



International Civil Aviation Organization

Sixth Meeting of CNS/MET Sub-Group of APANPIRG

Bangkok, 15-19 July 2002

Agenda Item 18: Any other business

COMPARATIVE ANALYSIS OF REGIONAL DEVELOPMENTS

IN

AIR NAVIAGTION SYSTEMS INCLUDING CNS/ATM SYSTEMS

(Presented by Secretariat)

SUMMARY

This paper presents comparison of regional developments of air navigation systems including status of SARPs and implementation of the CNS/ATM Systems.

1. INTRODUCTION

1.1 The material provided in the Attachment 1 was compiled in February 2002, which provides a snapshot, using a matrix-based approach, on comparative analysis of regional developments in air navigation systems and related fields for review by the Council. Attachment 2 provides information on recent developments in SARPs and other implementation activities.

2. DISCUSSION

2.1 Monitoring of the status of elements of the CNS/ATM systems is one of the major activities of APANPIRG. In order to harmonize implementation plans and procedures between regions it is required to monitor developments in other regions and coordinate activities through the inter regional coordination mechanism.

2.2 The presentation of a matrix-based data on the regional developments in air navigation systems may serve as one of the tools for inter-regional co-ordination. Therefore, it will be an ongoing annual exercise for APANPIRG and its Sub-Groups to closely monitor development. This would also facilitate inter-regional co-ordination.

2.3 Information on the items of SARPs and Guidance Materials, Near Team's Activities, Outcome of APANPIRG/12 and information on other major implementation activities are also provided for the meeting to note.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- i) note the information provided in Attachments 1 and 2;
- ii) note the inter-regional developments in relation to the ASIA/PAC region; and
- iii) update the information in Attachment 1 for Asia and Pacific regions, as required.
- iv) note the recent developments provided in Attachment 2.

COMPARATIVE ANALYSIS OF REGIONAL DEVELOPMENTS IN AIR NAVIGATION SYSTEMS

AIR TRAFFIC MANAGEMENT								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
1	Revision of ATS route structure	South China Sea - 1 November 2001. Asia to Europe through Middle East via south of Himalayas - 28 November 2002.	Establishment of new ATS routes, namely UB540 Johannesburg-Francistown-Victoria Falls-Livingstone - 28 November 2002. Extension of route UR982 (Lome-Sao-Tome) - 28 November 2002. Implementation of RNAV Route UM114 - 28 November 2002.	Asia to Europe through Middle East via south of Himalayas - 28 November 2002. Revision of route structure in Eastern and Western part of Europe - On going.	The development of a new ATS RNAV route network in CAR/SAM Regions - In progress.	Asia to Europe through Middle East via south of Himalayas - 28 November 2002.	The ATS route structure of the NAM Region will be reviewed and included in an updated version of the NAM ANP.	-
2	RVSM	Pacific airspace - implemented on 24 February 2000. Western Pacific airspace - 21 February 2002. Hong Kong FIR and Sanya AOR - 31 October 2002. Asia to Europe south of Himalayas - 27 November 2003	Being pursued by RVSM/RNAV/ RNP TF. Target date to be determined. Parts of Region falling in SAM and EUR corridor - 24 January 2002.	European Region - 24 January 2002.	EUR/SAM corridor - 24 January 2002. CAR/SAM Regions - 1 April 2004.	Middle East Region - 27 November 2003.	Implementation of RVSM by Canada between FL 290 to FL 410 inclusive in Edmonton, Montreal and Winnipeg FIRs/CTAs up to North Pole planned for second quarter 2002. U.S. is planning to implement RVSM in the U.S. airspace from FL 290 to FL 410 - December 2004.	Horizontal RVSM expansion in the entire NAT Region from FL 310 to FL 390 completed on 1 November 2001. Vertical expansion of RVSM throughout NAT Region from FL 290 to FL 410 - 24 January 2002.
3	Establishment of regional airspace performance monitoring structure	In progress with a target date of September 2002.	Under consideration.	Under development.	Under consideration.	Under consideration.	Under consideration.	Implemented.

N.B. Historical data, wherever possible, has been indicated in *Italics*.

