INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT OF THE SEVENTH MEETING OF THE APANPIRG CNS/ATM IMPLEMENTATION CO-ORDINATION SUB-GROUP (CNS/ATM/IC/SG/7)

Singapore, 21 – 25 August 2000

The views expressed in this Report should be taken as those of the Sub-Group and not the Organization

Approved by the Meeting
and published by ICAO Asia and Pacific Office

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PART I – HISTORY OF THE MEETING

1. Introduction

1.1 The seventh meeting of the APANPIRG Communications, Navigation, Surveillance and Air Traffic Management, Implementation Co-ordination Sub-group (CNS/ATM/IC/SG/7) was hosted by the Civil Aviation Authority of Singapore and held in the Kallang Hall of the Singapore Aviation Academy, Singapore from 21-25 August 2000.

2. Attendance

2.1 The meeting was attended by 78 participants from 23 States, 3 International Organizations and 3 representatives from the Aviation Industry. A list of participants is provided at Attachment 1.

3 Officers and Secretariat

3.1 Mr. Rodney Bracefield, Manager, CNS/ATM of Civil Aviation Authority of New Zealand acted as Chairperson and presided over the meeting throughout its duration.

3.2 Mr. Owen Dell, Regional Officer ATM, and Mr. K.P. Rimal, Regional Officer CNS, ICAO Asia and Pacific Office were the Secretariat for the meeting.

4. Language and Documentation

4.1 The discussions were conducted in English. Documentation was issued in English with a total of 17 Working Papers and 25 Information Papers being considered by the meeting. A list of papers presented during the meeting is included in Attachment 2 to this report.

5. Opening of the Meeting

5.1 The meeting was opened by Mr. Rodney Bracefield, who welcomed the participants to Singapore and outlined the work programme before the Sub-Group.

6. Draft Conclusions and Draft Decisions - Definition

6.1 The CNS/ATM/IC Sub-Group records its actions in the form of Draft Conclusions and Draft Decisions with the following significance:

a) **Draft Conclusions** deal with matters that, according to terms of reference, merit directly the attention of States, or on which further action is required to be initiated by the Secretariat according to established procedures; and

b) **Draft Decisions** relate solely to matters dealing with the internal working arrangements of the Sub-Group.

6.2 **List of Draft Conclusions**

Draft Conclusion 7/1	–	Protection of aeronautical frequency spectrum
Draft Conclusion 7/2	–	Guidance Material on CNS/ATM Operations in the Asia Pacific Region
Draft Conclusion 7/4	–	Amendment to the Regional Plan
Draft Conclusion 7/5	–	Key Priorities for CNS/ATM Implementation
Draft Conclusion 7/6	–	ADS/CPDLC Planning Matrix

6.3 **List of Decision**

Decision 7/3	–	Tables of ATM Operational Enhancements

PART II – REPORT ON AGENDA ITEMS

Agenda Item 1: Adoption of Revised Provisional Agenda

1.1 The meeting reviewed the following provisional Agenda presented by the Secretariat and adopted it as the Agenda for the meeting.

Agenda Item 1:	Adoption of Revised Provisional Agenda
Agenda Item 2:	Review of APANPIRG Sub-Group Chairperson's reports
Agenda Item 3:	Review of recent developments, research, trials and demonstrations, associated with the implementation of the new CNS/ATM systems and global/regional plans
Agenda Item 4:	Review and updating of the Asia/Pacific Regional Plan for the new CNS/ATM Systems in the light of new developments
Agenda Item 5:	Identification and review of CNS/ATM implementation priorities for the Asia/Pacific Region
Agenda Item 6:	Identify, monitor and facilitate the transfer of CNS/ATM systems expertise, equipment, trials, data etc. between States and the identification of planning and cost/benefit analysis needs within the Region.
Agenda Item 7:	Review and effect co-ordination of the plans of States, international organizations, airlines and industries for the implementation of the Asia/Pacific Regional Plan for the New CNS/ATM Systems
Agenda Item 8:	Review and co-ordination of amendments to the Regional Air Navigation Plans to ensure adoption of the new CNS/ATM requirements including basic operational requirements and planning criteria
Agenda Item 9:	Intra & Inter Regional Co-ordination
Agenda Item 10:	Shortcomings and Deficiencies in the Air Navigation Field
Agenda Item 11:	Consideration of the Report of the APANPIRG Sub-group Work Programme Review Task Force
Agenda Item 12:	Development and proposal to APANPIRG of an appropriate future work programme
Agenda Item 13:	Any other business
Agenda Item 14:	Date and venue for next meeting

Agenda Item 2: Review of APANPIRG Sub-Group Chairperson's reports

2.1 **Report of the ATS/AIS/SAR/SG/10**

2.1.1 The tenth meeting of the ATS/AIS/SAR Sub-Group was held in Bangkok, Thailand from 26-30 June 2000. The meeting was attended by 58 experts from 22 States, one International Organization and one Aviation Industry Organization.

2.1.2 The Secretariat, on behalf of the Chairperson of the Sub-Group, briefed the meeting regarding CNS/ATM related issues discussed of the 10th meeting of the sub-group.

2.1.3 The Sub-Group meeting noted that the implementation of RVSM in the airspace of the Pacific had taken place on 24 February 2000 and implementation in Asia was tentatively scheduled for February 2002. The Sub-Group revised the Terms of Reference of the ICAO RVSM Implementation Task Force and recommended to APANPIRG that a revised RVSM Guidance Material for the Asia/Pacific Region be adopted.

2.1.4 On reviewing the updated WGS-84 Implementation Survey, the Sub-Group noted that States should clearly indicate in their AIP if the transformation to WGS-84 has been undertaken. Many airlines required this information prior to being able to navigate by GNSS. The non-implementation of the transition to WGS-84 continued to be recorded as a "Shortcoming" to be included in the list of Shortcomings and Deficiencies.

2.1.5 In discussing the issue of the carriage of pressure-altitude reporting transponders and ACAS II the Sub-Group noted the critical importance of aircraft not equipped with a pressure altitude reporting transponder not being permitted to share airspace used by aircraft equipped with airborne collision avoidance systems. The Sub-Group saw an urgent need to bring to the attention of States the need to implement regulations for the mandatory carriage and operation of pressure altitude reporting transponders without any further delay and developed a Draft Conclusion accordingly. Noting the need to encourage the carriage and operation of ACAS II by aircraft operating in the Asia/Pacific Region, the Sub-Group developed an additional Draft Conclusion for this purpose. The Sub-Group was advised that it was the intention of the Secretariat to expand an earlier survey regarding the carriage of pressure-altitude reporting transponders and ACAS II in order to obtain additional and more specific information.

2.1.6 The Sub-Group reviewed the list of ATS routes which had not been implemented in accordance with the ASIA/PAC ANP. The list was updated.

2.1.7 The Sub-Group considered the requirements for inclusion of SIGMET in VOLMET broadcasts. A Draft Proposal to amend the ASIA/PAC Air Navigation Plan (Doc 9673) to add a requirement for inclusion of SIGMET in VOLMET broadcasts for the Asia Region was also discussed.

2.1.8 The Sub-Group considered that taking into account the introduction of RNP, RNAV and RVSM into the Asia/Pacific region, consideration should be given by States and IATA to the development of a revised ATS route structure - Southeast Asia to/from Europe and the Middle East via south of the Himalayas, to gain the benefits of existing aircraft capabilities and the new CNS/ATM enhancements. The Sub-Group formed a Draft Conclusion accordingly.

2.1.9 The Sub-Group, considered that, following the success of the Y2K project, to assist in the development and implementation of future projects, involving States and the international aviation community, ICAO, where considered necessary, be requested to establish a small team to lead and develop the work programme; depending on the project and the area to be covered, hold sub-regional meetings to assist in fostering implementation; create a realistic target date for implementation and set priorities to achieve that date; and, where necessary, build into the work programme the necessary co-ordination with adjacent ICAO regions and States concerned. The Sub-Group developed a Draft Conclusion accordingly.

2.1.10 The Sub-Group reviewed the report of the Sixth Meeting of the AIS Automation Task Force and adopted revised Terms of Reference and Work Programme for the Task Force. The meeting was of the opinion that the work of the AIS Automation Task Force would need to be co-ordinated with the work of the ATN Transition Task Force and requested the Secretariat to ensure that the work of both Task Forces is co-ordinated where appropriate.

2.1.11 The Sub-Group reviewed the list of Shortcomings and Deficiencies in the ATS/AIS/SAR field and updated it for presentation to APANPIRG/11.

2.1.12 The Sub-Group reviewed the Subject/Tasks List provided by APANPIRG/10 and in the context of actions carried out at the meeting, the list was updated for presentation to APANPIRG/11.

2.2 Report of the COM/MET/NAV/SUR SG/4

2.2.1 The COM/MET/NAV/SUR SG/4 was held in Bangkok from 17 to 21 July 2000 and was attended by 86 experts from eighteen States, two International Organizations and two communication service providers. The Chairman of the COM/MET/NAV/SUR provided result of the Fourth Meeting of the Sub-Group by presenting a brief overview of the various agenda items and presenting the conclusions and decision drafted.

2.2.2 The Sub-Group reviewed its title, terms of reference and subject/task list. Included in this review was the consideration of the report of the Work Program Task Force which proposed modification to the establishment of APANPIRG Sub-Groups with consequential changes to the COM/MET/NAV/SUR title, Terms of Reference and Subject/Task List. The Sub-Group accepted the proposals of the Task Force relating to the changes in the Title and Terms of Reference and formulated a draft decision to support these changes for consideration by APANPIRG/11.

2.2.3 The Sub-Group also considered the status of actions on its third meeting and the outstanding conclusions from previous meetings. It was report that the Sub-Group was pleased with the handling of its third report and also the progress achieved with the resolution of outstanding conclusions.

2.2.4 The APANPIRG Key Priorities were reviewed by the Sub-Group and proposals to revise the key Priorities were made. These changes were considered under agenda item 5 of this meeting.

2.2.5 The shortcomings and deficiencies list in the COM/MET/NAV/SUR field were reviewed by the Sub-Group and revised based on information available to the Sub-Group. It was noted by the Sub-Group the progress that had been achieved with the resolution of many items on the list.

2.2.6 The Sub-Group reviewed implementation of aeronautical Fixed Services (AFS). Improvements were noted with many AFTN circuits and stations, and ATS direct speech circuits. The Sub-Group promoted the use of digital circuits for current and future AFS voice/data communications and to facilitate the introduction of ATN. The need for alternative communication arrangements in the case of single VSAT installations was also discussed.

2.2.7 The report of the ATN Task Force was reviewed by the Sub-Group. The Sub-Group endorsed conclusions of the Task Force regarding changes to the Task List, the ASIA/PAC ANP amendment concerning AFTN entry and exit points, amendments to the Chapters 5 and 7 of the Regional Plan for the new CNS/ATM system and the requirement for an ATN Seminar.

2.2.8 The Sub-Group considered Aeronautical Mobile Services issues and VHF Digital Links. Under this agenda item frequency congestion problems with HF services were considered and arrangements made to reduce congestion in the SEA-3 MWARA network. Information was exchanged on HF VOLMET Broadcast, ACARS to ATN transition, VDL research and development and recent application of datalink in the development of a new CNS/ATM route, L888.

2.2.9 GNSS development and implementation was considered by the Sub-Group. Progress and status reports were received on the GNSS SARPs, GLONASS, removal of selective availability from GPS, development of GNSS testing material by an ICAO Study Group and Ground Based Regional Augmentation. The Sub-Group also revised the Strategy for Provision of Precision Approach and Landing Guidance and Strategy for the Implementation of GNSS Navigation Capability in the ASIA/PAC Region. Both strategies have been revised and will be forwarded to APANPIRG/11 for consideration. The Sub-Group also drafted a conclusion that a GNSS Implementation Workshop be conducted.

2.2.10 The status of implementation of the International Satellite Communications System (ISCS/2) and the Satellite Distribution System (SADIS) were considered. A conclusion was drafted which updates the SADIS assessment tables. Concerns about the access to global WAFS products prompted the drafting of a conclusion to provide access through the Internet.

2.2.11 Various changes to charts within the WAFS were considered by the Sub-Group and appropriate conclusions drafted to assist in the final phase of WAFS transition.

2.2.12 Information was received and exchanged within the Sub-Group on OPMET information.

2.2.13 The Sub-Group reviewed the international airways volcano watch. Items considered were the outcomes of the VAWSG/3 meeting and the ASIA/PAC Volcanic Ash and Aircraft Operations Regional Handbook. Changes were introduced to reporting areas and deficiencies were noted in the implementation of the IAVW. This resulted in the drafting of a conclusion for the establishment of a SIGMET Special Implementation Project (SIP).

2.2.14 The Sub-Group considered the CNS and MET part of the ASIA/PAC FASID and provided amendments to the FASID as appropriate.

2.2.15 The WRC2000 had been complete prior to the Sub-Group meeting and the outcomes of the WRC2000 were considered based on reviews presented by ICAO and State information papers. Aviation interests has been successfully pursued at the WRC2000 however it was noted the need to commence action of development of the aviation position for the next conference, WRC2003. The Sub-Group drafted a conclusion that sought to initiate this next round of activity.

2.2.16 The meeting, in noting the draft conclusion formulated by the COM/MET/NAV/SUR SG/4, considered that the COM/MET/NAV/SUR Sub-Group’s conclusion should be extended to add a new item d) and drafted the following revised conclusion for consideration by APANPIRG/11.

Draft Conclusion 7/1 - Protection of aeronautical frequency spectrum

That States,

a) assign high priority to the aeronautical spectrum management;

b) participate in the development of States' position for WRCs at the national level to ensure support to ICAO position;

c) ensure to the extent possible aviation representatives are included in States delegation to the APT Conference Preparatory Group meetings and at WRCs;

d) designate a focal point contact person responsible for the preparation of WRC2003 issues and provide notification of appointment to the ICAO Regional Office.

2.2.17 The Sub-Group concluded its meeting by considering information on development and changes within the ASIA/PAC region, which influenced COM/MET/NAV/SUR fields. This included the development of a working group on the preparation of the Meteorology chapter of the ASIA/PAC Regional Plan for the New CNS/ATM System.

