International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Sixth Meeting of the GREPECAS Aerodromes and Ground Aids/Aerodrome Operational Planning Subgroup (AGA/AOP/SG/6)
San Jose, Costa Rica, 23 to 27 June 2008

Agenda Item 6: Review of other technical matters

6.1 The ICAO Global Air Navigation Plan

(Presented by the Secretariat)

SUMMARY

In 1998, the Council approved the Global Air Navigation Plan for CNS/ATM Systems (Doc 9750) (Global Plan) and agreed that future updates of the Global Plan should be made by the Secretariat based on the ongoing work of ICAO. In 2001, the Council approved the first amendment to the Global Plan.

As a follow-up to the Eleventh Air Navigation Conference (AN-Conf/11), held in 2003, and to the sixth consultative meeting between the Air Navigation Commission and the industry, held in 2004, the Secretariat drafted and submitted to the Council in November 2006 the second amendment to the Global Plan for its approval.

This working paper contains the action suggested to GREPECAS/14.

References:

- Global Air Navigation Plan (Doc 9750); and
- Air Navigation Commission AN WP 8158, 05/10/06.

1. Global planning

1.1 Introduction

1.1.1 In order to preserve the vitality of civil aviation, a safe, protected, efficient, and environmentally sustainable air navigation system needs to be available at global, regional, and national level. This requires the implementation of an air traffic management system that permits optimum use of the enhanced capabilities offered by technical developments. The Global air navigation plan, with its initiatives and related interactive planning tools, serves as a strategic document, providing the planning methodology that will lead to global harmonisation.

1.2 **Achieving a global ATM system**

1.2.1 The global ATM operational concept is the basis for the promulgation of ATM operational requirements, objectives and benefits, and provides the support for the development of regional and national ATM implementation plans. The global ATM system provides interoperability and continuity across the various regions for all users and during all flight phases, its meets the agreed safety levels, provides for economical and optimum operations, is environmentally sustainable, and meets national safety requirements.

1.3 In order to further the implementation of CNS/ATM systems, an action plan was necessary. The first attempt was the ICAO coordinated global plan for CNS/ATM systems. In 1996, it was recognised that this plan had met its objective and had contributed to the attainment of the vision established by the FANS Committees, illustrating CNS/ATM systems and their implementation to the international community. It was concluded that a concrete plan that included all developments and focusing on regional implementation was necessary.

1.4 The Eleventh Air Navigation Conference (October 2003) agreed that the global plan was an important component in the development of regional and national plans, and that, together with the ATM operational concept, it offered an effective architecture for the implementation of a global system based on this concept.

1.5 The sixth consultative meeting between the Air Navigation Commission and the industry (May 2004) addressed the issue of the application of the recommendations of the Eleventh Air Navigation Conference, including "The global ATM – from concept to reality", with respect to which the meeting decided to encourage industry partners to work together in the development of common road maps or global action plans for their inclusion in the Global Plan. As a follow-up, specialised project groups representing the industry drafted two road maps for ATM implementation. The Commission requested the Secretariat to develop a proposal for amending the Global Plan so as to include relevant road map texts, and to submit the proposal for amendment to the Commission for its revision.

1.6 This second amendment to the Global Plan was prepared based on the recommendations of the Eleventh Air Navigation Conference and on the operational initiatives contained in the road maps. These initiatives, as developed by the industry, were consolidated in close cooperation with the latter in order to enable a smooth integration into the planning framework of the regional groups (PIRGs).

2. **Advantages of a global ATM system**

2.1 A major advantage of a global ATM system is that it will increase airspace capacity, thus improving efficiency without affecting the established safety levels. Furthermore, this system will enhance the management and transfer of information, expand surveillance capabilities, and improve navigation. This leads to a reduction of aircraft separation and a subsequent increase in airspace capacity.