AIR TRAFFIC MANAGEMENT								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
4	ACAS II	<i>Mandated from 23 March 2000.¹</i>	<i>Mandated from 1 January 2000.¹</i>	<i>Mandated from 1 January 2000.¹</i>	<i>Mandated from 1 January 2003.¹</i>	<i>Mandated from 1 July 2001.¹</i>	Implemented in Canada and the United States airspace.	<i>Mandated from 31 March 2001.¹</i>
5	RNAV/RNP	RNP 10: 1) North Pacific and Tasman - 23 April 1998; 2) South China Sea - 1 November 2001; 3) Australia and Indonesia - 1 November 2001; 4) Bay of Bengal - November 2002. Other routes in progress.	RNP5 - implemented in continental Johannesburg FIR in 1998. For other routes - Under consideration.	RNAV/RNP5 implemented in ECAC area from January 1998. Implementation of precision RNAV (nearly equivalent to RNP 1) in terminal areas is planned for 2003.	EUR/SAM corridor RNP10 - 4 October 2001; Five routes approved by the CAR/SAM RAN/3 Meeting have been implemented. Tests and demonstrations to be carried out by TC project RLA/98/003 related to the use of RNAV and RNP10 on designated routes in the region has been approved. For other routes - Under consideration.	RNP 5 Phase 1 Implemented - 14 June 2001. Phase 2 - 28 November 2002.	United States has implemented RNP in domestic and oceanic airspace since 1998. Canada is planning to implement RNP in domestic airspace in 2006. RNAV route structure in the NAM Region will be studied by a task force.	MNPS implemented in 1981.

¹ Full implementation before the global date (1 January 2003) is not expected.

COMMUNICATIONS								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
1	ATN (Subnetworks, End systems and Intermediate systems)	ATN transition plan has been developed with a target date of 2005 for ground-ground application namely AMHS.	ATN implementation is Under study. Focus is more on improving current circuits with long term plans for migrating to AMHS.	ATN transition plan has been developed. Pre-operational trials are in progress.	Current AFTN is being improved. Plans for the implementation of ATN regional backbone and interface with the AFTN using a gateway were established. Implementation of AMHS and AIDC are being studied.	ATN implementation is under consideration with initial focus on ground-ground application namely AMHS and AIDC - Dates to be determined. Guiding principles have been prepared.	ATN transition plan has been developed with focus on ground-ground applications. Test, development and validation phases completed. Operational implementation is under review.	Investigation of operational ATN data link scenarios in the Region with focus on air-ground applications is in progress.
2	Air-ground communication infrastructure	VHF voice in continental and terminal areas. VHF data being studied. AMSS for data and voice in oceanic and remote areas. SSR Mode S data link for high density airspace are being planned.	VHF Voice is provided in terminal areas. Extension of VHF coverage to en route areas is in progress in several FIRs. HF Voice is provided in most of FIRs and CPDLC based on FANS_1/A is being used.	Implementation of air-ground data link services is planned for 2002-2007. Horizontal expansion of 8.33 kHz channel spacing is planned effective from 31 October 2002. Vertical expansion of 8.33 kHz channel spacing may be necessary by 2008.	Implementation of VDL Mode 2 to support CPDLC and D-ATIS will be studied. Tests on HF DL are being conducted.	VHF voice in continental and terminal areas. VHF data being studied. AMSS for data and Voice in oceanic and remote areas. SSR Mode S data link for high density airspace are being considered.	There are plans for AMSS for voice and ATN-compatible sub-networks such as VDL Mode 2, HF DL and AMSS to support CPDLC applications	HF is the main communication and already saturated with difficulty of obtaining additional frequencies. CPDLC based on FANS_1/A is used for routine communications. AMSS application is being assessed
3	Ground-ground communication infrastructure	Some of the States have implemented digital networks. Other States are also considering upgrading their networks.	Two major satellite networks have been provided in the States of the Region. Other areas are also being considered.	Well developed. Many of the States have upgraded to digital networks.	Number of digital networks have been implemented in the Region. Interconnection of these networks so as to provide interoperability is in progress.	Establishment of a regional satellite based digital network is under consideration.	Well developed. Canada, Mexico and United States have upgraded to digital networks.	Well developed. Many of the States have upgraded to digital networks.

