International Civil Aviation Organization
CAR/SAM Regional Planning Implementation Group (GREPECAS)
First Meeting of the Communications, Navigation and Surveillance / Air Traffic Management Subgroup (CNS/ATM/SG/1)
(Lima, Peru, 15 to 19 March 2010)

Agenda Item 4: **Review of the of the pending matters of ATM/CNS/SG, ATM and CNS Committees with their Task Forces aimed at considering this matters in the working programme of the CNS/ATM Subgroup**

UPDATE OF PERFORMANCE OBJECTIVES AND ATM OPERATIONAL IMPLEMENTATION SCENARIO

(Presented by the Secretariat)

SUMMARY

This Working Paper presents the operational implementation scenarios, taking into account the regional performance objectives (RPOs) adopted by GREPECAS to reorganize the CNS/ATM/SG work programmes. The analysis envisages other strategic operational improvements (SOI) to facilitate the CAR/SAM States/Territories/International Organizations the development and harmonization of their air navigation systems implementation plans.

Suggested action for the meeting is presented in paragraph 4.1.

References:

- Doc 9854 - *Global Air Traffic Management Operational Concept*
- Doc 9882 – *Manual on Air Traffic Management System Requirements*
- Doc 9883 – *Manual on Global Performance of the Air Navigation System*
- Doc 9750 - *Global Air Navigation Plan*
- Report of the Eleventh Air Navigation Conference (AN-Conf/11, Montreal, Canada, October 2003)
- Report of the GREPECAS/15 Meeting (Río de Janeiro, Brazil, October 2008)

1. Introduction

1.1 The operational concept presents ICAO's vision of a harmonized and inter-functional integrated ATM system on a worldwide basis. The ATM global system is described as a world-wide seamless among Regions inter-functional system, for all users and during all phases of flight, compliant with agreed safety levels, allowing for economic and optimal operations and improving its relationship with the environment.

1.2 Moreover, the Global Air Navigation Plan describes the strategy to attain short and medium-term ATM benefits based on ATM infrastructure and on the capabilities of the available and foreseen aircraft. The Global Plan contains long-term initiatives, necessary to provide guidance on the evolution towards a global ATM system, as envisaged in the operational concept.

1.3 GPIs support the initiatives, developed as Regional Performance Objectives (RPOs), where the short and medium-term strategies to achieve evolutionary progress in the ATM system implementation are reflected. The long term initiatives, which are necessary to provide guidance to the evolution towards a global ATM system, will be added to the Global Plan as they are developed and approved.

1.4 Based on the recommendations of the Eleventh Air Navigation Conference (AN-Conf/11) towards the implementation of performance-based air navigation, ICAO has developed guidance material including: a) *Global Air Traffic Management Operational Concept* (Doc 9854); b) *Manual on Air Traffic Management System Requirements* (Doc 9882); c) *Manual on Global Performance of the Air Navigation System* (Doc 9883); and d) *Global air navigation Plan* (Doc 9750).

1.5 Doc 9883 describes the process to develop a framework based on performance through RPOs with tasks, persons/bodies in charge, metrics and indicators reflecting Strategic Operational Improvements (SOIs) required in response to the ATM community expectations. Doc 9882 helps defining the requirements of the seven components of the ATM system, at any moment of the planning process.

1.6 GREPECAS, through Conclusion 14/51, adopted 7 ATM performance objectives, so as the ATM/CNS/SG could start the reorganization of its work programme. Later, GREPECAS, through its Conclusion 15/1, adopted a regional performance based framework and at the same time, invited States to implement a national performance framework.

2 Analysis

Performance Framework for Air Navigation Systems

2.1 As the aviation industry has evolved towards a less regulated and more entrepreneurial environment with more responsibilities, the advantages of the transition of systems-based planning towards performance-based planning are more evident.

2.2 The Global ATM System requires that tactical management changes to strategic management and the facilitation of the participation of all the members of the ATM community in the decision making process for safe and efficient air transport operations. Service provision management, as defined in the ATM Operational Concept, is evolving towards a systemic approach.

