced KPI variant: • Landing runway ID • Arrival gate ID
Data Feed Providers	Airports (airport operations), airlines (OOOI data), ADS-B data providers and/or ANSPs
Formula / Algorithm	At the level of individual flights: 1. Select arriving flights, exclude helicopters 2. Compute actual taxi-in duration: AIBT minus ALDT 3. Compute additional taxi-in time: actual taxi-in duration minus unimpeded taxi-in time At aggregated level: 4. Compute the KPI: sum of additional taxi-in times divided by number of IFR arrivals
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • China / Europe benchmarking study (CAUC - EUROCONTROL, 2017) • PRC Performance Review Report (EUROCONTROL 2017) • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI14	Arrival punctuality
Definition	Percentage of flights arriving at the gate on-time (compared to schedule)
Mesurement Units	% of scheduled flights
Operations Measured	IFR arrivals of scheduled airlines
Variants	Variant 1A – % of arrivals within ± 5 minutes of scheduled time of arrival Variant 1B – % of arrivals delayed ≤ 5 minutes versus schedule Variant 2A – % of arrivals within ± 15 minutes of scheduled time of arrival Variant 2B – % of arrivals delayed ≤ 15 minutes versus schedule

Objects Characterized	The KPI is typically computed for traffic flows, individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This is an airspace user and passenger focused KPI: arrival punctuality gives an overall indication of the service quality experienced by passengers, and the ability of the airlines to execute their schedule at a given destination.
Parameters	On-time threshold (maximum positive or negative deviation from scheduled arrival time) which defines whether a flight is counted as on-time or not. Recommended values: 5 minutes and 15 minutes.
Data Requirement	For each arriving scheduled flight: • Scheduled time of arrival (STA) or Scheduled in-block time (SIBT) • Actual in-block time (AIBT)
Data Feed Providers	Schedule database(s), airports, airlines and/or ANSPs
Formula / Algorithm	At the level of individual flights: 1. Exclude non-scheduled arrivals 2. Categorize each scheduled arrival as on-time or not At aggregated level: 3. Compute the KPI: number of on-time arrivals divided by total number of scheduled arrivals
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • China / Europe benchmarking study (CAUC - EUROCONTROL, 2017) • PRC Performance Review Report (EUROCONTROL 2017)

KPI15	Flight time variability
Definition	Distribution of the flight (phase) duration around the average value.
Mesurement Units	Minutes/flight
Operations Measured	Scheduled flights with the same flight ID on a given airport-pair (flight XYZ123 from A to B): the gate-to-gate duration, and at more detailed level the duration of the individual flight phases (taxi-out, airborne, taxi-in)
Variants	Different parameter values possible (see ‘Parameters’).
Objects Characterized	The KPI is typically computed for the scheduled traffic flows interconnecting a given cluster of airports (two or more; selection/grouping based on size and/or geography).

Utility of the KPI	The “variability” of operations determines the level of predictability for airspace users and hence has an impact on airline scheduling. It focuses on the variance (distribution widths) associated with the individual phases of flight as experienced by airspace users. The higher the variability, the wider the distribution of actual travel times and the more costly time buffer is required in airline schedules to maintain a satisfactory level of punctuality. In addition, reducing the variability of actual block times can potentially reduce the amount of excess fuel that needs to be carried for each flight in order to allow for uncertainties.
Parameters	Minimum monthly flight frequency filter: flights with a frequency less than 20 times per month are not included in the indicator. Outlier filter: Variant 1: Only 70% of the (remaining) flights are considered in the indicator, i.e. the 15th percentile (percentile 1) is used to determine the shortest duration, the 85th percentile (percentile 2) is used to determine the longest duration Variant 2: Only 60% of the (remaining) flights are considered in the indicator, i.e. the 20th percentile (percentile 1) is used to determine the shortest duration, the 80th percentile (percentile 2) is used to determine the longest duration
Data Requirement	For each flight: OOOI data: gate “out” (AOBT), wheels “off,” wheels “on,” and gate “in” (AIBT) actual times.
Data Feed Providers	Airlines
Formula / Algorithm	At the level of flights with the same flight ID, at monthly or longer (e.g. annual) time aggregation level: 1. Exclude flight IDs not meeting the minimum monthly frequency requirement 2. Sort flights in ascending order of flight (phase) duration 3. Identify shortest (percentile 1) and longest (percentile 2) duration 4. Compute variability: (longest – shortest) / 2 At the more aggregated level: 5. Compute the KPI: weighted average of the individual flight ID variabilities
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • PRC Performance Review Report (EUROCONTROL 2017) • CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

KPI16	Additional fuel burn
Definition	Additional flight time/distance and vertical flight inefficiency converted to estimated additional fuel burn attributable to ATM
Mesurement Units	kg fuel/flight

Operations Measured	Actual IFR flights
Variants	Variant 1 – simple approach: calculation based on the average value other KPIs for groups of flights and corresponding average fuel burn values Variant 2 – advanced approach: calculation based on values computed for individual flights
Objects Characterized	This KPI is a conversion of the additional flight time/distance and vertical flight inefficiency KPIs to a corresponding (estimated) additional fuel consumption; hence it describes a performance characteristic of the same objects as the additional flight time/distance and vertical flight inefficiency KPIs: en-route airspace, terminal airspace and airports. Typically the KPI is published at the level of a State or (sub)region.
Utility of the KPI	This KPI is designed to provide a simple method for estimating ATM-related fuel efficiency at aggregated level, without the need to model fuel burn at the level of individual flights. By adding the average additional fuel burn value of the individual flight phases, a gate-to-gate value is produced which is representative for an "average flight". The KPI is often further converted into additional CO2 emission (for the environment KPA) and/or the monetary value of fuel savings (for the cost effectiveness KPA). The KPI is sometimes called the "benefit pool": it gives an indication of the ATM-induced flight inefficiency that is theoretically actionable by ATM. In practice the actionable "benefit pool" is smaller: real optimum performance is achieved at a residual non-zero value of the KPI.
Parameters	Average fuel flow (kg/min) during taxi Average fuel flow (kg/min) during arrival in terminal airspace Average fuel flow (kg/km) in en-route airspace Average additional fuel flow (kg/FL/km) during cruise due to flying lower
Data Requirement	Indicator values to be converted to estimated additional fuel burn: KPI02 Taxi-Out Additional Time (min/flight) KPI13 Taxi-In Additional Time (min/flight) KPI05 Actual en-Route Extension (%) & average en-route distance flown (km/flight) KPI08 Additional time in terminal airspace (min/flight) KPI17 Level-off during climb KPI18 Level capping during cruise & average cruise (ToC-ToD) distance flown (km/flight) KPI19 Level-off during descent
Data Feed Providers	Performance analysts

Formula / Algorithm	At aggregated level: Compute the KPI: (KPI02 Taxi-Out Additional Time x Average fuel flow during taxi) + (KPI13 Taxi-In Additional Time x Average fuel flow during taxi) + (KPI05 Actual en-Route Extension (%) x Average en-route distance flown x Average fuel flow in en-route airspace) + (KPI08 Additional time in terminal airspace x Average fuel flow during arrival in terminal airspace) + (KPI17 Level-off distance during climb x Average additional fuel flow during climb) + (KPI18 Average number of FL too low x Average distance during cruise x Average additional fuel flow per FL too low during cruise) + (KPI19 Level-off distance during descent x Average additional fuel flow during descent).
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016)

KPI17	Level-off during climb
Definition	Distance and time flown in level flight before Top of Climb.
Mesurement Units	NM/flight and minutes/flight
Operations Measured	Actual IFR flights
Variants	Variant 1: Average distance flown in level flight before Top of Climb Variant 2: Average time flown in level flight before Top of Climb
Objects Characterized	The KPI is typically computed for traffic flows, individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This KPI is intended to give an indication of the amount of level flight during the climb phase. Ideally, there should be no level flight during climbs because level flight results in a higher fuel burn and possibly more noise. Aircraft should reach their cruising altitudes as soon as possible since the fuel consumption is lower at higher altitudes.
Parameters	• Analysis radius: the radius around the analysed airport within which the climb trajectory is analysed (e.g. 200NM). • Vertical speed limit: maximum vertical speed used to detect the start and end of a level segment (e.g. 300 feet/minute). • Level band limit: altitude band within which data points have to stay to be included in a level segment (e.g. 200 feet). • Minimum level time: minimum time duration for a level segment to be considered in the results (e.g. 20 seconds). • Exclusion box percentage: percentage of the Top of Climb altitude which is used to define the lower altitude of the exclusion box (e.g. 90%). E.g. level segments occurring above the lower altitude limit of the exclusion box and longer than the exclusion box time are excluded from the results. • Exclusion box time: a level segment in the exclusion box and longer than the exclusion box time is excluded (e.g. 5 minutes). • Minimum altitude: the altitude where the level segment detection during the climb starts. The trajectory below this altitude is not analysed (e.g. 3000 feet).

Data Requirement	For each flight trajectory: • 4D data points (latitude, longitude, altitude and time) • Departure airport ARP coordinates
Data Feed Providers	Trajectory data providers (reporting archived actual trajectories based on ADS-B and/or other surveillance data sources) and/or ANSPs.
Formula / Algorithm	Level segments in the climb trajectory within the analysis radius are detected using the vertical speed limit and level band limit. The methodology considers a data point as the start of a level segment when the following conditions are met: • the altitude difference with the next data point is less than or equal to the level band limit; and • the vertical speed towards the next data point is less than or equal to the vertical speed limit. The level segment ends when the altitude difference between the altitude of the beginning of the level segment and the altitude of a data point is more than the level band limit or when the vertical speed between two consecutive data points is more than the vertical speed limit.
References & Examples of Use	• Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) • PRC Performance Review Report (EUROCONTROL 2017) • European ANS Performance Data Portal

KPI18	Level capping during cruise
Definition	Flight Level difference between maximum Flight Levels on a measured airport pair and maximum Flight Levels on similar unconstrained airport pairs.
Mesurement Units	Flight Levels/flight
Operations Measured	The cruise phase of IFR flights.
Variants	Variant 1: based on the maximum cruise Flight Level in the last filed flight plans Variant 2: based on the maximum cruise Flight Level of actual trajectories (surveillance data)
Objects Characterized	The KPI is typically computed for traffic flows on individual airport pairs or groups of airport pairs (weighted average).
Utility of the KPI	This KPI is intended to give an indication of the amount of vertical flight inefficiency related to maximum Flight Levels during the cruise phase (level capping). It measures the average Flight Level difference between the maximum Flight Levels of respectively flights on the analysed airport pair and flights on similar unconstrained airport pairs. The KPI is purely based on statistical processing of vertical flight profiles; it does not require any data on operational level capping constraints.

Parameters	• Great Circle Distance (GCD) interval: the width of the ranges of great circle distances (e.g. 10NM). If 10 NM is used, reference distributions are built for airport pairs with a great circle distance in the following ranges: [0NM, 10NM), [10NM, 20NM), [20NM, 30NM)… • Number of reference flights: minimum number of flights in every GCD interval (e.g. 1000 flights). • Percentile interval: the interval between the calculated percentiles of the distributions (e.g. 1 percent). • Excluded flights percentage: percentage of flights excluded from the higher and lower end of the distributions to account for outliers (e.g. 10%).
Data Requirement	For each flight trajectory: • Maximum cruise Flight Level • Departure airport • Arrival airport
Data Feed Providers	For variant 1: ANSPs; For variant 2: Trajectory data providers (reporting archived actual trajectories based on ADS-B and/or other surveillance data sources) and/or ANSPs
Formula / Algorithm	Reference distributions of the maximum Flight Levels of reference flights are built for every GCD interval. Reference flights are flights on airport pairs which have a great circle distance similar to the great circle distance of the analysed airport pair and which have no flight level capping constraints. The reference distributions are then converted into percentiles for every percentile interval. Distributions and percentiles for the analysed airport pair are calculated in the same way. For each percentile interval, the Flight Level value of the airport pair is subtracted from the Flight Level value of the reference. When the airport pair value is higher than the reference value, the result of the subtraction is negative. This might appear as if the flights are more efficient than the reference flights. Nevertheless, the focus is put on finding the inefficiencies, so negative values are set to 0. The result of the percentile interval is then multiplied by the number of flights corresponding to the percentile interval (e.g. if the width of the percentile interval is 1%, the number of flights corresponding to the percentile interval is 1% of the total number of flights on the airport pair). Summing up over all percentile intervals gives the total vertical flight inefficiency (number of Flight Levels summed over all flights). The vertical flight inefficiency per flight value is then calculated by dividing the total vertical flight inefficiency by the number of flights on the considered airport pair. The number of flights for this calculation step is 80% of the total number of flights on the airport pair if the excluded flights percentage is 10% (lowest 10% and highest 10% of the flights are not used). This methodology is done for groups of aircraft types having similar performance to avoid comparing e.g. jet aircraft and turboprop aircraft which have significantly different nominal cruising altitudes.
References & Examples of Use	• PRC Performance Review Report (EUROCONTROL 2017)

KPI19	Level-off during descent
Definition	Distance and time flown in level flight after Top of Descent.
Mesurement Units	NM/flight and minutes/flight

Operations Measured	Actual IFR flights.
Variants	Variant 1: Average distance flown in level flight after Top of Descent Variant 2: Average time flown in level flight after Top of Descent
Objects Characterized	The KPI is typically computed for traffic flows, individual airports, or clusters of airports (selection/grouping based on size and/or geography).
Utility of the KPI	This KPI is intended to give an indication of the amount of level flight during the descent phase. Ideally, there should be no level flight during descents because level flight results in a higher fuel burn and possibly more noise. Ideally, aircraft should be able to descend from Top of Descent until touchdown.
Parameters	• Analysis radius: the radius around the analysed airport within which the descent trajectory is analysed (e.g. 200NM). • Vertical speed limit: maximum vertical speed used to detect the start and end of a level segment (e.g. 300 feet/minute). • Level band limit: altitude band within which data points have to stay to be included in a level segment (e.g. 200 feet). • Minimum level time: minimum time duration for a level segment to be considered in the results (e.g. 20 seconds). • Exclusion box percentage: percentage of the Top of Descent altitude which is used to define the lower altitude of the exclusion box (e.g. 90%). E.g. level segments occurring above the lower altitude limit of the exclusion box and longer than the exclusion box time are excluded from the results. • Exclusion box time: a level segment in the exclusion box and longer than the exclusion box time is excluded (e.g. 5 minutes). • Minimum altitude: the altitude where the level segment detection during the descent ends. The trajectory below this altitude is not analysed (e.g. 1800 feet).
Data Requirement	For each flight trajectory: • 4D data points (latitude, longitude, altitude and time) • Arrival airport ARP coordinates
Data Feed Providers	Trajectory data providers (reporting archived actual trajectories based on ADS-B and/or other surveillance data sources) and/or ANSPs.
Formula / Algorithm	Level segments in the descent trajectory within the analysis radius are detected using the vertical speed limit and level band limit. The methodology considers a data point as the start of a level segment when the following conditions are met: • the altitude difference with the next data point is less than or equal to the level band limit; and • the vertical speed towards the next data point is less than or equal to the vertical speed limit. The level segment ends when the altitude difference between the altitude of the beginning of the level segment and the altitude of a data point is more than the level band limit or when the vertical speed between two consecutive data points is more than the vertical speed limit.

References & Examples of Use	- Comparison of ATM-Related Operational Performance: U.S./Europe (September 2016) - PRC Performance Review Report (EUROCONTROL 2017) - European ANS Performance Data Portal

ICAO GANP PORTAL

ASBU THREADS

Concept of Operation | Elements

Information

AMET	Meteorological information	Information

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Meteorological information provided to support operational efficiency and safety.
Block 0	Global, regional and local meteorological information to support flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.
Block 1	Meteorological information supporting automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.
Block 2	Integrated meteorological information in support of enhanced operational ground and air decision-making processes, particularly in the planning phase and near-term.
Block 3	Integrated meteorological information in support of enhanced operational ground and air decision-making processes, for all flight phases and corresponding air traffic management operations.
Block 4	Integrated meteorological information supporting both air and ground decision making for all phases of flight and ATM operations, especially for implementing immediate weather mitigation strategies.