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NAVIGATION								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
1	GNSS	Transition to WGS-84 is in progress. Strategy for implementation of GNSS along with a check list has been developed. Satellite based augmentation system (MSAS) is being developed. GNSS is being used for oceanic and continental en- route operations.	Transition to WGS-84 is in progress. GNSS strategy has been adopted. SBAS test bed in cooperation with EGNOS is under study. GNSS is being used for oceanic and continental en- route operations. Development of harmonized GNSS procedures for States of SADC completed in December 2001	Transition to WGS-84 is on-going. Launching of “Galileo”, a new constellation of navigation satellites is under consideration with full operation capability slated for 2008. Satellite based augmentation system (EGNOS) is being developed. GNSS is being used for continental en route operations.	Transition to WGS-84 is in progress. SBAS test bed project in cooperation with WAAS was established. GNSS is being used for oceanic and continental en route operations.	Transition to WGS-84 is in progress. Strategy for implementation of GNSS is under development. SBAS test bed in cooperation with EGNOS is under study. GNSS is being used for continental en route operations	Transition to WGS-84 completed in Canada and United States. In Mexico, it is in progress. The GNSS/GPS strategy has been adopted. SBAS based on the United States' wide area augmentation system (WAAS) is being developed. GNSS is being used for oceanic and continental en-route operations. A GNSS approach implementation programme has been initiated by all three States and GNSS augmentation system agreements have been completed for the future expansion of the GNSS concept.	Transition to WGS-84 completed. GNSS is being used for oceanic operations.

N.B. Historical data, wherever possible, has been indicated in *Italics*.

SURVEILLANCE								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
1	SSR Modes A/C and SSR Mode S	Currently SSR Modes A and C is employed. In the near future SSR Mode S in some terminal areas and high density en route will be planned	Surveillance in most FIRs is through voice position - reporting. PSR and SSR Mode A/C is employed in some busy terminals and for en-route operations. A PSR/SSR Plan on selected airspaces has been developed and is included in the AFI FASID.	Currently SSR Modes A and C is employed. SSR Mode S in some terminal areas and high density en route is planned for implementation in 2005.	Currently SSR Modes A and C is employed. In the near future SSR Mode S in some terminal areas and high density en route will be planned. Plans for SSR data sharing are being studied.	The Region is well covered by radars (PSR/SSR Mode A/C). In near future SSR Mode S in some terminal areas and high density en route will be planned.	En-route radar surveillance has seen substantial improvements with the upgrading of radar systems in a large part of the airspace. In several areas of the Gulf of Mexico and Northern Canada, surveillance has been restricted to position reports sent by pilots via air-ground communications, a plan to improve radar surveillance in the Gulf of Mexico is being developed.	Surveillance in most of the NAT Region is via position reports using HF Voice at approximately every 10 of longitude.
2	ADS	ADS will be used initially for oceanic airspace and later in remote areas.	ADS will be used for low density, remote and oceanic airspace as well as outside SSR coverage.	ADS will be used in some parts of the Region.	ADS will be used initially for oceanic airspace and later in remote areas.	ADS will be used initially for oceanic airspace and later in remote areas and possibly as a backup to SSR in high density traffic areas.	ADS will be used in oceanic or remote areas; however, further review is needed for continental domestic airspace areas.	To improve surveillance, the regional plan specifies ADS over the ATN. Nevertheless, provisions have been made to accommodate FANS_1/A-equipped aircraft.
3	ADS-B trials are in progress in a few States such as Australia and Japan. Implementation plans yet to be finalized.	To be determined.	To be determined.	To be determined.	To be determined.	To be determined.	ADS-B trials are in progress in Canada and United States. Implementation plans still have to be finalized.	-