2.2.18 The Sub-Group suggested that it next meet during the period 16 to 20 July 2001 in Bangkok.

Agenda Item 3: Review of recent developments, research, trials and demonstrations, associated with the implementation of the new CNS/ATM systems and global/regional plans

3.1 **Actions Taken on Conclusions and Decisions of CNS/ATM/IC/SG/6**

3.1.1 The meeting reviewed the Decisions and Conclusions of APANPIRG/10 with respect to CNS/ATM matters. The meeting noted the actions which had been taken and also determined the current status of CNS/ATM related conclusions and decisions developed by the APANPIRG/10 meeting.

3.1.2 Action in regard to these matters has been described in other agenda items of this Report with the exception of APANPIRG Conclusion 10/29 relating to CNS/ATM Training and Human Resource Development Strategy. The meeting was advised that the Council of ICAO noted the Conclusion and requested the Secretary General to take action thereon in the context of ANC Task No. PEL-9601 (Human Resource Planning & Training Needs Study Group). The meeting recalled that no further action could be taken at a regional level until the outputs from the Study Group were available. The Study Group was next scheduled to meet during the year 2000.

3.2 **Guidance Material on CNS/ATM Operations in the Asia/Pacific Region**

3.2.1 The meeting was advised that the most recent meeting of the Informal South Pacific ATS Co-ordination Group (ISPACG), (Brisbane 6-10 December 1999), discussed the growing need within the Asia Pacific Region, due to the increasing number of participating ATS units and operators, for common CNS/ATM operational ATS and pilot documentation. ISPACG noted that the ICAO CNS/ATM/GM was available as common guidance material but that it did not contain operational ATS and pilot procedures such as are detailed in the South Pacific Operations Manual (SPOM).

3.2.2 In the interests of standardization, it was suggested by ISPACG that the SPOM and the ICAO CNS/ATM/GM should be jointly reviewed with the objectives of:

a) re-aligning and updating the ICAO CNS/ATM/GM to provide core guidance material and a framework for State CNS/ATM Operations Manuals; and

b) re-issuing the SPOM as a joint South Pacific CNS/ATM Operations Manual.

3.2.3 Under this scenario, the ICAO CNS/ATM/GM would provide a base publication from which States could publish operational ATS and pilot procedure supplements in accordance with their particular major geographic traffic flows. The reissued SPOM could also serve as a model State CNS/ATM Operations Manual for other groups of implementing States. Accordingly, ISPACG requested ICAO to facilitate a small group of experts to achieve this task.

3.2.4 A meeting of a small group of experts took place 5-6 March in Melbourne following which work was undertaken by correspondence. The ATS/AIS/SAR/SG/10 meeting noted the fact that the CNS/ATM/GM was currently the subject of a major review but was not finalized at the time of the meeting. In recognition of the fact that timely publication of the revised CNS/ATM/GM is required, the ATS/AIS/SAR/SG/10 meeting requested the CNS/ATM/IC Sub-Group to review the revised draft.

3.2.5 The meeting reviewed the revised CNS/ATM/GM and advised the Secretariat that it could benefit from some additional enhancements, namely:

i) The strengthening of the Foreword to indicate that the intent of the publication was Guidance Material only and reference should be made to other ICAO publications such as Annexes/PANS etc before any operational implementation is undertaken;

ii) The inclusion of a description of the process for amendment of the Guidance Material;

iii) The inclusion of a section relating to ATC training, similar to the section concerning pilot training;

iv) A clarification in the section on ADS Procedures regarding the current limits of ADS use, i.e. for the application of procedural separation only;

v) A clarification in the section on Air/Ground Voice Communications amplifying the requirement to maintain voice communications equipment;

vi) An updating of the performance characteristics of GPS due to the removal of selective availability, and;

vii) The removal or full expansion of the List of Acronyms.

3.2.6 Subject to the above enhancements being completed the meeting agreed that the following Draft Conclusion should be presented to APANPIRG/11:

Draft Conclusion 7/2 – Guidance Material on CNS/ATM Operations in the Asia/Pacific Region

That, the revised Guidance Material on CNS/ATM Operations in the Asia/Pacific Region, contained at Appendix A to the Report on Agenda Item 3, be adopted and circulated to States and appropriate International Organizations.

3.3 Subject/Task Lists from ATS/AIS/SAR/SG/10 and COM/MET/NAV/SUR/SG/4 Meetings

3.3.1 The meeting reviewed and noted the updated Subject/Task List from the ATS/AIS/SAR/SG/10 and COM/MET/NAV/SUR/SG/4 meetings.

3.4 Traffic Forecasts for Major Traffic Flows

3.4.1 The meeting was advised that APANPIRG/10 had requested that the Asia Pacific Area Traffic Forecasting Group (APA TFG) schedule a special meeting in the year 2000 to develop traffic forecasts for the nine major traffic flows of the Asia Pacific Region.

3.4.2 The APA TFG developed an aggregate forecast for each of the major traffic flows using established historical trends and forecasts published in the latest APA TFG Report (Doc 9747), as well as other ICAO forecast publications where available. When such forecasts were not available the APA TFG developed an independent assessment using other available information.

3.4.3 The meeting was provided with draft summary aircraft movement forecasts that are expected to be included in the final report. It was noted that the average annual aircraft movement growth rates for the period 1999-2010 vary from a low of 3.6% for the South East Asia – North East Asia traffic flow (mature market) to a high of 6.6% for the Asia/Australia – Africa traffic flow which is a developing route with low traffic volume.

3.4.4 The meeting noted with appreciation the work of the APA TFG.

3.5 **Japan MTSAT Functions and Current Status**

3.5.1 Japan advised the meeting that in 1994 the Council for Civil Aviation, a consultancy body for the Minister of Transport recommended that sufficient system redundancy was required in order to ensure the air navigation systems became safer and more reliable. It was also recommended that, in addition to the existing satellites, a new satellite system to support the ICAO CNS/ATM Systems for the Asia/Pacific Region would be required. Japan advised that the Asia/Pacific Region is only covered by a single satellite, either Inmarsat satellites over the Pacific Ocean or over the Indian Ocean. To that end, Japan Civil Aviation Bureau (JCAB) decided to launch a new satellite which is designed to be widely utilized for aircraft operators and ATS providers in the Region. The satellite, known as Multi-functional Transport Satellite (MTSAT) is capable of providing services throughout the Asia/Pacific Region.

3.5.2 Japan advised that the MTSAT has two missions, one is meteorological and other is aeronautical. The MTSAT system will not only be capable of handling oceanic ATS communications within the Japanese FIRs, but will also be offered to the civil aviation community in the Asia/Pacific Region as an aviation infrastructure. The MTSAT system will provide DCPC in voice (SAT voice) and data (CPDLC), GPS augmentation information, and ADS capability. The MTSAT system, including both the satellite elements and ground systems, will be maintained in a dual configuration by JCAB. MTSAT Satellite-based Augmentation System (MSAS) will provide three types of GPS augmentation information, namely an integrity function, a ranging function and a differential correction function, similar to the United States WAAS and European EGNOS.

3.5.3 Japan informed the meeting that since the MTSAT Monitoring and Ranging Stations had been implemented in Australia and Hawaii, the Asia/Pacific States could implement MSAS with a lower number of Ground Monitor Stations (GMS) than by implementing SBAS with the WAAS and EGNOS. GMS would be required for implementation of GNSS. Japan further advised that, for the Asia/Pacific States, MSAS would be more cost effective than implementing SBAS by Inmarsat systems. Japan also stated that since the MSAS has been designed to be interoperable with the WAAS and EGNOS at the signal-in-space level, users will not require additional on-board avionics for navigation. In its initial stage, MSAS could provide non-precision approach capabilities, and subsequently, when two MTSATs become operational, it is expected that precision approach capabilities would be available.

3.5.4 The new MTSAT-1 and MTSAT-2 will be launched in early 2003 and in the summer of 2004 respectively. In order to maintain a dual operation, additional MTSATs will be launched at regular interval to replace existing MTSATs. The MTSAT Aeronautical Mobile Satellite Services (AMSS) functions will become operational within Japanese fiscal year (FY) 2003. The MSAS will commence its initial operation in Japanese FY 2004.

3.5.5 Japan advise the meeting that it will offer the use of the MTSAT to Asia/Pacific States on a non-profit basis, and does not intent to seek economic profit from MTSAT services.

3.6 Plan for Decommission of Navigation Aids in Japan

3.6.1 Japan advised the meeting of its plans for decommissioning NDBs associated with the implementation of MSAS. Japan has decided to decommission NDBs commencing after 2001 and to be concluded by 2015. This will be achieved in phases according to the life cycle of the NDBs. After 2015 decommission of VOR/DMEs will gradually commence.

3.7 ADS/CPDLC at Magadan ACC

3.7.1 The Russian Federation advised the meeting that during the period from 22 April to 31 June 1999 sixteen flights were made on international ATS A218 in the Russian Far East within the framework of the first phase of the experimental operation of an air traffic controller workstation with ADS/CPDLC functions installed at the Magadan ACC.

3.7.2 During the period under review, the Magadan ADS/CPDLC workstation software worked steadily and no malfunctions were recorded. At the same time there were several failures of the leased Magadan-Anchorage data link circuit. The instability of the circuit operation was caused by technical reasons such as low elevation angle of “Statsionar-16” satellite for the ground earth station in Anchorage which resulted in mitigation of the signal in the troposphere. For this reason a number of flights using CNS/ATM technology originally planned for A218 route were cancelled.

3.7.3 The analysis of the flights using CNS/ATM technology showed that no ADS contract losses were recorded. Message time delivery analysis is due after the second phase of the experimental operation.

3.7.4 At present the Magadan-Anchorage data circuit is implemented. A VSAT station is installed in Magadan and a Magadan-Seattle circuit using Intelsat satellite is operational. It is linked to Annapolis through a telecommunication provider. By the end of the year all trials will be completed and the workstation will be put into regular operation. It will be used to provide CNS/ATM ATS on cross-polar routes, bridging North America and South-East Asia.

3.8 Russian Federation Application of Non-precision Approaches using GNSS

3.8.1 The Russian Federation advised the meeting that since 1998 it had carried out experimental non-precision approach (NPA) operations using GNSS. The operations were conducted in Samara at Kurumoch international airport with the participation of Lufthansa and Samara Airlines.

3.8.2 Over 30 approaches have been made by Lufthansa A-310 and A-320 aircraft with FMS on board, which proved the validity of the developed schemes, approach accuracy for the airport minimum requirements and the developed procedures for controller and crew interaction.

3.8.3 After the GNSS approaches for Kurumoch are made public in the AIP the Russian Federation is planning to start experimental operation of TU-154M aircraft with an Allied Signal KLN-90B receiver on board as well as implementation of NPAs with vertical guidance (NPV-1 and NPV-2). After trials and certification of ICAO SARPs compliant GBAS are completed experimental CAT-I approaches using GNSS will be started. GNSS-based approaches will be used at alternative and emergency aerodromes along cross-polar routes.

3.9 ADS –B Implementation in Russia

3.9.1 The Russian Russian Federation advised the meeting that ADS-B is considered to be one of the main surveillance methods for the ATM system of Russia. A project to operate ADS-B experimentally by “Tyumenaerocontrol” regional state enterprise for ATC and airspace use has been prepared and is to be implemented in the following two years aimed at establishing surveillance and ATC in the ACC, aerodrome control and local control centres. The purpose of the projects is to assess advantages which ADS-B gives to ATM system, airlines and respectively equipped aircraft.

3.9.2 As part of the project it is planned to assess the ATC technology and the operational procedures for aircraft crews using ADS-B as an additional means of air traffic control as well as to finalise the equipment certification procedures. An important part of the project is assessing the application of ADS-B for the purpose of supporting helicopters operations in areas with no ATC radar coverage. According to FAAR plans, system installation is to begin in late 2000 – early 2001 followed by operation tests.

3.9.3 It is intended that implementation of the following similar systems is to begin in other regions of Russia starting from 2001: Automated surface movement guidance and control system at Moscow Domodedovo Airport (A-SMGCS) and ADS-B surveillance system for air traffic control in Moscow airspace below the lower flight level.

3.10 ATC Upgrade Project in Afghanistan

3.10.1 IATA provided the meeting with information relating to an ATC upgrade project, which is currently taking place in Afghanistan. IATA has been assisting Afghanistan with the project which will establish a platform for provision of air traffic management utilising a satellite based communications network and VSAT technology within the Kabul FIR and additionally provide transition capability to a CNS/ATN environment including the establishment of a regional ATN capability. The project will also provide complete VHF coverage over the Kabul FIR.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ASIA AND PACIFIC OFFICE

GUIDANCE MATERIAL ON CNS/ATM OPERATIONS IN THE ASIA/PACIFIC REGION

16 May 2000

Issued by the ICAO Asia/Pacific Regional Office, Bangkok

RECORD OF AMENDMENT

No.	Date	Entered by

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FOREWORD

The Guidance Material on CNS/ATM Operations in the Asia/Pacific Region was developed as the result of a decision by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG), which recognized the need for such a document to ensure standardization of CNS/ATM operational procedures throughout the Region. The information contained in this guidance material is not intended to be regulatory or mandatory in nature. Reference should be made to other relevant ICAO documentation (e.g., Annexes and PANS etc) prior to any operational implementation.

The 1st edition of the guidance material was issued in July 1997. This 2nd edition was developed over the period from March to September 2000. Whenever any user identifies a need for change to this guidance material, a Request For Change (RFC) form should be completed and submitted to the ICAO Asia/Pacific Regional Office. APANPIRG will consider RFCs on an annual basis and if adopted will be incorporated and published as an amendment to the guidance material.

The target audience for the guidance material comprises the operational planners within the ATS providers and airlines who are responsible for the introduction of CNS/ATM and the development of procedures for its use. It is also intended that it be used as a reference document for the development of training material and operations manuals for use by air traffic contro1lers and pilots. The technical descriptions of the systems are presented at a level appropriate for these groups. For more detailed technical information on the systems, refer to the publications referenced in the appropriate sections.

Operations manuals for both pilots and air traffic controllers should incorporate the regionally agreed log-on, ADS and CPDLC procedures that are described in this guidance material. In the interest of standardization, the incorporation of the recommended layout of these procedures in the manuals is also recommended.

This guidance material is based on the operational experience gained through the use of CNS/ATM systems in the Asia/Pacific Region. The terminology used is based on the FANS-1/A system in use in the Region at the date of publication. Future editions will include information on other systems, e.g., ATN based systems and ADS-B, once there are definite plans for the introduction of such systems into the Region.