ELEMENTS

Element ID	Title
AMET-B0/1	Meteorological observations products
AMET-B0/2	Meteorological forecast and warning products
AMET-B0/3	Climatological and historical meteorological products
AMET-B0/4	Dissemination of meteorological products
AMET-B1/1	Meteorological observations information
AMET-B1/2	Meteorological forecast and warning information
AMET-B1/3	Climatological and historical meteorological information
AMET-B1/4	Dissemination of meteorological information

AMET-B2/1 Meteorological observations information

AMET-B2/2 Meteorological forecast and warning information

AMET-B2/3 Climatological and historical meteorological information

AMET-B2/4 Meteorological information service in SWIM

AMET-B3/1 Meteorological observations information

AMET-B3/2 Meteorological forecast and warning information

AMET-B3/3 Climatological and historical meteorological information

AMET-B3/4 Meteorological information service in SWIM

AMET-B4/1 Meteorological observations information

AMET-B4/2 Meteorological forecast and warning information

AMET-B4/3 Climatological and historical meteorological information

AMET-B4/4 Meteorological information service in SWIM

DAIM	Digital Aeronautical Information Management	Information

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Provision of **aeronautical information services** (AIS) is a State responsibility. States provide an Aeronautical Information Service that focuses on making available the following products: Aeronautical Information publication (AIP), Aeronautical Information Circular (AIC), Aeronautical charts, AIP supplements and NOTAMs.
Block 1	Improved aeronautical information based on **enhanced data quality** (accuracy, resolution, integrity, timeliness, traceability, completeness, format) to support Performance-Based Navigation (PBN), airborne computer-based navigation systems and ground automation. In addition, **digital exchange and processing** of aeronautical information allows a more efficient management of information by avoiding reliance on manual processing and manipulation.
Block 2	The exchange of aeronautical information is now based on **service orientation** in accordance with the SWIM concept. **Fully digital aeronautical information** should be the standard and paper aeronautical information should have been abandoned. All airspace users and ANSPs are required to continuously provide and subscribe airspace constraint alerts so that any changes to any constraint are immediately available. **Improvement in the position and time accuracy of the data**. All airspace constraints have an applicability time, including static constraints. Additional aeronautical information is provided in support to network operations. Within this timeframe a considerable amount of traffic in higher and lower airspace is flying. Traditional aeronautical information will be complemented by **new information required to support operations in high airspace or the UAS Traffic Management concept**. A rich dynamic obstacle database is available

for this environment and automated dynamic geo-fence restrictions apply.

ELEMENTS

Element ID	Title
DAIM-B1/1	Provision of quality-assured aeronautical data and information
DAIM-B1/2	Provision of digital Aeronautical Information Publication (AIP) data sets
DAIM-B1/3	Provision of digital terrain data sets
DAIM-B1/4	Provision of digital obstacle data sets
DAIM-B1/5	Provision of digital aerodrome mapping data sets
DAIM-B1/6	Provision of digital instrument flight procedure data sets
DAIM-B1/7	NOTAM improvements
DAIM-B2/1	Dissemination of aeronautical information in a SWIM environment
DAIM-B2/2	Daily Airspace Management information to support flight and flow
DAIM-B2/3	Aeronautical information to support higher airspace operations
DAIM-B2/4	Aeronautical information requirements tailored to UTM
DAIM-B2/5	NOTAM replacement

FICE	Flight and Flow Information for a Collaborative Environment (FF-ICE)	Information

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	The exchange of messages between ATS units is performed manually using the AFTN and/or via voice. Messages are pre-formatted and have a limited number of characters, which results in limitations on the amount of information that can be exchanged. The dependency of manual action for message exchange generates high probability of miscoordination or lack of it.
Block 0	To improve coordination between air traffic service units (ATSUs) by using ATS interfacility flight data communication. The benefit is the improved efficiency through digital transfer of flight data.
Block 2	Provide the flight information management basis for initial TBO. Implement collaborative coordination and maintenance of advanced flight information for planning, re-planning and ATFM. ATFM considers operator flight preferences. Capacity and demand balancing improvement (better capacity utilization) due to timely and accurate flight information. Mechanisms are in place to support the exchange and synchronization of intent suitable for planning flights pre-departure and in execution. Mechanisms to support ATFM including the update of existing exchange models and/or development of new exchange models for exchange of ATFM initiatives and weather impacts on flight operations. It also includes variations to support new types of operations at the higher and lowest airspace, not used by today’s commercial air traffic.
Block 3	Trajectory management integrated with tactical ATC operations. Mechanisms support the synchronization

of intent across applications supporting planning through tactical ATC operations (e.g., separation provision and tactical RSEQ processes). ANSP-to-ANSP coordination processes become trajectory-based providing more seamless boundaries. Information models support the application of dynamic airspace constraints allowing their interaction with the trajectory to be managed strategically or tactically, as appropriate.

Block 4	• End-to-end trajectory management to support flight trajectories transition to high density airspace or airports (supports their time -based TS, RSEQ and NOPS). • Full FF-ICE which includes multi-ANSP full flight information exchange system and operational agreements.

ELEMENTS

Element ID	Title
FICE-B0/1	Automated basic inter facility data exchange (AIDC)
FICE-B2/1	Planning Service
FICE-B2/2	Filing Service
FICE-B2/3	Trial Service
FICE-B2/4	Flight Data Request Service
FICE-B2/5	Notification Service
FICE-B2/6	Publication Service
FICE-B2/7	Flight information management service for higher airspace operations
FICE-B2/8	Flight information management service for low-altitude operations
FICE-B2/9	Flight information management support for inflight re-planning
FICE-B3/1	Flight information management services for enhanced trajectory operations
FICE-B4/1	Integrated flight information management system for end-to-end global flight planning
FICE-B4/2	Real-Time Participation of operators in flight information

SWIM	System Wide Information Management	Information

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Prior to SWIM, store-and-forward based exchange of information is being used between ATM stakeholders (ANSP, airspace users, airport, etc) relying on point-to-point connectivity and protocols using pre-defined messages.
Block 2	**System Wide Information Management (SWIM)** is a new way for managing and exchanging information. It replaces the current ground-ground point-to-point information exchange by an **aviation intranet** relying on internet technologies enabling **information services** to be provided to the ATM community. In order to facilitate publish/subscribe and request/reply based information exchange through

standardised information services, provisions for the information service content and service overview are defined and appropriate SWIM governance established.

In addition, **Air/Ground (A/G) System Wide Information Management** is a capability that enables improved operational awareness and decision making by flight crews by exchanging information with the aircraft and its automation systems. A/G SWIM makes the **aircraft** a **node** in the network and supports the exchange of information such as trajectories, aeronautical, meteorological, and flight and flow information between ground based ATM components and the flight deck. As a first step, A/G SWIM is supporting the exchange of **non-safety-critical information**.

SWIM governance ensures interoperability for global access to SWIM information by the ATM community.

This thread is an enabler to support all operational improvements that require information.

Block 3	**A/G SWIM** will become available for the exchange of **safety critical information** between ground ATM components and the aircraft.

ELEMENTS

Element ID	Title
SWIM-B2/1	Information service provision
SWIM-B2/2	Information service consumption
SWIM-B2/3	SWIM registry
SWIM-B2/4	Air/Ground SWIM for non-safety critical information
SWIM-B2/5	Global SWIM processes
SWIM-B3/1	Air/Ground SWIM for safety critical information

Operational

ACAS	Airborne Collision Avoidance System (ACAS)	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Airborne collision avoidance system (ACAS) is the last resort safety net for pilots. Although ACAS is independent from the means of separation provision, ACAS is part of the ATM system. ACAS is subject to global mandatory carriage for airplanes with a maximum certificated take-off mass greater than 5.7 tons.
Block 1	The traffic alert and collision avoidance system (TCAS) version 7.1 provides short-term improvements to existing airborne collision avoidance systems (ACAS) to reduce nuisance alerts as well as enhancing the logic for some geometries (i.e., Uberlinghen accident). This will reduce trajectory deviations and increase safety in cases where there is a breakdown of separation.
Block 2	Implementation of a new airborne collision avoidance system will support more efficient operations and

airspace procedures while complying with safety regulations. Fewer “nuisance alerts” will reduce pilot and controller workload as personnel spend less time responding to such alerts, increasing safety. Remotely-Piloted Aircraft Systems (RPAS) will be provided with a new collision avoidance function.

ELEMENTS

Element ID	Title
ACAS-B1/1	ACAS Improvements
ACAS-B2/1	New collision avoidance system
ACAS-B2/2	New collision avoidance capability as part of an overall detect and avoid system for RPAS

ACDM	Airport Collaborative Decision Making	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	All stakeholders involved in aerodrome operations have their own processes that are conducted as efficiently as possible. However, there is not enough effective information sharing among them. Some basic coordination between ATC and ramp control (which may also be provided by ATC) exists. The aerodromes operate in isolation from the ATM network and aircraft operators manage their operations independently from each other.
Block 0	Aerodrome operators, aircraft operators, air traffic controllers, ground handling agents, pilots and air traffic flow managers share live information that may be dynamic, in order to make better and coordinated decisions. This applies notably in day to day operations and also in case of severe weather conditions or in case of emergencies of all kinds; for these cases A-CDM procedures are referred to in the snow plan, the aerodrome emergency response plan and the aerodrome manual. In some cases, aerodromes are connected to the ATM network via the ATFM function or to ATC through data exchange.
Block 1	Aerodromes are integrated within the ATM Network, from the strategic through all tactical phases. Situational awareness and decision support information is made available to affected stakeholders to establish a common understanding of the various needs and capabilities and make adjustments to assets in order to cope with these needs. Support mechanisms include an Airport Operations Planning (AOP) and an Airport Operations Centre (APOC).
Block 2	Planning and management of airport operations is enhanced through Total Airport Management (TAM), meaning that passenger terminal management is fully integrated with “traditional” A-CDM in order to optimise aerodrome operations and passenger management. Tools and decision support information supporting landside management are made available and interfaced with Airport Operations Centre.
Block 3	All stakeholders are fully connected. All tactical decisions are synchronized and operations are managed by trajectory. All ground processes including aircraft turnaround operations and the landside processes are agreed on the en-route to en-route view of flight operations. Expected ground event times are managed with known impacts to the ATM system, to ensure that the agreed trajectory is consistent with the Airport Operations Plan.

ELEMENTS

Element ID	Title
ACDM-B0/1	Airport CDM Information Sharing (ACIS)
ACDM-B0/2	Integration with ATM Network function
ACDM-B1/1	Airport Operations Plan (AOP)
ACDM-B1/2	Airport Operations Centre (APOC)
ACDM-B2/1	Total Airport Management (TAM)
ACDM-B3/1	Full integration of ACDM and TAM in TBO

APTA	Improve arrival and departure operations	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block Description

Baseline **Terminal Area Arrival and Departure Procedures**

Where implemented, standard terminal arrival procedures (STARs) provide a defined lateral path for arriving aircraft to connect to the approach. Similarly, Standard Instrument Departure procedures (SIDS), where implemented, provide a lateral path for aircraft to depart the terminal area after take-off. These terminal procedures enable more efficient terminal airspace management.

Approach Procedures

Aircraft with appropriate equipment are capable of flying instrument approaches promulgated as Instrument Approach Procedures, including ILS and RNP APCH. (Prior to the PBN Manual, the RNP APCH approaches were known as GPS or GNSS Approaches). Approach minima are operationally derived from the procedure design, aircraft type and equipage, and supporting ground infrastructure. PBN procedures may be implemented alone or can be added with existing conventional procedures.

Since GNSS can support PBN procedures independent of ground based navigation infrastructure, it is a foundational building block that can enable implementation of PBN to improve arrival, departure and approach operations globally.

Block 0 **Terminal Area Arrival and Departure Procedures**

Procedures implemented as STARS in terminal airspace provide lateral path guidance to support improving the efficiency in the descent phase of flight by enabling near idle power operations from top of descent, to a point where the aircraft transitions to approach operations. For takeoff, SIDS provide a lateral path that can support continuous climb operations to the top of climb where the cruise phase of flight starts.

Enhanced STARS and SIDS with altitude constraints along the lateral path improve ATC management, and further support operational efficiency by providing vertical profiles that all aircraft can follow.

Approach Procedures

Performance based aerodrome operating minima (PB AOM) allows for implementation of vertically guided approaches at a wider range of aerodromes, and facilitates a phased approach to improvement in approach capabilities. Advanced aircraft with technology such as Enhanced Vision Systems (EVS) benefit from operational credits to continue operations below normal minima.

Helicopter Point in Space procedures allow for access to landing locations other than heliports.

Block 1 **Terminal Area Arrival and Departure Procedures**

Improvement in airspace management is brought by the utilization of advanced capabilities such as standardized Baro-VNAV functionality and scalable RNP. These optimise descent phase and terminal airspace by providing vertical descent and climb corridors in combination with more precise lateral paths in the terminal area. Such advanced capabilities will reduce the amount of protected airspace vertically and laterally which will enhance the efficiency and flexibility of the terminal airspace design, allowing for optimum arrival and departure operations. These enhancements build on the achievements developed in Block 0.

Approach Procedures

Further development of the PB AOM concept includes more options such as synthetic vision guidance systems (SVGS).

Block 2 **Approach Procedures**

Development of GBAS Cat II/III approaches allows for an alternative precision approach landing system to be used in low visibility operations.

ELEMENTS

Element ID	Title
APTA-B0/1	PBN Approaches (with basic capabilities)
APTA-B0/2	PBN SID and STAR procedures (with basic capabilities)
APTA-B0/3	SBAS/GBAS CAT I precision approach procedures
APTA-B0/4	CDO (Basic)
APTA-B0/5	CCO (Basic)
APTA-B0/6	PBN Helicopter Point in Space (PinS) Operations
APTA-B0/7	Performance based aerodrome operating minima – Advanced aircraft
APTA-B0/8	Performance based aerodrome operating minima – Basic aircraft
APTA-B1/1	PBN Approaches (with advanced capabilities)
APTA-B1/2	PBN SID and STAR procedures (with advanced capabilities)
APTA-B1/3	Performance based aerodrome operating minima – Advanced aircraft with SVGS
APTA-B1/4	CDO (Advanced)
APTA-B1/5	CCO (Advanced)
APTA-B2/1	GBAS CAT II/III precision approach procedures
APTA-B2/2	Simultaneous operations to parallel runways
APTA-B2/3	PBN Helicopter Steep Approach Operations

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Block 1	Enhanced traffic situational awareness and quicker visual acquisition of targets through basic airborne situational awareness during flight operations and visual separation on approach are enabled by the evolutions of ADS-B IN capabilities and associated applications. In oceanic airspace, the use of Performance Based Longitudinal Separation minima and Performance Based Lateral Separation minima will enable the optimisation of trajectories.
Block 2	The Interval Management (IM) procedure using distance or time wil be implemented to improve traffic flow and aircraft spacing. Within this timeframe a considerable amount of traffic in high upper and lower airspace is flying. In the lower airspace, UTM separation rules apply based on vehicle to vehicle interaction. In the high upper airspace separation is provided strategically through sharing of operators business and mission trajectories.
Block 3	The Interval Management (IM) procedure will be gradually implemented in more complex geometries including departures thanks to upgrades of airborne functionalities and performance based surveillance. UAS/RPAS will use an airborne functionality to remain well clear from traffic in all phases of flight, even in uncontrolled airspace.
Block 4	Use of airborne conflict detection and resolution to achieve own separation from traffic designated by ATC to enable more efficient flight profile while reducing ATCO workload… At this point in time, there is enough accurate and timely information so that all constraints (static, dynamic, vehicles or obstacles) are separated from each other and are described as spatial temporal volumes with trajectories. The use of the information allows for performance based separation. This means that the separation is provided based on the performance requirements on time and position of all constraints in the airspace.

