

International Civil Aviation Organization

ELEVENTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/11) Bangkok, Thailand, 2 - 6 October 2000

Agenda Item 3: CNS/ATM Implementation and Related Activities

Report on Technical and Operational Developments Related to CNS/ATM Systems

(Presented by the Secretariat)

SUMMARY

This paper provides information on technical and operational developments in 1999 and up to April 2000, as well as near-term future developments related to CNS/ATM systems.

Proposed action by the APANPIRG is in paragraph 6.

1. Introduction

1.1 This paper provides information on technical and operational developments in 1999 and up to April 2000, as well as near-term future developments related to communications, navigation and surveillance/air traffic management (CNS/ATM) systems.

2. Overview

2.1 It is recognized that work related to CNS/ATM systems development and implementation continues to rank amongst the highest priority items on ICAO's work programme. Through its panels and study groups, ICAO has progressed the development of Standards and Recommended Practices (SARPs), Procedures for Air Navigation Services (PANS) and guidance material, as described in this paper. Near-term future developments are also summarized. Implementation of CNS/ATM systems requires planning on global, regional and national bases. The work of ICAO's planning and implementation regional groups (PIRGs) in this respect is summarized in paragraph 4 below. In February 2000, the ICAO Regional Directors, in response to a request from Headquarters, prepared general assessments of the developments in CNS/ATM systems implementation programmes in their respective regions. The survey described in paragraph 5 below is preliminary in nature and reflects the general views of the ICAO Regional Directors.

2.2 A summary of the development status of CNS/ATM systems-related SARPs, PANS and guidance material are at Appendix A to this paper. As requested by the Council, a summary of the main activities of panels of the Commission and study groups involved in CNS/ATM systems during 1999 – 2000 is provided in tabular form at Appendix B. The associated tasks of the Technical Work Programme (TWP)

of the Organization in the Air Navigation Field are listed in the same table.

3. Standards and Recommended Practices (SARPs), procedures for air navigation services (pans) and guidance material related to CNS/ATM systems

3.1 Developments in 1999 – 2000

Pressure-altitude reporting transponders

3.1.1 In order to improve the effectiveness of air traffic services as well as airborne collision avoidance system-II (ACAS-II) and to support implementation of the minimum safe altitude warning system (MSAW), the requirements for carriage of pressure-altitude reporting transponders by aircraft in international general aviation, in Annex 6, Part II and Part III, Section III, were aligned with ACAS carriage and operation requirements with effect from 1 January 2003 unless an exemption is provided by the appropriate authority (C 156/12).

Communications

3.1.2 The second edition of the *Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN)* (Doc 9705) was published in December 1999.

3.1.3 Amendment 74 to Annex 10, which became applicable on 4 November 1999, introduced SARPs for the high frequency (HF) data link and for a common worldwide air-to-air communication channel. It also amended SARPs for emergency locator transmitters (ELT) and the selective calling system (SELCAL).

3.1.4 A set of amendments to the aeronautical mobile-satellite service (AMSS) SARPs, and the VHF data link (VDL) Mode 2 was finalized by the sixth meeting of the Aeronautical Mobile Communications Panel (AMCP/6) (23 to 30 March 1999). They are expected to be included in Annex 10, Volumes III and V, as an element of Amendment 75 with the applicability date of 2 November 2000.

Navigation

3.1.5 The Global Navigation Satellite System Panel (GNSSP) continued developing SARPs for GNSS that included general provisions and technical specifications for the global positioning system (GPS), globalnavigation satellite system (GLONASS), aircraft-based augmentation systems (ABAS), satellite-based augmentation systems (SBAS), and ground-based augmentation system (GBAS). This first package of GNSS SARPs was finalized at the GNSSP/3 Meeting held in Montreal from 12 to 23 April 1999. The system defined in the first package of SARPs will be capable of supporting near-Category I and Category I operations.

3.1.6 By the end of 1999, it became apparent that validation of the GBAS and SBAS parts of SARPs would require more time than envisaged at GNSSP/3 and the validation work would have to continue during the first half of 2000. This will result in the postponement of adoption of GNSS SARPs to the year 2001.

Surveillance

3.1.7 Amendment 74 to Annex 10, which became applicable on 4 November 1999, introduced a note in Annex 10 that relates to the waiving of patent rights on the Mode S extended squitter technique. The *Procedures for Air Navigation Services* — *Rules of the Air and Air Traffic Services* (PANS-RAC, Doc 4444) and Annex 11 — *Air Traffic Services* were updated to include SSR procedures. *Air traffic management*

3.1.8 Amendment 35 to Annex 2 and Amendment 39 to Annex 11, which became applicable on 4 November 1999, contained revised provisions relating to air traffic services (ATS) airspace classifications and visual meteorological conditions (VMC) clearances. The amendments included, *inter alia*, the relocation in Annex 2 of a table and the inclusion in that table of values for VMC in Class A airspace in order to indicate VMC minima to instrument flight rules (IFR) flights in all types of airspace as well as a revision of the requirements for distance from clouds in Class B airspace to coincide with those of other classes of airspace. In Annex 11, the provisions relating to airspace classifications were revised so that Class E airspace cannot be used for control zones. Provisions were revised to limit VMC clearance to airspace Classes D and E. Amendment 3 to the PANS-RAC, which became applicable on 4 November 1999, revised procedures relating to clearances to fly maintaining own separation while in VMC, limiting its use to airspace Classes D and E under specified conditions and aligned text with Annex 2 with regard to operation in control zones.