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RELATED ISSUES								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
1	Transition from current single volume ANP to two volumes Basic ANP and FASID documents	Approved by the President of the Council on 11 August 2001; Document in final preparation stage for publication.	Material finalized and will go through an approval process.	Material finalized and published.	Approved by the CAR/SAM/RAN 3 Meeting. FASID is being kept up to date.	Scheduled for finalization by third quarter 2002.	A revision programme was proposed to update the FASID document.	The NAT Basic ANP and FASID are being reviewed and is scheduled to be completed by the middle of 2002.
2	Development and update of Regional plan for CNS/ATM systems	Reviewed and updated. It now includes a new chapter on the subject of meteorology.	Reviewed and updated.	Reviewed and updated.	Under review to update the Plan.	Reviewed and updated.	Reviewed and updated.	New plan being developed.
3	Meteorological component of CNS/ATM systems Transition to final phase of World Area Forecast System (WAFS)	Migration from traditional alphanumeric code forms to digital code forms (WMO BUFR and GRIB code forms) is being addressed. The Regional Area Forecast Centres have been phased out and their responsibilities have been transferred to the World Area Forecast Centres.	Migration from traditional alphanumeric code forms to digital code forms (WMO BUFR and GRIB code forms) is being addressed. The Regional Area Forecast Centres have been phased out and their responsibilities have been transferred to the World Area Forecast Centres	Migration from traditional alphanumeric code forms to digital code forms (WMO BUFR and GRIB code forms) is being addressed. The Regional Area Forecast Centres have been phased out and their responsibilities have been transferred to the World Area Forecast Centres.	Initial discussions have taken place to address migration from traditional alphanumeric code forms to digital code forms (WMO BUFR and GRIB code forms). The transfer of responsibilities from the Regional Area Forecast Centres to the World Area Forecast Centre, Washington is under way.	Migration from traditional alphanumeric code forms to digital code forms (WMO BUFR and GRIB code forms) is being addressed. The Regional Area Forecast Centres have been phased out and their responsibilities have been transferred to the World Area Forecast Centres.	Initial discussions have taken place to address migration from traditional alphanumeric code forms to digital code forms (WMO BUFR and GRIB code forms). The transfer of responsibilities from the Regional Area Forecast Centres to the World Area Forecast Centre, Washington is under way.	Not applicable as this issue is being addressed by the States as part of EANPG. Not applicable.

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RELATED ISSUES								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
4	Review of deficiencies	Addressed as part of the PIRG work programme. Appropriate management tools are being developed.	Addressed as part of the PIRG work programme. The list of deficiencies are grouped on the basis of States in addition to facility wise. Establishment of an aviation safety board is under consideration.	Addressed as part of the PIRG work programme.	Addressed as part of the PIRG work programme. An aviation safety board has been created.	Addressed as part of the PIRG work programme.	-	Addressed as part of the PIRG work programme.
5	Specific to the region	Guidance material to enhance aeronautical information services activities within the Region has been developed. AIS quality assurance manual has been developed.	The new larger aeroplane task force has been established to evaluate the impact on aerodromes of the AFI Region. Establishment of an appropriate body for addressing regional human resource and training issues is under consideration.	Focussing on increasing the efficiency and capacity at international aerodromes through the implementation of capacity enhancing procedures.	Human resources and training issues are being addressed. The development of an ATS Quality Assurance Programme and its associated activities are being carried out.	Formulation of a plan for development of regional training capabilities within specific training centres is being addressed.	-	Work has been initiated for the development of operational and economic performance indicators to be used throughout NAT Region.

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AIR TRANSPORT – TRAFFIC FORECAST AND ECONOMIC ISSUES								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
1	Traffic Forecasting Groups (TFGs)	Traffic Forecasting Group-is in existence since 1991. Forecasts prepared for major route group up to the year 2015. Tenth meeting of TFG was held in Bangkok from 11 to 20 June 2001.	Traffic Forecasting Group formed in 1998. Major route groups identified. Forecasts to be prepared in 2002. Second meeting of TFG was held in Nairobi from 12 to 16 March 2001.	Data developed by EUROCONTROL are being used.	Traffic Forecasting Group established in 1996. Forecasts prepared for major route group up to the year 2010. In support of the study of the transitional plan (Project RLA/98/003), forecasts for 18 major traffic flows have been prepared by the Secretariat in lieu of CAR/SAM TFG. Fourth meeting of TFG was held in Lima from 17 to 21 July 2000.	Traffic Forecasting Group (TFG) created in 1998. Forecasts prepared for major route group up to the year 2015. Fourth meeting of TFG was held in Cairo on 22 February 2001.	Data being developed by CAN/MEX/USA.	NAT Forecasting Group was established in 1965.
2	Traffic forecasts	Traffic forecasts have been developed and are currently under review to reflect changes due to recent events.	Forecasts are under development.	No ICAO involvement.	Traffic forecasts have been developed and are currently under review to reflect changes due to recent events.	Traffic forecasts have been developed and are currently under review to reflect changes due to recent events.	No ICAO involvement.	Traffic forecasts are developed annually. However, they are currently under review to reflect changes due to recent events.
3	Cost benefit study, business case analysis and cost recovery system	To progress the task of establishing a framework for business case studies for the implementation of CNS/ATM systems, a special implementation project has been proposed.	Business case and cost benefit analysis has been carried out for SADC States for the UACC project. Similar exercise is under consideration for route AR4.	Business case and cost benefit analysis are being carried out by EUROCONTROL.	The Secretariat has been approached to assist in the economic aspects of the study of the transitional plan (Project RLA/98/003) to CNS/ATM systems.	A business case illustrative application is being developed for the region.	Business case and cost benefit analysis are being carried out by CAN/MEX/USA	The feasibility of creating a common cost-recovery system for the provision of air navigation services in the northern part of the region is being considered. Cost effectiveness of implementation of new systems are studied as an ongoing exercise.

