INTERNATIONAL CIVIL AVIATION ORGANIZATION
Fourth Meeting of AFI Region Directors General of Civil Aviation (DGCA/4)
(Matsapha, Manzini, Swaziland, 8 to 9 November 2010)

Agenda Item 4: Air Navigation

4.2: Strategies for Communication, navigation and surveillance (CNS) infrastructure

DESCRIPTION OF IMPLEMENTATION STRATEGIES FOR GLOBAL AIR NAVIGATION PLAN INITIATIVES

(Presented by the Secretariat)

SUMMARY

This information paper provides the DGCA/4 Meeting with the strategies for the implementation of the ICAO Global Plan Initiatives for aeronautical communications, navigation and surveillance, for reference and guidance during its deliberations under Agenda Item 4.2.

Action by the meeting is at **paragraph 3.**

REFERENCES

-ICAO Global Air Navigation Plan, Doc 9750

This Working Paper is related to Strategic Objectives: **A.** Safety - Enhance global civil aviation safety; and **D.** Efficiency - Enhance the efficiency of aviation operations

1. INTRODUCTION

1.1. The *Global Air Navigation Plan (Global Plan)*, was developed on the basis of an industry roadmap in an effort to facilitate implementation of the Recommendations of the 11TH Air Navigation Conference and ensure that focused efforts would lead to near- and medium-term benefits. The Global Plan, therefore, contains near- and medium-term guidance on air navigation system improvements necessary to support a uniform transition to the ATM system envisioned in the operational concept.

2. DISCUSSION

2.1. In accordance with the Global Plan, planning will be focused on specific performance objectives, supported by a set of "Global Plan Initiatives" ("initiatives"). These initiatives are options for air navigation system improvements that when implemented result in direct performance enhancements. States and regions will choose initiatives that meet performance objectives, identified through an analytical process, specific to the particular needs of a State, region, homogeneous ATM area or major traffic flow. A set of interactive planning tools will assist with the analytical process.

2.2. Appendix to this information paper contains the strategies for the implementation of the Global Plan initiatives pertaining to communications, navigation and surveillance (CNS), as described in the Global Plan (Doc 9750).

3. CONCLUSION

3.1. The meeting is invited to take note of the information contained in this paper.

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Appendix

Description of strategies for the implementation of the ICAO Global Plan initiatives pertaining to Communications, Navigation and Surveillance (CNS)

(Extract from Global Air Navigation Plan, Doc 9750)

1. COMMUNICATION INFRASTRUCTURE (GPI-22)

Description of strategy

1.1. ATM depends extensively and increasingly on the availability of real-time or near real-time, relevant, accurate, accredited and quality-assured information to make informed decisions. The timely availability of appropriate aeronautical mobile and fixed communication capabilities (voice and data) to accommodate ATM requirements and to provide the adequate capacity and quality of service requirements is essential. The aeronautical communication network infrastructure should accommodate the growing need for information collection and exchange within a transparent network in which all stakeholders can participate.

1.2. The gradual introduction of performance-based SARPs and system-level and functional requirements will allow the increased use of commercially available voice and data telecommunication technologies and services. In the framework of this strategy, States should, to the maximum extent possible, take advantage of appropriate technologies, services and products offered by the telecommunication industry.

1.3. Considering the fundamental role of communications in enabling aviation, the common objective is to seek the most efficient communication network service providing the desired services with the required performance and interoperability required for aviation safety levels at minimum cost.

2. DATA LINK APPLICATIONS (GPI-17)

Description of strategy

2.1. The implementation of less complex data link services (e.g. pre-departure clearance, oceanic clearance, D-ATIS, automatic position reporting) can bring immediate efficiency benefits to the provision of ATS. Transition to the use of data link communications for more complex safety-related uses that take advantage of a wide variety of CPDLC messages, including ATC clearances, is already being successfully implemented.

2.2. Use of CPDLC and implementation of other data link applications can bring significant advantages over voice communication for both pilots and controllers in terms of workload and safety. In particular, they can provide efficient linkages between ground and airborne systems, improved handling and transfer of data, reduced channel congestion, reduced communication errors, interoperable communication media and reduced workload. The reduction of workload per flight translates into capacity increases and enhanced safety.

2.3. Communication data link and data link surveillance technologies and applications should be selected and harmonized for seamless and interoperable global operations. ADS-C, ADS-B and CPDLC are in service in various regions of the world but lack global harmonization. Current regional initiatives, including utilizing unique message subsets and CPDLC procedures, hinder efficient development and acceptance for global aircraft operations. Existing and emerging technologies should be implemented in a harmonized global manner in the near term to support long-term goals. Harmonization will define global equipage requirements and therefore minimize user investment.

2.4. FANS-1/A and aeronautical telecommunication network (ATN) applications support similar functionality, but with different avionics requirements. Many internationally-operated aircraft are

equipped with FANS-1/A avionics initially to take advantage of data link services offered in certain oceanic and remote regions. FANS-1/A equipage on international business aviation aircraft is underway and is expected to increase.

3. NAVIGATION SYSTEMS (GPI-21)

Description of strategy

3.1. Airspace users need a globally interoperable navigational infrastructure that delivers benefits in safety, efficiency and capacity. Aircraft navigation should be straightforward and conducted to the highest level of accuracy supported by the infrastructure.