Human factors

3.1.9 The manual on *Human Factors Guidelines for Air Traffic Management Systems* (Doc 9758) was completed in January 2000 and is intended for publication in July 2000. The manual aims to provide guidance to ICAO panels and study groups when developing CNS/ATM-related SARPs. It will also assist States in the consideration of human factors issues when purchasing and implementing CNS/ATM-related technology. The manual is intended for publication in July 2000.

Regional human resources planning and training needs for CNS/ATM implementation

3.1.10 A human resource planning manual has been completed in draft and is expected to be reviewed by the Human Resources and Planning and Training Needs Study Group (HRPTSG) in the third or fourth quarter of 2000. The manual, which contains a chapter on training needs due to new technology, addresses tactical and strategic human resource planning, as well as a procedure for converting human resource plans into long-range training plans and short-range instructional schedules.

3.1.11 A prototype software programme is being developed in parallel with the *Human Resource Planning Manual* that aims to maintain and communicate the effect of CNS/ATM technologies on civil aviation job profiles. The first working version of the software is scheduled to be ready toward the end of the year 2000.

3.2 Near-term activities

Communications

3.2.1 The final set of ATN SARPs dealing mainly with network security and management were reviewed and finalized at ATNP/3 (7 to 18 February 2000).

3.2.2 Work on assessment of next-generation satellite communication systems and development of the relevant SARPs was finalized at AMCP/7 from 22 to 30 March 2000.

3.2.3 Validation activities for VHF digital link (VDL) Modes 3 and 4 was completed and SARPs finalized at AMCP/7 from 22 to 30 March 2000. The communication link VDL Mode 4 is intended for ADS-B in surveillance functions.

Navigation

3.2.4 Development of SARPs for more demanding GNSS applications (e.g. precision approach for CAT II/III operations) will continue. Complementary obstacle clearance criteria have been developed at OCP/12 (28 June to 9 July 1999).

3.2.5 Criteria for stabilized approaches have been developed and included in a proposed amendment to PANS-OPS; comments from States will be requested during 2000. The applicability date is planned for 1 November 2001.

Surveillance

3.2.6 Work on surveillance enhancements to support ADS-B on the SSR Mode S data link, including compatibility assessment of ADS-B and ACAS and development of the relevant SARPs will continue.

Air traffic management

3.2.7 Work continues on the development of ADS and controller pilot data link (CPDLC) procedures as well as further reductions in separation minima aimed at increasing airspace capacity while maintaining or enhancing present safety levels. Progress is being made on the development of an operational concept document that will provide a road-map to States and regional planning groups for implementation of CNS/ATM.

4. Global and regional planning and implementation related to CNS/ATM Systems

4.1 Global plan

4.1.1 The Global Air Navigation Plan for CNS/ATM Systems (Global Plan) will be distributed to States later this year, a draft of which was distributed at the World-wide CNS/ATM Systems Implementation Conference, Rio de Janeiro, 11 to 15 May 1998. The first proposed amendment to the Global Plan will be presented to the Air Navigation Commission later in the year and will consist of amendments to take into account the most recent work of the GNSSP and the Air Traffic Management Operational Concept Panel (ATMCP). A new section addressing the environment will be added to include the latest work of the ICAO Committee on Aviation Environmental Protection (CAEP) and relevant aspects of national planning will be added.

4.1.2 In follow-up of the above, the Global Plan, its associated planning methodology and the tables in Volume II are now in the process of being formally integrated into the work of the PIRGs.

4.2 **Regional plans**

General

4.2.1 The implementation of CNS/ATM systems is regarded in the context of the overall modernization of air navigation systems that includes conventional systems as well as new elements. The following paragraphs summarize the regional developments which have been initiated and implemented by the Planning and Implementation Regional Groups.

AFI Planning and Implementation Regional Group (APIRG)

4.2.2 APIRG continued the evolutionary development of the AFI Regional CNS/ATM Plan at its twelfth meeting held in Tunis in June 1999 by further updating the plan reflecting therein inputs provided by States and users. Many AFI States participated in the activities of the implementation coordination groups (ICG) which follow implementation of the AFI CNS/ATM Plan within the ten areas of routings (AR) established in the AFI Region to cater for the planning requirements of the areas of major traffic flows in the AFI Region. With regard to the AR 10 area of routing, APIRG invited Australia, India and Maldives to participate in the activities of the related ICG for coordination purposes in relation to the AFI and ASIA/PAC CNS/ATM Plans. At this meeting, APIRG also adopted an AFI GNSS Implementation Plan.

ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG)

4.2.3 APANPIRG, at its tenth meeting held in Bangkok from 30 August to 3 September 1999, further reviewed and updated the Asia/Pacific Regional Plan for the new CNS/ATM systems to harmonize with the format of the Global Air Navigation Plan for CNS/ATM Systems. Other major developments initiated by APANPIRG include preparation of guidance material for the ground element in the aeronautical telecommunication network (ATN) transition, implementation of RNAV route UM501 (Phuket, Thailand to Bubaneswar, India) with effect from 1 October 1999, implementation of RVSM effective from 24 February 2000 in the Pacific airspace, preparation of the Asia/Pacific Basic ANP and the Asia/Pacific FASID documents, deciding a tentative target date of February 2002 for implementation of RVSM in the Western Pacific/South China Sea area, the implementation of required navigation performance (RNP) in the entire Pacific airspace at an RNP 10 level and establishment of a Business Case Task Force to develop a framework for the business case studies of various options in the implementation of air navigation facilities in the region.

Caribbean and South American Planning and Implementation Regional Group (GREPECAS)

4.2.4 The Third Caribbean/South American (CAR/SAM/3) Regional Air Navigation Meeting took place in Buenos Aires in October 1999 following a cycle of annual meetings of GREPECAS over the past decade. It developed the first regional air navigation plan to be structured in a new, two-part format of Basic Air Navigation Plan (ANP) and Facilities and Services Implementation Document (FASID), intended to improve the utility of the plan as an aid in implementing the required air navigation infrastructure, including new communications, navigation, surveillance and air traffic management (CNS/ATM) systems. The new plan incorporated, and thus gave a formal status to, the essential elements of the Global Air Navigation Plan for CNS/ATM Systems and the CAR/SAM Regional Plan for the Implementation of the CNS/ATM Systems, developed by GREPECAS. As part of its approach to CNS/ATM, the meeting reaffirmed the general strategy of transition from conventional ground-based navigation systems to GNSS in an incremental and evolutionary manner.

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European Air Navigation Planning Group (EANPG)

4.2.5 The forty-first meeting of the EANPG was held in Paris in December 1999. The group developed regional air navigation strategy which will be used as a guideline for all CNS/ATM transition planning in the European Region. The other major developments include implementation of 8.33 kHz channel spacing, deciding a target date of 24 January 2002 for RVSM implementation in the European airspace, preparation of the EUR Basic ANP and the EUR FASID documents and development of new ATS procedures to increase airport capacity.

Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG)

4.2.6 The sixth meeting of MIDANPIRG scheduled for 1999 was postponed to May 2000. However, its subsidiary bodies continued their meetings in order to present their outcomes to the MIDANPIRG/6 Meeting. The other major developments include: finalizing the CNS/ATM Implementation Plan for the Middle East Region; harmonization of timescales and alignment of its structure with the Global Plan; development of MID Regional RNP/RNAV Guidance Material; preparation of the MID Basic ANP and the MID FASID documents in alignment with that of the CAR/SAM Regions; development of recommendations concerning early implementation of ACAS in the MID Region; introduction of changes in the MID ATS route network; detailed review of the status of implementation of aeronautical charts of Annex 4 in the MID Region; further progression of WGS-84 implementation within the MID Region; development of GNSS implementation strategy for the MID Region including joint development work between the MID Region and EGNOS; and implementation of inter-regions satellite test-bed (ISTB) for the MID Region.

North Atlantic Systems Planning Group (NAT SPG)

The NAT SPG held its thirty-fifth meeting in June 1999 in Paris, France. Its contributory bodies devoted significant time to planning for the implementation of CNS/ATM systems. The outcome includes update of long-term traffic forecasts, development of North Atlantic ATM concept, carrying out a latest risk assessment concerning RVSM implementation, continuation of the NAT implementation cost-effectiveness programme until the end of 2000 and development of FANS 1/A implementation plan. The main tasks of the NAT SPG were to review the safety of the NAT air navigation system and to develop a plan to mitigate the effects of the Year 2000 (Y2K) problem on air navigation systems. The group also made special efforts with regard to the continued expansion of RVSM in the NAT Region.

5. CNS/ATM implementation status — Survey

5.1 In February 2000, the ICAO regional directors, in response to a request from Headquarters, prepared general assessments of the developments in CNS/ATM implementation programmes in their regions. As such the survey is preliminary in nature and reflects general views of the ICAO regional directors. In the meantime, a more structured comparative analysis of regional developments in the air navigation field is on hand in the Secretariat and on its completion the report will be reviewed by the Commission. These assessments vary widely reflecting the perception of the question posed. Some of the following extracts from the regional assessments are identifying shortcomings of planning, whereas others are listing achievements.