It is intended that States will use this guidance material in the implementation of CNS/ATM systems. Specifically, this will include development of operational documentation, which will ensure ground-to-air and ground-to-ground standardized operational procedures. Accordingly this guidance material is written in two distinct styles; Parts 1 & II provide background material and are written in the style of reference material; Part III provides examples of operational procedures and is written in the style of an operations manual.

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GUIDANCE MATERIAL ON CNS/ATM OPERATIONS IN THE ASIA/PACIFIC REGION

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CHAPTER 1

CHAPTER 1

1. OVERVIEW OF CNS/ATM

1.1 EVOLUTION OF CNS/ATM

1.1.1 In the early 1980's, it became evident to the ICAO Council that the present communications, navigation and surveillance (CNS) and air traffic management (ATM) systems would not be adequate for operations into the 21st century. As a consequence, the Council established the Special Committee on Future Air Navigation Systems (FANS) in 1983, to study, identify and assess new technologies, including satellite technology, and to make recommendations for the future development of navigation systems for civil aviation.

1.1.2 After the completion of the work of the original FANS committee, the FANS Phase II committee (FANS-II) was established in 1989, to ensure that the implementation of CNS/ATM was undertaken on a global basis, and in a cost-effective manner.

1.1.3 The proposal developed by the FANS committee came to be known as the CNS/ATM concept and was endorsed by the Tenth Air Navigation Conference in 1991.

1.1.4 The FANS-II committee was tasked to produce a Global Coordinated Plan for the implementation of CNS/ATM. The plan was presented at the fourth meeting of the committee (FANS-II/4) held in September 1993, and was later approved by the Council. The Global Coordinated Plan was updated in 1998 to become the Global Air Navigation Plan for CNS/ATM Systems.

1.1.5 In the Asia/Pacific Region, CNS/ATM operations commenced in the South Pacific in 1995 with the first use of CPDLC and SATCOM to improve communications over the Pacific Ocean. Subsequent developments in the Region have resulted in almost total coverage of the Pacific Ocean with CPDLC services to suitably equipped aircraft. The regional operational procedures needed to operate the CPDLC service have been agreed between operators and ATS providers, documented in the "South Pacific Operations Manual" and jointly issued by the member States of ISPACG. RNP-10 was implemented in the region in 1997 to support the introduction of RNAV routes and reduced lateral separation between oceanic routes. ADS services became available to ATS providers in the South Pacific early in 2000. Procedures for the use of ADS by air traffic control were also agreed and published by the ISPACG member States in the South Pacific Operations Manual.

1.1.6 This issue of the Asia/Pacific CNS/ATM Guidance Material is a part of the continuation of the regional development and implementation of ATM, based on state-of-the-art data link and satellite communications, navigation and surveillance systems, taking into account validated operational experience with CPDLC, RNP, RNAV and ADS.

1.2 CNS/ATM GLOBAL SYSTEM CONCEPT

1.2.1 The CNS/ATM system is based on global navigation systems, global communications systems, and automatic dependent surveillance. These systems can be, in part, dependent on facilities of other States and facilities provided by communications service providers, which are not under the auspices of any particular State.

1.2.2 The FANS-1/A end-to-end system may be considered as an eight-link chain, where six of the links are between the pilot and the controller. Each link of the chain represents a specific element of the system. The determination of the requirements for each of these elements needs to address not only the requirements for each individual element, but also the interaction of that element with other links of the chain, in order to ensure end-to-end interoperability.

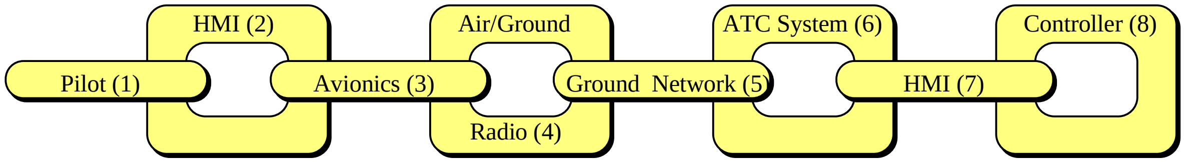

Figure 1-1: FANS-1/A End-to-End System

1.3 COMMUNICATIONS

One of the key features of the new CNS-based air traffic management system is the availability of two-way data communications between aircraft and the ATC system, between the ATC system and the airline operational control system, and between ATC systems.

1.3.1 Air-Ground Communications

1.3.1.1 The available means of communication between ground and aircraft are VHF voice, HF voice, controller pilot data link communications (CPDLC) and satellite voice. In areas where new and improved routes and/or airspace are established beyond the range of normal VHF voice communications, CPDLC is the primary means of communication, with complementary HF voice and satellite voice.

1.3.1.2 CPDLC is a means of communications between controller and pilot using data link for ATC communications. It is the introduction of data link communications, and the ability to maintain such communications with aircraft in oceanic and remote areas, which represents the most significant change in the communications environment.

1.3.2 Ground-Ground Communications

1.3.2.1 Communications between and within ATS units may be by AFTN, voice, or ATS inter-facility data communications (AIDC).

1.3.2.2 AIDC provides a means by which data may be exchanged during the notification, coordination and transfer of control phases of operations. The use of AIDC significantly reduces the need for voice coordination.

1.3.2.3 The AIDC message sets and procedures are designed for use over any ground-to-ground circuit, including the AFTN and the aeronautical telecommunications network (ATN).

1.3.3 Data Communications Networks

1.3.3.1 The Global Air Navigation Plan for CNS/ATM Systems envisages that at some stage the ATN will be the communications network to be used for all ground-to-air and ground-to-ground data communications.

1.3.3.2 Because at the time of first agreements between airlines and air traffic service providers to use data link in ATC, the standards for the ATN were undefined and ATN-based equipment unavailable, the initial implementation of CNS/ATM used the existing Aircraft Communications Addressing and Reporting System (ACARS) networks. These networks are designed for the transmission of character-based messages to and from the aircraft. The ATN, by comparison, is designed for the transmission of binary messages. Both the CPDLC and ADS applications are defined using a binary (bit-oriented) message set. The binary messages produced by these applications cannot be transmitted over the ACARS network without being packaged as character messages. This packaging is achieved in the FANS-1/A aircraft and compatible ground systems in accordance with the AEEC 622 specification.

1.3.3.3 The Air Navigation Commission discussed use of AEEC-622 based CNS/ATM systems during its consideration of the report of the first meeting of the ICAO ATN Panel and endorsed the use of AEEC-622 based systems. While recognizing that such systems would not provide all the benefits of the ATN, they were seen to be a valuable interim step towards facilitating the early introduction of data link applications to air traffic management.

1.3.3.4 Boeing and Airbus Industries have developed systems based on the AEEC 622 protocol, which differ slightly in architecture, but provide the same applications. These systems are referred to in this guidance material collectively as FANS-1/A.

1.4 NAVIGATION

1.4.1 The level of aircraft navigation capability required for particular operations is expressed by required navigation performance (RNP) criteria. Under this concept, aircraft are certified or approved as meeting a certain RNP type. There is no requirement for the carriage of specified navigation equipment; nor is the navigation equipment used to achieve the performance criteria necessarily the same for all aircraft.

1.4.2 For air traffic management purposes the air traffic authorities will designate certain routes or airspace as specific RNP routes or airspace. This indicates to the users that State approval is required for the operator to flight plan and fly within the designated route or airspace.

1.4.3 The major technological changes in navigation are the adoption of global navigation satellite systems (GNSS), area navigation (RNAV) computers and databases. These systems provide for worldwide navigation coverage, and are increasingly being used for non-precision and precision approaches, in addition to en-route navigation.

1.5 SURVEILLANCE

1.5.1 In the CNS/ATM systems environment, surveillance is also provided by automatic dependent surveillance (ADS). ADS allows an aircraft to send flight identification, position, predicted route and weather data addressed to a specific ATS unit at specified intervals, or on the occurrence of a specific event at the request of the ATS unit. ADS is not intended to replace radar but rather to be used in those areas where procedural separation is applied. It replaces voice position reporting in those areas.

1.6 AIR TRAFFIC MANAGEMENT

1.6.1 The term air traffic management (ATM) covers all the functions of airspace management (including both strategic and tactical airspace management), air traffic management services and air traffic flow management. The procedures which are being developed for the use of the new CNS components in the ATM systems will see the ground resources more concentrated on the management of active air traffic and less on voice communications to collect information on air traffic dispositions. ATC decision-making should be enhanced by the availability of the outputs from automated processing of digitized data affecting air traffic management tasks. Human factors and air traffic control loop errors (air and ground) should reduce with the introduction of enhancements such as CPDLC and ADS.

1.6.2 In the development of automated ATM systems, it is important that the human decision making processes are properly engineered into new systems. Guidance on the human centered automation principles involved in this process is contained in the *Human Factors Digest No 11, Human Factors in CNS/ATM Systems (ICAO Circular 249-AN/149)*.

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CHAPTER 2

CHAPTER 2

2. SYSTEM DESCRIPTION

2.1 CNS/ATM IMPLEMENTATION IN THE ASIA/PACIFIC REGION

2.1.1 The implementation of CNS/ATM systems in the Asia/Pacific regions is based on AEEC 622 protocols and utilizes existing air/ground data processing services. FANS-1/A (AEEC 622) Data Link Services are supported by global aeronautical data communications networks. These existing data networks provide connectivity to both VHF and Satellite media. Different ground network domains are internetworked to provide ATS systems with access to all equipped aircraft within their area of responsibility.

2.1.2 Aircraft utilise the Aircraft Communications Addressing and Reporting System, (ACARS) to communicate via either VHF or Satellite. The on-board Management Unit (MU) provides the management functions to allow data to be routed between different on-board components, including both the Satellite and VHF transceivers.

2.1.3 Air-Ground Data Link communications is developed from the following components:

a) Data Link application software, resident on both the FANS-1/A equipped aircraft and FANS-1/A ATM host systems implemented by ATS Providers supporting FANS data link services.

b) Data communications networks providing connectivity to the terrestrial elements as follows:

   i) VHF sub network, consisting of Remote Ground Stations (RGS) providing air-ground access to equipped aircraft via VHF when they are in range.

   ii) Satellite Ground Earth Stations (GES), providing access to equipped aircraft when outside of VHF coverage. Inmarsat Satellite coverage is global between 82 degrees North and 82 degrees South.

   iii) Air-Ground Processors, providing message conversion between ACARS and ground formats, message routing based on message type and aircraft tracking functionality. These processors are also interconnected to provide access to other air-ground processors, thus providing internetworking capability.

2.2 ATS DATA LINK COMMUNICATIONS NETWORKS

2.2.1 Data Link Communications Service Providers

2.2.1.1 Today's data link services for ATC are provided by the following:

Inmarsat	Space segment, accessed by multiple GES operators globally.
SITA AIRCOM	Dual, geographically diverse Air-Ground processing, situated in Asia and North America connected by a global data communications network. Connection to two GESs globally providing full duplication with KDD's GES. Supports over 500 VHF RGS in over 160 countries. Interconnection to ARINC exists for internetworking of ATS Data Link applications.
ARINC ADNS	Air ground processing connected to five GESs providing global coverage. Supports 650 VHF RGSs within the United States for contiguous US data link coverage. Interconnection to SITA exists for internetworking of en-route ATS data link applications.
AVICOM (Japan)	VHF Air-ground processing (AOC/ATS). Provides access to 48 RGS within Japan.

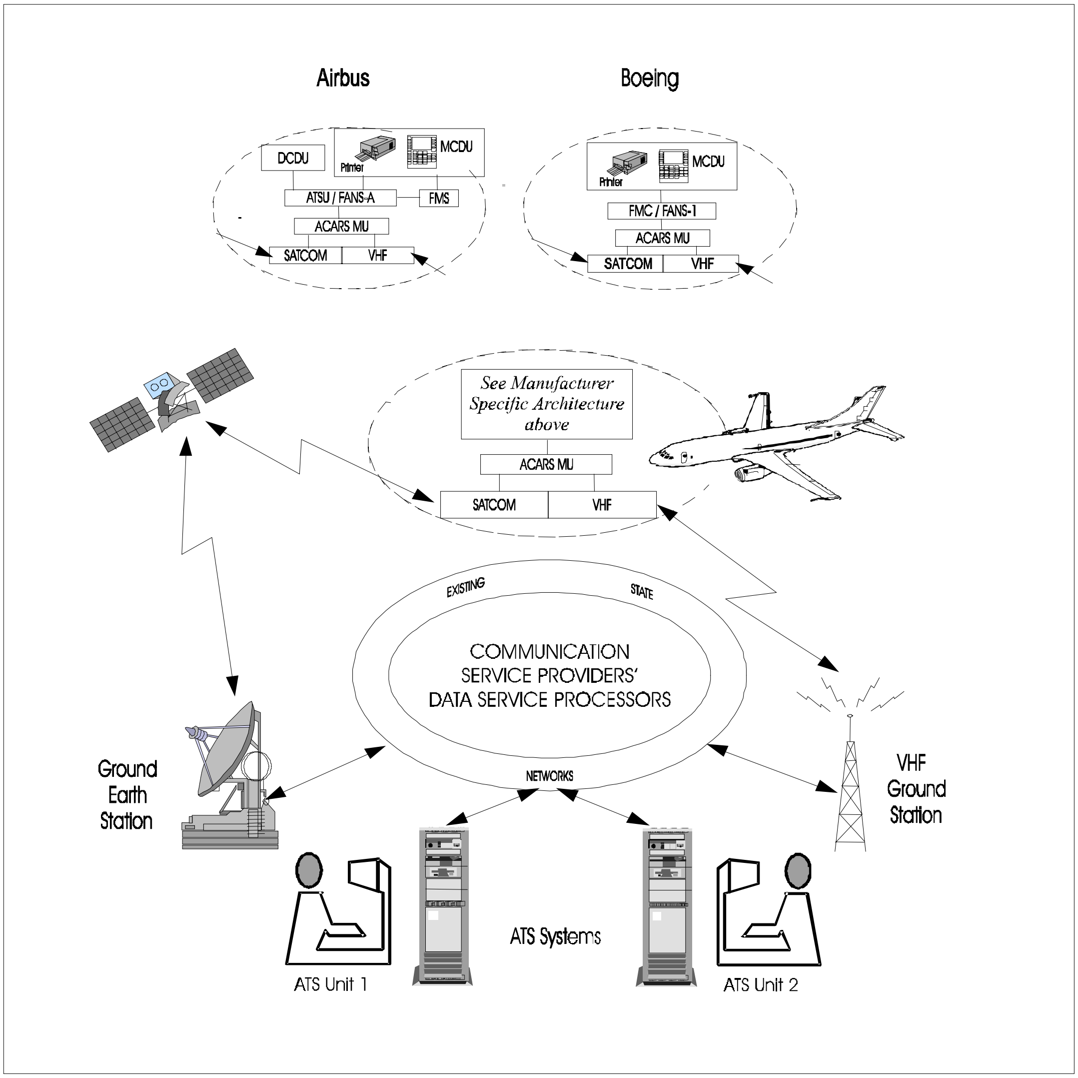


Figure 2-1: Data Link Architecture for FANS-1/A Applications

2.2.2 Communications Network Internetworking

2.2.2.1 Internetworking between the Data Link Service Providers (DSP) Processors is essential to ensure that each ATS Provider has access to all FANS-1/A equipped aircraft within its Flight Information Region (FIR).