ELEMENTS

Element ID	Title
CSEP-B1/1	Basic airborne situational awareness during flight operations (AIRB)
CSEP-B1/2	Visual Separation on Approach (VSA)
CSEP-B1/3	Performance Based Longitudinal Separation Minima
CSEP-B1/4	Performance Based Lateral Separation Minima
CSEP-B2/1	Interval Management (IM) Procedure
CSEP-B2/2	Cooperative separation at low altitudes
CSEP-B2/3	Cooperative separation at higher airspace
CSEP-B3/1	Interval Management (IM) Procedure with complex geometries
CSEP-B3/2	Remain Well Clear (RWC) functionality for UAS/RPAS
CSEP-B4/1	Airborne separation

FRTO	Improved operations through enhanced en-route trajectories	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	En-route trajectories are constrained by the fixed route network, permanently segregated areas, conventional navigation or limited use of area navigation (RNAV), rigid allocation of airspace between civil and military authorities, and rigid sector configurations. Conflict detection is a manual task, performed on the basis of paper/electronic flight strips.
Block 0	En-route trajectories are enhanced by using more direct routings, and collaborative airspace management process and tools. ATCOs are assisted by tools for the conflict identification and conformance monitoring.
Block 1	Block 1 introduces the initial steps towards trajectory-based operations by the enhancement of FRTO B0 processes and system support or the deployment of new processes and system support where necessary. In continental airspace, the most important operational improvement is related to Free Route Airspace (FRA) as the continuation of direct routing introduced in FRTO B0. For airspace where FRA cannot be deployed, or for connectivity between FRA and terminal manoeuvring areas (TMAs), RNP routes might be considered. Collaborative airspace management is enhanced with new features such as real time airspace management (ASM) data exchanges. Additional system capabilities such as dynamic sectorization intend to align the traffic demand to the available capacity.
Block 2	Block 2 includes further steps towards trajectory-based operations by the enhancement of FRTO B1 processes and system support or the deployment of new processes and system support where necessary applicable to both continental and oceanic airspace where trajectory type operations are common. The most important operational improvement is related to the large scale cross border Free Route Airspace (FRA) as the continuation of FRTO B1. Large scale FRA (e.g. Continental operations) are envisaged to be widely deployed, except where structure provides for efficient performance-based routings into and out of high density airspace. There is a need ensure a smooth transition between FRA and highly structured airspace based on Dynamic Airspace Configuration (DAC) principles. There is a need for more dynamic, accurate and precise information on constraints allowing the FRA extension and accommodation of different business trajectories. All trajectories, planned and submitted/shared, are consistent with constraints and associated avoidance measures. This will be supported by Enhanced Collaborative Decision Making (ECDM) processes in the execution phase, enabling optimisation of trajectories in real time. Airspace user's participation in the ECDM will be extended to a higher level of integration between the decision support tools and it will be a major factor for the harmonisation of the competing goals. One of most important tools to support the ECDM concept is the integration of ATFM and ATC planning by bridging the gap between conventional ATFM planning and conventional sector based ATC planning, maintaining the autonomy and certain level of flexibility of ATC for separation management. The local components of integrated ATFM/ATC planning function are addressed by FRTO B2. Dynamic Sector Management will evolve into Dynamic Airspace Configuration (DAC), capable of accomodating traffic demand and air traffic flows in real time. DAC will be mainly executed at a network level, FRTO elements cover: the local DAC components to be provided as inputs (ATC sectorisation, airspace structure, and restrictions), the application of dynamic airspace configuration identified at a network Level and the local adaptation and fine-tuning of DAC according to local ATC needs. This

capability will be based on the Network Operations Plan, which will evolve and allow for airspace adaptations at a local level, always taking into account the overall network effect of these changes. In addition, new ATC working methods will be established (like Flight Centric ATC), in order to optimise ATCO workload in this dynamic environment which is not necessarily based on geographical sectors but rather on distribution of logical flows and individual trajectories.

Any airspace user, including manoeuvrable new entrants, operating at regular airspace will follow the same rules and procedures. If they are not manoeuvrable then they will become a dynamic type of restriction.

Within this timeframe a considerable amount of traffic in high upper and lower airspace is flying. These operating environments will be free routing and any new proposal or change to any existing trajectory should be strategically de-conflicted from constraints. Seamless airspace and operations between ATSUs with interoperable ATC tools and systems are envisaged. The tools and system should include at least:

- Enhanced conflict and complexity resolution tools taking into account the network
- Associated trajectory optimisation processes;
- Tools for trajectory coordination, revision and execution.

ELEMENTS

Element ID	Title
FRTO-B0/1	Direct routing (DCT)
FRTO-B0/2	Airspace planning and Flexible Use of Airspace (FUA)
FRTO-B0/3	Pre-validated and coordinated ATS routes to support flight and flow
FRTO-B0/4	Basic conflict detection and conformance monitoring
FRTO-B1/1	Free Route Airspace (FRA)
FRTO-B1/2	Required Navigation Performance (RNP) routes
FRTO-B1/3	Advanced Flexible Use of Airspace (FUA) and management of real time airspace data
FRTO-B1/4	Dynamic sectorization
FRTO-B1/5	Enhanced Conflict Detection Tools and Conformance Monitoring
FRTO-B1/6	Multi-Sector Planning
FRTO-B1/7	Trajectory Options Set (TOS)
FRTO-B2/1	Local components of integrated ATFM and ATC Planning function (INAP)
FRTO-B2/2	Local components of Dynamic Airspace Configurations (DAC)
FRTO-B2/3	Large Scale Cross Border Free Route Airspace (FRA)
FRTO-B2/4	Enhanced Conflict Resolution Tools

GADS	Global Aeronautical Distress and Safety System (GADSS)	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Air Traffic Service Unit (ATSU) Alerting Service. ATSUs provide an alerting service according to ICAO Annex 11. ATSU's have the responsibility to assess and set the emergengy phases and notify and coordinate with the relevant search and rescue (SAR) authorities, aircraft operators and adjacent ATSUs. Rescue Coordination Centres (RCCs) to operate in accordance with Annex 12.
Block 1	In oceanic areas without automatic surveillance, ATSU Alerting Service is supported with aircraft tracking capability implemented by the aircraft operator. Point of Contact (PoC) information is provided to facilitate establishing contact between relevant Stakeholders in emergency situations.
Block 2	Addition of capabilities to identify and share the location of aircraft in distress, to guide SAR services to the distress site and to recover Flight Data.

ELEMENTS

Element ID	Title
GADS-B1/1	Aircraft Tracking
GADS-B1/2	Contact directory service
GADS-B2/1	Autonomous Distress Tracking
GADS-B2/2	Distress tracking information management
GADS-B2/3	Post Flight Localization
GADS-B2/4	Flight Data Recovery

NOPS	Network Operations	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block Description

Block 0 The Air Traffic Flow Management (ATFM) is used to manage the flow of traffic in a way that minimizes delay and optimises the use of the entire airspace and available capacity. The management of airspace starts to be integrated with the management of the traffic flows. Some main processes are automated, however substantial procedural support is still required to balance demand with available capacity. Collaborative ATFM can manage traffic flows by:

- smoothing flows and managing rates of sector entry;
- re-route traffic to avoid flow constraint areas;
- level capping;
- collaborative airspace management;
- ATFM slot management including departure information planning;
- adjust flow measures by use of enhanced collaborative flight planning and enhanced tactical flow management.

Block 1 Many AFTM processes are automated, while some elements are still managed procedurally. This module introduces enhanced processes to manage flows or groups of flights in order to improve overall fluidity. It refines ATFM techniques, integrates the management of airspace and traffic flows through a holistic network operational planning dynamic/rolling process in order to achieve greater efficiency and enhance network performance. It also increases the collaboration among stakeholders in real time so as to better know the Airspace Users preferences, to inform on system capabilities and ATC capacity and further enhance Collaborative Decision Making (CDM) to address specific issues/circumstances, including Airspace Users flight prioritisation input as regards ATFM measures.

Airports operations planning starts to be integrated in the network operations planning.

ATFM includes the following main features:

- management of occupancy counts and application of ATFM measures;
- management of arrival/ overfly times (TTA/TTOs);
- enhanced Network Operation Planning;
- enhanced ATFM slot management;
- integration of network planning and airport planning;
- dynamic/rolling airspace management process;
- management of dynamic airspace configurations;
- complexity management;
- ATFM contribution to the extended Arrival Management.

Block 2 ATFM evolves to support Trajectory Based Operations (TBO). There will be an improved Trajectory Forecast based on the qualification and quantification of uncertainties, probabilistic approaches, and enriched en-route and airport information sharing.

Enhanced Demand and Capacity Balancing (DCB) provides capabilities which create a paradigm shift with all stakeholders expressing dynamically and precisely their needs which have to be accommodated within an agreed performance framework.

The Collaborative Network Operations Planning will be further enhanced.

Initial steps towards Airspace Users' driven priorities and the extended airports integration with the ATM Network Planning are envisaged.

Within this timeframe a considerable amount of traffic in high upper and lower airspace is flying. Due to the characteristics of this traffic, the principles of block 4 network operations are exhibited at higher airspace and within the UTM airspace.

Block 3 ATFM further supports trajectory based operations (TBO) based on the use of the more precise information provided by the different nodes of the air navigation system (aircraft becomes a node of information). All vehicles participate in intent sharing and airspace intent network is in place).

Collaborative Network Operations becomes cooperation in network operations. This means providing optimal flow planning for pre-flight and active flight trajectories that will be impacted by another network operational region supported by common procedures and exchanges.

Block 4 ATFM shifts from trajectory management to airspace constraints management. The availability of more timely accurate information allows for a shift on the provision of DCB, capacity accommodates demand and not vice versa therefore airspace users plan and execute their own business and mission trajectories based on real time management of the constraints by the ANSPs.

ELEMENTS

Element ID	Title

NOPS-B0/1 Initial integration of collaborative airspace management with air traffic flow management

NOPS-B0/2 Collaborative Network Flight Updates

NOPS-B0/3 Network Operation Planning basic features

NOPS-B0/4 Initial Airport/ATFM slots and A-CDM Network Interface

NOPS-B0/5 Dynamic ATFM slot allocation

NOPS-B1/1 Short Term ATFM measures

NOPS-B1/2 Enhanced Network Operations Planning

NOPS-B1/3 Enhanced integration of Airport operations planning with network operations planning

NOPS-B1/4 Dynamic Traffic Complexity Management

NOPS-B1/5 Full integration of airspace management with air traffic flow management

NOPS-B1/6 Initial Dynamic Airspace configurations

NOPS-B1/7 Enhanced ATFM slot swapping

NOPS-B1/8 Extended Arrival Management supported by the ATM Network function

NOPS-B1/9 Target Times for ATFM purposes

NOPS-B1/10 Collaborative Trajectory Options Program (CTOP)

NOPS-B2/1 Optimised ATM Network Services in the initial TBO context

NOPS-B2/2 Enhanced dynamic airspace configuration

NOPS-B2/3 Collaborative Network Operation Planning

NOPS-B2/4 Multi ATFM slot swapping and Airspace Users priorities

NOPS-B2/5 Further airport integration within Network Operation Planning

NOPS-B2/6 ATFM adapted for cross-border Free Route Airspace (FRA)

NOPS-B2/7 UTM Network operations

NOPS-B2/8 High upper airspace network operations

NOPS-B3/1 ATM Network Services in full TBO context

NOPS-B3/2 Cooperative Network Operations Planning

NOPS-B3/3 Innovative airspace architecture

OPFL	Improved access to optimum flight levels in oceanic and remote airspace	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block Description

Block 0 Use of in trail procedure (ITP) enables equipped aircraft to change flight levels through otherwise blocking

Block	Description
Block 0	Use of in-trail procedure (ITP) enables equipped aircraft to change flight levels through otherwise blocking traffic for the purpose of flight efficiency or to avoid turbulence.
Block 1	Use of ADS-Bthe in-trail procedure (ITP) IN technologyprocedures enables equipped aircraft to change flight levels through otherwise blocking traffic for the purpose of flight efficiency or to avoid turbulence.
Block 2	Lateral offsets climb and descend within standard separation buffer. Supports Free-Routing by providing tactical maneuvering accommodation to support cruise climb/descent (e.g. flight deck supported procedures for climbs/descends according to the sep minima). No difference between oceanic or continental airspace is made at this point.

ELEMENTS

Element ID	Title
OPFL-B0/1	In Trail Procedure (ITP)
OPFL-B1/1	Climb and Descend Procedure (CDP)

RATS	Remote Aerodrome Air Traffic Services	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Aerodrome ATS are provided by an on-site tower.
Block 1	Aerodrome ATS may be provided from a facility other than an on-site tower, this ‘remote’ facility could be physically located at the aerodrome or at a distant location.

ELEMENTS

Element ID	Title
RATS-B1/1	Remotely Operated Aerodrome Air Traffic Services

RSEQ	Improved traffic flow through runway sequencing	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Air traffic controllers use local and manual procedures and their expertise to sequence departures or arrivals in real time. This is generally leading to sub-optimal solutions both for the realized sequence and the flight efficiency, especially in terms of taxi times and ground holding for departures, and in terms of holding for arrivals. In some cases, user preference is addressed through airspace user access to pre-departure arrival time booking and swapping system integrated with arrival management process.
Block 0	Arriving flights are “metered” and sequenced by arrival ATC based on inbound traffic predication information, optimizing runway utilization. Also departures are sequenced allowing improved start/push-

Block	Description
	back clearances, reducing the taxi time and ground holding, delivering more efficient departure sequences and reduce surface congestion.
Block 1	Extension of arrival metering and integration of surface management with departure sequencing to improve runway management.
Block 2	Integrated arrival management and departure management to enable dynamic scheduling and runway configuration to better accommodate arrival/departure patterns and integrate arrival and departure management. In addition, integrated arrival management and departure management expands scope from single airport operations to take into account multiple airports within the same terminal airspace.
Block 3	Extended metering within an integrated AMAN, SMAN and DMAN environment to enable dynamic scheduling and support network operations based on full FF-ICE which includes multi-ANSP. Flight information exchange system and operational agreements. Transition operations, including approach and departure to and from runways is supported by automation that runs time based separation to the threshold with display characteristics to support the operations. By this timeframe, full time-based management across merge points, departure and arrival airports is in place.
Block 4	The increase in the use of accurate time and position constraints allows a shift from traffic synchronization managed by the ANSP setting target times to fulfilling the business and mission trajectory target time at the runway.

ELEMENTS

Element ID	Title
RSEQ-B0/1	Arrival Management
RSEQ-B0/2	Departure Management
RSEQ-B0/3	Point merge
RSEQ-B1/1	Extended arrival metering
RSEQ-B2/1	Integration of arrival and departure management
RSEQ-B2/2	Arrival management in terminal airspace with multiple airports
RSEQ-B3/1	Departure management in terminal airspace from multiple airports
RSEQ-B3/2	Extended arrival management supporting overlapping operations into multiple airports
RSEQ-B3/3	Increased utilization of runway capacity by improved real-time runway scheduling
RSEQ-B3/4	Improved operator fleet management in runway sequencing

SNET	Ground-based Safety Nets	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Block 0	Ground Based Safety Nets are an integral part of the ATM system using primarily ATS surveillance data with warning times of up to two minutes. Upon receiving an alert, air traffic controllers are expected to immediately assess the situation and take appropriate action if necessary.

Block	Description
	The goal of current Ground Based Safety Nets is collision avoidance, or the avoidance of collision with terrain or obstacles, or to warn the controllers of the unauthorized penetration of an airspace. Alerts from short- term conflict alert (STCA), area proximity warnings (APW), minimum safe altitude warnings (MSAW) and approach path monitoring (APM) are proposed. Ground-Based Safety Nets do not change the way air traffic controllers perform their work and have no influence on the calculation of the sector capacity.
Block 1	Technological advantages will bring new opportunities, including the possibility to develop new or enhanced Ground-Based Safety Nets. But these advantages shall not compromise the robustness and the safety performance of the Safety Nets in operation. Thanks to ADS-B and Mode S Enhanced Surveillance, ground based safety nets can be provided with airborne data enabling performance improvements (less nuisance alerts, earlier positive alerts). However, a very important point is the compatibility of STCA with airborne safety nets. In particular, the compatibility between STCA and ACAS needs constant improvement whilst maintaining their independence.