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5.2 Asia and Pacific Office

5.2.1 It is clear from discussions with States in this office's area of accreditation that several factors are hindering the implementation of the CNS/ATM systems. Chief among these factors are the absence of complete ICAO provisions relating to these systems, the absence of many ATM-related SARPs, and the lack of ICAO provisions/guidance in the area of CNS/ATM training. In addition, transition issues, such as complicated and inter-related ATM operational procedures, have demonstrated the need for joint cooperation initiatives (such as common operations manuals) by groups of States and users.

5.3 Eastern and Southern African Office

5.3.1 Significant progress has been registered in the implementation of CNS/ATM. In 1999, implementation coordination groups (ICGs) were established for the ten areas identified in the AFI CNS/ATM Implementation Plan and progress was made in the implementation of ATS routes, fixed communication facilities and air-ground VHF communication. To publish aeronautical coordinates in WGS-84 geodetic reference datum, fifteen States have completed the required surveys.

5.3.2 The Southern African Development Community (SADC) very small aperture terminal (VSAT) project was extended to all member States, thus providing fixed communications. Two workshops for the design of GNSS approach procedures have been organized. Only one State has authorized the use of GPS as primary and supplementary means of navigation. South Africa is implementing a radar surveillance.

5.4 European and North Atlantic (EUR/NAT) Office

5.4.1 There has been a substantial push in the EUR and NAT Regions for CNS/ATM implementation planning to be driven by the ATM requirements for safety and capacity rather than simply the utilization of CNS technology. This has meant more effort was required at the start of the CNS/ATM planning process but this has provided a sound basis for future progress. So, after what may be seen at times as a conservative start on CNS/ATM transition planning, the EUR and NAT Regions are well placed to make sustainable progress with CNS/ATM implementation.

5.4.2 Detailed CNS/ATM planning has been conducted in the high traffic density homogeneous area of Europe, to plan the necessary ATM measures and the consequent CNS systems, to serve aviation needs in the near and longer term. The introduction of reduced vertical separation minimum (RVSM) early in 2002, the use of RNP for area navigation and consolidation of air traffic services are some of the early steps. The recent implementation of 8.33 kHz has also been a necessary step to meet current demand and to provide the VHF capacity necessary for the introduction of data link channels to enable future CNS/ATM developments.

5.4.3 The eastern areas of the region have a very different set of requirements that must also be addressed differently in planning CNS/ATM implementation. These requirements, and the necessary interface with the western parts of the region, are also subject to detailed planning activity.

5.5 Middle East (MID) Office

5.5.1 The States of the Middle East Region have adopted an approach to CNS/ATM planning based on homogeneous areas, as recommended by the World-Wide CNS/ATM Systems Implementation Conference. Three homogeneous areas have been defined, and regional implementation timescales have been

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proposed for most of the components of CNS/ATM plans. However, only nine of the fifteen States covered by the MID Air Navigation Plan have produced national CNS/ATM plans. Work has been proceeding on the development of plans for two RNP5 RNAV routes, to take advantage of the reduced lateral route spacing available at this RNP value and reduce congestion in a critical part of the MID ATS route network. The implementation of these routes should occur during the year 2000. Discussions have also been initiated with the European Tripartite Group (ETG) with a view to using European geostationary navigation overlay service (EGNOS) as a satellite-based augmentation system (SBAS) system in the MID Region.

5.6 North American, Central American and Caribbean (NAM/CAR) Office

5.6.1 In the NAM/CAR Region, the implementation of CNS/ATM systems and infrastructure is showing progress on several fronts. Canada, Mexico, and the United States have finalized their transition and implementation plan. In Central America, progress has been limited to WGS-84 implementation and planning for ADS for oceanic use. In the Eastern Caribbean, global navigation satellite system (GNSS) routes and terminal procedures are being considered on a trial basis. In the CAR Region, the AIS automation plan is being implemented and NOTAM databases are now operating in Cuba, Mexico, Trinidad and Tobago.

5.6.2 In Canada and the United States, implementation of the GPS non-precision approaches has been extensive. In 1999, the Gulf of Mexico Working Group was created to implement GPS routes, RVSM, and ADS. Implementation of ATM elements is in varying stages in E/CAR, C/CAR, and Central America. GPS routes and terminal procedures are being tested in E/CAR. Testing and trials for WAAS and EGNOS have been initiated in several States. In the NAM/CAR Region as a whole, WAFS has been fully implemented.

5.7 South American (SAM) Office

5.7.1 CNS/ATM planning and implementation is under way in accordance with programmed objectives. The CAR/SAM Regions are implementing the RNP concepts. A plan for GNSS augmentation is under preparation. Under a United Nations Development Programme (UNDP) project, training to national specialists was provided on CNS/ATM and Economics. To determine the cost benefits parameters of the CNS/ATM technology, inter region traffic flows are being examined. In the SAM Region, an ATN compatible digital network is being implemented. In the SAT subregion, ATS and RNAV route structure is being established using the RNP concept.