2.2.2.2 Different airlines may be contracted to different DSP for the Satellite media. Through internetworking, aircraft may communicate via a GES from which there is no direct connection to the DSP of a particular ATS Provider.

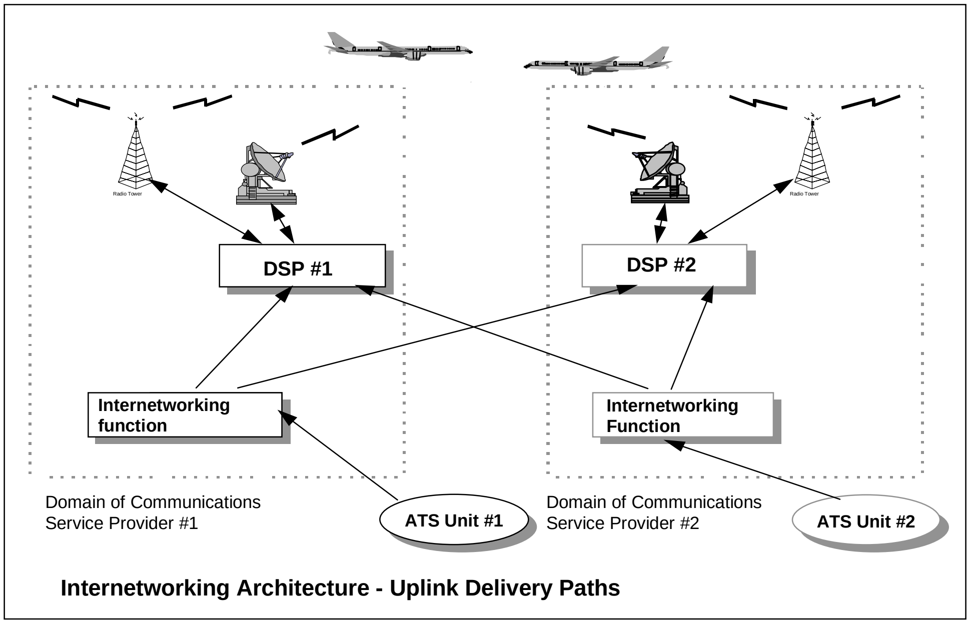


Figure 2-2: Data Link Service Provider Internetworking

2.2.2.3 Each Data Link Service Provider offering FANS-1/A data link services must support the internetworking function. This function provides the logic that determines the uplink message routing, ensuring that messages can reach a FANS-1/A aircraft within a given time, irrespective of media or GES used.

2.2.2.4 The uplink routing philosophy requires that the internetworking function have information regarding aircraft connectivity at any given time. This is obtained through use of the Media Advisory (MA) message. These messages are transmitted by aircraft upon a change in media and/or DSP.

2.2.2.5 Generally, the first attempt to deliver a message is made using information derived from the most recently received MA message. This will indicate whether VHF is in use and if so, through which service provider.

2.2.2.6 In the absence of MA messages, or if the first attempt to deliver a message has failed, then the internetworking function will forward the message to the DSP of the aircraft's contracted Satellite DSP.

2.3 COMMUNICATIONS

2.3.1 The CNS/ATM system provides for the use of any of the following communications, or a combination thereof:

a) Voice Air-Ground Communications:

i) VHF;

ii) UHF;

iii) Direct HF;

iv) Indirect HF; and

v) SATVOICE

b) Data Link Air-Ground Communications:

i) Controller Pilot Data Link Communications (CPDLC) application via ACARS AEEC 622 data link utilising Satellite, VHF and HF (under development) subnetworks;

ii) AOC via ACARS AEEC 622 data link; and

iii) AOC via ACARS.

c) ATS Ground-Ground Communications:

i) Voice communications;

ii) ATS Interfacility Data Communications (AIDC); and

iii) AFTN.

d) DSP Internetworking.

2.3.2 SATVOICE

2.3.2.1 SATVOICE is a satellite telephone system that is available on suitably equipped aircraft through the Inmarsat Geostationary Satellite Network.

2.3.2.2 Operators with the SATVOICE capability have to establish contracts with the DSPs to utilise their Ground Earth Stations (GES) to establish a connection through to an ATS Provider. The aircraft is required to logon to a GES for the region. In some areas, more than one satellite or GES is available. This makes an air-to-ground calling much easier to establish than a ground-to-air initiated call. For security reasons, calls originating from the ground must have a PIN number to determine call priority and access to the aircraft. These discrete numbers are available from the DSPs.

2.3.2.3 The use by ATS Providers of automated dialling systems is highly recommended to protect access data confidentiality. Such systems would also contribute to limit any error in dialling sequence that could result in a call being unsuccessful or inadvertently established with the wrong aircraft.

2.3.2.4 SATVOICE is only intended to be used for non-routine cases when other communication means are either not available or are inappropriate for the situation.

2.3.3 Controller Pilot Data Link Communications (CPDLC)

2.3.3.1 CPDLC provides both controller and pilot with efficient data link communication services. CPDLC messages can be formed by the use of up to five message elements for controller pilot instructions, requests, confirmations, and emergencies, etc. CPDLC messages are visually displayed to the controller at the ATC FANS Workstation and the pilot in the cockpit and are printable on paper.

2.3.3.2 CPDLC remedies a number of shortcomings over previous systems. These include:

a) providing an autoload capability that will allow ground systems and aircraft Flight Management Computers (FMC) to load critical data, such as route of flight, which alleviates the possibility of errors that can occur due to manual data input;

b) significant reduction of transmission time;

c) alleviation of frequency congestion; and

d) elimination of misunderstandings that are due to poor voice transmission quality, propagation problems, accents, and the lack of instant access to a record of previously issued voice transmissions.

2.3.3.3 Some new factors to be considered when using data link include:

a) the need to set aside time to select and compose messages, and to read received messages;

b) the 'party-line' effect of voice communications is not available when using data link; and

c) the silent datalink environment removes the opportunity for 'audio inflections' that alert controllers and pilots of errors.

2.3.3.4 **Element Numbers**

2.3.3.4.1 Each pre-formatted message element is assigned a unique identification number. For example, the element CLIMB TO AND MAINTAIN [level] is always uplink element number 20.

2.3.3.4.2 Depending on the urgency attribute, an uplink free text element is either number 169 (normal urgency) or 170 (distress urgency), without regard to the content.

2.3.3.4.3 An uplink message consisting of five different free text elements with normal urgency attributes will be constructed of five message elements assigned number 169, whereas a message consisting of five pre-formatted elements will be made up of five elements each assigned their own unique identification number.

2.3.3.4.4 Neither the controller nor the flight crew will see these numbers as part of the message.

2.3.3.4.5 The numbers displayed in the left column in the following table are the numbers specifically assigned to each element. Message categories can be defined with the most used elements at the top of the list, so the element numbers in each category do not follow a sequence as is shown in the table.

UPLINK - VERTICAL CLEARANCES

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
6	EXPECT [altitude]	Notification that a level change instruction should be expected.	R
7	EXPECT CLIMB AT [time]	Notification that an instruction should be expected for the aircraft to commence climb at the specified time.	R
8	EXPECT CLIMB AT [position]	Notification that an instruction should be expected for the aircraft to commence climb at the specified position.	R
9	EXPECT DESCENT AT [time]	Notification that an instruction should be expected for the aircraft to commence descent at the specified time.	R

2.3.3.5 **Message Attributes**

2.3.3.5.1 Each message element is assigned a number of attributes within the code. The attributes include urgency, alert and response requirements. The Response Attribute determines the type of response required to close each message dialogue

2.3.3.5.2 For downlink messages the choices are basic:

a) The Y attribute requires a response from the controller; and

b) The N attribute does not require a response.

2.3.3.5.3 The urgency attributes are assigned to each message element and are either Normal or Distress urgency. A Distress urgency attribute, such as assigned to one of the two uplink free text elements [freetext_urgent], means that this message will be delivered ahead of other messages with a normal urgency attribute.

2.3.3.5.4 Alert attributes are assigned to some messages, such as the MAYDAY downlink, and these messages will trigger aural and visual alerts when received by the ground system.

2.3.3.5.5 The controller and flight crews do not see these attributes. System processing of the various message attributes means that the human in the chain is presented with a message in a recognisable form.

2.3.3.6 **Summary**

2.3.3.6.1 Individual element numbers are assigned to each uplink and downlink message element. In the FANS-1/A system each uplink message element is assigned an individual number between zero and 182 inclusive, and downlink elements are assigned numbers between zero and 80 inclusive. Message elements always retain the same element number.

2.3.3.6.2 It is possible for one message to be constructed from a total of five different message elements and, therefore, five individual element numbers.

2.3.3.6.3 A clearance delivered by CPDLC requires no specific read back by the crew, only a WILCO or UNABLE response.

2.3.3.7 **Message Identification Numbers (MIN)**

2.3.3.7.1 Each full message, whether consisting of one element or five, is assigned a Message Identification Number (MIN) by the originating system. The MIN is a number between zero and 63 and its purpose is to allow a CPDLC dialogue to be tracked so that uplink and downlink messages belonging to the same dialogue are correctly paired and closed off. The MIN assigned to a downlink message by the avionics is assigned from the next available number in the avionics' sequence. The uplink MIN assigned by the ground system comes from the ground systems sequence. The two MIN sequences are totally unrelated and any match in sequence numbering is purely coincidental.

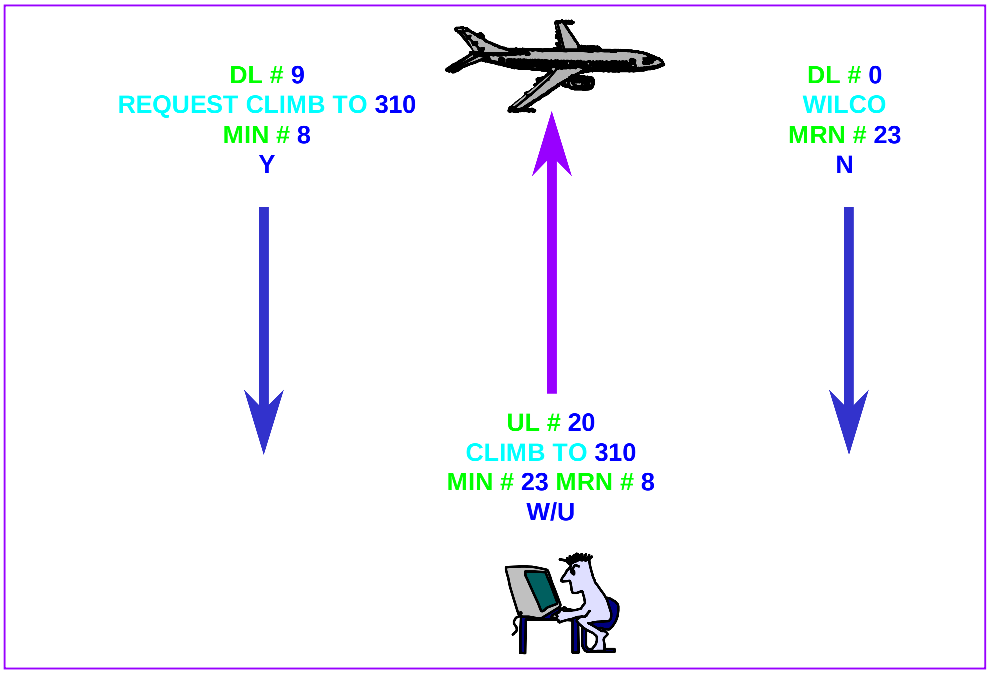
2.3.3.8 **Message Reference Number (MRN)**

2.3.3.8.1 For any system receiving a message with an attribute requiring a response, the MIN of that message becomes the Message Reference Number (MRN) for the purposes of the response and is returned to the originating system as part of the response message.

2.3.3.8.2 MIN/MRN Example. As an example, an aircraft sends the following downlink message to a ground system (refer to the diagram on the following page):

> 'REQUEST CLIMB TO FL310. '
>
> This message is assigned a MIN by the avionics (say 8).
>
> A downlink clearance request contains an attribute requiring a response. The controller returns an uplink clearance to the aircraft: CLIMB TO FL310.
>
> The uplink is assigned its own MIN by the ground system (say 23). The MINs assigned by different systems are unrelated.
>
> The MIN of the downlink (8) becomes a MRN for the response. As a result, the avionics will know which message to pair the response with, that is, which message is being referenced by the response.
>
> The response attribute of a clearance message requires either a WILCO or an UNABLE response from the flight crew. The MIN of the uplink clearance (23) now becomes an MRN and is returned to the ground system with the WILCO. As a result of the MRN, the ground system will know which message the WILCO is referencing.
>
> In this example, the original downlink request was closed by the uplink response in both the avionics and the ground system, but because the uplink clearance also contained a response attribute (W/U) the dialogue remains open until a WILCO or UNABLE response is received from the aircraft. The WILCO (or UNABLE) downlink does not have a response attribute, so this dialogue is now closed.

2.3.3.8.3 The following diagram illustrates the various numbers used in a dialogue. The only components of a message created from pre-formatted elements that are sent across the networks are the element numbers, the message variable (eg. the level - 310), the MIN/MRN, the response and urgency attributes and a message, or application text field, check known as a cyclic redundancy check (CRC). The text portion is decoded from a file held in each end system.



2.3.3.9 **Pre-Formatted and Free Text Differences**

2.3.3.9.1 There are some important differences between pre-formatted and free text message elements. Preformatted messages have defined intent, whereas the intent of a free text message may be misconstrued.