ELEMENTS

Element ID	Title
SNET-B0/1	Short Term Conflict Alert (STCA)
SNET-B0/2	Minimum Safe Altitude Warning (MSAW)
SNET-B0/3	Area Proximity Warning (APW)
SNET-B0/4	Approach Path Monitoring (APM)
SNET-B1/1	Enhanced STCA with aircraft parameters
SNET-B1/2	Enhanced STCA in complex TMAs

SURF	Surface operations	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Traditional surface movement guidance and control system (SMGCS) implementation (visual surveillance, aerodrome signage, lighting and markings). Surface operations are comprising all operations on the platform including those dedicated to airport maintenance functions.
Block 0	This module aims to enhance the situational awareness of Air Traffic Controllers and pilots during ground operations by the provision of the aerodrome surface situation on their respective displays being A-SMGCS for the controller or electronic maps in the cockpit. Some initial alerting services for prevention of runway incursions are proposed to the controller.
Block 1	Using capabilities offered by enhanced surveillance of the surface and new capabilities to support traffic management during ground operations, additional assistance is provided to aerodrome controllers and pilots by enhancement of alerting services and improved vision of the situation on the surface. The improved management of taxi times through improved routing services allow to gain predictability and

performance to support runway sequencing.

Block 2	Full situational awareness is provided to all actors including vehicle drivers. Small UAS operating airport specific functions (e.g. runway inspection, calibration, inspections, …) are integrated in A-SMGCS. Enhanced vision systems allow to perform optimum surface management in Low Visibility Conditions. Complete predictability and efficiency of ground operations at all conditions contribute to trajectory-based operations.
Block 3	The complete and reliable knowledge of ground traffic with associated data and information allow for development of automation and optimization of Surface Traffic Management in complex situation. The performance of the management of the Surface can be anticipated and computed. It is supporting as such full synchronization of tactical decisions and full trajectory-based operations. RPAS are part of the traffic.

ELEMENTS

Element ID	Title
SURF-B0/1	Basic ATCO tools to manage traffic during ground operations
SURF-B0/2	Comprehensive situational awareness of surface operations
SURF-B0/3	Initial ATCO alerting service for surface operations
SURF-B1/1	Advanced features using visual aids to support traffic management during ground operations
SURF-B1/2	Comprehensive pilot situational awareness on the airport surface
SURF-B1/3	Enhanced ATCO alerting service for surface operations
SURF-B1/4	Routing service to support ATCO surface operations management
SURF-B1/5	Enhanced vision systems for taxi operations
SURF-B2/1	Enhanced surface guidance for pilots and vehicle drivers
SURF-B2/2	Comprehensive vehicle driver situational awareness on the airport surface
SURF-B2/3	Conflict alerting for pilots for runway operations
SURF-B3/1	Optimization of surface traffic management in complex situations

TBO	Trajectory-based operations	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Block 0	Introduction of time-based management within a flow centric approach.
Block 1	Initial Integration of time-based decision making processes.
Block 2	Pre-departure trajectory synchronization within a flight centric and network performance approach. Extended time-based management across multiple FIRs for active flight synchronization.
Block 3	Network performance on demand synchronization of trajectory-based operations.

Block 4	Total airspace management performance system.

ELEMENTS

Element ID	Title
TBO-B0/1	Introduction of time-based management within a flow centric approach.
TBO-B1/1	Initial Integration of time-based decision making processes
TBO-B2/1	Pre-departure trajectory synchronization within a flight centric and network performance approach
TBO-B2/2	Extended time-based management across multiple FIRs for active flight synchronization
TBO-B3/1	Network based on-demand synchronization of trajectory based operations
TBO-B4/1	Total airspace management performance system

WAKE	Wake Turbulence Separation	Operational

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Wake turbulence separation minima applied to IFR flights is provided based PANS ATM DOC.4444 **three** aircraft wake turbulence **categories** (heavy, medium and light). The wake turbulence separation does not apply to VFR flights neither to IFR flights executing visual approach when the aircraft has reported having the preceding aircraft in sight although the ATC unit concerned will issue a caution of possible wake turbulence when appropriate.
Block 1	Wake turbulence separation applied to IFR flights is provided based on **7 groupings** of aircraft wake turbulence. In airports with **parallel runways** with runway centre lines spaced less than 760m (2500 ft) apart, under certain wind conditions, wake turbulence separation can be reduced on dependent parallel approaches or wake turbulence independent departures. **Independent segregated parallel operations** can be undertaken.
Block 2	Wake turbulence separation applied to IFR flights is provided based on leader/follower static pair-wise wake separations delivered either through a tailored **7 (or more) groups** of aircraft or a decision support tool referring to an **aircraft pairwise** separation matrix . In airports with **parallel runways** with runway centre lines spaced less than 760m (2500 ft.) apart, under monitored wind conditions, wake turbulence separation can be reduced on dependent parallel approaches or wake turbulence independent departures. **Independent segregated parallel operations** can be realised, based on static pair-wise wake separations.
Block 3	Wake turbulence separation applied to IFR flights is provided based on a **time based** leader/follower time based **pair-wise** wake separations delivered through a decision support tool referring to an aircraft pairwise separation matrix.

In airports with **parallel runways** with runway centre lines spaced less than 760m (2500 ft.) apart, under monitored wind conditions, wake turbulence separation can be further reduced on dependent parallel approaches or wake turbulence independent departures using time based separation minima.

Wake separation minima on **independent segregated parallel** runway operations can be further reduced, based on pair-wise time based wake separations.

ELEMENTS

Element ID	Title
WAKE-B2/1	Wake turbulence separation minima based on 7 aircraft groups
WAKE-B2/2	Dependent parallel approaches
WAKE-B2/3	Independent segregated parallel operations
WAKE-B2/4	Wake turbulence separation minima based on leader/follower static pairs-wise
WAKE-B2/5	Enhanced dependent parallel approaches
WAKE-B2/6	Enhanced independent segregated parallel operations
WAKE-B2/7	Time based wake separation minima for arrival based on leader/follower static pair-wise
WAKE-B2/8	Time based wake separation minima for departure based on leader/follower static pair-wise
WAKE-B3/1	Time based dependent parallel approaches
WAKE-B3/2	Time based independent segregated parallel operations
WAKE-B4/1	En-route Wake Encounter Ground based Prediction
WAKE-B4/2	En-Route Wake Encounter on-board flight management/mitigation

CNS technology and services

ASUR Surveillance systems Technology

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Aircraft surveillance is accomplished through the use of non cooperative and cooperative surveillance radar. Non cooperative surveillance radar derives aircraft position based on radar echo returns. Cooperative surveillance radar is used to transmit and receive aircraft data for barometric altitude, identification code. However, non cooperative and cooperative surveillance radars cannot be easily sited in oceanic locations, or rough terrain such as in mountainous regions, and have a heavy reliance on mechanical components with large maintenance requirements.
Block 0	Surveillance is provided supported by new technologies such as ADS-B OUT and wide area multilateration (MLAT) systems. These capabilities will be used in various ATM services, e.g., traffic information, search and rescue, and separation provision. ADS-B OUT and MLAT systems complement

	existing cooperative surveillance radar and may be deployed independently or together. Depending on local airspace needs, ADS-B or MLAT may replace cooperative radar.
Block 1	ADS-B surveillance is provided using receivers on spacecraft, allowing improved options for surveillance in oceanic and remotes areas.
Block 2	The evolution of ADS-B and transponder avionics provides new aircraft/atmospheric information to support ANSP and vehicle-to-vehicle applications. New community and internet-based surveillance system to track airborne vehicles at low altitudes and/or high altitudes. Performance-based surveillance framework is provided for ANSP services. Within this timeframe, vehicle identities/positions/velocities may be shared using the internet. Automated dependent surveillance broadcast vehicle-to-vehicle potentially is provided in a different spectrum in lower airspace for small RPA operations.
Block 3	All aircraft identities/positions/velocities are provided/shared by the operator using an aviation network. A performance-based surveillance framework allows ANSPs to determine the most effective blend of surveillance methods. Cooperative surveillance is expected to be the principal means of surveillance and is typically provided by ADS-B and MLAT systems; rotating radars will be replaced at end-of-life where appropriate. New passive non-cooperative surveillance techniques available to provide such services at lower cost.

ELEMENTS

Element ID	Title
ASUR-B0/1	Automatic Dependent Surveillance – Broadcast (ADS-B)
ASUR-B0/2	Multilateration cooperative surveillance systems (MLAT)
ASUR-B0/3	Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)
ASUR-B1/1	Reception of aircraft ADS-B signals from space (SB ADS-B)
ASUR-B2/1	Evolution of ADS-B and Mode S
ASUR-B2/2	New community based surveillance system for airborne aircraft (low and higher airspace)
ASUR-B3/1	New non-cooperative surveillance system for airborne aircraft (medium altitudes)
ASUR-B4/1	Further evolution of ADS-B and MLAT

COMI Communication infrastructure Technology

CONCEPT OF OPERATIONS BY BLOCK

Block Description

Baseline **Air-Ground**

Air-ground ATS communications have been historically accomplished through the use of voice communications between pilots and controllers.

Voice over HF has been the traditional communication means to provide Air Traffic Services (ATS) over oceanic and remote airspace.

Voice over VHF has been the traditional communication means to ensure Air Traffic Services over domestic airspace. Voice over SATCOM is used as a backup means for emergency situations.

Ground-Ground

Ground-Ground ATS communication has been using Aeronautical Fixed Telecommunication Network (AFTN) over dedicated low speed circuits (2.4-9.6Kbps) to support the exchange of Flight plan/Clearance/Transfer between ANSPs. The ATS voice communication is used for routine communication when the AFTN infrastructure is not available. ATS voice communication is also utilized in case of emergency.

Block 0	**Air-Ground** VHF, HF and SATCOM \Communications: • VHF Voice Communications remains the primary means of information exchange in most regions. • Continued use of the ACARS Network to support the distribution of ATS message sets (FANS) • Intoduction of the ATN/OSI Network to to support B1 • Continued use of VDL Mode 2 to support ATN/OSI and FANS. • Continued use of SATCOM Class C, VDL Mode0/A and VDL Mode 2 as Datalinks to support Terrestrial, Oceanic and Remote Airspace and as a complement to voice and in order to reduce voice channel congestion and increase capacity. • Continued use of HFDL as the Datalink to support Oceanic Airspace as a complement to voice and in order to reduce voice channel congestion and increase capacity. **Ground-Ground** Deployment of IP based AMHS linked service: • as an improvement over AFTN in term of bandwidth and length of the message, • as a mean to enhance traffic transfer between ANSPs by expanding the use of ATS Inter-Facility Communication Data (AIDC) to improve efficiency of air traffic management by reducing the use of ATS voice service.
Block 1	**Air-Ground** Improved Terrestrial Data Communications: • VHF Voice Communications remains the primary means of information exchange in most regions. • Introduction of the VDL Mode 2 Multi-Frequency design to accommodate increased capacity and reduce interference. • Introduction of the New SATCOM Class B Satellite Datalinks to increase performance and deliver increased ATN/OSI and ACARS network connectivity. **Ground-Ground** Introduction of IP based network to replace point-to-point circuits: • AMHS with extension service to support XML, FTBP (IWXMM). • Expansion of AIDC to enhance efficiency and safety. • Implement regional IP networks. • AeroMACS circuits for airport local communications.
Block 2	**Air-Ground** Improved Link Performance: • VHF Voice Communications remains the primary means of information exchange in terminal area, however a major shift toward greater use of Datalink in the enroute and surface domains is envisioned.

- Introduce Connectionless VDL Mode-2 design to improve performance and spectrum efficiency.
- Introduce new SATCOM Class B systems to support both voice and data operations with total global coverage.
- Introduction of the ATN/IPS Network technology to improve datalink performance, support message routing and multilink environments, improve system cyber-security and achieve cost reductions.
- AeroMACS for aircraft mobile connection.

Ground-Ground

- Implement network services.
- Implement AMHS/IP addressing gateway to support legacy services during transition.
- Connect regional IP networks to provide for a federated aviation network for exchange of information.

Converged (both g/g and a/g) communications

- Make use of available link technologies meeting performance requirements to provide aviation communications for non-safety critical information.

Block 3 **Air-Ground**

IP-based connection and broadband communication links:

- Introduce SATCOM Class A into Oceanic and Domestic Airspace to provide improve link performance and to achieve increased resiliency through the use of commercially available Satellite constellations which meet the ATS performance requirements.
- Introduce new Broadband A/G Communication systems (LDACS) to support increasingly large messages with stringent requirements and digital products.

Converged (both g/g and a/g) communications

- Make use of available link technologies meeting performance, interoperability and certification requirements to provide aviation communications for safety critical information.

ELEMENTS

Element ID	Title
COMI-B0/1	Aircraft Communication Addressing and Reporting System (ACARS)
COMI-B0/2	Aeronautical Telecommunication Network/Open System Interconnection (ATN/OSI)
COMI-B0/3	VHF Data Link (VDL) Mode 0/A
COMI-B0/4	VHF Data Link (VDL) Mode 2 Basic
COMI-B0/5	Satellite communications (SATCOM) Class C Data
COMI-B0/6	High Frequency Data Link (HFDL)
COMI-B0/7	ATS Message Handling System (AMHS)
COMI-B1/1	Ground-Ground Aeronautical Telecommunication Network/Internet Protocol Suite (ATN/IPS)
COMI-B1/2	VHF Data Link (VDL) Mode 2 Multi-Frequency
COMI-B1/3	SATCOM Class B Voice and Data
COMI-B1/4	Aeronautical Mobile Airport Communication System (AeroMACS) Ground-Ground
COMI-B2/1	Air-Ground ATN/IPS

COMI-B2/1 Air-Ground ATN/IPS

COMI-B2/2 Aeronautical Mobile Airport Communication System (AeroMACS) aircraft mobile connection

COMI-B2/3 Links meeting requirements for non-safety critical communication

COMI-B3/1 VHF Data Link (VDL) Mode-2 Connectionless

COMI-B3/2 SATCOM Class A voice and data

COMI-B3/3 L-band Digital Aeronautical Communication System (LDACS)

COMI-B3/4 Links meeting requirements for safety critical communication

COMS	ATS Communication service	Technology

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Air-ground ATS communications have been historically accomplished through the use of voice communications between pilots and controllers. Voice over HF has been the traditional communication means to provide Air Traffic Services over oceanic and remote airspace. Voice over VHF has been the traditional communication means to provide Air Traffic Services over domestic airspace. Voice over SATCOM is used as a backup means for emergency situations.
Block 0	Introduction of air-ground ATS data link services: • **CPDLC (ATN B1)** as a complement to voice for domestic airspace in order to reduce voice channel congestion and increase capacity, • **CPDLC and ADS-C (FANS 1/A)** as a means to improve communications and surveillance in airspace where procedural separation is being applied.
Block 1	Extension of air-ground ATS data link services: • **CPDLC (FANS 1/A+)** as a complement to voice for domestic airspace in order to reduce voice channel congestion and increase capacity, • **PBCS approved CPDLC and ADS-C (FANS 1/A+)** as a means to apply reduced separations in airspace where procedural separation is being applied. Introduction of **Satellite Voice Communications** in airspace where procedural separation is being applied for routine communications in support of Air Traffic Services.
Block 2	Extension of air-ground ATS data link services: • **CPDLC and ADS-C (B2)** as a means to increase automation on ground and aircraft systems, gradually moving towards full and continuous air-ground synchronization of the aircraft trajectory. Extension of **Satellite Voice Communications with PBCS approved systems** in airspace where procedural separation is being applied to support further reduction of separations.
Block 3	Extension of air-ground ATS data link services:

- **Extended CPDLC and ADS-C (B2)** as a means to increase further automation on ground and aircraft systems, supporting the introduction of Advanced Interval Management and dynamic RNP operations.