2.3 As a follow-up to GREPECAS Conclusion 15/1, ICAO has performed workshops on performance-based planning through two Special Implementation Projects (SIPs) for the CAR/SAM Regions. The first workshop was held in Lima, Peru, from 13 to 17 April 2009; and the second workshop was held in Mexico City, Mexico, from 6 to 10 July 2009.

2.4 Regional implementation initiatives were integrated into the ATM/CNS/SG work programme through the following 7 ATM performance objectives approved by GREPECAS:

1. En-route airspace ATS route structure optimization
2. Terminal airspace ATS route structure optimization
3. RNP approaches implementation
4. Improvements to civil-military coordination and co-operation
5. Alignment of upper airspace classification
6. Improvement of demand-capacity balance (ATFM)
7. Improve ATM situational awareness.

2.5 The described ATM performance objectives were defined with integrated strategies and inter-related implementation tasks facilitating the regional planning process. The **Appendix** to this Working Paper shows the ATM Performance Objectives and the status of compliance in relation with GPIs. The finalizing and implementation horizon of the tasks of each strategy goes from 2010 to 2016.

PBN Implementation

2.6 PBN implementation is related with RPOs 1, 2 and 3. Many of the tasks described in PBN strategies are currently developed by States/Territories/International Organizations. ICAO has kept continuous coordination and monitoring on the latest implementations of RNAV routes and RNAV/RNP approach procedures.

2.7 Nevertheless, in the medium-term, the development of an integral PBN airspace concept foreseeing new ATS capabilities to cover the future air traffic growth demand is required (see WP/10). This task will need the analysis of the new upper and lower airspace and airport adjacent areas requirements, through the coordination of a multi-disciplinary group on factors such as airspace organization and management, assessment of the existing fleet capacity and of the available CNS infrastructure, publication of routes and procedures, performance metrics, etc.

Navigation Infrastructure

2.8 Navigation has developed from simple NDBs and DF equipment to VOR with DME to provide guidance to pilots along air routes and provide positioning data to support Area Navigation Capability. For landing, ILS has been the guidance aid used to enable low visibility procedures down to CAT III over the past 50 years. With the advent of GNSS, we now have the ability with a single navigation source of operating globally to an accuracy of a few meters. This source, aided by satellite based augmentations and with GPS augmented by GBAS, will provide accuracy and availability capable of supporting approach down to Cat I. It is required to analyze current navigation infrastructure and all future navigation applications for the use of an on-board RNAV system.

Improvements to Civil/Military Coordination and Co-operation

2.9 The need of a greater airspace and operations monitoring capacity requires improvements to the coordination among civil and military authorities. In the medium-term, this coordination will facilitate the implementation of the flexible use of airspace (FUA) and will also have an impact on an improvement to search and rescue (SAR) services that are presently provided by mixed civil and military agencies.

Upper Airspace A Classification

2.10 Harmonizing upper airspace classifications helps the implementation of PBN. In line with PBN objectives, airspace should be structured as a continuous space, free of discontinuities and operational differences wherein divergent rules and procedures are not applied.

2.11 It also facilitates the introduction and better use of data link communications, better flight plans processing systems, as well as airspace management coordination instruments and advanced message exchange capacities, and therefore a more flexible and dynamic airspace management is obtained. The upper airspace should be published as A Classification when it is over FL195 in a uniform manner in the CAR/SAM Regions.

Improve Demand and Capacity Balance (ATFM)

2.12 Traffic growth in the medium-term will require the implementation of improvements to the demand and capacity balance of air navigation services. The possible implementation areas should be coordinated in a regional manner in order to avoid differences between the applicable procedures. Regional ATFM implementation activities are extended beyond 2014.