2.3.3.9.2 Some pre-formatted uplink elements arm the avionics to automatically send a downlink report when a specific event occurs e.g., passing a waypoint. Some pre-formatted uplink elements can be auto-loaded into the Flight Management Computer e.g., route clearances. Some pre-formatted uplink elements (containing speed, level or route variables) automatically update the Flight Data Record (FDR) on receipt of a WILCO response from the crew. Free text messages do not perform any of these functions.

2.3.3.9.3 Another major difference between pre-formatted message elements and free text elements is in the delivery of the message. For a message constructed of pre-formatted elements, only the message number, associated attributes and any variable contained in the element are transmitted. The message number is then decoded by a file of message elements stored in the receiving system. In contrast, the entire free text message is sent to the receiving system.

2.3.3.10 **Message Set Tailoring**

2.3.3.10.1 As the text of a pre-formatted message element is not transmitted, there is some scope for the tailoring of the pre-formatted message elements to suit the user's environment. An important point is that message text seen by the controller does not differ in any way from the text seen by the flight crew, as the message text is decoded from the airborne file.

2.3.3.10.2 The procedures for the sending of uplink messages state that free text shall only be used when an appropriate pre-formatted message element does not exist, or as an additional amplification of a pre-formatted element.

2.3.3.11 The Cyclic Redundancy Check (CRC)

2.3.3.11.1 The security is provided by the last four characters added to the end of each block, known as a Cyclic Redundancy Check (CRC). This is a check sum of the message header, the message contents and the sending time-stamp expressed as bits and performed on a per-block basis. The code is analysed by the receiving system and is a verification of the entire message. If the CRC is intact, then the message has not been corrupted during transmission and is accepted. If the CRC is not intact, the block that failed the check is automatically requested to be resent. The CRC check ensures that CPDLC has one of the highest integrity ratings of any aviation system, especially when compared with voice communications.

2.3.4 ATS Interfacility Data Communication (AIDC)

2.3.4.1 AIDC provides the means by which data is exchanged between and within ATS units, during the notification, coordination, and transfer of control phases of operations.

2.3.4.2 The standards for AIDC are defined by the Asia/Pacific Regional Interface Control Document (ICD) for ATS Inter-facility Ground-Ground Data Communications (AIDC). The ICD also describes a configuration management process that will ensure stability in the design and implementation of the messages as evolutionary development is coordinated through the regional planning groups.

2.3.4.3 The message set and procedures described in the Asia/Pacific ICD have been designed for use with the existing AFTN and the future ATN. In the interest of global standardization, ICAO-agreed methods and messages were used wherever possible. Where ICAO methods and messages did not meet requirements, new messages were identified using existing ICAO field definitions to the extent possible and any regional differences considered necessary were identified and detailed.

2.3.5 Aeronautical Operational Control (AOC)

2.3.5.1 In addition to its primary use for AOC messages, operational control data link can be used for uplinking flight plans directly to the aircraft flight management computer (FMC).

2.4 NAVIGATION

2.4.1 Required Navigation Performance (RNP)

2.4.1.1 Detailed information on RNP is available in the Manual on Required Navigation Performance (Doc 9613).

2.4.2 The FANS-1/A Navigation Package

2.4.2.1 The FANS-1/A Navigation Package consists of three Inertial Reference Systems providing position and velocity information to two Long Range Navigation Systems (LRNS) contained in individual Flight Management Systems each of which also references its own Global Positioning System (GPS) receiver and VOR/DME/ILS signals. These sensor inputs are resolved into a single aircraft position solution within each LRNS. This navigation package is capable of being approved for RNP 4.

2.5 SURVEILLANCE

2.5.1 Automatic Dependent Surveillance (ADS)

2.5.1.1 In the CNS/ATM systems environment, surveillance is provided by Automatic Dependent Surveillance (ADS). ADS allows an aircraft to send position data addressed to a specific ATS Provider at specified intervals, or on the occurrence of a specific event at the request of the ATS Provider.

2.5.1.2 In non-radar airspace, the effective use of ADS in air traffic services will facilitate the application of reduced separation minima, enhance flight safety, and better accommodate user-preferred profiles.

2.5.1.3 The ADS application is contract based. Contracts must be established with the aircraft avionics by the ground system before any ADS reports can be received. The ADS application allows the implementation of reporting contracts, which are established by the ground system with an aircraft's avionics. An ADS contract is a reporting plan that establishes the conditions of ADS data reporting, such as the data required by the ATS Provider System and the frequency of the ADS reports.

2.5.1.4 The ATS Provider commences interrogating an aircraft FMC to deliver ADS reports at a pre-determined time or distance prior to the ATS airspace boundary. This is a system parameter that may vary from one ground system to another.

2.5.2 **Contract Types**

2.5.2.1 Three types of contracts can be established with an aircraft. Each of these contracts operates independently from the others. These contracts are the:

a) Periodic Contract;

b) Event Contract; and

c) Demand Contract.

2.6 COMMON REFERENCES

2.6.1 **GPS Navigation Reference Position**

2.6.1.1 Global Positioning System (GPS) has been made available by the United States for the civil use of air navigation. GPS is referenced to the international standard of World Geodetic System of 1984 (WGS-84).

2.6.2 **WGS-84 Navigation Reference Datum**

2.6.2.1 The World Geodetic System of 1984 (WGS-84) is the standard geodetic datum, and is an essential part of CNS/ATM.

2.6.3 **Navigation Data Bases**

2.6.3.1 Airlines and several other organisations that provide flight planning and aeronautical charting services maintain internal navigation databases from which to assemble routes and charts. These databases should be compiled from information provided by States in accordance with the Standards and Recommended Practices in ANNEX 15 - Aeronautical Information Services, to the Convention on International Civil Aviation. The accuracy of the information provided by the States is therefore, in the first instance, the responsibility of the State. With the advent of aircraft Flight Management Systems, Airlines have a need to update their aircraft fleet navigation databases monthly from the central database. These updates are generally programmed to coincide with AIRAC dates.

2.6.4 **Time**

2.6.4.1 Coordinated Universal Time (UTC) derived from the Global Positioning System (GPS) raw transmitted time is the common standard. Wherever data link communications are utilized by an ATS Provider, clocks and other time recording devices should be checked as necessary to ensure correct time to within plus or minus 1 second of UTC. For further information, refer to ICAO Annex 11.

GUIDANCE MATERIAL ON CNS/ATM OPERATIONS IN THE ASIA/PACIFIC REGION

PART II – OPERATIONAL PLANNING

TABLE OF CONTENTS

CHAPTER 1

1. CNS/ATM SYSTEM PLANNING

This section describes the steps for planning and implementing CNS/ATM and is supplemental to the ICAO *Air Traffic Services Planning Manual, (Doc 9426-AN/924)*, the ICAO *Global Air Navigation Plan For CNS/ATM Systems (Doc 9750-AN/963),* the ICAO *National Plan For CNS/ATM Systems Guidance Material* and the *Asia/Pacific Regional Plan For the New CNS/ATM Systems.* Special attention is given to planning for short-term and long-term ATS functional requirements, ensuring that technical requirements will meet end-to-end interoperability, and co-ordination is achieved with controllers and airspace users.

1.1 ATS PLANNING

ATS planning is a systematic process of evaluating short-term and long-term needs that will form the basis for the development of ATS functional requirements. It is important to note that all aspects of ATS planning which includes service to international air carriers bear a continuous global impact. Therefore, adoption and application of international standards is paramount to the integrity and safety of the air traffic system.

1.1.1 Identification of Needs and Capabilities

1.1.1.1 To minimize the transitional impact of CNS/ATM, consideration should be given to the needs and capabilities of:

a) The State ATS Provider,

b) The Adjacent State(s) ATS Provider(s), and

c) The Airspace Users

1.1.2 Assessing the Needs and Capabilities of the State ATS Provider

1.1.2.1 CNS/ATM planning should start with an evaluation of the capabilities and life span of the existing ATS infrastructure. This in turn should be compared with future air traffic requirements. Elements to be considered include:

a) *Traffic flows*. This includes evaluation of city pairs, hours of peak traffic, and military special use airspace.

b) *Traffic growth*. The forecast of traffic growth should be evaluated and factored into the ground system design. Traffic growth should be predicted for at least the expected life span of a particular system that is being considered.

c) *Traffic Complexity*. Factors to be considered include traffic patterns, peak hours of traffic flows, airport curfews, restricted airspace, controller workloads, crossing situations, and service to a mixed fleet of CNS/ATM equipped and non-equipped airspace users.

d) *Cost and Benefit*. Development of new ATS systems should take cost and benefit into consideration. The development of an open system architecture is important to allow for future expansion of capabilities. For example, low-density airspace with limited means of supporting revenue will not carry the same requirements as high-density airspace. Furthermore, low-density airspace with predicted levels of significant growth should be planned around automation systems that can expand to meet the growing need.

e) *International Obligations.* Consideration needs to be given to the international commitments made by the Provider State. This would include international activities such as ICAO Planning Groups and Air Navigation Plans.

f) *Existing infrastructure*. The existing ATS infrastructure, its purpose, and useful life should be factored in CNS/ATM planning. For example, civilian use of military radar may not necessitate planning for domestic use of ADS.

1.1.2.2 In planning for ATS data link communication, consideration should be given to the following:

a) data link communications will require keyboard input proficiency; and

b) even in a data link environment, emergency and non-routine communications will usually revert to voice.

1.1.3 **Assessing the Needs and Capabilities of Adjacent State(s) ATS Provider(s)**.

1.1.3.1 The ATS Provider should confer with adjacent States to explore and develop common solutions to common requirements. This would include:

a) co-ordinating and harmonizing CNS/ATM implementation schedules.

b) either attending or forming planning sessions that includes participation from Adjacent State(s) ATS Provider(s) and airspace users.

1.1.4 **Assessing the Needs and Capabilities of the Airspace Users**.

1.1.4.1 The development of a CNS/ATM system requires matching system automation and procedures to the needs and capabilities of airspace users and air traffic controllers. The composition of the airspace users, i.e. their operational life span, avionics configurations, percentage of FANS 1/A air carriers, should be taken into account. There should be active, ongoing consultation between the ATS Provider and its airspace users. This would include domestic users, both civil and military, as well as international air carriers.

1.2 IMPLEMENTATION STRATEGY.

1.2.1 Following completion of the assessments, an ATM operational planning table can be identified that will be appropriate to the management of the airspace.

1.2.2 In order to develop an implementation strategy for each ATM operational enhancement, ATS Providers should compare their current capabilities with functional requirements for each enhancement to be introduced.

CHAPTER 2

2. TECHNICAL REQUIREMENTS FOR INTEROPERABILITY

2.1 COMMUNICATIONS

2.1.1 Air/Ground Voice Communications

2.1.1.1 FANS-1/A equipped aircraft are required to maintain Air/Ground Voice Communications equipment, capable of maintaining communications over the entire route of flight, in accordance with ICAO provisions and as approved by the State of Registry or State of the Operator. The requirement for current Air/Ground Voice Communications may be reduced only after considerable analysis has been provided by the operator of the aircraft and presented to the State of Registry or State of the Operator.

2.1.1.2 Air/Ground Voice Communications may utilize VHF (UHF for State aircraft), HF or satellite voice as the communications medium, depending on the airspace, route of operations and air traffic service to be provided.

2.1.1.2.1 *VHF and HF voice*: The technical specification for VHF and HF voice communication performance is contained in *Annex 10 - Aeronautical Telecommunications*.

2.1.1.2.2 *SATVOICE:* The technical specification for ATS satellite voice communication is contained in *RTCA DO-222*.

2.1.2 Air/Ground Data Link Communications Applications

2.1.2.1 ATS air/ground data link communications are implemented via the CPDLC application. Individual operators may also implement company operational control data link applications.

2.1.2.1.1 *CPDLC:* The technical specification for CPDLC is provided in *RTCA DO-219*. The technical specification for the bit to character conversion and the ATS Facilities Notification (AFN) application is provided in *AEEC 622-2*. Deviations from the aforementioned standards in specific airframe implementations are provided in the manufacturers interoperability documents, the Boeing *Air Traffic Services System Requirements and Objectives* document (ATS/SR&O) and the Airbus *AIM FANS System Objectives and Requirements* document (FANS-A SO&R).

2.1.2.1.2 *Airline Operational Control Data Link:* The use of flight plan uplink from the airline operational control host computer to the aircraft is required for certain ATS procedures (e.g. route modification, wind data uplink). The technical specification for Airline Operational Control Data Link Communication Applications is provided in *AEEC 702-5* the *Boeing ATS/SR&O* and the *Airbus FANS-A SO&R*.

2.1.3 ATS Ground/Ground Communications

2.1.3.1 The AIDC application should provide the AFTN/AIDC messages defined by the *Asia/Pacific Regional Interface Control Document (ICD) for ATS Inter-Facility Data Communications (AIDC), version 1.0, June 1995*, as supplemented by appropriate Letters of Agreement (LOA). The LOA between States will define the agreed AIDC messages that will be exchanged between particular ATS facilities.

2.1.4 Air/Ground Data Link Communication networks

2.1.4.1 *Satellite Data Link Communication:* The technical specification for satellite communication is provided in *AEEC 741* and the *Inmarsat Satellite Definition Manual (SDM).*

2.1.4.2 *Sub-Network Data Link Communication:* The technical specification for the sub-network is provided in the *AEEC 618-4 (Sub-Network)* and *AEEC 620 (Data Link Message Addressing)* documents.

2.1.4.3 *Aircraft Data Link Processor:* The technical specification for the aircraft Data Link Processor is provided in the *AEEC 724B* document.

2.1.4.4 *ATS Ground Communication Network:* The ATS ground communication network must conform to the *AEEC 622-2*, *AEEC 620* and *AEEC 618-4* protocols. The availability of communication services should be monitored end to end. (It is recommended that the end systems should be alerted when any component of the ground communication network is unavailable or has failed)

2.1.4.5 *Communications Network Internetworking:* Requirements for ATS internetworking and interoperability are provided in the *Boeing ATS/SR&O* and the *Airbus FANS-A SO&R*. The primary air/ground ATS data link network is provided by the INMARSAT, SITA, AVICOM-Japan and ARINC communication networks. The ATS communication network is available for the delivery of messages associated with ATS applications from source to destination through a formal network routing process.