ELEMENTS

Element ID	Title
COMS-B0/1	CPDLC (FANS 1/A & ATN B1) for domestic and procedural airspace
COMS-B0/2	ADS-C (FANS 1/A) for procedural airspace
COMS-B1/1	PBCS approved CPDLC (FANS 1/A+) for domestic and procedural airspace
COMS-B1/2	PBCS approved ADS-C (FANS 1/A+) for procedural airspace
COMS-B1/3	SATVOICE (incl. routine communications) for procedural airspace
COMS-B2/1	PBCS approved CPDLC (B2) for domestic and procedural airspace
COMS-B2/2	PBCS Approved ADS-C (B2) for domestic and procedural airspace
COMS-B2/3	PBCS approved SATVOICE (incl. routine communications) for procedural airspace
COMS-B3/1	Extended CPDLC (B2 incl. Adv-IM and dynamic RNP) for dense and complex airspace
COMS-B3/2	Extended ADS-C (B2 incl. Adv-IM and dynamic RNP) for dense and complex airspace

NAVS Navigation systems Technology

CONCEPT OF OPERATIONS BY BLOCK

Block	Description
Baseline	Before Block 0, navigation systems deployed and in operation are a combination of ground-based navigation systems (NBD, VOR, DME, ILS), and global satellite-based navigation systems (**GNSS**). Airborne Based Augmentation Systems (**ABAS**), Ground-Based Augmentation System (**GBAS**) and Satellite-Based augmentation systems (**SBAS**) augment a single frequency of GPS and GLONASS constellations, but GLONASS utilization remains limited at this stage. ABAS is the widest available development, including GNSS hybridization with inertial system (INS)/barometric vertical navigation (Baro-VNAV) and largely supports PBN implementation, but its performance is not as optimal as SBAS and GBAS, in particular for approach and landing phases of flight. The implementation of ground-based conventional navigation systems starts to decrease in number with the rationalization of conventional infrastructure through Navigation Minimum Operating Networks (NAV MON), while the implementation of satellite-based navigation systems starts to increase. ABAS and SBAS support PBN implementation for all phases of flight down to Category I precision approaches. GBAS supports approach and landing operations down to Category I minima. Three SBAS are certified for PBN operations: WAAS in North America (US, Canada and Mexico), EGNOS in Europe, MASAS in Japan. A few certified GBAS are deployed worldwide, including US, Australia, Germany and Spain.
Block 0	**GBAS** is provided to support precision approach and landing operations at a specific airport, in particular

Category I operation utilizing GBAS Approach Service Type C (GAST-C), with the improved accuracy, integrity, and availability of satellite navigation.

SBAS and **ABAS** are implemented as a mean to comply with ICAO Assembly Resolution A37-11 regarding Vertically-Guided Approach. SBAS is provided to support PBN in all phases of flight with increased accuracy and integrity. ABAS is provided to support non-precision (LNAV) and vertically-guided approach with Baro-VNAV as well as other terminal and en-route navigations.

Rationalization of conventional navigation aid infrastructure through **Minimal Operating Networks** starts to happen and supports a reduction in the number of NDBs, VORs, and, where appropriate in some States, ILS. Alternative Positioning, Navigation, and Timing is based upon a combination of existing ground navaids, airborne inertial systems and ATC procedures.

Block 1 With enhanced ionospheric monitoring and mitigation as well as enhanced VHF Data Broadcast receiver performance, **extended GBAS** is provided to support precision approach and landing operations at a specific airport, particularly Category II operation utilizing GAST-C and Category II/III operation utilizing GAST-D, with the improved accuracy, integrity, and availability.

Within this Block 1 timeframe, new core constellations and new signals are available for civil aviation use (multi-constellation concept), i.e. Galileo (Europe) and Beidou (China), and support dual frequency navigation signals. GPS (USA) and GLONASS (Russia) also evolve to support dual frequency navigation signals.

Rationalization of the conventional infrastructure through Minimal Operating Networks continues to be implemented and supports a reduction in the number of NDBs, VORs, and, where appropriate in some States, ILS. Alternative Positioning, Navigation, Timing remains based upon a combination of existing ground navaids, airborne inertial systems and ATC procedures. New APNT infrastructure is being explored and evaluated.

Block 2 **Dual-Frequency Multi-Constellation (DF/MC) GBAS, SBAS, and ABAS** start to be provided, improving the resolution of atmospheric propagation errors affecting navigation core constellation signals and supporting additional robustness, compared to single frequency interference.

Block 3 Airborne equipage for Dual-Frequency Multi-Constellation (DF/MC) including GBAS, SBAS and ABAS capabilities will grow over time. Additional technology developments to support more robust navigation may become matured and be deployed in some regions. Technologies developed to support widespread UAS deployment could potentially be adopted as part of these improvements to robust navigation.

Rationalization of conventional navigation aids will continue when the dependency on GNSS signals is alleviated by new technologies. New support technologies necessary for GNSS cyber security will be deployed in this timeframe (e.g. key management and distribution systems for cryptographic GNSS signal authentication systems). Technologies for GNSS anti-spoofing will be standardized and deployed to some degree.

Block 4 GNSS will be the primary means of navigation globally with conventional navigation aids maintained only as necessary for backup capability. Dual-Frequency Multi-Constellation (DF/MC) airborne equipage will be deployed on most of the fleet supported by more robust backup technologies allowing operations during GNSS unavailability. More advanced sensor fusions for increased operational autonomy will be introduced (i.e. less reliance on external or single thread systems and services) for greater reliability of navigation capabilities.

ELEMENTS

Element ID	Title
NAVS-B0/1	Ground Based Augmentation Systems (GBAS)

NAVS-B0/1 Ground Based Augmentation Systems (GBAS)

NAVS-B0/2 Satellite Based Augmentation Systems (SBAS)

NAVS-B0/3 Aircraft Based Augmentation Systems (ABAS)

NAVS-B0/4 Navigation Minimal Operating Networks (Nav. MON)

NAVS-B1/1 Extended GBAS

NAVS-B2/1 Dual Frequency Multi Constellation (DF MC) GBAS

NAVS-B2/2 Dual Frequency Multi Constellation (DF MC) SBAS

NAVS-B2/3 Dual Frequency Multi Constellation (DF MC) ABAS

Appendix C – Regional SWOT analysis examples

Reference: 2020 – 2021 SAM Regional workshops

STRENGHTS
ACTIVE REGIONAL PLANS. FRAME ALIGNED TO GLOBAL PLANS (GANP, GASP, GASEP).
IMPULSE TO ATM/CNS IMPLEMENTATION AND SUPPORT SERVICES. CNS RESOURCES AND REGIONAL COORDINATION. REGIONAL IP NETWORK – REDDIG.
AIRLINES / INDUSTRY DEVELOPED. STATE/STAKEHOLDERS RELATIONSHIP.
AUTHORITIES / REGULATORS. REGULATORY STRUCTURE (LARS)
REGION INTEGRATED IN SOCIAL-POLITICAL ASPECT. REGIONAL IMPLEMENTATION AND FOLLOW-UP FORUMS.
LEADERSHIP OF RO SAM ICAO. UNIT RESPONSE OF THE REGION/INDUSTRY TO THE HEALTH EMERGENCY.
STRUCTURE OF AIR SPACE. SEAMLESS. HARMONIZED ATS CONTINGENCY PLANS.
ICAO TECHNICAL COOPERATION – PROJECTS RLA 06 901, SRVSOP, ETC. TECHNICAL DOCUMENTATION / REGIONAL GUIDES. ICAO PORTAL.
COMPETENT PROFESSIONAL STAFF, AND EXPERIENCED.
AIRPORT OPERATION MODEL. TECHNICAL IMPROVEMENTS/OPERATIONAL SAFETY. REGULATOR OVERSIGHT.
REGIONAL HUBS. INFRASTRUCTURE SUPPORTS REGIONAL CONNECTIVITY.
WEAKNESSES
LACK OF REGIONAL STRUCTURE ANS MORE RESILIENT. TECHNOLOGY/BACKUP UNITS - BACKUPS.
EXCESSIVE ROTATION IN PUBLIC ADMNISTRATION. MANAGEMENT MODEL FOR ANS/AUTHORITY/INDUSTRY. DIFFICULTY COORDINATING BETWEEN SYSTEM ACTORS.
CUMBERSOME OR SLOW BUDGET EXECUTION FOR TECHNOLOGY ADMISSION. REQUIRES PROPER PREPARATION T.O.R.
MANAGEMENT OF NATIONAL PNNA PLANS. FOCUS OF PROGRAMS/ PROJECTS FOR IMPLANTATION.
CNS INTEROPERABILITY STILL IN PROCESS. DEPENDENCE AND GAPS OF TECHNICAL EQUIPMENT AND MAINTENANCE.
DISCONTINUED IMPLANTATION IN THE ANS. GAPS IN THE QMS OF MET AND AIM. SSP AND SMS SYSTEMS STILL IN PROCESS.
SPECIALIZED TRAINING, SIMULATORS AND OJT (AIM, PANSOPS, ETC.) COSTLY AND/OR ESCAZA. THERE IS NO NEED TO ORIENT GLOBAL PLANS. IMPLEMENTATION ANS (EXAMPLE FUA, ATFM) INCOMPLETE.
HUMAN RESOURCES. GAP/GENERATIONAL CHANGE. HUMAN TALENT POLICIES/MANAGEMENT - CAREER PLAN. KNOWLEDGE TRANSFER/TECHNOLOGY.
COMMUNICATION / COOPERATION INTERREGIONAL CARIBE - SOUTH AMERICA AND OTHERS.
CERTIFICATION OF AIRPORTS AFFECTED BY CONCESSION SCHEME.
LIMITED AIR CONNECTIVITY IN THE REGION
OPPORTUNITIES
GANP/ 6 -ASBU. FOUR LAYERS AND INDICATORS.
DEVELOPMENT OF REGIONAL/NATIONAL PLANS. CIVIL AVIATION AS A DEVELOPMENT ENGINE.
ECONOMIC FOSTERING. ACCESSIBLE FINANCING.
INNOVATION, RESEARCH AND DEVELOPMENT IN TECHNOLOGY FOR ANS DELIVERY.
TENDENCY TO RESILIENCE AND COST/EFFICIENCY. RESILIENT PROCESSES/LESSONS LEARNED.
USOAP AUDITS.
TRANSITORY LOW DEMAND PERMITS INTERNAL IMPROVEMENT ACTIVITIES (ADMINISTRATION, PROCEDURES, ATM, ETC.).
GREATER ACCESS TO COURSES, VIRTUAL MEETINGS/WORKSHOPS. PARTICIPATION OF EXPERTS, SYNERGY.
VIRTUALIZED/AUTOMATED ANS SERVICES. EFFICIENT USE OF RESOURCES AND DATABASE. REGULATOR SURVEILLANCE BY REMOTE MEANS.
TENDENCY TO A COLLABORATIVE ENVIRONMENT. INCLUDES TECHNOLOGY SHARING TRAINING.

CNS /ATM TECHNOLOGY IN EVOLUTION.
THREATS
SLOW RECOVERY INDUSTRY/AEROLINEAS (> 2024). REORGANIZATION OF THE AERONAUTICAL MARKET, COMPETITION BY MARKETS.
NEW OUTBREAK/PANDEMIA.
CHANGES IN THE PATTERN OF MOBILIZATION OF PEOPLE (TELECONFERENCES). LOSS OF USER CONFIDENCE.
ECONOMY SLOWED DOWN. CHANGE IN PUBLIC PRIORITIES IN STATES. DEFERMENT OF INVESTMENTS IN ANSP/AIRPORT/INDUSTRY.
POLITICAL SITUATIONS OF STATES. POSSIBLE LEGAL INSTABILITY. EXCESSIVE INTERVENTION.
ATTACKS ON CYBER SECURITY

Appendix D - ASBU elements of operational thread

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAs AND KPIs

Remark: TBD means that the focus areas or specific KPI have not been defined.

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
ACAS-B1/1 ACAS Improvements	Safety	TBD	Improve mid-air collision avoidance (safety net)	TBD
APTA-B0/1 PBN Approaches (with basic capabilities)	Capacity	Capacity, throughput & utilization	Equip additional RWY ends with instrument approaches	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Reduce approach minima (ceiling & visibility)	KPI10: Airport peak throughput
APTA-B0/2 PBN SID and STAR procedures (with basic capabilities)	Capacity	Capacity, throughput & utilization	Increase airport arrival rate	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Mitigate local airspace capacity constraints if this is the problem	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Mitigate noise constraints if this is the problem	KPI10: Airport peak throughput
	Efficiency	Vertical flight efficiency	Reduce permanent (airspace and approach procedure design) and semi-permanent (ATFCM measures) altitude constraints along the descent portion of traffic flows, in enroute and terminal airspace	KPI19: Level-off during descent
	Efficiency	Vertical flight efficiency	Reduce permanent (airspace and departure procedure design) and semi-permanent (ATFCM measures) altitude constraints (level capping) along the climb portion of traffic flows, in terminal and en-route airspace	KPI17: Level-off during climb

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
APTA-B0/3 SBAS/GBAS CAT I precision approach procedures	Capacity	Capacity, throughput & utilization	Equip additional RWY ends with instrument approaches	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Reduce approach minima (ceiling & visibility)	KPI10: Airport peak throughput
APTA-B0/4 CDO (Basic)	Efficiency	Vertical flight efficiency	Avoid efficiency penalties attributable to non-optimum ToD (descent starts before or after the optimum ToD)	KPI19: Level-off during descent
	Efficiency	Vertical flight efficiency	Avoid tactical lengthening of arrival path (eg vectoring, holding, trombone extension) because this leads to level flight	KPI19: Level-off during descent
	Efficiency	Vertical flight efficiency	Reduce descent inefficiency attributable to altitude constraints imposed by ATM	KPI19: Level-off during descent
APTA-B0/5 CCO (Basic)	Efficiency	Vertical flight efficiency	Reduce permanent (airspace and departure procedure design) and semi-permanent (ATFCM measures) altitude constraints (level capping) along the climb portion of traffic flows, in terminal and en-route airspace	KPI17: Level-off during climb
APTA-B0/6 PBN Helicopter Point in Space (PinS) Operations	Capacity	Capacity, throughput & utilization	Mitigate local airspace capacity constraints if this is the problem	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Reduce approach minima (ceiling & visibility)	KPI10: Airport peak throughput
APTA-B0/7 Performance based aerodrome operating minima – Advanced aircraft	Capacity	Capacity, throughput & utilization	Reduce approach minima (ceiling & visibility)	KPI10: Airport peak throughput

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
APTA-B0/8 Performance based aerodrome operating minima – Basic aircraft	Capacity	Capacity, throughput & utilization	Equip additional RWY ends with instrument approaches	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Reduce approach minima (ceiling & visibility)	KPI10: Airport peak throughput
APTA-B1/1 PBN Approaches (with advanced capabilities)	Capacity	Capacity, throughput & utilization	Equip additional RWY ends with instrument approaches	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Reduce approach minima (ceiling & visibility)	KPI10: Airport peak throughput
APTA-B1/2 PBN SID and STAR procedures (with advanced capabilities)	Capacity	Capacity, throughput & utilization	Increase airport arrival rate	KPI11: Airport throughput efficiency
	Capacity	Capacity, throughput & utilization	Mitigate local airspace capacity constraints if this is the problem	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Mitigate noise constraints if this is the problem	KPI10: Airport peak throughput
	Efficiency	Vertical flight efficiency	Reduce permanent (airspace and approach procedure design) and semi-permanent (ATFCM measures) altitude constraints along the descent portion of traffic flows, in enroute and terminal airspace	KPI19: Level-off during descent
	Efficiency	Vertical flight efficiency	Reduce permanent (airspace and departure procedure design) and semi-permanent (ATFCM measures) altitude constraints (level capping) along the climb portion of traffic flows, in terminal and en-route airspace	KPI17: Level-off during climb
APTA-B1/3 Performance based aerodrome operating	Capacity	Capacity, throughput & utilization	Reduce approach minima (ceiling & visibility)	KPI10: Airport peak throughput