2.2 Global ATM will also permit the implementation of automation systems to increase traffic. The ATM system will be capable of accepting an aircraft preferred flight profile, and helping aircraft operators to reduce operating costs and delays. Likewise, operators will be able to equip international aircraft with a minimum level of avionics to be used anywhere. General aviation aircraft will have greater access to avionics for operating under flight conditions and for entering and exiting airports, tasks which would have been impossible otherwise because of operating costs and associated requirements.

3. Benefits for the States providing air navigation infrastructure worldwide

3.1 For States providing and maintaining extensive ground infrastructure, a reduction is foreseen in the overall cost of operating and maintaining the facilities, as traditional ground systems become obsolete and greater use is made of satellite-based technology. Likewise, global ATM gives developing States a convenient opportunity to improve their infrastructure in order to process more traffic with a minimum investment. Many of these States have extensive underutilised airspace, mainly due to the expenses involved in the acquisition, operation, and maintenance of the required ground infrastructure. CNS/ATM systems will allow them to modernise without incurring in excessive costs, even for the provision of precision and non-precision approaches.

4. Environmental and other benefits

4.1 With the growth of the aeronautical industry, the impact of air traffic operations on the global atmosphere becomes increasingly important, in addition to the local effect of noise and the quality of air. In particular, it is foreseen that, by optimising cruise levels and routes, and through the implementation of continuous descent arrivals and approaches, ATM improvements could help reduce aviation fuel consumption, thus mitigating the effect of increased traffic on global aircraft engine emissions.

4.2 In addition to the aforementioned benefits, there are others, such as: lower passenger and cargo fares, time savings for the passengers, transfer of high technology through training, improved productivity, industry restructuring, better business opportunities, increased employment, among others.

5. What is new in the revised Global Plan?

5.1 The following table shows what is new in the revised Global Plan, comparing the current with the new version:

No	Current version	New version
1	Only covers CNS and ATM elements, known as the Global ANP for CNS/ATM systems.	Coverage is extended to related elements, such as AIS/AGA/MET, known as the Global ANP.
2	Developed by ICAO with indirect participation of the industry and the States.	Developed by ICAO with direct participation of the industry and the States.
3	Covers the short, medium, and long term.	Covers the short, medium, and long term. The long term is based on the ATM operational concept.
4	Objective- and system-based.	Performance-based.
5	P-based (paper).	E-based (electronic).
6	Provides passive harmonisation.	Ensures active harmonisation.
7	Implementation based on 45 objectives and systems.	The 45 objectives have been redefined and aligned with performance, based on 23 Global Plan initiatives.
8	Implementation not supported by planning tools.	Diversity of planning tools available (software, Web, Project management, etc.).

5.2 **Appendix A** to this working paper provides details of the planning process for attaining a global ATM system, the work programme, and the evolutionary construction of an ATM system based on the operational concept.

6. **Discussion**

6.1 The Global Air Navigation Plan becomes an implementation framework that:

a) provides precise information for measuring performance.
b) provides the baseline for measuring the achievements and implementation of the ICAO ATM operational concept.
c) integrates and automates the Business Plan process.
d) shares common information and processes.

6.2 This paper addresses aspects involving aerodrome design and management, as well as runway operations, aimed at the implementation of management and design strategies to improve the use of movement areas and maximise runway capacity.

7. **Suggested action**

7.1 The Meeting is invited to:

a) take note of the second amendment to the Global Air Navigation Plan for CNS/ATM Systems (Doc 9750), now entitled Global Air Navigation Plan; and

b) develop/modify/harmonise the regional work programme and the regional air navigation plan, based on the Global Air Navigation Plan.

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APPENDIX A

Ref: Doc 9750 Global Air Navigation Plan, Chapter 1 - Introduction

EVOLUTION TO THE GLOBAL PLAN INITIATIVES

INTRODUCTION

In the process of evolution towards the Global Plan initiatives, there is a strategy for achieving short- and medium-term ATM benefits based on ATM infrastructure and existing and foreseen aircraft capabilities. The strategy contains guidelines on the ATM improvements required for a uniform transition to the ATM system foreseen in the global air traffic management operational concept (Doc 9854). The operational concept is oriented towards an integrated, harmonised, and globally inter-operational ATM system. A global ATM system can be described as a global system that permits a seamless operation for all users and during all flight phases across the regions of the world, and which meets the agreed safety levels, permits optimal cost-effective operations, is environmentally sustainable, and meets national security requirements.

