

FOURTH MEETING OF THE ALLPIRG/ADVISORY GROUP

Montreal, 6 to 8 February 2001

Agenda Item 2.1: Interregional coordination and harmonization mechanism – Overview of progress in the standardization of CNS systems

TECHNICAL DEVELOPMENTS RELATED TO CNS SYSTEMS

(Presented by the Secretariat)

INFORMATION PAPER

SUMMARY

This paper presents the technical developments in CNS systems that have taken place since April 1999 and focuses mainly on the development of Standards and Recommended Practices (SARPs) and guidance material.

1. INTRODUCTION

1.1 The International Civil Aviation Organization (ICAO) with the assistance of panels of the Air Navigation Commission (ANC) and study groups continues the development and maintains the currency of the Standards and Recommended Practices (SARPs) and guidance material for communications, navigation, and surveillance (CNS) systems. Following is an overview of these activities and technical developments since ALLPIRG/3 (April 1999).

2. AERONAUTICAL TELECOMMUNICATION NETWORK (ATN)

2.1 The first set of aeronautical telecommunication network (ATN) SARPs, which was incorporated in Annex 10 — *Aeronautical Telecommunications*, in 1998, consisted of basic building blocks to enable the necessary system development, prototyping and initial implementations. In February 2000, the ATN Panel finalized draft SARPs and supporting technical specifications on ATN systems management and security. However, in order to ensure backward compatibility and to allow sufficient time for the development and availability of systems complying with new requirement, it has been suggested that for now, the implementation of new systems management and security features be optional. A definite date, beyond which ATN is not to be used without security, should be considered after sufficient technical and operational experience has been gained.

2.2 The proposal to amend Annex 10, as formulated by the ATN Panel, comprises the incorporation of the aforementioned new ATN features as well as the following new system-level and functional requirements:

- a) common ICAO data interchange network (CIDIN)/ATS message handling service (AMHS) gateway;
- b) data link - aviation routine weather report (D-METAR); and
- c) directory services.

2.3 The above-mentioned amendments to ATN SARPs which are being processed as part of Amendment 76 to Annex 10 also include a number of enhancements to ATSMHS and context management (CM) applications, the deletion of ATN pass-through service (for aeronautical fixed telecommunication network (AFTN) messages) and some other changes to system level requirements necessitated from recent developments in air-ground subnetworks.

3. AERONAUTICAL MOBILE SATELLITE SERVICE (AMSS)

3.1 The aeronautical mobile-satellite service (AMSS) SARPs and guidance material have been in Annex 10 since 1995. They are based on geostationary orbit satellite technology and support voice and packet data services for safety applications. A number of evolutionary developments to the technology were subsequently reviewed by the sixth meeting of Aeronautical Mobile Communications Panel (AMCP/6, 23-30 March 1999), that developed a proposal for amendment of the AMSS SARPs and guidance material, to introduce a new antenna type (intermediate gain antenna), a new voice channel type and enhanced provisions for interoperability among AMSS. The proposed amendment was adopted by Council on 13 March 2000 and became applicable on 2 November 2000.

3.2 The AMCP also conducted a review of alternative satellite technologies in addition to the geostationary satellite technology currently specified in Annex 10. Such alternative technologies include non-geostationary orbit systems and other geostationary systems, and were generically termed “next-generation satellite systems”. The purpose of the review was to enable the use of commercial satellite services that were under development at the time and which did not meet the existing AMSS SARPs but could offer potential benefits to aviation. The AMCP activity included a basic feasibility study, the development of acceptability criteria to be used to assess prospective satellite providers and the development of draft SARPs for AMSS systems. The draft SARPs used a “generic” approach, whereby only high-level, service and performance-oriented requirements were specified, as opposed to detailed technology-specific requirements. The AMCP/7 (22-30 March 2000) completed the development of the draft next-generation satellite systems (NGSS) SARPs but noted that their introduction into Annex 10 would be premature due to the lack of acceptable service providers which could meet the proposed SARPs. Instead, the draft SARPs should be introduced into Annex 10 only at the time when acceptable service providers could be identified through the application of the acceptability criteria developed by the panel. After consultation with States, the ANC agreed to postpone the introduction of the draft SARPs into Annex 10. The panel will monitor developments in this field and will recommend to this effect at an appropriate time.

4. VHF AND HF AIR-GROUND DATA LINKS

4.1 The AMCP/7 meeting also completed the core SARPs for VHF digital link (VDL) Modes 3 and 4 in March 2000. The VDL Mode 3 SARPs provide the integrated voice/data system as per Recommendation 6/2 of the Special Communications/Operations Divisional Meeting (1995). The SARPs for VDL Mode 4 specify one of the data links to support surveillance requirement as per Recommendation 6/3 of the same meeting. The draft SARPs for VDL Modes 3 and 4 were reviewed by the Air Navigation Commission in the light of comments received from States. The SARPs are now scheduled for review and adoption by the Council in March 2001. Manuals for VDL Modes 3 and 4 that include the detailed technical specifications and material relating to the implementation of these data links are being processed for publication. Work on the development of frequency assignment planning criteria for these data links is still ongoing and this activity is to be completed in 2001.