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
minima – Advanced aircraft with SVGS				
APTA-B1/4 CDO (Advanced)	Efficiency	Vertical flight efficiency	Avoid efficiency penalties attributable to non-optimum ToD (descent starts before or after the optimum ToD)	KPI19: Level-off during descent
	Efficiency	Vertical flight efficiency	Avoid tactical lengthening of arrival path (eg vectoring, holding, trombone extension) because this leads to level flight	KPI19: Level-off during descent
	Efficiency	Vertical flight efficiency	Reduce descent inefficiency attributable to altitude constraints imposed by ATM	KPI19: Level-off during descent
APTA-B1/5 CCO (Advanced)	Efficiency	Vertical flight efficiency	Reduce permanent (airspace and departure procedure design) and semi-permanent (ATFCM measures) altitude constraints (level capping) along the climb portion of traffic flows, in terminal and en-route airspace	KPI17: Level-off during climb
CSEP-B1/1 Basic airborne situational awareness during flight operations (AIRB)	Safety	TBD	Improve mid-air collision avoidance (safety net)	TBD
	Safety	TBD	Improve separation provision (at a planning horizon > 2 minutes)	TBD
CSEP-B1/2 Visual Separation on Approach (VSA)	Safety	TBD	Improve separation provision (at a planning horizon > 2 minutes)	TBD
CSEP-B1/3 Performance Based Longitudinal	Capacity	Capacity, throughput & utilization	Improve what's needed to reduce longitudinal separation minima	KPI06: En-route airspace capacity
	Capacity	Capacity, throughput & utilization	Take advantage of increased navigation precision (airspace with PBN operations) to implement	KPI06: En-route airspace capacity

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
Separation Minima			route networks and airspace structures with smaller lateral and vertical safety buffers	
CSEP-B1/4	Capacity	Capacity, throughput & utilization	Improve what's needed to reduce lateral separation minima	KPI06: En-route airspace capacity
FRTO-B0/1 Direct routing (DCT)	Efficiency	Flight time & distance	Overcome route selection inefficiencies associated with route network design	KPI04: Filed flight plan en-route extension
FRTO-B0/2 Airspace planning and Flexible Use of Airspace (FUA)	Access and equity	TBD	Improve airspace reservation management	TBD
	Efficiency	Flight time & distance	Facilitate direct routing of portions of the flight (if this does not cause network problems)	KPI05: Actual enroute extension
	Efficiency	Flight time & distance	Overcome route selection inefficiencies associated with route & airspace availability as known at the flight planning stage	KPI04: Filed flight plan en-route extension
	Efficiency	Flight time & distance	Reduce need for tactical ATFM rerouting to circumnavigate airspace closed at short notice	KPI05: Actual enroute extension
	Efficiency	Flight time & distance	Reduce need to avoid airspace because of lack of confirmation that it will be open	KPI04: Filed flight plan en-route extension
	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during climb to avoid Special Use Airspace	KPI17: Level-off during climb
	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during cruise to avoid Special Use Airspace	KPI18: Level capping during cruise
	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during cruise to avoid Special Use Airspace	KPI19: Level-off during descent
FRTO-B0/3 Pre-validated and coordinated ATS routes to support flight and flow	Capacity	Capacity shortfall & associated delay	Establish/update/publish the catalogue of strategic ATFM measures designed to respond to a variety of possible/typical/recurring events degrading the airspace system (e.g. predefined action plans)	TBD
	Flexibility	TBD	Improve flexibility of the Air Navigation System	TBD

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
FRTO-B0/4 Basic conflict detection and conformance monitoring	Capacity	Capacity, throughput & utilization	Reduce ATCO workload (enroute)	KPI06: En-route airspace capacity
	Safety	TBD	Improve early detection of conflicting ATC Clearances (CATC) (en-route / departure / approach)	TBD
	Safety	TBD	Improve separation provision (at a planning horizon > 2 minutes)	TBD
	Safety	TBD	Reduce number of vertical & lateral navigation errors during flight (cases of non-conformance with clearance)	TBD
FRTO-B1/1 Free Route Airspace (FRA)	Efficiency	Flight time & distance	Overcome route selection inefficiencies associated with route network design	KPI04: Filed flight plan en-route extension
FRTO-B1/2 Required Navigation Performance (RNP) routes	Capacity	Capacity, throughput & utilization	Overcome capacity limitations attributable to route network design	KPI06: En-route airspace capacity
	Capacity	Capacity, throughput & utilization	Take advantage of increased navigation precision (airspace with PBN operations) to implement route networks and airspace structures with smaller lateral and vertical safety buffers	KPI06: En-route airspace capacity
FRTO-B1/3 Advanced Flexible Use of Airspace (FUA) and management of real time airspace data	Access and equity	TBD	Improve airspace reservation management	TBD
	Efficiency	Flight time & distance	Facilitate direct routing of portions of the flight (if this does not cause network problems)	KPI05: Actual enroute extension
	Efficiency	Flight time & distance	Overcome route selection inefficiencies associated with route & airspace availability as known at the flight planning stage	KPI04: Filed flight plan en-route extension
	Efficiency	Flight time & distance	Reduce need for tactical ATFM rerouting to circumnavigate airspace closed at short notice	KPI05: Actual enroute extension
	Efficiency	Flight time & distance	Reduce need to avoid airspace because of lack of confirmation that it will be open	KPI04: Filed flight plan en-route extension

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during climb to avoid Special Use Airspace	KPI17: Level-off during climb
	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during cruise to avoid Special Use Airspace	KPI18: Level capping during cruise
	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during cruise to avoid Special Use Airspace	KPI19: Level-off during descent
FRTO-B1/4 Dynamic sectorization	Capacity	throughput & utilization	Improve flexibility of sector configuration management	TBD
	Capacity	throughput & utilization	Improve flexibility to modify sector configuration at short notice to cope with traffic pattern variations	TBD
FRTO-B1/5 Enhanced Conflict Detection Tools and Conformance Monitoring	Safety	TBD	Improve early detection of conflicting ATC Clearances (CATC) (en-route / departure / approach)	TBD
	Safety	TBD	Reduce number of vertical & lateral navigation errors during flight (cases of non-conformance with clearance)	TBD
FRTO-B1/6 Multi-Sector Planning	Cost effectiveness	TBD	Reduce costs in the Air Navigation System	TBD
NOPS-B0/1 Initial integration of collaborative airspace management with air traffic	Efficiency	Flight time & distance	Facilitate tactical decisions leading to a shorter actual route than in the FPL	KPI05: Actual enroute extension
	Efficiency	Flight time & distance	Overcome route selection inefficiencies associated with route & airspace availability as known at the flight planning stage	KPI04: Filed flight plan en-route extension
	Efficiency	Flight time & distance	Reduce need for tactical ATFM rerouting to circumnavigate airspace closed at short notice	KPI05: Actual enroute extension

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
flow management	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during climb introduced to avoid airspace above	KPI17: Level-off during climb
	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during cruise introduced to avoid airspace above	KPI18: Level capping during cruise
	Efficiency	Vertical flight efficiency	Reduce altitude restrictions during descent to avoid Special Use Airspace	KPI19: Level-off during descent
NOPS-B0/2 Collaborative Network Flight Updates	Capacity	Capacity shortfall & associated delay	Ensure that the measures applied are absolutely necessary and that unnecessary measures are avoided	TBD
	Capacity	Capacity shortfall & associated delay	Establish/improve the capability to use opportunities to mitigate disturbances, originating from: More precise surveillance data	TBD
NOPS-B0/4 Initial Airport/ATFM slots and A-CDM Network Interface	Capacity	Capacity shortfall & associated delay	For a given airspace entry slot: let airspace users swap the slot to another flight (slot substitution or UDPP – User Driven Prioritisation Process)	TBD
NOPS-B0/5 Dynamic ATFM slot allocation	Capacity	Capacity shortfall & associated delay	Implement TMIs to delay take-off times	KPI07: En-route ATFM delay
	Capacity	Capacity shortfall & associated delay	Use ATFM oriented flow management: delay push-back of inbound traffic	TBD
NOPS-B1/1 Short Term ATFM measures	Capacity	Capacity shortfall & associated delay	Establish/improve the capability to use opportunities to mitigate disturbances	TBD
	Capacity	Capacity shortfall & associated delay	TMI-based optimisation (only impacts traffic when a TMI or restriction is manually activated for one or more constraint satisfaction points)	TBD
NOPS-B1/10 Collaborative Trajectory Options Program (CTOP)	Capacity	Capacity shortfall & associated delay	For a given flight: at flight plan filing time airspace users provide network management with a range of trajectory options and associated trade-off criteria, from which one solution is chosen (CTOP – Collaborative Trajectory Options Program)	KPI04: Filed flight plan en-route extension

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
	Capacity	Capacity shortfall & associated delay	For a given flight: at flight plan filing time airspace users provide network management with a range of trajectory options and associated trade-off criteria, from which one solution is chosen (CTOP – Collaborative Trajectory Options Program)	KPI07: En-route ATFM delay
	Capacity	Capacity shortfall & associated delay	For a given flight: at flight plan filing time airspace users provide network management with a range of trajectory options and associated trade-off criteria, from which one solution is chosen (CTOP – Collaborative Trajectory Options Program)	KPI18: Level capping during cruise
NOPS-B1/2 Enhanced Network Operations Planning	Capacity	Capacity shortfall & associated delay	Establish/update the crisis management capabilities and plans (to cope with the risk of large scale disruptions)	TBD
NOPS-B1/4 Dynamic Traffic Complexity Management	Capacity	Capacity, throughput & utilization	Overcome operational ATC service delivery limitations if these are the blocking factor	KPI06: En-route airspace capacity
NOPS-B1/5 Full integration of airspace management with air traffic flow management	Efficiency	Flight time & distance	Facilitate tactical decisions leading to a shorter actual route than in the FPL	KPI05: Actual enroute extension
	Efficiency	Flight time & distance	Overcome route selection inefficiencies associated with route & airspace availability as known at the flight planning stage	KPI04: Filed flight plan en-route extension
	Efficiency	Flight time & distance	Reduce need for tactical ATFM rerouting to circumnavigate airspace closed at short notice	KPI05: Actual enroute extension
	Efficiency	Efficiency Vertical flight efficiency	Reduce altitude restrictions during climb introduced to avoid airspace above	KPI17: Level-off during climb
	Efficiency	Efficiency Vertical flight efficiency	Reduce altitude restrictions during cruise introduced to avoid airspace above	KPI18: Level capping during cruise

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
	Efficiency	Efficiency Vertical flight efficiency	Reduce altitude restrictions during descent to avoid Special Use Airspace	KPI19: Level-off during descent
NOPS-B1/6 Initial Dynamic Airspace configurations	Capacity	Capacity shortfall & associated delay	Establish/update/publish the catalogue of strategic ATFM measures designed to respond to a variety of possible/typical/recurring events degrading the airspace system (e.g. predefined action plans)	TBD
NOPS-B1/7 Enhanced ATFM slot swapping	Capacity	Capacity shortfall & associated delay	For a given airspace entry slot: let airspace users swap the slot to another flight (slot substitution or UDPP – User Driven Prioritisation Process)	TBD
NOPS-B1/9 Target Times for ATFM purposes	Capacity	Capacity shortfall & associated delay	TMI-based optimisation (only impacts traffic when a TMI or restriction is manually activated for one or more constraint satisfaction points)	TBD
	Capacity	Capacity, throughput & utilization	Optimise en-route airspace capacity	TBD
OPFL-B0/1 In Trail Procedure (ITP) OPFL-B1/1 Climb and Descend)	Efficiency	Vertical flight efficiency	Increase acceptance of pilot requests for higher cruise level	KPI18: Level capping during cruise
	Efficiency	Vertical flight efficiency	Efficiency Reduce level restrictions during cruise issued by ATCOs for conflict resolution purposes	KPI18: Level capping during cruise
OPFL-B1/1 Climb and Descend Procedure (CDP)	Efficiency	Vertical flight efficiency	Increase acceptance of pilot requests for higher cruise level	KPI18: Level capping during cruise
	Efficiency	Vertical flight efficiency	Reduce level restrictions during cruise issued by ATCOs for conflict resolution purposes	KPI18: Level capping during cruise
RATS-B1/1 Remotely Operated	Cost effectiveness	TBD	Reduce costs in the Air Navigation System	TBD
	Flexibility	TBD	Improve flexibility of the Air Navigation System	TBD

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
Aerodrome Air Traffic Services	Safety	TBD	Maintain or improve safety during surface movement	TBD
	Safety	TBD	Maintain or improve safety on the runway	TBD
RSEQ-B0/1 Arrival Management	Capacity	Capacity, throughput & utilization	Apply arrival balancing	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Apply smart sequencing to harmonise final approach speeds (arrival)	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Apply smart sequencing to optimise wake vortex separations (arrival)	KPI10: Airport peak throughput
	Capacity	Capacity, throughput & utilization	Improve arrival sequencing and metering to fill all arrival slots	KPI11: Airport throughput efficiency
	Efficiency	Flight time & distance	Apply TTA and en-route speed reduction if traffic is already airborne	KPI08: Additional time in terminal airspace
	Efficiency	Flight time & distance	Reduce need to fine-tune traffic spacing in terminal airspace (arrival)	KPI08: Additional time in terminal airspace
RSEQ-B0/2 Departure Management	Capacity	Capacity, throughput & utilization	Maintain or improve departure rate of the RWY	KPI10: Airport peak throughput
	Efficiency	Efficiency Flight time & distance	Avoid additional holding time after line up caused by departure metering not factored in during pushback planning	KPI02: Taxi-out additional time
	Efficiency	Efficiency Flight time & distance	Improve the delivery of departing traffic into the overhead stream	KPI02: Taxi-out additional time
RSEQ-B0/3 Point merge	Capacity	Capacity, throughput & utilization	Apply merging & synchronisation of arrival flows	KPI10: Airport peak throughput
RSEQ-B1/1 Extended arrival metering	Capacity	Capacity shortfall & associated delay	Apply (unplanned) airborne holding to inbound traffic	TBD
	Capacity	Capacity shortfall & associated delay	Delay take-off of inbound traffic (sequencing & metering measures)	TBD
	Capacity	Capacity shortfall & sociated delay	Slow down inbound traffic during en-route	TBD
	Efficiency	Flight time & distance	Extend arrival management to a greater radius around the destination airport	KPI08: Additional time in terminal airspace

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
SNET-B0/1 Short Term Conflict Alert (STCA)	Safety	TBD	Improve mid-air collision avoidance (safety net)	TBD
SNET-B0/2 Minimum Safe Altitude Warning (MSAW)	Safety	TBD	Reduce controlled flight into terrain (CFIT) and obstacle collision risk	TBD
SNET-B0/3 Area Proximity Warning (APW)	Safety	TBD	Reduce unauthorized penetration of airspace risk	TBD
SNET-B0/4 Approach Path Monitoring (APM)	Safety	TBD	Reduce controlled flight into terrain (CFIT) and obstacle collision risk	TBD
SNET-B1/1 Enhanced STCA with aircraft parameters	Safety	TBD	Improve mid-air collision avoidance (safety net)	TBD
SNET-B1/2 Enhanced STCA with aircraft parameters	Safety	TBD	improve mid-air collision avoidance (safety net)	TBD
SURF-B0/1 Basic ATCO tools to manage traffic during	Efficiency	Flight time & distance	Avoid taxi-in additional time resulting from adverse conditions	KPI13: Taxi-in additional time
	Efficiency	Flight time & distance	Avoid taxi-out additional time resulting from adverse conditions	KPI02: Taxi-out additional time

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
ground operations	Safety	TBD	Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	TBD
	Safety	TBD	Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	TBD
	Safety	TBD	Reduce number of taxi errors (cases of non-conformance with clearance)	TBD
SURF-B0/2 Comprehensive situational awareness of surface operations	Safety	TBD	Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	TBD
	Safety	TBD	Avoid incorrect presence of vacating aircraft or vehicles onto the runway protected area)	TBD
	Safety	TBD	Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	TBD
	Safety	TBD	Improve collision avoidance during taxi operations (safety net)	TBD
SURF-B0/3 Initial ATCO alerting service for surface operations	Safety	TBD	Improve runway collision avoidance (safety net)	TBD
SURF-B1/1 Advanced features using visual aids to support traffic management during ground operations	Efficiency	Flight time & distance	Avoid taxi-in additional time resulting from adverse conditions	KPI13: Taxi-in additional time
	Efficiency	Flight time & distance	Avoid taxi-out additional time resulting from adverse conditions	KPI02: Taxi-out additional time
	Safety	TBD	Improve collision avoidance during taxi operations (safety net)	TBD
	Safety	TBD	Reduce number of taxi errors (cases of non-conformance with clearance)	TBD