There are many ways of presenting a transition map. The Global Plan focuses on operational and technical improvements that will provide short- and medium-term benefits to aircraft operators. Long-term initiatives, which are necessary to guide the evolution towards a global ATM system as foreseen in the operational concept, will be added to the Global Plan as they are developed and approved.

Planning will focus on performance objectives, supported by a set of "Global Plan Initiatives" ("initiatives"). The States and the Regions should select the initiatives that meet their performance objectives and that have been identified through an analytical process, and which specifically address the particular needs of a State, Region, ATM homogeneous area, or main air traffic flow. Planning instruments will assist in the analytical process.

THE PLANNING PROCESS

Achieving a global ATM system

The development of a global ATM system is based on an agreed structure of ATM homogeneous areas and main traffic flows or routing areas. These areas and flows bring together the various elements of worldwide aeronautical infrastructure into a global system. The PIRGs are permanently identifying, updating, and analysing these areas and traffic flows in cooperation with aircraft operators, whose requirements are reflected therein.

ATM homogeneous area – Main traffic flows and routing areas

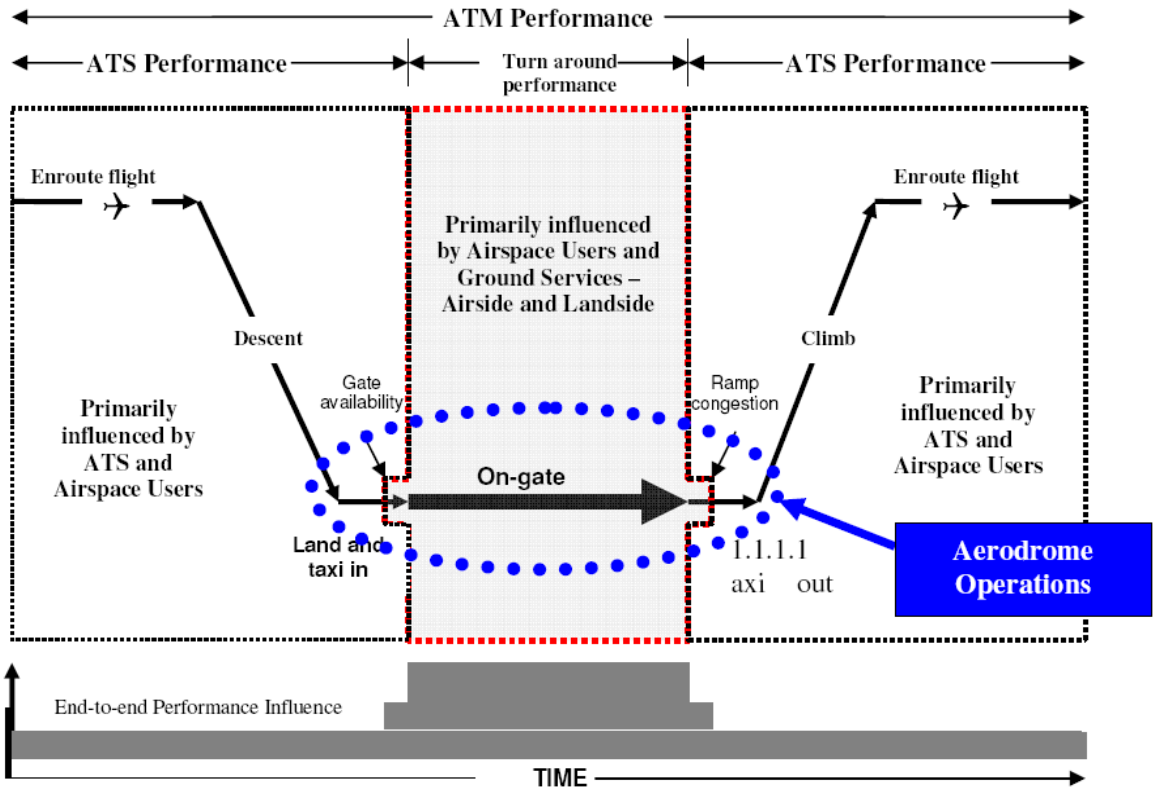
An ATM homogeneous area is an airspace with a common ATM interest, with similar characteristics in terms of traffic density, complexity, air navigation system infrastructure requirements, or other given considerations, and where a common detailed plan will foster the implementation of inter-operational ATM systems. ATM homogeneous areas may cover States, specific sections of States, or groups of States. They may also cover extensive oceanic and continental areas. Consideration is given to common areas of interest and requirements.