5.8 Western and Central African Office

5.8.1 CNS/ATM implementation in Africa is a methodical process the progress of which is hampered by technical and, mainly, financial constraints. Appropriate measures will have to be taken to streamline the AFI CNS/ATM Implementation Plan and time-frames. Further, for the medium and long terms, there will be a need for financial assistance to support the implementation of CNS/ATM systems.

5.8.2 In addition to the issue of financial resources, absence of SARPs (for example, GNSS, augmentation systems, and ADS applications) hampers implementation/progress. Some States have highlighted the vulnerability of the satellite systems, and there is a tendency to keep the existing systems as a back-up.

6. Action by the APANPIRG

6.1 The APANPIRG is invited to note the information on the technical and operational developments related to CNS/ATM systems.

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				SARPs/PANS	GUIDANCE MATERIAL		
M. FIF	AIN ELD	Elements	TARGET COMPLETION DATE ¹	STATUS	TARGET COMPLETION DATE ²	STATUS	
		Global air traffic management requirements	2005	Annexes 2 and 11 SARPs and PANS-RAC procedures under development.	2000	Operational concept of global ATM being defined as part of updated global plan.	
	A T M	Interoperability and functional integration of flight operations, ATS, ATFM and tactical ASM	2005	Annexes 2 and 11 SARPs and PANS-RAC procedures under development.			
А		Required total system performance (RTSP)	2005	Draft policy statement under development.			
T M		ATM requirements for communications, navigation and surveillance	2002	Annexes 2, 6 and 11 SARPs and PANS-RAC procedures under development.			
	A	Airspace infrastructure planning	_	_	Completed	Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689) published.	
	S M	RNP and RNAV for en-route operations	Completed	Annex 11 SARPs and PANS-RAC procedures adopted by Council in 1998.	Completed	Update of the <i>Manual on</i> <i>Required Navigation Performance</i> (<i>RNP</i>) (Doc 9613) completed. Second edition published.	

DEVELOPMENT STATUS OF SARPS AND GUIDANCE MATERIAL RELATED TO CNS/ATM SYSTEMS

APPENDIX A

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Main			SARPs/PANS		GUIDANCE MATERIAL	
IVIA FIE	AIN ELD	Elements	TARGET COMPLETION DATE ¹	Status	TARGET COMPLETION DATE ²	Status
		Separation between aircraft	2000	PANS-RAC procedures approved by Council in 1998; further amendment to Annexes 2, 6, 11 and PANS-RAC under development.	2000	Amendment to <i>Air Traffic Services</i> <i>Planning Manual</i> (Doc 9426) to be developed. Amendment to the <i>Manual on Implementation of a</i> <i>300 m (1 000 ft) Vertical</i> <i>Separation Minimum between</i> <i>FL 290 and FL 410</i> (Doc 9574) completed. Additional guidance is under development for the Manual on APM (Doc 9689).
А	А	ATS (uplink of MET data)	2001	Annex 3 SARPs and PANS-RAC procedures concerning D-ATIS and D-VOLMET being developed with the assistance of the METLINKSG.		_
T M	T S	ATS (uplink of SIGMET information in graphical format)	2004	Initial Annex 3 SARPs specifying the code to be used for graphical SIGMETs being developed with the assistance of the METLINKSG.		
		WAFS planning and implementation (final phase)	2004	Annex 3 SARPs for global WAFS SIGWX forecasts in binary format (BUFR code) for direct transmission to airline and ATM computers being developed with the assistance of WAFSSG.		

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Main				SARPs/PANS	Gt	GUIDANCE MATERIAL		
M. FII	AIN ELD	Elements	TARGET COMPLETION DATE ¹	Status	TARGET COMPLETION DATE ²	Status		
		ATS applications for air-ground data links	2003	Annex 11 SARPs and PANS-RAC procedures were developed.	Completed	The Manual of Air Traffic Services Data Link Applications (Doc 9694) published and dispatched in second quarter 1999. Additional guidance is under development.		
		Data interchange between automated ATS systems	2002	Annex 11 SARPs and PANS-RAC procedures under development.				
		ILS/MLS/GNSS ³ operations	2001	PANS procedures under review.				
	A T F M	ATFM systems and procedures	2005	Annexes 2 and 11 SARPs and PANS-RAC procedures to be developed.	2000	ATFM part of the ATM operational concept under development.		
CNS/ATM		Human Factors	2000	HF-related SARPs were developed and incorporated in Annexes 10 and 11. Further, HF- related requirements are being developed for PANS-OPS.	2000	A chapter on Human Factors issues was developed and included in the <i>Manual of Air</i> <i>Traffic Services Data Link</i> <i>Applications</i> (Doc 9694). A manual containing HF guidelines on ATM systems has been developed.		
		Human Resource Planning and Training			2000	The human resource planning guidance material is under development. A potential approach and format for regional training planning was developed. Regional training guidance was incorporated into the CAR/SAM Basic ANP, General Planning aspects.		