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
SURF-B1/2 Comprehensive pilot situational awareness on the airport surface	Safety	TBD	Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	TBD
	Safety	TBD	Avoid incorrect presence of vacating aircraft or vehicles onto the runway protected area)	TBD
	Safety	TBD	Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	TBD
	Safety	TBD	Improve collision avoidance during taxi operations (safety net)	TBD
SURF-B1/3 Enhanced ATCO alerting service for surface operations	Safety	TBD	Improve early detection of conflicting ATC Clearances (CATC) related to runway usage	TBD
	Safety	TBD	Improve early detection of conflicting ATC Clearances (CATC) related to taxi operations	TBD
SURF-B1/4 Routing service to support ATCO surface operations management	Efficiency	Efficiency Flight time & distance	Avoid taxi-in additional time resulting from adverse conditions	KPI13: Taxi-in additional time B
	Efficiency	Efficiency Flight time & distance	Avoid taxi-out additional time resulting from adverse conditions	KPI02: Taxi-out additional time
	Efficiency	Efficiency Flight time & distance	Introduce 4D planning of taxi-in surface movements	KPI13: Taxi-in additional time
	Efficiency	Efficiency Flight time & distance	Introduce 4D planning of taxi-out surface movements	KPI02: Taxi-out additional time
SURF-B1/5 Enhanced vision systems for taxi operations	Efficiency	Flight time & distance	Avoid longer taxi-in due to taxi errors	KPI13: Taxi-in additional time
	Efficiency	Flight time & distance	Avoid longer taxi-out routes due to taxi errors	KPI02: Taxi-out additional time
	Efficiency	Flight time & distance	Avoid slow taxi-in due to ATC and/or pilot	KPI13: Taxi-in additional time
	Efficiency	Flight time & distance	Avoid slow taxi-out due to weather conditions	KPI13: Taxi-in additional time

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
	Efficiency	Flight time & distance	Avoid slow taxi-out due to ATC and/or pilot	KPI02: Taxi-out additional time
	Efficiency	Flight time & distance	Avoid slow taxi-out due to weather conditions	KPI02: Taxi-out additional time
	Efficiency	Flight time & distance	Reduce ATC constraints during low visibility taxi-in	KPI13: Taxi-in additional time
	Efficiency	Flight time & distance	Reduce ATC constraints during low visibility taxi-out	KPI02: Taxi-out additional time
	Safety	TBD	Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	TBD
	Safety	TBD	Avoid incorrect presence of vacating aircraft or vehicles onto the runway protected area)	TBD
	Safety	TBD	Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	TBD
	Safety	TBD	Improve early detection of conflicting ATC Clearances (CATC) related to taxi operations	TBD
	Safety	TBD	Reduce number of taxi errors (cases of non-conformance with clearance)	TBD
TBO-B0/1 Introduction of time-based management within a flow centric approach.	Capacity	Capacity shortfall & associated delay	Mitigate demand/capacity imbalance at airports and/or associated terminal airspace	TBD
	Capacity	Capacity shortfall & associated delay	Mitigate demand/capacity imbalance in en-route airspace	TBD
TBO-B1/1 Initial Integration of time-based decision	Capacity	Capacity shortfall & associated delay	Mitigate demand/capacity imbalance at airports and/or associated terminal airspace	TBD
	Capacity	Capacity shortfall & associated delay	Mitigate demand/capacity imbalance in en-route airspace	TBD

ASBU Element	KPA	Focus Areas	Specific performance objective(s) supported	KPI
making processes				

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ATTACHMENT

TEMPLATE APPROVED BY THE COUNCIL
on 18 June 2014

(*NAME*) AIR NAVIGATION PLAN

VOLUME III

(*NAME*) AIR NAVIGATION PLAN

VOLUME III

TABLE OF CONTENTS

(*NAME*) ANP, VOLUME III

PART 0 – INTRODUCTION

1. INTRODUCTION

1.1 The background to the publication of ANPs in three volumes is explained in the Introduction in Volume I. The procedure for amendment of Volume III is also described in Volume I. Volume III contains dynamic/flexible plan elements related to the application of a performance-based approach for a cost-effective and benefit-driven modernization of the air navigation system in line with the Global Air Navigation Plan (GANP).

1.2 Collaborative decision-making is key for a cost-effective modernization of the air navigation system and ensures that all concerned aviation stakeholders are involved and given the opportunity to influence decisions in order to reach defined performance objectives. Volume III guides the aviation community in the application of performance management process and identification of relevant and timely operational improvements to a given region's air navigation system including some within the Aviation System Block Upgrade (ASBU) framework.

1.3 The information contained in Volume III is, therefore, related to:

- Planning: objectives, priorities, targets and needs planned at regional or sub-regional levels;
- Monitoring and reporting: performance and implementation monitoring of the agreed targets. This information should be used as the basis for reporting purposes (i.e.: global and regional air navigation reports and performance dashboards); and/or
- Guidance: providing regional guidance material for the implementation of specific system/procedures in a harmonized manner.

1.4 [***name of PIRG***] is responsible for managing and updating Volume III on a regular basis.

(*NAME*) ANP, VOLUME III

PART I - GENERAL PLANNING ASPECTS (GEN)

1. PLANNING METHOD

1.1 A performance-based approach is results-oriented, helping decision makers set priorities and determine appropriate trade-offs that support optimum resource allocation while maintaining an acceptable level of safety performance and promoting transparency and accountability among stakeholders.

1.2 The Thirteenth Air Navigation Conference recommended the ICAO encourage the planning and implementation regional groups (PIRGs) to embrace a performance-based approach for implementation and adopt the six-step performance management process, as described in the Manual on Global Performance of the Air Navigation System (Doc 9883), by reflecting the process in Volume III of all regional air navigation plans. Recommendation 4.3/1 — Improving the performance of the air navigation system refers.

1.3 Although there are several ways to apply a performance-based approach, ICAO advocates for a globally harmonized performance management process based on six well-defined steps. The goal of this cyclic six-steps method is to identify optimum solutions based on operational requirements and performance needs so that the expectations of the aviation community can be met by enhancing the performance of the air navigation system and optimizing allocation and use of the available resources.

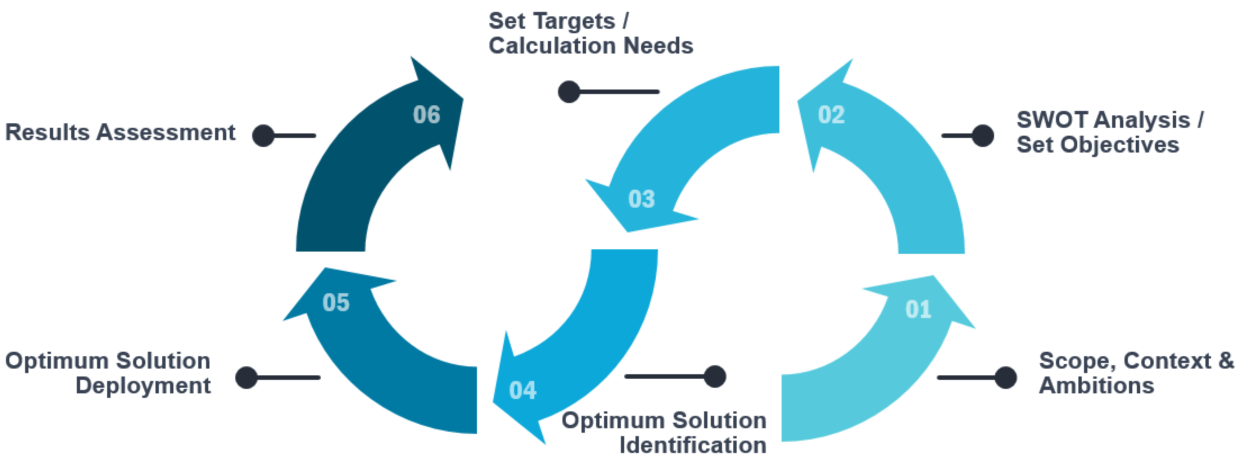

Figure 1 Six-step performance management process

1.4 Steps 1 and 2 serve to know your system, its strengths, weakness, opportunities and threats as well as how it is performing in order to set objectives. The catalogue of performance objectives that is part of the GANP global performance framework facilitates the definition of objectives.

1.5 Based on these objectives, targets can be set in step 3. An analysis of this data leads to the identification of potential solutions, in step 4, to achieve the targets by addressing the weakness and threats of the system. Once a set of potential solutions have been identified, a cost-benefits analysis, environmental impact assessment, safety assessment and human factor assessment should be performed to identify the optimum solution. In the GANP performance framework, a list of KPIs, linked to the relevant objectives in the performance objectives catalogue, is provided to set targets though the quantification of objectives. A list of potential solutions to be consider as part of step 4 is the ASBU framework with its functional description of the operational improvements and their associated performance benefits.

1.6 Step 5 manages a coordinated deployment of the agreed solution by all stakeholders based on the previous steps. Regional plans might need to be developed for the deployment of solutions by drawing on supporting technology requirements.

1.7 Finally, step 6 consists of monitoring and reporting the performance of the system after the full deployment of the solution.

1.8 This is an iterative planning process, which may require repeating several steps until a final plan with specific regional targets is in place. This planning method requires full involvement of States, service providers, airspace users and other stakeholders, thus ensuring commitment by all for implementation.

Review and evaluation of air navigation planning

2.1. The progress and effectiveness against the priorities set out in the regional air navigation plans should be annually reported, using a consistent reporting format, to ICAO.

2.2. Performance monitoring requires a measurement strategy. Data collection, processing, storage and reporting activities supporting the identified global/regional performance metrics are fundamental to the success of performance-based approaches.

2.3. The air navigation planning and implementation performance framework prescribes reporting, monitoring, analysis and review activities being conducted on a cyclical, annual basis.

Reporting and monitoring results

2.4. Reporting and monitoring results will be analyzed by the PIRGs, States and ICAO Secretariat to steer the air navigation improvements, take corrective actions and review the allocated objectives, priorities and targets if needed. The results will also be used by ICAO and aviation partner stakeholders to develop the annual Global Air Navigation Report. The report results will provide an opportunity for the international civil aviation community to compare progress across different ICAO regions in the establishment of air navigation infrastructure and performance-based procedures.

2.5. The reports will also provide the ICAO Council with detailed annual results on the quality of service provided worldwide as well as the performance areas which require more attention. This will serve as input for the triennial policy adjustments to the GANP and its priorities.

(***NAME***) ANP, VOLUME III

PART II – PERFORMANCE MANAGEMENT PLANNING AND ANS IMPLEMENTATION (PMP)

1. STEP 1: DEFINE SCOPE, CONTEXT AND SET AMBITIONS

General

1.1 The purpose of Step 1 is to reach a common agreement on the scope and (assumed) context of the regional air navigation system on which the performance management process will be applied, as well as a common view on the general nature of the expected performance improvements.

Geographical scope

1.2 The geographical scope is defined in Volume I and in particular in the following tables:

- Table GEN I-1 — List of Flight Information Regions (FIR)/Upper Information Regions (UIR) in the Region
- Table ATM I-1 — Flight Information Regions (FIR)/Upper Flight Information Regions (UIR) of the Region
- Table SAR I-1 — Search and Rescue Regions (SRR) of the Region
- Table AOP I-1 — International aerodromes required in the Region
- Table PMP III (NAME Region) - 1 – List of CTA/TMA in the Region (Optional. Please note that, if it is decided that this level of granularity is required in the Region, the rest of the performance management process will be applied at this level of granularity for consistency purposes. If this table is not developed, the PMP will be applied at an FIR level)

Homogeneous areas and/or major traffic flows

1.3 The homogeneous ATM areas and major traffic flows/routing areas identified are given in:

- Table GEN II-1 — Homogeneous areas and major traffic flows identified in the Region

Time Horizon

1.4 Volume III of the (***NAME***) ANP provides short- (***years***) and medium- (***years***) term implementation planning.

Traffic forecast

1.5 A uniform strategy has been adopted by ICAO for the purpose of preparing traffic forecasts and other planning parameters in support of the regional planning process.

- ***(include traffic forecast for the Region from ATB)***

1.6 In the ***(NAME)*** Region, in addition to the ICAO forecast, the following forecast from ***(source)*** is used for planning purposes. ***(if applicable)***

Political (high level) ambitions

1.7 The expectations of the global aviation community are defined in 11 Key Performance Areas (KPAs). The GANP considers all these areas through the performance ambitions. Although all these areas are equally important, as they are interrelated and cannot be considered in isolation, some areas are more visible to society than others.

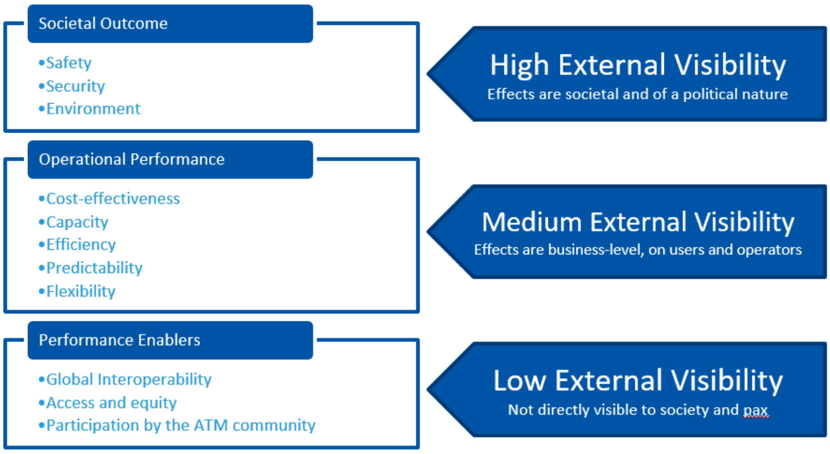

Figure 2 The 11 KPAs of the GANP

1.8 The regional air navigation plan public's perception of safe air travel is key to the prosperity of the aviation sector, which is why, safety is critical when planning the implementation of air navigation operational improvements. To determine if these improvements can be implemented in a safe manner, a safety risk assessment provides information to identify hazards that may arise from, for example:

a) any planned modifications in airspace usage;
b) the introduction of new technologies or procedures; or
c) the decommissioning of older navigational aids.

1.9 A safety risk assessment also enables the assessment of potential consequences. Based on the results of a safety risk assessment, mitigation strategies may be implemented to ensure that an acceptable level of safety performance is maintained. Any operational improvement should be implemented only on the basis of a documented safety risk assessment.

1.10 Fatalities resulting from acts of unlawful interference also affect the public's perception of aviation safety. The cumulative improvements to aviation security globally enhance the safety, facilitation and operational aspects of the international civil aviation system.

1.11 Some safety and environment considerations can be found in Volume I.

1.12 After political consultation the following set of performance ambitions have been prioritized within the **(*NAME*)** Region, **(*DECLARATION*)** refers.

- ***(include the set of ambitions in a set of KPAs)***

2. STEP 2: KNOW YOUR SYSTEM – SWOT ANALYSIS AND REGIONAL OBJECTIVES

General

2.1 The purpose of Step 2 is to develop a detailed understanding of the performance behaviour of the system (this includes producing a list of opportunities and issues), and to decide which specific performance aspects are essential for meeting the general expectations. The essential performance aspects are those which need to be actively managed (and perhaps improved) by setting performance objectives.

SWOT analysis

2.2 A SWOT analysis allows the development of an inventory of present and future opportunities and issues (weaknesses, threats) that may require performance management attention.

2.3 A SWOT analysis, requires the identification of:

- Strengths: internal attributes of a system or an organization that can help in the realization of ambitions or in meeting expectations.

- Weaknesses: internal attributes of a system or an organization that are a detriment to realizing ambitions or meeting expectations.
- Opportunities: are external conditions that help in the realization of ambitions or in meeting expectations.
- Threats: external conditions that are a detriment or harmful to realizing ambitions or meeting expectations.

2.4 Once the strengths, weakness, opportunities and threats are identified, action can be taken to target and exploit or remove these factors. The SWOTs in the **(*NAME*)** Region can be found in **Table PMP III-1**.