2.2 NAVIGATION

All aircraft operating in oceanic and remote areas are required to carry two long-range navigation systems (LRNS) in order to meet the minimum navigation equipment requirements as specified in *Annex 6-Operation Of Aircraft.*

2.3 SURVEILLANCE

The aircraft surveillance systems must be approved by the State of Registry or State of Operator to meet the Standards for ATS Surveillance in a designated airspace or along a CNS/ATM designated route.

2.3.1 **Automatic Dependent Surveillance**

2.3.1.1 The technical specification for ADS is provided in *AEEC 745-2* and *RTCA DO-212*. The technical specification for the bit to character conversion and the ATS Facilities Notification (AFN) application is provided in *AEEC 622-2*. Deviations from the aforementioned standards in specific airframe implementations are provided in the manufacturers interoperability documents, the *Boeing ATS/SR&O* and the *Airbus FANS-A SO&R*

2.3.2 **Pilot Position Reports**

2.3.2.1 The technical specification for the CPDLC position report is provided in *RTCA DO-219*. The technical specification for the bit to character conversion and the ATS Facilities Notification (AFN) application is provided in *AEEC 622-2*. Deviations from the aforementioned standards in specific airframe implementations are provided in the manufacturers interoperability documents, the *Boeing ATS/SR&O* and the *Airbus FANS-A SO&R.*

2.3.3 **ATC Secondary Surveillance Radar**

2.3.3.1 The technical specifications for Secondary Surveillance Radar (SSR) are contained in *ANNEX 10 - Aeronautical Telecommunications Equipment.*

2.3.4 **Voice Position Reports**

2.3.4.1 The requirements for voice position reports are specified in *PANS-RAC (ICAO Doc 4444)*.

CHAPTER 3

3. OPERATOR PLANNING

3.1 INTRODUCTION

3.1.1 Operators contemplating the introduction of FANS operations should adopt a systematic planning methodology to minimize the lead time. At the outset they should notify the relevant regulatory authority of their intentions so that the regulatory authority may also complete it's own preparation to issue operational approvals. Operators should take into account:

a) those aircraft that will require modification;

b) the need to amend documents;

c) the requirement for the training and qualification of personnel; and

d) the CAA approval process for the issue of airworthiness and operations.

3.2 AIRCRAFT MODIFICATION AND DOCUMENTATION

3.2.1 Aircraft Modification Approval

3.2.1.1 The Engineering Department needs to obtain approvals for FANS-1/A or equivalent after the modification of aircraft.

3.2.2 Major Items for the Aircraft Modifications

3.2.2.1 The following items are an example of the major aircraft modifications that are needed to upgrade a B747-400 to be capable of obtaining approval for operations using FANS 1.

SUBJECT	DESCRIPTION
SATCOM	Install a SATCOM System that is compatible with Boeing Air Traffic Service System Requirements and Objective Manual D240U123.
ACARS	Install an ACARS MU that is compatible with Boeing Air traffic Service Requirements and Objectives Manual D240U123.
IDS	Upgrade IDS software to version -011 or later to enable FANS function.
GPS	Obtain GPS Master Changes from Boeing to install a dual GPS system integrated into the FMC.
FMC	Obtain a FANS Master Changes from Boeing to obtain FANS software. FANS features can be obtained on an individually, depending on the desired FANS functionality.
CMC	Hardware and software upgrade. Load Aircraft software -009 or later. Install P/N 622-8592-105 or later.
PRINTER	Replace cockpit printer with one that has a high speed ARINC 429 specification port to support the FMC interface. *NOTE: This is an optional FANS feature dependent upon the FMC options obtained.*

3.2.3 Required Documents for Airworthiness and Flight Operations Approvals

3.2.3.1 Operators should ensure that the following documents are in place to obtain the approvals:

a) Instantaneous change notices;

b) Operating procedures;

c) Quick Reference Handbook;

d) Fault Reference Handbook; and

e) Minimum Equipment Lists (MEL).

3.3 FLIGHT OPERATIONS

3.3.1 Operations of FANS-1/A or Equivalent Aircraft

3.3.1.1 To obtain an Operational Specification approval from the Regulatory authority for the use of FANS-1/A or equivalent equipment, the following need to be addressed by the operator:

a) Use of GPS;

b) Use of CPDLC;

c) Use of RNP for airspace management;

d) RNAV/RNP approach procedures (referenced to RNP);

e) Enhanced FMS functions; and

f) Use of ADS.

3.3.1.2 Advisory information distributed within the flight operations department of the airline needs to ensure that all affected personnel are aware of CNS/ATM concepts and the programs for the introduction of GPS, RNP, CPDLC and ADS.

3.3.2 Flight Operations Policy and Procedures

3.3.2.1 Operators should assess operational requirements, establish their operational policy and procedures, and incorporate them in appropriate documents. Operators should understand the character of the CNS/ATM environment when creating operational policy and procedures. Consideration should be given to:

a) the increased “head down time” for flight crew;

b) pre-formatted messages with new interpretations such as **STANDBY, REQUEST DEFERRED;**

c) the limitations of free text messages;

d) flight crew handling rules for ATC uplink messages, including normal and urgent instructions;

e) sequence of actions to be taken in case of re-route operations;

f) time required for selecting , composing and sending downlink messages;

g) time required for reading and interpreting uplink messages;

h) the need to close the loop between uplink and downlink messages;

i) the need for maintaining a shared crew awareness of the progress of ATC data link communications; and

j) the inability of pilots to monitor other data link transmissions in the area of operations.

3.3.3 Company Operations Manuals for CNS/ATM Operations

3.3.3.1 The company Operations Manuals and any other Operating Guides for CNS/ATM should include:

a) cockpit preparation;

b) AFN logon;

c) CPDLC procedures;

d) ATC/crew/dispatch initiated re-route;

e) Required Time of Arrival;

f) company operational control (FMC route and wind/temp data uplink);

g) complementary voice communications ;

h) navigation: GNSS (GPS if applicable);

i) navigation : rules and procedures for RNP operations ;

j) surveillance : ADS;

k) DARP operation;

l) ACAS operation;

m) weather deviation procedures;

n) non-normal procedures(CPDLC/DARP/RNP);

o) contingency procedures;

p) RNP airspace/large navigation errors; and

q) Minimum Equipment List.

3.3.4 **Operational Control System**

3.3.4.1 The operator should provide an Operational Control system in accordance with Annex 6 when required by the State of Registry of State of the Operator. This should include a data link ground processor and a company communications system.

3.4 **COMPANY COMMUNICATIONS SYSTEM**

3.4.1 **Communication Sources**

3.4.1.1 Operators should provide access to communications sources that are appropriate to coordinate with their aircraft and the ATC System for the purpose of exercising operational control. These communications systems include:

a) **Air/Ground Voice Communications,** which may utilize one or more of the following:

   i) VHF;

   ii) HF Direct Communications;

   iii) HF communication relayed by an intermediate radio operator; or

   iv) SATVOICE.

b) **Air/Ground Data Link Communications,** which may utilize one or more of the following:

   i) VHF (Dedicated or via a communication service provider network, e.g. ACARS);

   ii) SATCOM; or

   iii) HF (currently under development).

c) **Ground/Ground Voice Communications,** which may utilize one or more of the following:

   i) Dedicated voice circuit; or

   ii) Public Telecommunication Network, which may be considered for remote locations or where infrequent communications cannot justify the cost of dedicated circuits.

d) **Ground/Ground Data Link Communications,** which may utilize one or more of the following:

   i) Aeronautical Fixed Telecommunication Network (AFTN);

   ii) Dedicated circuit; or

   iii) Aeronautical Telecommunication Network (ATN).

3.4.2 **Airline Operational Control to ATC Data Link Communication**

3.4.2.1 This allows direct communications between operational control and ATS for strategic flight planning and coordination purposes.

3.5 PERSONNEL TRAINING AND QUALIFICATION

Operators will be required to establish appropriate levels of operational staff training and qualification to satisfy their State of the registry/operator.

3.5.1 **Preparation of Training Systems**

3.5.1.1 Operators should establish training courses to meet the requirements of the State of Registry or State of the Operator. In developing these courses, consideration should be given to the following:

- a) the training syllabus;
- b) training device, e.g. FANS simulator, Computer Based Training, Audio Visual Training;
- c) training materials, e.g. Training Guide Book;
- d) flight and simulator instructors; and
- e) training staff.

3.5.2 **Flight Crew Training Objectives**

3.5.2.1 The objectives of flight crew training for CNS/ATM are to ensure that the pilot can demonstrate:

- a) a satisfactory knowledge of:
  - i) CNS/ATM concepts, terminology and architecture;
  - ii) CNS/ATM components – GNSS, CPDLC, ADS, operational control data link, ATN, RNP, ATM;
  - iii) CNS/ATM procedures appropriate to approach and departure phases of flight;
  - iv) CPDLC procedures – means of communication, pre-flight phase, AFN logon, exchange of CPDLC messages, transfer of connection, disconnection, abnormal cases, use of complementary voice communications;
  - v) Human Factors considerations in the data link environment;
  - vi) Aircraft equipment requirements;
  - vii) Principles of airborne CNS/ATM equipment;
  - viii) Appropriate CNS/ATM operating procedures for typical navigational tasks;
  - ix) Contingency weather deviation procedures – sequence of actions when no ATC clearance is available.
  - x) RNP contingency procedures - one RNP capable LRNS, inability to navigate to the specified RNP, loss of all LRNS;
- b) the ability to satisfactorily perform the following operational tasks:
  - i) Flight plan preparation for a flight using CNS/ATM operational procedures, including any special requirements for communications, navigation, surveillance or crew;
  - ii) Pre-flight check for CNS/ATM operation;
  - iii) Use of FMS MCDU - CNS/ATM function;
  - iv) AFN logon;
  - v) Operation of ADS;
  - vi) CPDLC - exchange of CPDLC messages, FIR boundary procedure, disconnection;
  - vii) Operation of operational control data link;
  - viii) Operation of SATCOM;

- ix) Operation of GPS;
- x) Perform contingency procedures associated with degradation of RNP;
- xi) Operation of the Required Time of Arrival (RTA) function;
- xii) Identification of deterioration of navigation performance, cross checking procedure to identify navigation errors;
- xiii) DARP operations;
- xiv) Use of CPDLC under emergency or abnormal situations;
- xv) Non-normal procedures - CPDLC connection and disconnection;
- xvi) Appropriate interaction between two pilots in a data link environment;
- xvii) Use of voice - HF, SATVOICE.

3.5.3 **Objectives for Flight Operations Officer/Dispatcher Training**

3.5.3.1 The objective of the training is to ensure that the flight operations officer/dispatcher can demonstrate:

a) a satisfactory knowledge of:

- i) CNS/ATM concepts, terminology and architecture;
- ii) CPDLC: System description - usage and role in communications - procedures: AFN Logon, exchange of CPDLC messages, transfer of CPDLC connection, disconnection and abnormal cases - MEL;
- iii) SATVOICE: System description - usage and role in communications - procedures;
- iv) complementary use of voice communications;
- v) operational control data link communications with ATC
- vi) World Geodetic System (WGS-84);
- vii) GNSS (GPS): System description - MEL;
- viii) RNP: Concept, routes, airspace, approval, requirements, flight planning and operational procedures;
- ix) RNP contingency Procedures - one RNP capable LRNS, inability to navigate to the specified RNP, loss of all LRNS;
- x) ADS: system description - usage and role in ATM - operational procedures - MEL;
- xi) ATM: ATC Flight Plan, strategic coordination, flow control;
- xii) DARP operations - general, sequence, procedures, abnormal circumstances;
- xiii) Distress and urgency conditions and procedures.

b) the ability to satisfactorily perform the following operational tasks:

- i) flight plan preparation for a flight using CNS/ATM operational procedures, including any special requirements for navigation, surveillance or crew;
- ii) flight crew briefing;
- iii) flight watch;
- iv) DARP operations.

3.5.4 **Final Actions prior to Implementation**

3.5.4.1 Prior to introducing any new CNS/ATM operations, operators should verify the following have been satisfied:

a) Conduct operational trials of the procedures for new CNS/ATM operations

b) Establish Operator Readiness prior to implementation by ensuring that:

   i) Operational policies and procedures are in place, and incorporated in the appropriate documents;

   ii) Aircraft to operate under the specific requirements are approved by State authorities;

   iii) Flight crew training and qualification is complete;

   iv) Flight Operations Officer/Dispatcher training and qualification is complete.

CHAPTER 4

4. ATS TRAINING

4.1 INTRODUCTION

4.1.1 ATS providers contemplating the introduction of CNS/ATM operations should give due consideration to air traffic controller training. Successful implementation is ultimately dependent upon successful training. Air traffic control staff will require specific training regarding ATS system displays and automation features as well as the CNS/ATM concepts and procedures. Depending on the complexity of the system, training may be relatively simple, as in the case of providing CPDLC only, or complex, as in the case of full CNS/ATM systems implementation incorporating such features as conflict probes. Air traffic controller training programmes should be developed based on system user manuals and other material.

4.2 INITIAL PLANNING

4.2.1 During initial planning, ATS providers should consider:

a) Involving operational controllers at the earliest possible stage of system development;

b) The time required to develop, test and validate a system in order to confirm system interoperability, acceptable operational performance, and certification;

c) The need for a simulator;

d) The need for a reserve (back-up) system;

e) The time required to develop and validate training material;

f) A method by which to validate the training;

g) The stage of system development at which it is acceptable to commence training development and the training itself;

h) A requirement to maintain continuity of the training;

i) The minimum training hours and qualification requirements of the State;

j) The need for supporting documentation for the training, the operational system and CNS/ATM concepts;

k) The need to train instructors (both simulator and on the job) and simulator pilots;

l) The need for instructors to remain operationally current;

m) The need for back up instructors and simulator pilots;

n) The need for training and/or familiarization of associated personnel such as

- Controllers working adjacent sectors;
- Pilots;
- Flight service staff;
- AFTN staff;
- Technical support staff;
- Airline fight planners; and
- Military operators.

4.3 PERSONNEL TRAINING AND QUALIFICATION

ATS providers will be required to establish appropriate levels of operational staff training, assessment and qualification to satisfy the individual State requirements.

4.3.1 **Preparation of Training**

4.3.1.1 ATS providers should establish training courses to meet the requirements of the State. In developing these courses, consideration should be given to the following:

a) The training curriculum;

b) The training syllabus;

c) Training aids, e.g., ATC simulators, Computer Based Training, Audio Visual Training;

d) Training materials, e.g., Training Guide Books;

e) On the job training;

f) Examination and final performance assessments;

g) Staffing;

- during the training development phase;
- instructors and simulator pilots (including reserves);
- during the training delivery phase;
- for parallel or ghosting operations;
- On the job instructors;
- to ensure the maintenance of current training/cyclical training requirements during all phases;
- to meet annual leave requirements;
- requirements post implementation.