3.2. To meet those needs, the progressive introduction of performance-based navigation must be supported by an appropriate navigation infrastructure consisting of an appropriate combination of global navigation satellite systems (GNSS), self-contained navigation systems (inertial navigation system) and conventional ground-based navigation aids.

3.3. GNSS provides standardized positioning information to the aircraft systems to support precise navigation globally. One global navigation system will help support a standardization of procedures and cockpit displays coupled with a minimum set of avionics, maintenance and training requirements. Thus, the ultimate goal is a transition to GNSS that would eliminate the requirement for ground-based aids, although the vulnerability of GNSS to interference may require the retention of some ground aids in specific areas.

3.4. GNSS-centered performance-based navigation enables a seamless, harmonized and cost-effective navigational service from departure to final approach that will provide benefits in safety, efficiency and capacity.

3.5. GNSS implementation will be carried out in an evolutionary manner, allowing gradual system improvements to be introduced. Near-term applications of GNSS are intended to enable the early introduction of satellite-based area navigation without any infrastructure investment, using the core satellite constellations and integrated multisensory airborne systems. The use of these systems already allows for increased reliability of non-precision approach operations at some airports.

3.6. Medium/longer-term applications will make use of existing and future satellite navigation systems with some type of augmentation or combination of augmentations required for operation in a particular phase of flight.

4. WORLD GEODETIC SYSTEM – 1984 (GPI-20)

Description of strategy

4.1. The geographical coordinates used across various States in the world to determine the position of runways, obstacles, aerodromes, navigation aids and ATS routes are based on a wide variety of local geodetic reference systems. With the introduction of RNAV, the problem of having geographical coordinates referenced to local geodetic datums is more evident and has clearly shown the need for a universal geodetic reference system. ICAO, to address this issue, adopted in 1994 the World Geodetic System — 1984 (WGS-84) as a common horizontal geodetic reference system for air navigation with an applicability date of 1 January 1998.

4.2. Fundamental to the implementation of GNSS is the use of a common geographical reference system. ICAO adopted the WGS-84 Geodetic Reference System as that datum, and many States have implemented or are implementing the system. Failure to implement, or a decision to use an alternative reference system, will create a seam in ATM service and will delay the full realization of GNSS benefits. Completion of the implementation of the WGS-84 Geodetic Reference System is a prerequisite for a number of ATM enhancements, including GNSS.

5. SITUATIONAL AWARENESS (GPI-9)

Description of strategy

5.1. The further implementation of enhanced surveillance techniques (ADS-C or ADS-B) will allow reductions in separation minima and an enhancement of safety, increase in capacity, and improved flight efficiency, all on a cost-effective basis. These benefits may be achieved by bringing surveillance to areas where there is no primary or secondary radar, when cost-benefit models warrant it. In airspaces where radar is used, enhanced surveillance can bring further reductions in aircraft separation minima and improve, in high traffic density areas, the quality of surveillance information both on the ground and in the air, thereby increasing safety levels. The implementation of sets of quality-assured electronic terrain and obstacle data necessary to support the ground proximity warning systems with forward-looking terrain avoidance function as well as a minimum safe altitude warning (MSAW) system will benefit safety substantially.

5.2. Implementation of surveillance systems for surface movement at aerodromes where weather conditions and capacity warrant will also enhance safety and efficiency while implementation of cockpit display of traffic information and associated procedures will enable pilot participation in the ATM system and improve safety through greater situational awareness.

5.3. In remote and oceanic airspace where ADS-C is used, FANS capabilities exist on many air transport aircraft and could be added to business aircraft. ADS-B can be used to enhance traffic surveillance in domestic airspace. In this respect, it should be noted that the 1090 extended squitter is available and should be accepted as the global choice for the ADS-B data link.

5.4. At terminal areas and at aerodromes surrounded by significant terrain and obstacles, the availability of quality-assured terrain and obstacle databases containing digital sets of data representing terrain surface in the form of continuous elevation values and digital sets of obstacle data of features, having vertical significance in relation to adjacent and surrounding features considered hazardous to air navigation, will improve situational awareness and contribute to the overall reduction of the number of controlled flight into terrain related accidents.

6. AERONAUTICAL RADIO SPECTRUM (GPI-23)

Description of strategy

6.5. States need to address all regulatory aspects on aeronautical matters on the agendas for International Telecommunication Network (ITU) World Radiocommunication Conferences (WRC). Particular attention is drawn to the need to maintain the current spectrum allocations to aeronautical services.

6.6. The radio spectrum is a scarce natural resource with finite capacity for which demand from all users (aeronautical and non-aeronautical) is constantly increasing. Thus the ICAO strategy on aeronautical radio spectrum aims at long-term protection of adequate aeronautical spectrum for all radio communication, surveillance and radio navigation systems. The process of international coordination taking place in the ITU obliges all spectrum users (i.e. aeronautical and non aeronautical) to continually defend and justify spectrum requirements. Civil aviation operations are expanding globally creating pressure on the already stressed and limited available aeronautical spectrum.

6.7. The framework of this initiative involves the support and dissemination by States of the ICAO quantified and qualified policy statements of requirements for aeronautical radio frequency spectrum agendas for ITU World Radiocommunication Conferences (WRC). This is necessary to maintain the current spectrum allocations to aeronautical services and ensure the continuing availability of adequate aeronautical radio spectrum and ultimately the viability of existing and new air navigation services globally.

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