2) approval by the Secretary General
3) OCP is developing PANS-OPS criteria for SBAS/GBAS

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	Elements	SARPS/PANS		GUIDANCE MATERIAL		
MAIN FIELD		TARGET COMPLETION DATE ¹	Status	TARGET COMPLETION DATE ²	Status	
	VHF digital link (Modes 3 and 4)	2000	Mode 4 validation commenced in 1997. Mode 3 validation started in 1998.	2000 ¹⁾	Being developed by AMCP.	

Elements	5	SARPs/PANS	GUIDANCE MATERIAL		
	TARGET COMPLETION DATE ¹	Status	TARGET COMPLETION DATE ²	Status	
AMSS	1999	Amendment to SARPs recommended by AMCP/6.	Completed	Amendment recommended by AMCP/6.	
RNP/RNAV (en-route)	Completed	Adopted/approved by Council in 1994 (Annexes 2, 4, 6, 11, 15 and PANS-RAC).	Completed	Guidance material for RNP1 operations under development.	
	_	_	Completed	The Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689) published in 1998.	
RNP (terminal area, approach, landing, departure)	Completed	Recommended by AWOP/16 and adopted by the Council in 1999.	Completed	Developed by AWOP, in parallel with SARPs.	
WGS-84	Completed	Adopted by Council in 1994, 1995, 1997 and 1998. Annexes 4, 11, 14 (both volumes) and 15 updated, provisions	Completed	<i>WGS-84 Manual</i> , (Doc 9674) and Amendment 1 issued.	
	ELEMENTS AMSS RNP/RNAV (en-route) RNP (terminal area, approach, landing, departure) WGS-84	ELEMENTSTARGET COMPLETION DATE1AMSS1999AMSS1999RNP/RNAV (en-route)Completed RNP/RNAV (en-route)RNP(terminal area, approach, landing, departure)Completed AmpletedWGS-84Completed	BLEMENTSINTERSIGET COMPLETION DATEISTATUSAMSS1999Amendment to SARPs recommended by AMCP/6.RNP/RNAV (en-route)CompletedAdopted/approved by Council in 1994 (Annexes 2, 4, 6, 11, 15 and PANS-RAC).RNP (terminal area, approach, landing, departure)CompletedRecommended by AWOP/16 and adopted by the Council in 1999.WGS-84CompletedAdopted by Council in 1994, in 1995, 1997 and 1998.MCS-84CompletedAnnexes 4, 11, 14 (both volumes) and 15 updated, provisions and 15 updated, provisions 	ELEMENTS Image: Completion Date Status Targer commended by AMCP/6. Targer commended by AMCP/6. AMSS 1999 Amendment to SARPs recommended by AMCP/6. Completed RNP/RNAV (en-route) Completed Adopted/approved by Council in 1994 (Annexes 2, 4, 6, 11, 15 and PANS-RAC). Completed RNP (terminal area, approach, landing, departure) Completed Recommended by AMOP/16 and adopted by the Council in 1999. Completed WGS-84 Completed Adopted by Council in 1998. Completed Annexes 4, 11, 14 (both volumes) and 15 updated, provisions and 15 updated, prov	

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Muss	Elements		SARPs/PANS	GUIDANCE MATERIAL		
MAIN FIELD		TARGET COMPLETION DATE ¹	Status	TARGET COMPLETION DATE ²	Status	
	Aeronautical data bases	2000	SARPs for the standard conceptual information model required for the provision of electronic aeronautical information, electronic charts display in the cockpit, provision of electronic terrain data and exchange of electronic aeronautical data initiated at the AIS/MAP/98 Divisional Meeting, are being developed by the Secretariat with the assistance of AISMAPSG and ADMSG.	2003	To be developed by the Secretariat with the assistance of AISMAPSG and ADMSG.	
	GNSS performance criteria to support operational requirements	2001	Draft material was developed at the GNSSP/3 (12 to 23 April 1999).	2001	Developed by GNSSP in parallel with SARPs.	
NAV (cont'd)	SARPs for the mid-term use of existing satellite navigation systems with augmentation sub-systems	2001	Draft SARPs were recommended by GNSSP/3.	2001	Developed by GNSSP in parallel with SARPs.	
	SARPs in support of longer-term satellite navigation systems	2000	Guidance on the long-term GNSS was developed by GNSSP/3 (21 to 23 April 1999).	—		

Many			SARPS/PANS	Gt	GUIDANCE MATERIAL		
MAIN FIELD	Elements	TARGET COMPLETION DATE ¹	STATUS	TARGET COMPLETION DATE ²	STATUS		
	Surveillance system specifications for ADS-B	2001	Surveillance enhancements (ANC Task No. CNS-9601) being developed by SICASP.	2000			
	SSR procedures	1999	Update of Annex 11 and PANS-RAC.	Completed			
SUR	ADS procedures	2001	Annex 11 SARPs and PANS-RAC procedures being developed by the ADSP.	Completed	Manual of ATS Data Link Applications (Doc 9694) published and dispatched in second quarter 1999.		
	ADS-B and equivalent	On-going	Being developed by ADSP and SICASP.	On-going	Amendment to the <i>Manual of ATS</i> <i>Data Link Applications</i> (Doc 9694) to be developed.		
	ADS: inclusion of turbulence reporting	2001	Annex 3 SARPs and PANS-RAC turbulence reporting procedures based on the eddy dissipation rate being developed with the assistance of METLINKSG.				

