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ASSEMBLY — 37TH SESSION

TECHNICAL COMMISSION

Agenda Item 35: The global air traffic management (ATM) system

A GLOBAL CNS TECHNOLOGY ROADMAP – A TOOL TO AID INVESTMENT DECISIONS

(Presented by the Council of ICAO)

EXECUTIVE SUMMARY

The development of a global CNS technology roadmap is proposed to assist States and other stakeholders with their implementation decisions. 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 always clear. This makes it difficult for States and aircraft operators to make long-term investment decisions. These decisions are critical as the advanced capabilities defined in the Global Air Navigation Plan will depend on advanced CNS technologies.

The proposed roadmap will differ from others as it will inform States of the prospective capabilities of aircraft, the plans of airframe manufacturers as well as the implementation programmes of progressive ATS providers in different regions along with the expected operational benefits. Of special importance to States is the fact that it will also deal with issues of transition and interoperability. It is the intention to make the ICAO Global CNS Technology Roadmap the global source of information for CNS technology investment decisions for States and all civil aviation stakeholders.

Action: The Assembly is invited to call on ICAO to develop and maintain a global CNS technology roadmap.

Strategic Objectives:	This working paper relates to Strategic Objective D by proposing a global CNS technology roadmap which will assist States and stakeholders in their planning and investment decisions.
Financial implications:	Resources for the activities referred to in this paper are included in the proposed budget for 2011 to 2013.
References:	Annex 10 — *Aeronautical Telecommunications*

(4 pages)

1. INTRODUCTION

1.1 Today, those responsible for communications, navigation and surveillance (CNS) planning are confronted with an array of choices. Taking for example the field of communications:

a) VHF digital link (VDL) Modes 2, 3 or 4;

b) internet protocol (IP) or open systems interconnect (OSI) for the aeronautical telecommunication network (ATN); and

c) future air navigation systems (FANS), FANS-1+/A+, FANS-2/B or ATN-B, ATN-2.

1.2 Although many are familiar with the above terms, it is difficult to understand the differences between these technologies, what utility they provide or when they may be required.

1.3 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.

1.4 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.

1.5 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 could 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, as one example, would show how and when such solutions could 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 not certain at this time. A transition roadmap is therefore 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 always 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 have lacked 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 projects, ie; Data Comm and LINK 2000+.

3.2 A global roadmap applicable to international aviation as a whole, that informs all States of the prospective capabilities of aircraft and also of the implementation programmes of progressive ATS providers could be beneficial as follows:

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

b) widespread deployment, which will ease transition issues.

3.3 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.

3.4 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.

3.5 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.

3.6 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 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 As international civil aviation faces many CNS technology choices, the Assembly is invited to ask ICAO to develop the proposed roadmap to be the global source of planning guidance for CNS investments by all stakeholders in the civil aviation community.

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