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LEGAL ISSUES								
No.	System	ASIA/PAC	AFI	EUR	CAR/SAM	MID	NAM	NAT
1	Addressing legal issues such as universal accessibility, continuity, certification and liability.	Legal issues have been raised but these are beyond the scope of regional bodies. HQ should continue to provide guidance and address and resolve them at global level.	The subject has not yet been examined by APIRG. We expect the HQ to adequately address this issue for the benefit of PIRGs.	Legal issues were discussed in the context of the Galileo programme.	Legal issues are beyond the resolution at the regional level. HQ must provide the leadership in this domain.	The question is too large and complex. MIDANPIRG did not look into the matter deep.	-	-
2	Development of an interim legal framework	An interim legal framework, the “Charter on the Rights and Obligations of States Relating to GNSS Services”, was adopted in 1998 by the 32nd Session of the Assembly in the form of Resolution A32-19, which embodies certain fundamental principles applicable to GNSS. The ICAO headquarters is accelerating its efforts to resolve the complex legal issues involved and will continue to provide guidance at global level. The Secretariat Study Group on Legal Aspects of CNS/ATM systems will finalize the concept of a contractual framework for CNS/ATM systems and provide a path toward its implementation, including the consideration of an international convention. The security aspects concerning prevention of unlawful interference with CNS/ATM systems will also be reviewed in the context of aviation security.						

-END-

N.B. Historical data, wherever possible, has been indicated in *Italics*.

SARPS, PANS AND GUIDANCE MATERIAL RELATED TO AIR NAVIGATION SYSTEMS

Recent developments

Communications

1.1.1 The validation of detailed technical specifications for very high frequency (VHF) digital link (VDL) Modes 3 and 4 as well as the systems management and security service of the aeronautical telecommunication network (ATN) was completed.

1.1.2 The Aeronautical Mobile Communications Panel (AMCP) began assessment of the need for SARPs for the universal access transceiver (UAT) serving as a data link for automatic dependent surveillance-broadcast (ADS-B) applications and for VDL Mode 4 serving as a communication data link.

1.1.3 Work was initiated on the relocation of detailed technical specifications of the aeronautical mobile-satellite service (AMSS) into a technical manual.

1.1.4 Frequency assignment criteria for VDL Mode 2 were completed.

Navigation

1.1.5 Progress continued in a number of States and international organizations on the development and implementation of global navigation satellite systems (GNSS). A few more States approved the global positioning system (GPS) for supplemental or primary use for some operations and types of airspace.

1.1.6 The first package of SARPs for GNSS was incorporated into Annex 10 — *Aeronautical Telecommunications*, Volume I — *Radio Navigation Aids* as part of Amendment 76 which became applicable in November 2001. The package contains general provisions and technical specifications for the global positioning system (GPS), GLObal Navigation Satellite System (GLONASS), aircraft-based augmentation system (ABAS), satellite-based augmentation system (SBAS), and ground-based augmentation system (GBAS). Pursuant to the adoption of the above-mentioned SARPs, a number of system enhancements, including GBAS positioning service, were developed and included in Amendment 77 to Annex 10.

1.1.7 Development of the SBAS continued. This form of augmentation is expected to support the use of GNSS for all phases of flight including approach with vertical guidance (APV) and in future, Category I precision approach. Several architectures for the GBAS to support precision approach applications also continued to be developed and tested. The latter type of augmentation may be used by some States as an alternative in support of Category I operations.

Surveillance

1.1.8 Amendments to secondary surveillance radar (SSR) Mode S and airborne collision avoidance system (ACAS) SARPs were adopted in 2002 for inclusion in Annex 10 as part of Amendment 77. Additionally, work continued on the development of guidance material on the airborne separation assurance system (ASAS) to assist in the development of requirements. Moreover, initial concepts were developed to help the definition of required surveillance performance (RSP).