A main traffic flow concentrates a significant volume of air traffic on the same path or on nearby flight paths. Main traffic flows may cross several ATM homogeneous areas with different characteristics. A routing area covers one or more main traffic flows, and is defined for purposes of developing a detailed plan for the implementation of ATM systems and procedures. A routing area may cross several ATM homogeneous areas with different characteristics. A routing area specifies common interests and requirements for underlying homogeneous areas, and a detailed plan for the implementation of ATM systems and procedures will be developed for a given airspace or aircraft.

The basic planning parameter is the number of aircraft movements that require ATM services. High-level planning requires estimates and forecasts of annual aircraft movements during the planning period. Aircraft fleet capabilities are also important parameters that should be identified for planning purposes. For detailed planning, forecasts of aircraft movements during peak periods are required; for instance, during an hour of particularly intense movement. Likewise, civil and military activities need to be properly coordinated, and consideration must be given to special use airspace (SUA).

ATM homogeneous areas and main traffic flows are especially related to en-route airspace. However, it is necessary to improve the capacity and efficiency of terminal control areas (TMAs) and aerodromes, and to work on the basis of a set of common initiatives. Consequently, several of the initiatives (see Table 1-1) were specifically designed to improve aerodrome and TMA operations.

The following table shows ATM performance: ATM influences – Aerodrome operations – En-route cycle.



ATM Influences - Aerodrome Operations – Enroute-to-Enroute Cycle

Work programme

After identifying ATM homogeneous areas and main traffic flows, a task in which all Regions have made significant progress, planners should conduct a study of the existing and foreseen aircraft fleet and its capabilities, traffic forecasts, ATM infrastructure, including human resource availability and requirements, among other elements. The analysis of the gathered data should permit the identification of performance "gaps". The Global Plan Initiatives would then be assessed in relation to these gaps in order to identify those that would better provide the operational improvements required to meet performance objectives. This planning process would continue with the identification of different options for the implementation of the initiatives, a profitability analysis of these various options, and the preliminary definition of additional infrastructure requirements. Additional steps would include the drafting of implementation plans and funding profiles, a more in-depth analysis of human resource requirements to support the identified initiatives, followed by additional profitability analyses. Lastly, national and regional implementation plans would be developed or amended based on the selected initiatives. Figure 1-1 contains a planning flow diagram.