Improve ATM Situational Awareness

2.13 Improvement in ATM situational awareness is translated in improvements to automation in terms of communications and surveillance. It is required to analyze other Strategic Operational Improvements (SOIs) and the development and harmonization of their air navigation systems implementation plans. Among these SOIs is the need to review and improve the infrastructure of communications and surveillance for future applications of the ATM system, based on the following:

- *Communications.* The field of communications is the most basic of the ATM enablers. Today the world's air ground communications are based on AM-DSB in the VHF band (18 MHz to 137 MHz). Over the years, in order to keep pace with capacity requirements, the channel spacing has been slowly reduced from 50 kHz to 25 kHz. In recent years, data link services have been introduced for CPDLC. This also uses VHF but with a modulation scheme designated VDL Mode 2. With increasing requirements for more voice channels in order to cope with ever increasing traffic, the VHF spectrum will soon become saturated and there will be no more channels to allocate. The Future Communications Infrastructure (FCI) will be a system of systems – facilitating both terrestrial and satellite communications within the same box thus reducing reliance on VHF for a period of time.

- *Surveillance.* Surveillance is used to allow controllers to see the aircraft and ensure that they are flying where they should. The most basic surveillance is the Primary Radar. Modern systems use a transponder which is located in the aircraft. SSR uses such a transponder to connect to information sources on the aircraft to provide altitude and identify information. SSR Mode S, the latest SSR development, also allows the provision of other parameters, including aircraft identity and selected altitude. The ADS-B differs from SSR in that the aircraft determines its own position based on GPS and transmits that position to the ground and to other aircraft. Finally Multilateration (MLAT) is the new technology being used with its application to airports and in en-route and TMAs to compute the position of the aircraft using data from a number of separate, omni-directional receivers.

- *Aeronautical information management (AIM).* To facilitate coordination, improve efficiency and safety and ensure that the ATM community shares the same information when collaborating on decisions, it is essential that quality assured electronic information (aeronautical, terrain and obstacle) be available in real-time. Electronic information will enhance pilots' situational awareness during en-route, terminal and aerodrome operations by loading on-board equipment with geo-referenced data sets. The same information may be made available at different ATC positions and pre-flight planning units as well as for access by airlines' flight planning departments or private/general aviation users.

- *Improve provision of Meteorological services.* Immediate access to real-time, global OPMET information is required to assist ATM in tactical decision-making for aircraft surveillance, air traffic flow management and flexible/dynamic aircraft routing which will contribute to the optimization of the use of airspace. Such stringent requirements will imply that most meteorological systems should be automated and that meteorological service for navigation be provided in an integrated and comprehensive manner through global systems such as WAFS, the IAVW and the TCWS. Increasing use of data-link to downlink and uplink meteorological information through such systems as D-ATIS and D-VOLMET will assist in the automatic sequencing of aircraft on approach and will contribute to the maximization of capacity. These forecasts and warnings, together with automated OPMET information, will contribute to maximizing runway capacity.

Enhance Safety and Efficiency of Aerodrome Operations

2.14 Improved aerodrome design and management activities, including coordination and collaboration between ATM providers, vehicle operators and aircraft operators will have a relevant impact on safety and capacity at aerodromes. As an integral part of aerodrome certification new requirements are seen for many international aerodromes in terms of ground infrastructure including, inter alia, RESA, aerodrome emergency planning, more high speed taxiways, additional parking gates, aerodrome management operations to reduce runway occupancy, improve gate movement and all meteorological weather operations, etc.

3 Conclusion

3.1 Existing and emerging technologies are providing options to support tactical as well as strategic air navigation services management. Nevertheless, technology itself cannot provide ideal solutions for airspace optimization of as well as for aircraft operations.

3.2 ICAO has coordinated several activities for the implementation of the performance-based ATM system considering four principles: operational enhancement approach; use of existing infrastructure; take advantage of the capacity of the structures of existing aircrafts; and improve whatever is necessary.

3.3 The work programmes of the CNS/ATM/SG should be in line with a CAR/SAM Performance-based Air Navigation Implementation Plan, which supports GREPECAS planning and serves as guidance material to harmonize States implementation plans. The regional CAR/SAM implementation plan should also be consistent with the performance objectives of the SESAR and NextGen programmes.

3.4 Moreover, the regional implementation work plan is respectively coordinated by the ICAO NACC and SAM Regional Offices with sub-regional Implementation Groups and technical co-operation experts supporting the development of tasks in line with GREPECAS planning. Nowadays, several States/Territories/International Organizations have presented their implementation plans to ICAO.