LEGEND

ATM	_	Air traffic management	COM		Communications
ADS	—	Automatic dependent surveillance	GNSS	—	Global navigation satellite system
ADS-B	—	ADS broadcast	NAV	—	Navigation
AIS		Aeronautical information services	RNAV		Area navigation
ASM	—	Airspace management	RNP		Required navigation performance
ATFM	—	Air traffic flow management	SSR		Secondary surveillance radar
ATN	—	Aeronautical telecommunication network	SUR		Surveillance
ATS		Air traffic services	WAFS		World area forecast system
CNS	—	Communications, navigation, and surveillance	WGS		World geodetic system

PANEL/STUDY	WORK PROGRAMME							
GROUP	TASKS	TITLE	TARGET COMPLETION DATE	STATUS (PROGRESS IN 1998-1999)				
	ATM-9506	Automatic dependent surveillance (ADS) systems and procedures	Completed	Guidance material was completed on issues related to CNS/ATM transition and the potential for accommodating existing systems and was presented to the ANC and dispatched to States.	PA			
			2000 and beyond	Work continued on draft SARPs, procedures and guidance material relating to the use of ADS, CPDLC and other data link applications.	NEL			
ADSP	ATM-9202	Global air traffic management	2000 and beyond	The development of the concept of required communication performance was progressed and ground work was prepared for an operational concept and operational requirements for the use of a system to increase aircraft situational awareness and airborne separation assurance.	S AND STU			
	ATM-9102	ATS applications for air-ground data links	2001	The issue of CNS/ATM transition and the potential for accommodating existing systems was also progressed.	UDY			
	ATM-9103	Data interchange between automated ATS systems	2001		GRO			
	ATM-9201	Update of provisions concerning the use of radar	1999		UPS IN			
	CNS-7002	Aeronautical electromagnetic spectrum	Ongoing	AMCP began work on spectrum protection tasks inherited from the disbanded FMSG.	VOL			
	CNS-8702	Aeronautical mobile satellite air-ground data link (AMSS subnetwork)	2000	Work on upgrades to the AMSS SARPs was approaching completion. Work on the development of acceptability criteria and SARPs for next-generation satellite systems began.	VED IN			
AMCP	CNS-9102	VHF air-ground digital link (VDL subnetwork)	2000	Validation of the draft SARPs for VDL Modes 3 and 4 continued.	CNS/			
	CNS-9603	Air-ground data link to support navigation and surveillance applications	2000		ATM-F			
	CNS-9602	High frequency data link (HFDL)	1999	Work on the HFDL SARPs was completed.	RELA			
	ATM-9501	Required total system performance	2001		TED			
	ATM-9202	Global air traffic management	2001 and beyond		ACT			
ATMCP	ATM-9510	Interoperability and functional integration of flight operations, ATS, ATFM and tactical ASM	2001	Second meeting of ATMCP Working Group was held in September 1999. Progress is being made on operational concept document.	IVITIES			
	ATM-9505	Airspace infrastructure planning	2001					

APPENDIX B

PANEL/STUDY			Work Proc	GRAMME	
GROUP	TASKS	TITLE	TARGET COMPLETION DATE	STATUS (PROGRESS IN 1998-1999)	
	CNS-7001	AFS systems planning studies	Completed	First package of ATN SARPs already in place; second package will be finalized by ATNP/3 during 7 to 18 February 2000.	
ATND	CNS-8101	AFTN procedures and message format	2000		
AINP	CNS-9403	Aeronautical telecommunication network (ATN)	2000		
	CNS-9901	AFS procedures	2000		
	CNS-6901	Microwave landing system (MLS)	1998 (completed)		
AWOP	CNS-9501	Performance requirements for non-visual to approach departure operations	1998 (completed)	The ANC agreed (148-14) to suspend the activities of AWOP.	
GNSSP	CNS-9401	Global navigation satellite system (GNSS)	2000	First set of SARPs recommended at GNSSP/3 Meeting, 12 to 23 April 1999.	
	CNS-7002	Aeronautical electromagnetic spectrum	Ongoing task		
				PANS-OPS arrival and departure criteria for RNAV and basic GNSS has	
OCP	OPS-8502	Flight procedures and obstacle clearance criteria based on GNSS & RNP systems	2001	been developed.	
	ATM-8505	Required navigation performance and area navigation for en-route operations	2000	Route spacings based on RNAV and RNP 1, a global target level of safety and the effects of GNSS on aircraft separation continued to be studied. Guidance material was developed for inclusion in the <i>Manual on Airspace</i> <i>Methodology for the Determination of Separation Minima</i> (Doc 9689).	
RGCSP	ATM-6301	Separation between aircraft	2000 and beyond	 Developments of proposals were advanced for the amendment of SARPs and PANS concerning reduced separation minima including: lateral distance-based intersecting track separation; 30 NM lateral and longitudinal separation to be presented to RGCSP/10. The reduction of longitudinal separation to below 10 minutes is under development. Amendments to SARPS and PANS for separation is under development and will be presented to RGCSP/10. The implementation of RVSM is continuing to be under review and the revision to the <i>Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive</i> (Doc 9574) is completed. 	