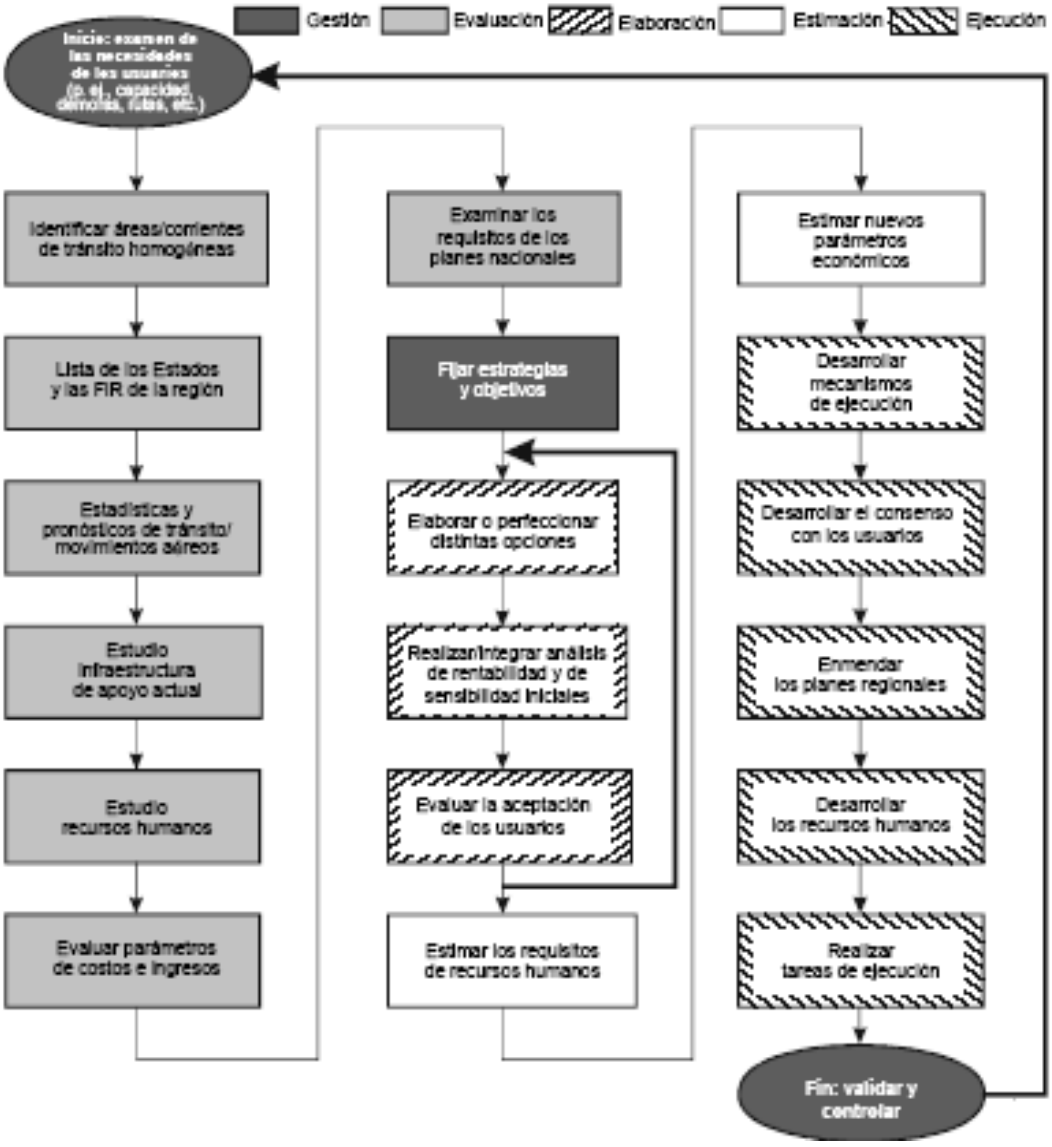


Figure 1-1 Planning Flow Diagram

EVOLUTION

Construction of an ATM system based on the operational concept

In order to attain the envisaged global ATM system, many initiatives will be gradually implemented throughout several years. The set of initiatives that make up the existing Global Plan are aimed at facilitating and harmonising the work already under way in the Regions and providing aircraft operators the benefits they require in the short and medium term. ICAO will continue developing new initiatives based on the operational concept to be included in this Global Plan. In all cases, initiatives must meet global objectives based on the operational concept. Based on this, planning and implementation activities begin with the application of the available procedures, processes, and capabilities. Evolution would then proceed with the application of emerging procedures, processes, and capabilities. And finally, there would be a migration to the ATM system based on the operational concept. Figure 1-2 illustrates the evolution of the Global Plan.