4.2 SARPs for VDL Mode 2 have been in Annex 10 since VDL Mode 2 implementation is underway, thus making VDL Mode 1 technology redundant. For this reason, the work is under way to remove from Annex 10 material relating to VDL Mode 1.

4.3 SARPs for the high frequency (HF) data link became applicable on 2 November 2000. The implementation of the high frequency (HF) data link is in progress and is nearing full global coverage. At the present time, no activity is planned to propose amendments to the SARPs.

4.4 The AMCP is continuing to work on a number of projects. These include a study of the need for enhanced data links to become available in the longer term and exploring the long-term requirements for aeronautical VHF systems in support of the air traffic management (ATM) beyond 2010. This work is expected to be considered at a panel meeting in 2002.

5. SURVEILLANCE SYSTEMS

5.1 SARPs for SSR Mode S has been in Annex 10 since November 1987, and SARPs for airborne collision avoidance system (ACAS II) and Mode S air-ground data link is in Annex 10 since November 1995.

5.2 The seventh meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP/7) held from 11 to 22 September 2000 recommended a number of updates to these SARPs. The panel also emphasized various implementation issues.

5.2.1 Regarding the implementation of Mode S, the panel recommendations as reviewed by the ANC stressed the importance of coordination with military users of Mode S to ensure compatible operation of civil and military Mode S systems and the correct information exchange between ACAS on board of aircraft and both military and civil Mode S capable systems.

5.2.2 It was noted that the use of unauthorized 24-bit aircraft addresses is decreasing, however, monitoring efforts should continue in States until the use of unauthorized aircraft addresses vanishes. This effort is essential to ensure the proper operation of ACAS II and identification of aircraft in non-primary surveillance radar environments.

5.3 Regarding the implementation of ACAS, States should implement carriage requirements for ACAS (Annex 6, Part I, Chapter 6, Paragraph 6.18 and *Regional Supplementary Procedures* (Doc 7030/4)) and be encouraged to monitor ACAS implementation. The SICASP/7 meeting developed new guidance material for ACAS II monitoring programmes. This new guidance material will be made available to all regional planning groups in order to harmonize monitoring programmes and assist in resolution of implementation interface issues. Further, the Panel emphasized the need to carry on the development of pilot and controller ACAS training programmes based on the ICAO training guidelines. ICAO will continue to coordinate these activities and make available the outcome of the monitoring and training programmes to all Contracting States.

6. GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)

6.1 The Global Navigation Satellite System Panel (GNSSP) in mid-2000 completed validation of draft SARPs that had been developed at the GNSSP/3 meeting in April 1999. The validation involved technical and operational issues such as signal quality monitoring, protection levels and frequency planning criteria for VHF data broadcast (VDB) of ground-based augmentation system (GBAS). As a result of the validation, the panel produced a consolidated list of changes to the draft GNSS SARPs and finalized guidance material addressing the identified issues.

6.2 The GNSS SARPs are scheduled to be presented for adoption by the ICAO Council in March 2001 for applicability on 1 November 2001. This first package of SARPs and guidance material covers the following elements of GNSS:

- a) global positioning system (GPS);
- b) global orbiting navigation satellite system (GLONASS) ;
- c) aircraft-based augmentation system (ABAS);
- d) satellite-based augmentation system (SBAS);
- e) ground-based augmentation system (GBAS); and
- f) GNSS receiver (essential characteristics).

In terms of functionality, the first package of SARPs provides for GNSS-based en route and terminal area operations including Category I precision approaches.

6.3 Having completed development of the first package of GNSS SARPs and their validation, the GNSS Panel began the development of SARPs for new elements and enhancements of GNSS such as ground-based regional augmentation system (GRAS), GPS L5 and Galileo. In parallel, the panel continues the development of the ICAO Manual on GNSS which is intended to provide guidance on a variety of issues associated with operational use of present GNSS. The GNSSP Spectrum sub-group continues its work on GNSS frequency protection and GNSS/RNSS compatibility issues taking into account the outcome of ITU WRC-2000 (ALLPIRG/4-WP/17 refers).

6.4 With regard to GRAS, two basic alternatives are being considered for standardization. One involves extending the existing standards for GBAS to support other than precision approach operations and

using GBAS with an extended service volume by providing position, velocity and time (PVT) information in support of area navigation. The other alternative makes use of the architecture similar to that used by an SBAS ground infrastructure. However, the data is converted to a GBAS message format and broadcast on very high frequency (VHF) using the GBAS data protocol. The outcome of this study will be available during 2001.

7. ACTION BY ALLPIRG

7.1 ALLPIRG is invited to note the technical developments related to CNS systems.

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