PANEL/STUDY			WORK PRO	GRAMME	
GROUP	TASKS	TITLE	TARGET COMPLETION DATE	STATUS (PROGRESS IN 1998-1999)	
	CNS-7901	Collision avoidance systems	2001	Work is concentrating on surveillance enhancements and ADS-B while monitoring ACAS and Mode S implementation in the States. SARPs for ADS D or Mode S lick on environment for SIGASD/7 (11 to 22 Southernorm	
SICASP	CNS-9601	Surveillance enhancements (ADS-broadcast)	2001	1999 tentative). Activities on ASAS are being progressed with the preparation of a manual on ASAS to be presented at SICASP/7.	
	CNS-9701	Airborne separation assurance system (ASAS)	2001		
ADMSG	AIS-9401	Aeronautical data bases	2002	Evaluation and validation of the SICIM and FAA/EUROCONTROL AICM/AIXM were initiated at the first meeting in November 1999; further work in 2000 - 01.	
	AIS-9401	Aeronautical data bases	2000	Amendment 29 to Annex 15 introduced aeronautical data base	
AIGMADGC	AIS-9801	Electronic aeronautical charts for cockpit display	2003	and publication resolutions. At the 3rd meeting (December 1999) work continued on tasks AIS-9801 and AIS-9802. The group will continue	
AISMAPSG	AIS-9802	Electronic terrain data	2003	work in 2000.	
	AIS-9806	Electronic exchange of aeronautical information	2002		
AVSSSG	CNS-7001	AFS systems planning studies	2000	The second meeting of AVSSSG was held in Montreal in October 1999. SARPs and guidance material on ATS voice networks are being developed.	
HFSG	PEL-9001	Flight safety and human factors	2000	Review of SARPs on CNS/ATM, to ensure that Human Factors are properly taken into consideration. SARPs submitted to the Council during the periodic cycles of revision of the relevant Annexes. Further, HF-related requirements are to be included in PANS-RAC under development.	
HRPTSG	PEL-9601	Regional human resource planning and training needs	2000	The first draft of the Human Resource Development Manual is under development. An initial version of a computer programme designed to indicate how CNS/ATM technologies affect job profiles and the consequential human	
				resource planning and training requirements was developed.	
	MET-9101	Amendment to Annex 3 concerning automated air-reporting	2001	Amendment 72 to Annex 3 being developed including the details of the turbulence index to be reported.	
METLINKSG	MET-9301	Future requirements for the uplink of OPMET information to aircraft in flight	2001	Amendment 72 to Annex 3 being developed including the meteorological specifications (templates) for D-ATIS and D-VOLMET.	

PANEL/STUDY		WORK PROGRAMME					
GROUP	TASKS	TITLE	TARGET COMPLETION DATE	STATUS (PROGRESS IN 1998-1999)			
	MET-9602	SIGMET information in graphical format	2004	Amendment 72 being developed including the specification of the numerical code to be used for the dissemination and uplink of graphical SIGMETs.			
TENSC	CNS-9402	Testing of radio navigation aids	2000	First and second meetings of the study group produced a revised version of Doc 8071, Volume I, <i>Manual on testing of ground-based radio</i>			
TRUSO	CNS-9401	Global navigation satellite system (GNSS)	2000	navigation systems (replacing former volumes I and II).			
WAFSSG	MET-8802	WAFS planning and implementation	2001	Amendment 72 to Annex 3 being developed to include global WAFS SIGWX forecasts in binary format (BUFR) code for direct transmission to airline and ATM computers.			

LEGEND

ANC Panels

ADSP AMCP ATMCP ATMCP ATNP AWOP GNSSP OCP RGCSP SICASP		Automatic Dependent Surveillance Panel Aeronautical Mobile Communications Panel Air Traffic Management Operational Concept Panel Aeronautical Telecommunication Network Panel All Weather Operations Panel Global Navigation Satellite System Panel Obstacle Clearance Panel Review of the General Concept of Separation Panel Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel	ADMSG AISMAPSG AVSSSG HFSG HRPTSG METLINKSG TRNSG WAFSSG		Aeronautical Data Modelling Study Group Aeronautical Information and Charts Study Group ATS Voice Switching/Signalling Systems Study Group Flight Safety and Human Factors Study Group Human Resource Planning and Training Study Group Meteorological Information Data Link Study Group Testing of Radio Navaids Study Group World Area Forecast System Study Group
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Study Groups