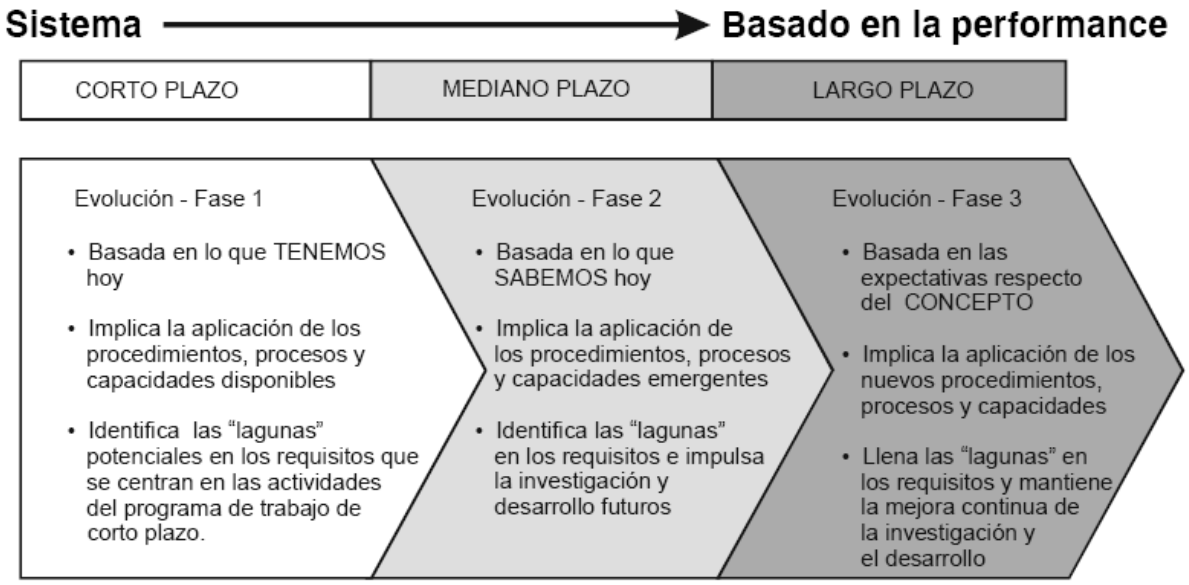


Figure 1-2 Evolution of the Global Plan

The proposed initiatives must not be considered independent but rather inter-related, subject to integration and mutual support, so as to facilitate the planning process. Integration is one of the objectives of a global ATM system. Several initiatives or several parts of various initiatives should be implemented, including decision-making support systems, performance-based navigation, cooperative airspace design and management, as well as terminal area and aerodrome design and management.

Table 1-1 Global Plan Initiatives and their relationship with the regional groups

IPM		*En-route*	*Terminal area*	*Aerodrome*	*Support infrastructure*	*Components related to the operational concept*
IPM-1	Flexible use of airspace	X	X			AOM, AUO
IPM-2	Reduced vertical separation minima	X				AOM, CM
IPM-3	Harmonisation of level systems	X				AOM, CM, AUO
IPM-4	Uniform classification of upper airspace	X				AOM, CM, AUO
IPM-5	RNAV and RNP (performance-based navigation)	X	X	X		AOM, AO, TS, CM, AUO