Regional objectives

2.5 The performance framework of the GANP includes a catalogue of performance objectives to facilitate the definition of objectives. Considering the objectives defined in the catalogue and based on the SWOT analysis, the **(*NAME*)** Region defines, within in the key performance areas prioritize in step 1, the objectives within **Table PMP III-2** to be pursued by the States within the Region.

3. STEP 3: QUANTIFY OBJECTIVES, SET TARGETS AND CALCULATE NEEDS

General

3.1 The purpose of Step 3 is to ensure that objectives are specific, measurable, achievable, relevant and time-bound (SMART) so that targets can be set and needs calculated.

List of regional indicators

3.2 The way to ensure that objectives are specific and measurable is by defining indicators. Indicators are the means to quantitatively express performance as well as actual progress in achieving performance objectives. Indicators need to be defined carefully:

- Since indicators support objectives, they should not be defined without having a specific performance objective in mind.
- Indicators are not often directly measures. They are calculated from supporting metrics according to clearly defined formulas. This leads to a requirement for cost data collection and flight data collection. If there is a problem with data availability to calculate these supporting metrics:
  - Set up the appropriate data reporting flows and/ or modelling activities, to ensure all supporting metrics are populated with data as required to calculate the indicator(s) associated with the objective; or
  - If this is not possible, aim for a different kind of performance improvement, by choosing a different performance objective, as constrained by data availability.

3.3 In order to facilitate this task, ICAO has defined a series of KPIs link to the catalogue of performance objectives within the 11KPAs. The ICAO KPIs associated to the performance objectives in the **(*NAME*)** Region are in **Table PMP III- 3**.

*Performance baseline in the **(NAME)** Region*

3.4 The only way of knowing an operational environment and identifying the existence of a problem is by collecting, processing and analysing data. The value of these indicators would be your performance baseline. The performance baseline for the **(*NAME*)** Region can be found in **Table PMP III-4**.

Regional targets and calculation of needs

3.5 Performance targets are closely associated with performance indicators, they represent the values of performance indicators that need to be reached or exceeded to consider a performance objective as being fully achieved.

3.6 To understand how challenging it is to reach your target, you should know your performance baseline. The difference between the baseline and the target is called the needs/performance gap.

3.7 The time available to achieve performance objectives is always limited. Therefore, targets should always be time-bounded.

3.8 The target and the time available to reach the target determine the required speed of progress for the performance objective. Care should be taken to set target so that the required speed of progress is realistic.

3.9 Based on the information submitted and after consideration by all stakeholders, the targets and needs in **Table PMP III-5** have been agreed for the **(*NAME*)** Region.

4. STEP 4: SELECT SOLUTIONS

General

4.1 The purpose of this step is to combine the knowledge of baseline performance, opportunities and issues with the performance objectives and targets, in order to make decisions in terms of priorities, trade-offs, selection of solutions and resource allocation. The aim is to optimize the decisions to maximize the achievement of the desired/required (performance) results.

Select solutions

4.2 Based on the agreed targets, States should perform a SWOT analysis at each operational environment to develop an inventory of present and future opportunities and issues that may require attention. The list then needs to be analyzed in a performance oriented way, to assess/ quantify the impact of drivers, constraints, impediments, etc. on the objectives under consideration. To what extent, when and under which conditions do these contribute to or prevent the required performance improvements.

4.3 States should consider the operational improvements (ASBU elements) within the ASBU framework as potential solutions to improve the selected objectives/KPIs in the operational environment under analysis. In order to help States with this task, ICAO has develop the Air Navigation System Performance Analysis (AN-SPA) tool, available for free at: https://www4.icao.int/ganpportal/ANSPA/Reports

4.4 Please note that the ASBUs are a list of potential solutions and therefore it might happen that the optimum solution for the operational environment under analysis is not within this list.

4.5 Once a list of potential solutions has been developed, it is important to do a safety assessment and an environmental impact assessment to analyze the feasibility of implementing that specific solution in the operational environment under analysis. ICAO has developed the following guidance to assist States to perform a safety assessment and an environmental impact assessment:

4.5.1 Safety assessment:

4.5.1.1 The 4th edition of the Safety Management Manual (SMM), was updated and published in October 2018 to provide supporting guidance for Amendment 1 to Annex 19 – Safety Management, including:

- Upgraded provisions for the protection of safety data, safety information and related sources;
- Integration of the 8 critical elements into the State Safety Programme (SSP) components; and
- Enhanced provisions for Safety Management System (SMS).

4.5.1.2 It also provides expanded guidance on the scope of Annex 19 its applicability, including discretionary SMS applicability, as well as the development of safety intelligence. In addition, to address the needs of the diverse aviation community implementing safety management and following a recommendation stemming from the 2nd High-level Safety Conference (HLSC/2015), the Safety Management Implementation (SMI) public website (www.icao.int/SMI) has been launched to complement the SMM. The SMI website serves as a repository for the sharing of practical examples, tools and educational material, which are being collected, validated and posted on an ongoing basis to support the effective implementation of SSP and SMS. An e-book version of the SMM in all ICAO languages is also available on the website.

4.5.2 Environmental impact assessment guidance:

4.5.2.1 This guidance identifies high-level principles that facilitate the robust definition and application of specific assessment approaches, methodologies and their respective metrics. The focus of these principles is on changes that relate to aircraft and ATM operational initiatives and may involve all phases of flight (e.g. Gate-to-Gate). The general principles of this guidance can be applicable to air navigation aspects arising from infrastructure proposals and major changes to airspace capacity or throughput, as well as operational changes. While the boundaries of an air navigation services environmental analysis are based on the needs of the study, for the purposes of this guidance material "air navigation services environmental assessment" is to be interpreted in the broadest possible sense and refers to impacts arising from changes to where, when, and how aircraft are operated.

https://store.icao.int/catalogsearch/result/?category_id=2&q=10031

4.5.2.2 Once the feasibility study has been done, we will still need to do a cost-benefit analysis to identify the optimum solution/s. ICAO has developed some guidance and a tool to assist you on this task:

4.5.3 Cost-benefit analysis:

https://data.icao.int/cba

4.5.3.1 Once the optimum solution(s) has(ve) been identified, States should report them to ICAO and they are reflected in **Table PMP III-6**.

5. STEP 5: IMPLEMENT SOLUTIONS

General

5.1 Step 5 is the execution phase of the performance management process. This is where the changes and improvements that were decided upon during the previous step are organized into detailed plans, implemented, and begin delivering benefits.

Select solutions

5.2 Once the optimum solution/s has/have been identified, it is the moment to start the execution phase of the performance management process. This is where the changes and improvements that you decided were the optimum solution for your problem during the previous steps are organized into plans, implemented and begin delivering services to achieve the expected performance. During this execution phase, it is important to keep track of the project deployments (time, budget, …).

5.3 Depending on the mature and magnitude of the change, this could mean:

- In the case of small-scale changes or day-to day management:
  - Assigning management responsibility for the implementation to an individual;
  - Assigning responsibility and accountability for reaching a performance target to an individual or organization
- In the case of major or multi-year changes:
  - Refining the roadmap of selected solutions into a detailed implementation plan, followed by the launching of implementation projects
  - Ensure that each individual implementation project is operated in accordance with the performance-based approach. This means launching and executing the performance management process at the level of individual projects. Each project derives its scope, context and expectations (see Step 1 of the process) from the overall implementation plan.

5.4 This can imply to overcome high-level political challenges, find funding and resources or look for external technical support.

5.5 In this step, States are expected to report on the status on the implementation by updating **Table PMP III-7**.

6. STEP 6: ASSESS ACHIEVEMENTS

General

6.1 The purpose of Step 6 is to continuously keep track of performance and monitor whether performance gaps are being closed as planned and expected.

Assess achievements

6.2 Once the project is implemented, it is time to assess the benefits from the implementation. This means measuring the performance of the operational environment under analysis once the solution/s has/have been deployed.

6.3 The purpose of this step is to continuously keep track of performance and monitor whether performance gaps are being closed as planned and expected.

6.4 First and foremost, this implies data collection to populate the supporting metrics with the data needed to calculate the performance indicators. The indicators are then compared with the targets defined during Step 3 to draw conclusions on the speed of progress in achieving the objectives.

6.5 This step also includes monitoring progress of the implementation projects, particularly in those cases where the implementation of solutions takes several years, as well as checking periodically whether all assumptions are still valid and the planned performance of the solutions is still meeting the (perhaps changed) requirements.

6.6 With regard to the review of actually achieved performance, the output of this step is simply an updated list of performance gaps and their causes. In practice, the scope of the activity is often interpreted as being much wider and includes recommendations to mitigate the gaps.

6.7 This is then called performance monitoring and review, which in addition to this step, includes step 1, 2 and 3.

6.8 For the purpose of organizing performance monitoring and review, the task can be broken down into five separate activities:

- Data collection

- Data publication
- Data analysis
- Formulation of conclusions; and
- Formulation of recommendations.

6.9 States should report on the benefits accrued from the implementation of the solutions in **Table PMP III-8.** This would constitute the baseline for the next iteration of the performance management process.

Table PMP III- (Region) - 1 – List of CTA/TMA in the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 States in **Table GEN I-1**

2 List of FIRs by State within **Table ATM I-1**.

3 CTAs/TMAs

4 Remarks

State	FIR	CTA/TMA		Remarks
		Indicator	Name	

Table PMP III-1 – Strengths, weakness, opportunities and threads in the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 Strengths: internal attributes of a system or an organization that can help in the realization of ambitions or in meeting expectations.

2 Weaknesses: internal attributes of a system or an organization that are a detriment to realizing ambitions or meeting expectations.

3 Opportunities: are external conditions that help in the realization of ambitions or in meeting expectations.

4 Threats: external conditions that are a detriment or harmful to realizing ambitions or meeting expectations.

5 List of SWOTs

6 Remarks

	List	Remarks
Strengths		
Weakness		
Opportunities		
Threats		

Example for the CAR Region:

	List	Remarks
Strengths	Reconocimiento político de la importancia de la aviación civil en la Región	
	Reconocimiento de liderazgo de la oficina Regional por parte de los Estados	
	Strong commitment from the RO to the States	
	Open skies policies	
	State of the art CNS infrastructure	
	Continuos investment ATM improvement	
	Buenos mecanismos de cohesión para la prestación del servicio de MET	
	Good trasition to digital aeronáutica information	
	Human factors considerations included	
Weakness	Different needs	
	Lack of technical skilled personnel	
	Infrastructura aeroportuaria saturada y non-compliance with the Standards	
	Lack of use of new CNS equipment	
	Lack of harmonization in ATM procedures and systems	
	Lack of MET instruments and equipment	
	Lack of attention of States to the establishment of SAR services	

	Lack of validation of to ensure that an aeronautical information products have been checked	
	Lack of quality of the information	
	Unresolved air navigation deficiencies	
	ANS safety oversight not at the same level of the ANSP	
	60.17 Regional ANS EI and 58.49 Regional AGA EI	
Opportunities	Tourism and economic growth	
	Continuos traffic growth	
	Access to funding (pool of donnors and partnerships)	
	Programas de asistencia disponibles	
	New technology available	
	Use of regional cooperation to address aviation challenges	
	Strategic geographical position of the Region	
Threats	Natural disasters	
	Political and social conflicts	
	Public Health events	
	Geografia insular and oversees territories	
	Lack of holistic approach to the national transport systems	
	Non-homogeneous traffic demand with peaks of traffic exceeding capacity	
	Lack of harmonization with regards to available assistant	

Table PMP III-2 – List of performance objectives by KPA for the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 ICAO defined 11 Key Performance Areas. *Include the list of KPAs and its definition*.

2 Performance Objectives. These objectives have been selected from the catalogue of performance objectives.

3 Remarks

KPA	Performance Objective	Remarks

Table PMP III-3 – List of KPIs by performance objective and KPA for the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 KPAs from **Table PMP III-2**.

2 Performance Objectives from **Table PMP III-2**.

3 KPIs based on the ICAO list of KPIs. ***If there is a KPI you would like to introduce, please submit it for coordination with the global performance expert group***

4 Remarks

KPA	Performance Objective	KPIs	Remarks

Table PMP III-4 – Performance baseline within the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 States in **Table GEN I-1**

2 List of FIRs/ CTAs/TMAs/Airports by State within **Table ATM I-1** or **Table PMP III-**(NAME Region) **- 1** and **Table AOP I-1**.

3 Value for the list of KPIs in **Table PMP III-3.**

4 Remarks

STATE	FIR/CTA/TMA /AIRPORT	KPIs							Remarks
		1	2	3					

Table PMP III-5 – Performance targets and needs within the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 States in **Table GEN I-1**

2 List of FIRs/CTAs/TMAs/Airports by State within **Table ATM I-1** or **Table PMP III-**(NAME Region) **- 1** and **Table AOP I-1**.

3 Targets for the list of KPIs in **Table PMP III-3.** ***(include the value of the regional targets/needs for the different operational environments identified in step 1)***

4 Remarks

STATE	FIR/CTA/TMA/AIRPORT	Targets							Remarks
		1	2	3					

Table PMP III-6 – Deployment planning: selected ASBU Elements / Operational Improvements for the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 States in **Table GEN I-1**

2 List of FIRs/ CTAs/TMAs/Airports by State within **Table ATM I-1** or **Table PMP III-**(NAME Region) **- 1** and **Table AOP I-1**.

3 Selected ASBU elements /operational improvements for each operational environment.

Please note that the ASBU elements are a set of operational improvements, however, there could be other improvements outside of the ASBU framework that might address identified issues and opportunities and therefore contribute to achieve the pursued level of performance.

4 Year when implementation of the selected solution is planned to start.

5 Year when implementation of the selected solution is foreseen to be completed.

6 Remarks

STATE	FIR/CTA /TMA/AIRPORT	ASBU Elements / Operational Improvements	Start Year	End Year	Remarks

Table PMP III-7 – Implementation progress on the selected operational improvements of the ASBU elements / Operational Improvements for the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 States in **Table GEN I-1**

2 List of FIRs/CTAs/TMAs/Airports by State within **Table ATM I-1** or **Table PMP III-**(NAME Region) **- 1** and **Table AOP I-1**.

3 Selected ASBU elements/operational improvement for each operational environment.

Please note that the ASBU elements are a set of operational improvements, however, there could be other improvements outside of the ASBU framework that might address identified issues and opportunities and therefore contribute to achieve the pursued level of performance.

4 Year when implementation of the selected solution is planned to start **PMP III-6**.

5 Year when implementation of the selected solution is foreseen to be completed **PMP III-6**.

6 Implementation progress:

- Completed (100%): the development or improvement is reportedly fulfilled (it is either in operational use or there is reported on-going compliance)
- Ongoing (1-99%): implementation is reported on-going, however not yet fully completed
- Planned (0%): a planned schedule and proper (approved and committed budgeted) actions are specified within the agreed data for completion but implementation has not yet kicked off
- Late (0-99%): part or all of the actions leading to completion are "planned" to be achieved after the end year date; or the implementation is ongoing but will be achieved later than that data or the end year date is already exceeded.

7 Remarks

STATE	FIR/CTA /TMA /AIRPORT	ASBU Elements / Operational Improvements	Start Year	End Year	Implementation progress	Remarks

Table PMP III-8 – Performance benefits accrued form the implementation of the selected ASBU elements / Operational Improvements for the (NAME) Region

EXPLANATION OF THE TABLE

Column

1 States in **Table GEN I-1**

2 List of FIRs/ CTAs/ TMAs/Airports by State within **Table ATM I-1** or **Table PMP III-**(NAME Region) **- 1** and **Table AOP I-1**.

3 Selected ASBU elements/operational improvements for each operational environment.

Please note that the ASBU elements are a set of operational improvements, however, there could be other improvements outside of the ASBU framework that might address identified issues and opportunities and therefore contribute to achieve the pursued level of performance.

4 Value after implementation for the list of KPIs in **Table PMP III-3.**

5 Remarks

STATE	FIR/CTA /TMA/AIRPORT	ASBU Elements/operational improvements	KPI			Remarks
			1	2	3	

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