Air traffic management

1.1.9 Amendment 76 to Annex 10, Volume II and the PANS-ATM (14th edition, applicability date of 1 November 2001) should facilitate implementation of the available technology in relation to controller-pilot data link communications (CPDLC) and data link — flight information service (D-FIS). Amendments stemming from recommendations of the tenth meeting of the Review of the General Concept of Separation Panel (RGCSP/10) introduced provisions for 55.5 km (30 NM) spacing between parallel RNAV route centre lines in remote and oceanic airspace (Amendment 41 to Annex 11) and 55.5 km (30 NM) longitudinal separation (Amendment 1 to the 14th edition of the PANS-ATM). These separation minima have associated requirements for automatic dependent surveillance (ADS) and are applicable only where aircraft navigation capability is RNP 4 or better. Coupled with this material, a new chapter dealing specifically with ADS procedures has also been incorporated into the same amendment to PANS-ATM with an applicability date of 28 November 2002.

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

1.1.10 The first draft of a human resource planning manual was completed in 2001. The aim of the manual is to enhance States' individual capabilities in this area. To ensure that the manual fully meets States' and/or air navigation service providers' needs and is sufficiently user-friendly, preliminary or "beta" testing of the manual is required. This will be done directly with States and air navigation service providers during a Regional Human Resource Planning Seminar planned for this year in the Caribbean and South American (CAR/SAM) Regions. Once the manual is approved, the Secretariat plans to organize regular human resource planning seminars to assist States in developing and implementing their training and staffing plans.

1.1.11 The completion of the human resource planning manual is a fundamental element in the overall strategy to ensure that training needed to implement new and emerging air navigation systems is available. The other key element is the implementation of a regional training planning process. The aim of this process is to ensure that the training needed to implement regional air navigation plans is accessible and affordable within all ICAO Regions. The specific steps and procedures that could form the basis of a regional training planning process were developed by the Secretariat. To ensure that the planning process meets the needs of a region, it will need to be reviewed and adapted as necessary by the PIRG concerned. The CAR/SAM Regions will be the first to consider implementation of the process.

1.2 Near-term (by 2004) activities

Communications

1.2.1 The AMCP will be considering the results of a comparative analysis of potential candidate links for ADS-B. The panel will also finalize frequency assignment criteria for VDL Modes 3 and 4.

1.2.2 The Aeronautical Telecommunication Network Panel (ATNP) will be developing provisions for the use of Internet Protocol (IP) networks and the optional use of the confidentiality feature (for message encryption) within the existing aeronautical information security framework (as reflected in ATN SARPs contained in Annex 10).

Navigation

1.2.3 Near-term enhancements to GNSS SARPs (defined in Amendment 77 to Annex 10) are being incorporated in the actual system design. This will improve system performance and expand services provided by SBAS and GBAS. Development of performance requirements and SARPs for more demanding GNSS applications (e.g. precision approaches for CAT II/III operations) and new GNSS elements (e.g. Galileo) will continue.

1.2.4 Implementation of GNSS (mainly GPS) based non-precision approach application (NPA) will be continued in ICAO Regions. These activities will be supported by the development of procedures and criteria for approaches with vertical guidance (APV) and Category I operations based on SBAS and GBAS.

Surveillance

1.2.5 The Surveillance and Conflict Resolution Systems Panel (SCRSP) will continue to address issues relating to the operational use of ACAS, ADS-B and the proposed ASAS. The panel will also continue monitoring of ACAS implementation worldwide and will further study the ACAS procedures for civil aircraft operation in case of military intercept.

Air traffic management

1.2.6 Work continues on the development of ADS and controller-pilot data link communications (CPDLC) procedures as well as further reductions in separation minima aimed at increasing airspace capacity while maintaining or enhancing present safety levels. The first version of an air traffic management (ATM) operational concept document that was finalized at the first meeting of the Air Traffic Management Operational Concept Panel (ATMCP) in March 2002 will be further refined based on comments received from States and a review by the Commission. The concept is expected to provide a road-map to States and the PIRGs for implementation of an integrated global ATM system.

Flight Safety and Human Factors Programme

1.2.7 A review of the *Human Factors Training Manual* (Doc 9683) is planned for 2003, specifically of Part 1, Chapter 3 (Human factors issues in the development and implementation of CNS/ATM systems) and Chapter 5 (Human factors issues in air traffic control). The objective of this review is to bring the document in line with the manual *Human Factors Guidelines for Air Traffic Management (ATM) Systems* (Doc 9758), as well as to include the latest developments since Doc 9683 was published. Constant monitoring of developments within the industry will continue in order to take appropriate action as developments warrant.