4.3.2 **Controller Training Objectives**

4.3.2.1 The objectives of controller training are to ensure that the controller can demonstrate:

a) a satisfactory knowledge of:

i) CNS/ATM concepts, terminology and architecture;

ii) CNS/ATM components – CPDLC, RNP, ADS, AIDC, ATN, ATM;

iii) CNS/ATM procedures appropriate to relevant phases of flight;

iv) RNP: Concept, routes, airspace, approval, requirements, flight planning and operational procedures;

v) SATVOICE: System description (usage and role in communications) procedures;

vi) Human Factors considerations in the data link environment;

vii) Connection Management;

viii) CPDLC procedures – Connection (active/non active), message set, exchange of CPDLC messages, closure, transfer of connection, disconnection, abnormal cases, use of complementary voice communications;

ix) ADS contract management and procedures;

x) Separation minima;

xi) Co-ordination;

xii) Flight plan requirements;

xiii) ATS system displays and automation;

xiv) Weather deviation procedures, including contingencies;

xv) RNP and RVSM contingency procedures;

xvi) CPDLC and ADS distress and urgency conditions and procedures.

b) the ability to satisfactorily perform the following operational tasks:

i) Connection Management;

ii) CPDLC procedures – Connection (active/non active), message set, exchange of CPDLC messages, closure, transfer of connection, disconnection, abnormal cases, use of complementary voice communications;

iii) ADS contract management and procedures;

iv) User Preferred Routes and DARP operations - general, sequence, procedures, abnormal circumstances;

v) Separation minima;

vi) Co-ordination;

vii) Flight plan entry for a flight using CNS/ATM operational procedures, including any special requirements for communications, navigation, and surveillance;

viii) Use of voice - HF, SATVOICE;

ix) Integration of all CNS/ATM procedures in conjunction with the use of ATS system displays and automated functions to provide a safe ATS service;

x) Relocation from the main to reserve to main system;

xi) Use of CPDLC and ADS under emergency or abnormal situations;

xii) Weather deviation procedures including contingencies;

xiii) Reaction to and handling of contingencies associated with degradation of RNP;

xiv) Reaction to and handling of contingencies associated with degradation of RVSM capability;

4.3.3 **Final Actions prior to Implementation**

4.3.3.1 Prior to introducing any new CNS/ATM operations, ATS providers should verify that the following have been satisfied:

a) Confirm that any ATS system display is fully interoperable and that any safety hazard analysis is complete;

b) Conduct of parallel operations to ensure integrity and stability of ATS system displays and automation;

c) Conduct operational trials of the procedures for new CNS/ATM operations;

d) Establish readiness prior to implementation by ensuring that:

i) Operational policies and procedures are in place, and incorporated in the appropriate documents;

ii) Controller training and qualification is complete;

iii) Training/familiarization of associated personnel is complete.

4.3.4 **ATS Policy & Procedures**

4.3.4.1 ATS providers should assess operational requirements, establish operational policy and procedures, and incorporate this information in appropriate documents. ATS providers need to understand the character of the CNS/ATM environment when creating operational policy and procedures. Consideration should therefore be given to:

a) Air traffic controllers ability to assimilate and adapt to a new concept of operations;

b) The complexity of the system;

c) The effect of system human machine interface (HMI) on operations;

d) The time required for selecting, composing and sending uplink messages;

e) The time required for reading and interpreting downlink messages;

f) The rules for handling uplink/downlink messages, including normal and urgent instructions;

g) The need for and limitations of free text messages;

h) The need to close the loop between uplink and downlink messages;

i) The inability of pilots to monitor other data link transmissions in the area of operations;

j) Pre-formatted messages with new interpretations such as **STANDBY, REQUEST DEFERRED;**

k) The sequence of actions to be taken in case of re-routing requests;

l) The need for maintaining situational awareness.

4.3.5 **ATS Manuals for CNS/ATM Operations**

4.3.5.1 ATS manuals and system user manuals for CNS/ATM may include:

a) Acronyms;

b) A concept of operations;

c) Connection management procedures;

d) CPDLC procedures;

e) Complementary voice communication procedures;

f) ADS procedures;

g) Emergency and non-routine procedures;

h) Separation minima;

i) Co-ordination requirements;

j) RVSM procedures;

k) RNP operations, rules and procedures;

l) Re-routing procedures including user preferred routes and DARP operations;

m) Weather deviation procedures;

n) Reaction to ACAS maneuvers;

o) A description of basic input and display features;

p) A description of the air situation display features;

q) Flight plan entry and amendment procedures;

r) Message handling procedures;

s) Position reporting and conformance monitoring requirements and procedures;

t) Conflict probe operations and procedures;

u) Clearance and Co-ordination requirements;

v) Special use airspace; and

w) Contingency procedures.

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PART III – SYSTEM OPERATIONS

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CHAPTER 1 - SYSTEM INTEGRITY AND MONITORING

CHAPTER 1

SYSTEM INTEGRITY AND MONITORING

1 INTRODUCTION

The FANS-1/A CNS/ATM system is an integrated system including physical systems (hardware, software, and communication networks), human elements (pilots and controllers), and the procedures for use by pilots and controllers.

Because of the integrated nature of the system and the degree of interaction among its components, end to end system monitoring is required. The procedures described in this section aim to ensure end-to-end system integrity by validation and the identification, reporting and tracking of problems revealed by monitoring.

These procedures do not replace the ATS incident reporting procedures and requirements, as specified in *ICAO Doc 4444*, *Appendix 4; ICAO Doc 9426*, *Chapter 3*; or applicable State regulations, affecting the parties directly involved in a potential ATS incident.

2 REFERENCE DOCUMENTS

Id	Name of the document	Reference	Date	Origin	Domain
1	Air Traffic Services System Requirements and Objectives - Generation 2 (B747-400) (ATS SR&O)	D926U068 Revision-	Apr 97	Boeing	CPDLC ADS AFN
2	AIM-FANS System Objectives & Requirements (South Pacific Oceanic Operations in an AEEC 622 Environment)	464.0840/95 Issue 4	30 Apr 97	Airbus	CPDLC ADS AFN
3	Air Traffic Services System Requirements & Objectives for the MD-90 (ATS SR&O)	MDC 98K9048 Revision -	Nov 98	Boeing	CPDLC ADS AFN
4	Air Traffic Services System Requirements and Objectives - Generation 1 (B757/767) (ATS SR&O)	D926T0240	Nov 98	Boeing	CPDLC ADS AFN
5	Air Traffic Services Systems Requirements and Objectives - Generation 3 (B777) (ATS SR&O)	D243W018-11, Revision A		Boeing	CPDLC ADS AFN

3 SYSTEM PERFORMANCE CRITERIA

The table below defines the minimum values to be met and verified. This does not prevent ATS providers from negotiating more constraining contractual requirements with their communication service providers if it is thought necessary.

Criteria	Definition	Values
Performance	End to end round trip time for uplinks. (Sending and reception of MAS)	Round trip time of 2 minutes, 95% of the messages. Round trip time of 6 minutes, 99% of the messages.
	End to end one-way time for downlinks. (Comparison of message time stamp and receipt time)	One-way time of 1 minute, 95% of the messages. One-way time of 3 minutes, 99% of the messages.
	Uplink messages only: Undelivered messages will be determined by: • Message assurance failure is received. After trying both VHF and SATCOM. Depending on reason code received, the message might, in fact, have made it to the aircraft. • No message assurance or flight crew response is received by ATS unit after 900 seconds	Less than 1% of all attempted messages undelivered.
Availability	The ability of the network data link service to perform a required function under given conditions at a given time: The maximum allowed time of continuous unavailability or downtime should be declared (MTTR) ∗	99.9% TBD
Reliability	The ability of a data link application/system to perform a required function under given conditions for a given time interval: it can be expressed in MTBF (mean time between failure) ∗	TBD
Integrity	The probability of an undetected failure, event or occurrence within a given time interval.	10^{-6}/hour

∗ Availability = MTBF x 100/(MTBF+MTTR)
Note: RTCA SC189/EUROCAE WG 53 is defining the performance requirements for specific operational environments.

4 ATC SYSTEM VALIDATION

To meet system integrity requirements, States should consider a validation process that confirms the integrity of their equipment and procedures. The processes should include:

a) A system safety assessment which demonstrates that the ATS provider's system will meet the safety objectives;
b) Integration test results confirming interoperability for operational use of airborne and ground systems; and
c) Confirmation that the ATS operation manuals are compatible with those of adjacent ATS providers and contain standard operating procedures.

4.1 SYSTEM SAFETY ASSESSMENT

The system safety assessment can be achieved through a functional hazard analysis or a documented system safety case. This should be conducted for initial implementation as well as for future enhancements and should include:

a) Identifying failure conditions;
b) Assigning levels of criticality;
c) Determining probabilities for occurrence; and
d) Identifying mitigating measures.

Following on from the safety assessment, States should institute measures to offset the identified failure conditions, or reduce the probability of their occurrence to an acceptable level. This could be accomplished through automation or procedures.

4.2 INTEGRATION TEST

States should conduct trials with aircraft to ensure that they meet the technical requirements for interoperability previously specified in this document.

5 SYSTEM MONITORING

Routine collection of data is necessary in order to ensure that the system continues to meet its performance, safety and interoperability requirements, and that operations and procedures are working as planned. The monitoring program serves two processes. First, summary statistical data should be produced periodically showing the performance of the system. This is accomplished through FANS-1/A Periodic Status Reports. In addition, as problems or abnormalities arise, they should be identified, tracked, analyzed, corrected and information disseminated as required, utilizing the FANS-1/A Problem Report. This process should remain in effect until the system conforms as planned.

5.1 THE MONITORING PROCESS

When problems or abnormalities are discovered, the initial analysis should be performed by the organization(s) identifying the problem. In addition, a copy of the problem report should be sent to the central reporting agency (CRA), which documents and tracks the problem. As some problems or abnormalities may involve more than one organization, the originator should be responsible for follow-up action to rectify the problem and forward the information to the CRA. It is essential that all information relating to the problem is documented and recorded and resolved in a timely manner.

The parties who need to be involved in this monitoring process and problem tracking for the review and analysis of the data collected are:

a) ATS providers or organizations responsible for ATS system maintenance (where different from the ATS provider);
b) State regulatory authorities;
c) Communication service providers;
d) Aircraft operators; and
e) Aircraft and avionics manufacturers.

5.2 DISPATCH OF CONFIDENTIAL INFORMATION

It is important that information that may have an operational impact on other parties be distributed to all users as soon as possible. In this way, each party is made aware of problems already encountered by others, and may be able to contribute further information to aid in the solution of these problems. Before dissemination of information, all references that could identify particular parties should be removed by the CRA.

5.3 FANS-1/A PROBLEM REPORTS

Problem reports may originate from many sources, but most will fall within two categories: reports based on observation of one or more specific events, or reports generated from the routine analysis of data. For example, a problem report could arise from an incident where there was confusion about the meaning of a clearance, as the result of inappropriate use of free text. The user would document the problem, resolve it with the appropriate party and forward a copy of the report to the CRA for tracking. This one incident may appear to be an isolated case, but the receipt of numerous similar reports by the CRA that could indicate a problem area that needs more detailed examination.

To effectively resolve problems and track progress, the problem report forms should be sent to the nominated point of contact at the appropriate organization and the CRA. The resolution of the identified problems may require:
a) Re-training of system operators, or revision of training procedures to ensure compliance with existing procedures;
b) Change to operating procedures;
c) Change to system requirements, including performance and interoperability; or
d) Change to system design.

5.4 FANS-1/A PERIODIC STATUS REPORT

The ATS providers should complete the FANS-1/A Periodic Status Report at specified intervals as provided for by regional agreement for the dissemination of information and as an indication of system performance. Additionally, the reports should identify any trend discovered in system deficiencies, the resultant operational implications, and the resolution, if applicable.

Communications service providers are also expected to submit FANS-1/A Periodic Status Reports on the performance of their networks at specified intervals. These reports may contain planned or current upgrades to the systems and may not be required as often as the reports from ATS providers.

5.5 PROCESSING OF REPORTS

Each party to the monitoring process should nominate a single point of contact for receipt of problem reports and coordination with the other parties. This list should be distributed to all parties to the monitoring process.

Each State should establish procedures within its ATS provider and regulatory authority to:

a) Assess problem reports and refer them to the appropriate technical or operational experts for investigation and resolution;
b) Coordinate with communication service providers and aircraft manufacturers;
c) Develop interim operational procedures to mitigate the effects of problems until such time as the problem is resolved;
d) Monitor the progress of problem resolution;
e) Prepare summaries of problems encountered and their operational implications and forward these to the CRA; and
f) Prepare the FANS-1/A Periodic Status Report at pre-determined times and forward these to the CRA.

6 FANS INTEROPERABILITY TEAM

The FANS Interoperability Team (FIT) should oversee the monitoring process to ensure the FANS-1/A system continues to meet its performance, safety, and interoperability requirements and that operations and procedures are working as planned. The FIT:

a) Reviews de-identified problem reports and determines appropriate resolution;
b) Recommends interim operational procedures to mitigate the effects of problems until such time as they are resolved;
c) Monitors the progress of problem resolution;
d) Prepares summaries of problems encountered and their operational implications;
e) Assesses system performance based on information in CRA periodic reports;
f) Authorizes and coordinates system testing.

7 CENTRAL REPORTING AGENCY (CRA)

The CRA is an organization tasked with the regular dissemination of de-identified statistical data based on monthly status reports received from FIT members. The CRA tracks problem reports and publishes de-identified information from those reports for dissemination to FIT members. Problem resolution is the responsibility of the appropriate FIT members.

The CRA:

a) Prepares consolidated problem summaries, with references to particular States and operators removed, for dissemination to all interested parties;
b) Collects and consolidates FANS-1/A Periodic Status Reports and disseminates these to all interested parties;
c) Examines all data to identify trends; and
d) Prepares an annual report, for presentation to APANPIRG by the regional group responsible for FANS-1/A implementation. This report contains:
    - A summary of the system performance based on the periodic status reports;
    - A summary of the numbers and categories of problems reported; and
    - A report of progress with rectification of significant problems.