IPM		*En-route*	*Terminal area*	*Aerodrome*	*Support infrastructure*	*Components related to the operational concept*
IPM-6	Air traffic flow management	X	X	X		AOM, AO, DCB, TS, CM, AUO
IPM-7	Dynamic and flexible management of ATS routes	X	X			AOM, AUO
IPM-8	Cooperative airspace design and management	X	X			AOM, AUO
IPM-9	Situational awareness	X	X	X	X	AO, TS, CM, AUO
IPM-10	Terminal area design and management		X			AOM, AO, TS, CM, AUO
IPM-11	RNP and RNAV SIDs and STARs		X			AOM, AO, TS, CM, AUO
IPM-12	Functional integration of ground and aircraft systems		X		X	AOM, AO, TS, CM, AUO
IPM-13	Aerodrome design and management			X		AO, CM, AUO
IPM-14	Runway operations			X		AO, TS, CM, AUO
IPM-15	Maintaining the same operational capacity under IMC and VMC conditions		X	X	X	AO, CM, AUO
IPM-16	Decision-making support systems and alert systems	X	X	X	X	DCB, TS, CM, AUO
IPM-17	Data link applications	X	X	X	X	DCB, AO, TS, CM, AUO, ATMSDM
IPM		*En-route*	*Terminal area*	*Aerodrome*	*Support infrastructure*	*Components related to the operational concept*
IPM-18	Aeronautical information	X	X	X	X	AOM, DCB, AO, TS, CM, AUO, ATMSDM
IPM-19	Meteorological systems	X	X	X	X	AOM, DCB, AO, AUO
IPM-20	WGS-84	X	X	X	X	AO, CM, AUO
IPM-21	Navigation systems	X	X	X	X	AO, TS, CM, AUO
IPM-22	Communication infrastructure	X	X	X	X	AO, TS, CM, AUO

IPM		*En-route*	*Terminal area*	*Aerodrome*	*Support infrastructure*	*Components related to the operational concept*
IPM-23	Aeronautical radio spectrum	X	X	X	X	AO, TS, CM, AUO, ATMSDM

Global Plan Initiatives – Aerodromes:

(IPM-13) AERODROME DESIGN AND MANAGEMENT

Scope: Implementation of management and design strategies to improve the use of the movement area.

Components related to the operational concept: AO, CM, and AUO.

Description of the strategy

Activities to improve aerodrome design and management, including coordination and cooperation among ATM service providers, vehicle and aircraft operators, may have a significant effect on safety and aerodrome capacity.

Local joint decision-making processes should seek the sharing of key data on flight scheduling so that all participants (aerodromes, ATC, ATFM, aircraft operators, ground handling service providers) may have a more precise knowledge on the status of the aircraft during the whole process “on the ground”. This will permit the adoption of minimum and precise ATFM measures and greater predictability of flight scheduling. Some of the benefits to be derived would be a more efficient use of aerodrome and ground handling resources, reduced delays, and greater predictability of flight scheduling.

As part of the air navigation system, the aerodrome will provide the necessary ground infrastructure, which includes, *inter alia*, the lighting, taxiways, runways and runway exits, and precise guides on the surface to improve safety and maximise aerodrome capacity under all weather conditions. The ATM system should allow for an efficient use of aerodrome airside capacity. In order to ensure an optimum use of aerodromes:

a) runway occupation time should be reduced once capacity and efficiency benefits are realised;

b) an attempt should be made at having the capability of conducting safe manoeuvres under all weather conditions while preserving capacity;

c) whenever possible, the precise guide on the surface to and from a runway will improve capacity and efficiency; and

d) the position (with an adequate level of precision) and intention of all vehicles and aircraft operating in the manoeuvring and movement areas should be known and reported to relevant members of the ATM community at aerodromes where a cost-benefit analysis has shown important capacity and efficiency gains.

(IPM-13) AERODROME DESIGN AND MANAGEMENT

Scope: The implementation of management and design strategies to improve the use of movement areas.

Components related to the operational concept: AO, CM, and AUO.

Description of the strategy

Activities to improve aerodrome design and management, including coordination and cooperation among ATM service providers, vehicle operators, aircraft operators, may have a major impact on safety and aerodrome capacity.

Local joint decision-making processes should seek to share key data on flight scheduling, in such a way that all participants (aerodromes, ATC, ATFM, aircraft operators, ground handling service providers) may have a more precise knowledge on the status of the aircraft during the whole process on the "ground". This will permit the adoption of minimum and precise ATFM measures and greater predictability of flight scheduling. Some of the benefits to be derived would be a more efficient use of aerodrome and ground handling resources, reduced delays, and greater predictability of flight scheduling.

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