INTERNATIONAL CIVIL AVIATION ORGANIZATION

Fourth Meeting of the APIRG Communications, Navigation and Surveillance Sub-group (Dakar, Senegal, 25-29 July 2011)

Agenda Item 2: ICAO 37th Assembly and Twelfth Air Navigation Conference (2012): CNS related issues

A CNS TECHNOLOGY ROADMAP – A TOOL TO AID INVESTMENT DECISIONS AND ENSURE SYSTEM COMPATIBILITY

(Presented by the Secretariat)

SUMMARY

The existence of many CNS technologies with similar names yet very different capabilities causes confusion. In addition to this, the operational benefits that can be achieved with the various technologies are not clear. This makes it difficult for States and aircraft operators to make long-term investment decisions. Many roadmaps exist however, they are limited in scope.

This paper supports the development by ICAO of a global CNS technology roadmap that would assist States and other stakeholders with their implementation decisions and recommends the development by APIRG of a regional CNS roadmap to be derived therefrom, in order to address CNS related issues and increase safety and efficiency of air navigation.

Action by DGCA/4 is contained in paragraph 5.

REFERENCES

- ICAO Global Air Navigation Plan (Doc 9750)
- ICAO Assembly, 37th Session (2010)
- Fourth Meeting of AFI DGCA (2010)

1. INTRODUCTION

1.1 Today, those responsible for aeronautical communications, navigation and surveillance (CNS) planning are confronted with a bewildering array of choices, and few understand the differences between these technologies, what utility they provide or when they may be required.

1.2 For air navigation service providers (ANSPs) and aircraft operators, the implementation of new CNS technologies requires significant investment. For aircraft operators there is also the added expense of certification and downtime. Most important to both groups is the early return on investment. For this, the implementation programmes of ANSPs and aircraft operators must be in unison.

1.3 Lacking are clearly stated global requirements that have agreed operational benefits with defined timelines for implementation. This makes long-term investment agreements and decisions difficult for States. These decisions are critical as advanced capabilities like 4D-trajectory and System-Wide Information Management (SWIM) will depend on advanced CNS technologies.

1.4 This paper points out areas where certainty is lacking and proposes the development of a global CNS technology roadmap to provide the needed certainty for States and all aviation stakeholders.

2. EXAMPLES OF UNCERTAINTY

2.1 In order to support the above points, a number of examples where uncertainty will hinder CNS implementation are given. The area of aeronautical communications provides the following.

2.2 Technologies

2.2.1 In the late 1980s, ICAO initiated the development of the Aeronautical Telecommunications Network (ATN) using the available technology at the time, known as open systems interconnect (OSI). Although some elements of ATN were implemented, it was never globally deployed or offered in its final form by aircraft manufacturers.

2.2.2 In the mid-1990s IP became the global standard. ICAO recognized this and Amendment 83 to Annex 10 — *Aeronautical Telecommunications* was adopted, offering two technical options for the ATN: one using OSI and the other using IP. Today OSI-based communications systems are becoming obsolete.

2.2.3 ATS message handling system (AMHS)

2.2.3.1 AMHS connectivity is being implemented by some States using OSI, while others are using IP. Complex gateways are available which convert between OSI and IP. The proposed roadmap would show how and when such solutions should be employed.

2.2.4 Air-ground communications

2.2.4.1 ICAO Standards exist for both OSI and the IP versions of VHF air-ground data link communications. Today only OSI is used and avionics manufacturers have no plans to develop IP-based equipment in the near future.

2.2.4.2 States are encouraged to implement the ATN using IP wherever possible for ground-ground communications but not, as explained above, for air-ground communications. More complex gateways will be the interim solution to link the mixed protocols of an IP-based ground infrastructure to an OSI-based air/ground infrastructure.

2.2.4.3 Airport surface communications data link systems based on IPs are planned for 2014. Additionally, future satellite systems for aeronautical telecommunications will be IP-based. VHF data link, on the other hand, has no choice but to continue to be based on OSI until late in this decade. This system will be used in parallel with various IP-based communications links.

2.2.4.4 How States and regions will manage this and how long this situation will last is unknown at this time. A transition roadmap is needed to address these questions.