1.3 Regional plans

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

1.3.1 The twelfth meeting of APANPIRG, which took place in Bangkok, Thailand in August 2001, further reviewed and updated the regional plan for CNS/ATM systems which now includes a new chapter

covering meteorological systems. The other major activities undertaken by APANPIRG are as follows: the development of the Asia and Pacific (ASIA/PAC) Basic ANP and FASID have been completed and approved by the President of the Council; a target date of 27 November 2003 has been set for the implementation of RVSM in the Bay of Bengal area and beyond, in conjunction with planned implementation in the Middle East (MID) Region; establishing an airspace system performance structure and funding mechanism for the ASIA/PAC Region in accordance with ICAO provisions in Amendment 40 to Annex 11 — *Air Traffic Services* is under consideration; to gain benefits in terms of safety, efficiency and capacity enhancements, the EMARSSH (Europe/Middle East/Asia Route structure South of Himalayas) project has been set up with a target date of implementation slated for 28 November 2002; implementation of aircraft collision avoidance systems II (ACAS II) in the ASIA/PAC Region was agreed upon with an applicable date of 23 March 2000, which is earlier than the global date of 1 January 2003; and, the ATN transition plan and related technical and planning documents were developed which outlined the requirements for ground-ground trunk circuits to be implemented by 2005.

1.4 Information on other major implementation activities

High frequency data link (HFDL)

1.4.1 Thirteen ground stations have already been implemented by ARINC Inc. at geographically diverse locations worldwide. The full network comprising sixteen ground stations is expected to be completed in 2002. The service is initially intended for aeronautical operational control (AOC) but efforts are underway by a number of ATS providers and aircraft operating agencies to start pre-operational trials of the link as a subnetwork of the ATN for air traffic service (ATS) communications.

VDL Mode 2

1.4.2 The société internationale de télécommunications aéronautiques (SITA) has already implemented ten ground stations supporting both VDL Mode 2 and aircraft communications addressing and reporting system (ACARS) in Europe and plans another twenty-five installations during 2002. These VDL Mode 2 ground stations will support the introduction of controller-pilot data link communications (CPDLC) in Europe, though they will also be used to provide for the exchange of aircraft communications addressing and reporting system (ACARS) messages (consisting of aeronautical operational control (AOC) and some limited ATS messages like pre-departure clearance).

1.4.3 To date, fifty-five ground stations have been deployed by ARINC Inc. in the continental United States (CONUS). The total number of stations envisaged (for providing total en-route coverage) in CONUS is 175. These stations will also support both CPDLC and ACARS.

1.4.4 In general, the ground stations being implemented in Europe and the United States, provide the necessary infrastructure for the gradual introduction of CPDLC (as an ATN application) in both continents in the 2003-2007 time frame.

VDL Mode 3

1.4.5 The contract for development of ground systems has been awarded in the United States as part of the Next Generation Air-Ground Communications (NEXCOM) Programme. Initial operational capability is expected to be achieved in the fourth quarter of 2002.

VDL Mode 4

1.4.6 Programmes have commenced to implement VDL Mode 4 ground stations in Sweden and part of the Russian Federation in support of ADS-B.

Improvement of VHF spectrum utilization

1.4.7 The 8.33 kHz VHF voice channel spacing has been implemented in the core part of Europe above FL245. This has resulted in the availability of a significant number of new operational frequencies. Many aircraft have already been equipped with the 8.33 kHz compatible VHF radio. Implementation by many other European States is expected in the near future.

GNSS

1.4.8 The programme for full-scale development and validation of the Galileo by the European Union (EU) and the European Space Agency (ESA), as another core satellite constellation of the GNSS, has recently been approved and funded. The GPS modernization programme also continued in the United States.

ATM Improvements

1.4.9 Substantial progress was made in all regions towards improving efficiency and capacity based on more accurate air navigation systems. In the Pacific Region, and in the South Atlantic corridor connecting Europe and South America, RNP formed the basis for a reduction of separation to 50 NM both longitudinally and laterally. Initial steps continued to be taken to implement similar reductions in the Caribbean, Middle East and South American Regions. RNP-5 was implemented in parts of the MID Region. RNP-5, in conjunction with RNAV, allowed States and aircraft operators in the EUR Region to take advantage of airborne RNAV capabilities within the coverage of existing VOR-based systems. RVSM was successfully implemented in the EUR Region, in the South Atlantic corridor and in parts of the Pacific Region.