3.5 Depending on the current and future scenarios, States/Territories/International Organizations should develop their performance based implementation plans identifying those initiatives adapting to their own needs and ensuring integration and harmonization of systems and infrastructure of air navigation with States/Territories/International Organizations and adjacent Regions.

3.6 Recognizing the need of having a performance-based inter-regional strategy to implement air navigation systems in the CAR/SAM Regions, the Meeting should consider harmonizing all the work programmes through the adoption of the following:

DRAFT
CONCLUSION 1/XX APPROVAL OF THE CAR/SAM PERFORMANCE BASED AIR NAVIGATION IMPLEMENTATION PLAN

That:

a) GREPECAS adopt a Performance-Based Air Navigation Implementation Plan as guidance material for the CAR/SAM Regions;

b) the CAR/SAM States, Territories and International Organizations develop their national action plans based on the CAR/SAM Performance Based Air Navigation Implementation Plan to achieve harmonized interregional implementation; and

b) ICAO take appropriate measures to monitor the implementation of the CAR/SAM Performance Based Air Navigation Implementation Plan and submit progress reports to GREPECAS Meetings.

4 Suggested Action

4.1 Recognizing the need of having a clearly defined strategy to implement performance based air navigation systems in the CAR/SAM Regions, the Meeting is invited to review the contents of this Working Paper and to consider the adoption of the Draft Conclusion mentioned in paragraph 3.6 above.

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APPENDIX

ATM PERFORMANCE OBJETIVES

As a result of the implementation tasks described in the ATM regional performance objectives (RPOs), it is observed that from the 23 Global plan initiatives (GPIs) of the Global Air Navigation Plan (Doc 9750), two have been finalized, several are under implementation process and others should be analyzed in coordination with other GREPECAS contributory bodies, as indicated below:

GPI		En-route	Terminal Area	Aerodrome	Supporting Infrastructure	Remarks
GPI-1	Flexible use of airspace	X	X			Adopted in work programme ATM. RPO 1, 2, 3
GPI-2	Reduced vertical separation minima	X				Finalized
GPI-3	Harmonization of level systems	X				Finalized
GPI-4	Alignment of upper airspace classifications	X				Adopted in work programme ATM. RPO 5
GPI-5	RNAV and RNP (Performance-based navigation)	X	X	X		Adopted in work programme ATM. RPO 1, 2, 3
GPI-6	Air traffic flow management	X	X	X		Adopted in work programme ATM. RPO 6
GPI-7	Dynamic and flexible ATS route management	X	X			Adopted in work programme ATM. RPO 1, 2, 3
GPI-8	Collaborative airspace design and management	X	X			Adopted in work programme ATM. RPO 1, 2, 3
GPI-9	Situational awareness	X	X	X	X	Adopted in work programme ATM. RPO 7
GPI-10	Terminal area design and management		X			Adopted in work programme ATM. RPO 1, 2, 3
GPI-11	RNP and RNAV SIDs and STARs		X			Adopted in work programme ATM. RPO 1, 2, 3
GPI-12	Functional integration of ground systems with airborne systems		X		X	Adopted in work programme ATM. RPO 7
GPI-13	Aerodrome design and management			X		TBD
GPI-14	Runway operations			X		TBD

GPI		En-route	Terminal Area	Aerodrome	Supporting Infrastructure	Remarks
GPI-15	Match IMC and VMC operating capacity		X	X	X	TBD (All WX operations)
GPI-16	Decision support systems and alerting systems	X	X	X	X	Adopted in work programme ATM. RPO 7
GPI-17	Data link applications	X	X	X	X	Adopted in work programme ATM. RPO 7
GPI-18	Aeronautical information	X	X	X	X	TBD
GPI-19	Meteorological systems	X	X	X	X	TBD
GPI-20	WGS-84	X	X	X	X	Adopted in work programme ATM. RPO 1, 2, 3
GPI-21	Navigation systems	X	X	X	X	TBD (Uso del GNSS - RPO 1, 2, 3)
GPI-22	Communication infrastructure	X	X	X	X	TBD (Improvement of aeronautical communications – RPO 7)
GPI-23	Aeronautical radio spectrum	X	X	X	X	TBD (ITRC-12)

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