2.3 Terminology

2.3.1 Air-ground data link can be supported by various systems, i.e; FANS-1/A; FANS-1+/A+; FANS-2/B; ATN/OSI, ATN/IPS, etc. These are not interoperable systems.

2.3.2 Some systems may share protocols but have different functions. Others may have the same function but use different communications protocols. Airlines and aircraft manufacturers require clear guidance and business plans on how to equip international fleets. Clarity is needed for international aviation planning. This too, is a goal of the proposed roadmap.

3. NEED FOR AN ICAO CNS TECHNOLOGY ROADMAP

3.1 Numerous CNS "roadmaps" have been produced, however, these tend to have a limited focus and lack international agreement, for example, airframe manufacturers have developed avionics-focussed roadmaps; and the US Federal Aviation Administration and EUROCONTROL have developed roadmaps for their specific programmes (NGATS, SESAR).

3.2 At the same time, the following ICAO Global Plan initiatives (GPIs) pertaining to CNS and their associated strategies need to be implemented consistently by all stakeholders, at global and regional level:

- Situational awareness (GPI-9)
- Data link applications (GPI-17)
- World geodetic system – 1984 (GPI-20)
- Navigation systems (GPI-21)
- Communication infrastructure (GPI-22)
- Aeronautical radio spectrum (GPI-23)

3.3 A global roadmap applicable to international aviation as a whole, that informs all States of the prospective capabilities of aircraft and also the implementation programmes of progressive ATS providers is missing. Benefits of this roadmap would include:

a) predictable implementation with early achievement of operational benefits and returns on investment; and

b) widespread deployment, which will ease transition issues.

3.4 The latter point is especially important as lengthy transition periods increase costs for aircraft operators and ANSPs given that dual systems must be supported either in the air or on the ground. Idle equipment in the air or on the ground generates costs with no forthcoming benefits.

3.5 Timelines will not be the same for all States and regions. A paper-based roadmap with multiple timelines will be confusing and difficult to interpret. An interactive means of presenting information that is applicable to all stakeholders, States or regions is needed. ICAO has the capability to produce such an online, interactive, graphics-based, information tool.

3.6 Such an interactive roadmap should address:

a) who it applies to - an ANSP, aircraft operator, airframe manufacturer;

b) where it applies – which State, region or flight information region;

c) what equipment and capability is required;

d) when the equipment and capability is required;

e) why the equipment and capability is required – operational benefits or a mandate; and

f) operational constraints and conditions to ensure that the benefits are achieved.

3.7 Such a roadmap should become the global source of information for CNS technology implementation decisions for all stakeholders. It is recommended that ICAO be the lead organization to produce and maintain such a roadmap. The endorsement of the ICAO Assembly is essential for this effort.

4. DEVELOPING THE ROADMAP

4.1 The development of a CNS roadmap will require the cooperation of all stakeholders. To engage the stakeholders (including industry groups, airframe and avionics manufacturers), they will be consulted and their cooperation requested. Simple correspondence will be routinely used to update the roadmap however a means to obtain comprehensive updates will also be needed. A ready solution exists: many CNS panels and working groups now enjoy regular participation by industry stakeholders. Updates to the CNS technology roadmap will be made a standing agenda item for these meetings.

5. CONCLUSION

5.1 In order to increase safety and efficiency of air navigation in the Africa-Indian Ocean (AFI) Region, the meeting is invited to:

a) note the development of a global CNS technology roadmap by ICAO, to serve as the global source of planning guidance for CNS investments by all stakeholders in the civil aviation community;

b) amend the work programme of the CNS Sub-group to include the development of a regional CNS roadmap based on the ICAO global roadmap, in order to assist States in addressing the current deficiencies, implementing CNS-related Global Plan initiatives, and ensuring compatibility between air navigation systems;

c) request States to ensure that due account is taken of the roadmap for the regional and national planning and implementation of air navigation systems;

d) request States to promote collaborative decision- making and partnership within the aviation industry for developing and implementing innovative and integrated solutions for CNS infrastructure components, according to identified priorities; and

e) request AFCAC, ICAO and other relevant institutions to facilitate the funding arrangements necessary for integrated programmes aimed at enhancing the regional air navigation infrastructure, including human resource aspects, based on the CNS technology roadmap.

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