8 LOCAL DATA RECORDING AND ANALYSIS

8.1 DATA RECORDING

ATS providers and communication service providers should retain the records defined below for at least 30 days to allow for accident/incident investigation purposes. These records should be made available for air safety investigative purposes in accordance with appropriate State directives.

These recordings should allow replaying of the situation and identification of the messages that were sent or received by the ATS system.

8.2 LOCAL DATA COLLECTION

REQUIREMENTS	WHO/WHAT	Communication Service Providers	ATS Providers	Airlines
Operational Procedures	Time stamped ATS messages with identification and reference numbers	Y (Every message going through)	Y (End System)	Y
	Message Assurance	Y	Y	N
	Anomaly event report	N	Y	Y
Performance	Availability	Y	Y (End System)	Y (Avionics/ Link with GES)
	Transit times	Y	Y	Y
Safety (i.e., operational, performance, interoperability requirements which are used to mitigate the effect of a failure condition)	Time stamped ATS messages with identification and reference numbers/MAS	Y (Every message going through)	Y	Y
	Anomaly event reports	Y	Y	Y
Interoperability	Time stamped ATS messages with identification and reference numbers/MAS	Y (Every message going through)	Y	N

9 FANS-1/A PROBLEM REPORT

Number

Date UTC		Aircraft Type	
Problem Start Time UTC		Problem End Time UTC	
Registration		Flight Number	
Originator			
Organization			
Origin & Destination			
Active Center		Next Center	
Position			
Description			

9.1 DESCRIPTION OF FIELDS

Field	Meaning
Number	A unique identification number assigned to this problem report. Organizations writing problem reports are encouraged to maintain their own internal list of these problems for tracking purposes. Once the problems have been reported to the CRA and incorporated in the database, a number will be assigned by the CRA and used for tracking by the FIT.
Date UTC	UTC date when the event occurred.
Aircraft Type	The airplane model involved (e.g., 777 or MD-11). Where a dash number records a significant change to the equipment fit (e.g. 747-400), the dash number should be provided as well.
Problem Start Time UTC	UTC time at which the observer first noticed the problem.
Problem End Time UTC	UTC time at which the problem was resolved or was no longer apparent.
Registration	Registration number (tail number) of the airplane involved. This should be in exactly the same format as was used for the logon to the ATC Unit, including any dashes used.
Flight Number	Flight identifier (call sign) of the flight involved. This should be in exactly the same format as was used for the logon to the ATC Unit, including any leading zeros in the number.
Originator	Point of contact at the originating organization for this report (usually the author).
Organization	The name of the organization (airline, ATS provider or data link service provider) that created the report.
Origin & Destination	The departure airport and destination airport for the sector being flown by the aircraft involved in the event. ICAO identifiers should be used.
Active Center	ICAO identifier of the ATC Unit controlling the airplane at the time of the event.
Next Center	If the problem involves a handover between ATC Units, or occurs close to the time of a handover, then this should contain the ICAO identifier of the ATC Unit to which control was being handed over.
Position	Location of the airplane at the time of the event. This could be the latitude and longitude, but could also be specified relative to a waypoint on the route or an FIR boundary.
Description	This should provide as complete a description of the situation leading up to the problem as is possible. Where the organization reporting the problem is not able to provide all the information (e.g., the controller may not know everything that happens on the airplane), it would be helpful if they would coordinate with the other parties to obtain the necessary information. The description should include: • A complete description of the problem that is being reported • The route contained in the FMS • Any flight deck indications, including EICAS messages that occurred • Any MCDU scratchpad messages that occurred • Any indications provided to the controller when the problem occurred • Any problems being experienced with other datalink systems (such as AOC), or indications that those other systems were unaffected • Any additional information that the originator of the problem report considers might be helpful but is not included on the list above

	IF NECESSARY TO CONTAIN ALL THE INFORMATION, ADDITIONAL PAGES MAY BE ADDED, AND IF THE ORIGINATOR CONSIDERS IT MIGHT BE HELPFUL, DIAGRAMS AND OTHER ADDITIONAL INFORMATION (SUCH AS PRINTOUTS OF MESSAGE LOGS) MAY BE APPENDED TO THE REPORT.

10 FANS-1/A PERIODIC STATUS REPORT FORM			
Originating Organization			
Date of submission		Originator	
Status for [Month/Year]			
Performance Measure	Data		
DELAY	All times will be calculated "less than" < the time band to the right.		
Uplinks: Round-trip transit delay time (ATS provider – delay between the time a message is sent and the time the Message Assurance (MAS) referring to this message is received) (Network provider - delay between the time a message arrives at the router and the time the MAS referring to this message arrives back at the router)	Number of messages with a round trip transit delay time of less than X seconds: X= 10s 20s 30s 60s 90s 120s 180s $\geq$180s Total number of uplink messages: Total number of lost uplink messages:		
Downlinks: (ATS provider – difference between embedded message time stamp and time message received from Network provider) Lost messages determined by: • Message assurance failure is received. After trying both VHF and SATCOM. Depending on reason code received, the message might, in fact, have made it to the aircraft. • No message assurance or flight crew response is received by ATS unit after 900 seconds	Number of messages with a downlink transit delay time of less than Y seconds: Y= 10s 15s 30s 45s 60s 90s $\geq$ 90s Total number of downlink messages: Total number of lost downlink messages:		
UNAVAILABILITY (Actual time windows of scheduled outages) (Actual time windows of unscheduled outages) (ATS providers - Instances of inability to communicate with individual aircraft)	For each window of unavailability, list start and end times and dates. Denote if notification was given to operators in each case. From: To: Notification (Y/N) Partial (Y/N)		

OPERATIONAL INDICATORS Total number of aircraft with connections Total number of successful connections at first attempt Total number of flights unable to connect Significant system changes and impact on performance.	CPDLC ADS
GENERAL COMMENTS	

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PART III – SYSTEM OPERATIONS

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CHAPTER 2 - CONNECTION MANAGEMENT

CHAPTER 2

CONNECTION MANAGEMENT

1 PRE-FLIGHT PHASE

1.1 IDENTIFYING DATA LINK AIRCRAFT

ATS systems use Item 10 (Equipment) of the standard ICAO flight plan to identify an aircraft's data link capabilities. The operator is responsible for inserting the following items in the ICAO flight plan:

- Item 10 **-** The letter "J" to indicate data link capability;
- Item 10 **-** The letter "D" in the Surveillance field to indicate ADS capability;
- Item 18 **-** The letters DAT/ followed by one or more letters as appropriate to indicate the type of data link equipment carried when "J" is entered in Item 10.
  (Refer ICAO DOC 4444)

Example:
ICAO Item 10: ....**J**......./…**D**
ICAO Item 18: **REG/**..……...**DAT/SV** (for a satellite and VHF data link equipped aircraft)

Letter following DAT/	Type of data link
S	Satellite data link
H	HF data link
V	VHF data link
M	SSR Mode S data link

Table 1: Specifying CPDLC Capability in FPL

1.2 REGISTRATION NUMBER

ATS systems compare the registration number of the aircraft contained in Field 18 (Other Information) of the ICAO flight plan with the registration contained in the ATS Facilities Notification (AFN) logon. The operator is responsible for ensuring that the correct aircraft registration is filed in Field 18 of the ICAO flight plan.

2 The CPDLC Connection Sequence

The life sequence of a CPDLC connection according to the flight phases is normally as follows:

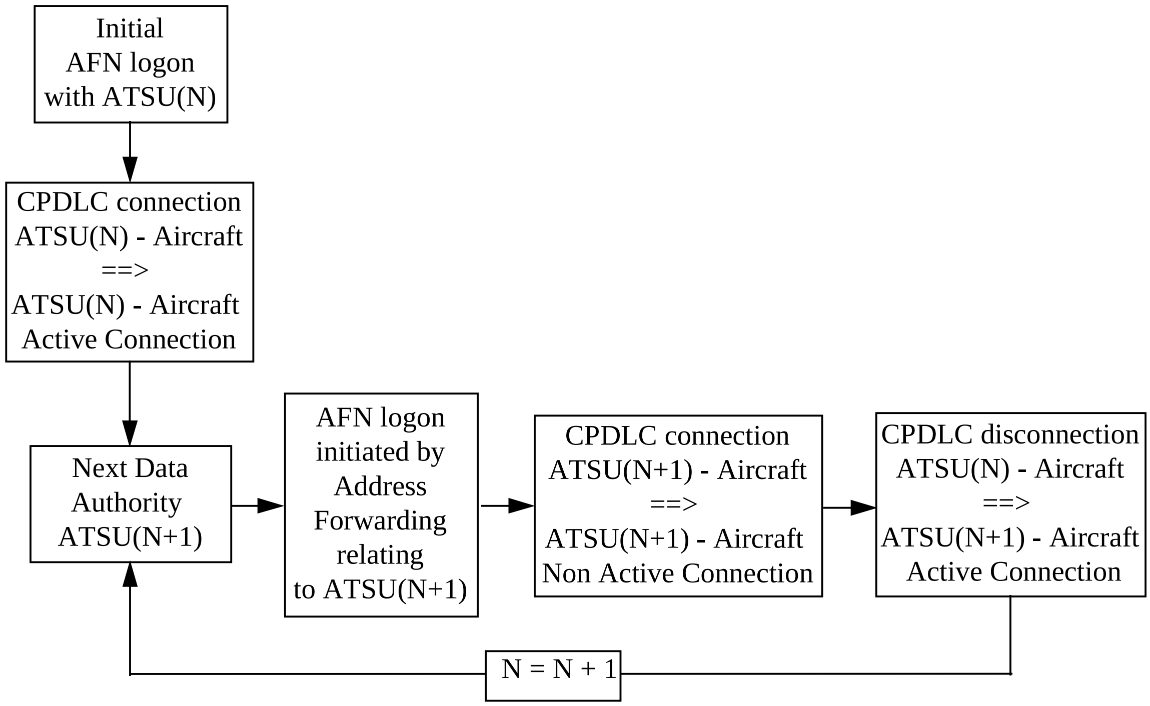

Figure 1: Life Sequence of the CPDLC Connection

3 THE AFN LOGON

3.1 PREREQUISITE FOR CPDLC AND / OR ADS CONNECTION

The AFN logon is a prerequisite to any CPDLC or ADS connection.

3.2 INITIATING AN AFN LOGON

The AFN logon can be initiated:

- Manually by the pilot during an "initial logon", or
- By an ATSU using the address forwarding process.

3.3 PURPOSE OF AN AFN LOGON

The AFN logon serves the following purposes:

a) To provide an ATSU with the data link application context of the aircraft, namely:
   - The ATS data link applications supported on board (CPDLC, ADS),
   - Their version numbers, and
   - The associated addresses (in the FANS-1/A context, these are the ACARS addresses unique to each aircraft).

b) To provide an ATSU with information such as the flight identification and the registration number. This information will allow the correlation of the flight attempting to logon with the corresponding flight data held by the ATS system. The aircraft logging on will then be positively identified by the ATS system.

c) To allow ATSUs to establish both ADS and CPDLC connections, where applicable.

3.4 THE INITIAL AFN LOGON

The initial AFN logon is performed by the pilot manually sending an **AFN CONTACT** message (FN_CON) containing the 4 character ICAO code of the ATSU.

An initial AFN logon is required when the aircraft does not already have an ADS or CPDLC connection, such as:

- When the aircraft is preparing to depart from an airport and the first logon to a ground system is executed,
- When the aircraft will enter a CPDLC area from an area where CPDLC services have not been provided, or
- When requested by ATC for situations such as when an unsuccessful address forwarding or next data authority notification has occurred.

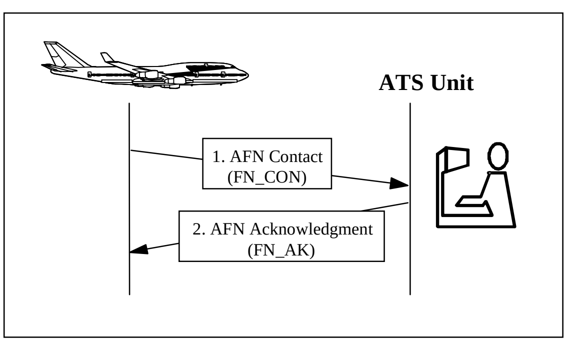

Figure 2: Initial AFN Logon

3.4.1 Parameter time for performing the initial AFN logon

For aircraft that will enter an area where CPDLC services will be provided and an initial logon is required, the pilot should send an AFN contact message (FN_CON) **between 15 and 45 minutes** prior to entering the area. ATSUs should ensure that an FN_CON message sent within this time frame would be accepted by the applicable ground system.

3.4.2 Notification of ATS variations

If an ATSU's ground system is unable to accept an FN_CON message sent between 15 and 45 minutes prior to the ETD or the estimate for entering the FIR, instructions should be published notifying the parameters during which a logon will be accepted.

3.4.3 Constructing the FN_CON message

To avoid an automatic rejection of the logon, the pilot should ensure that the flight identification and registration numbers contained in the FN_CON message are <u>exactly the same</u> as the flight identification and registration numbers filed in the flight plan.

3.4.4 FMS and ACARS flight identification

When comparing aircraft identifiers to enable flight plan coupling with the logon, the ATSU should only use the flight identifier and aircraft registration as contained within the end system portion of AFN logon message, i.e., that portion of the message where CRC checks are performed. The flight identifier in the ACARS message header has a different format to that required by the ground system (i.e., a two alpha character airline identifier followed by up to four numeric characters) and should not be used by the pilot to notify aircraft identification.

4 CPDLC CONNECTION

4.1 PURPOSE OF CPDLC CONNECTION

The purpose of a CPDLC connection is to allow the exchange of CPDLC messages between an aircraft and an ATSU.

4.2 MANAGEMENT OF CPDLC CONNECTIONS

ATSUs should manage CPDLC connections to ensure that, wherever possible, the active CPDLC connection is held by the ATSU with responsibility for the flight. Connections should be maintained and terminated to support this requirement; however aircraft may be connected with another ATSU or sector on occasions such as:

a) When an aircraft is transiting a CPDLC serviceable FIR, subject to coordination between ATSUs;

b) During the CPDLC connection transfer process;

c) Where the active connection is retained by the transferring ATSU subject to prior coordination;

d) When the aircraft is within a non-serviceable FIR and logons to the ATSU responsible for the next FIR; or

e) In emergency circumstances.

Care must be taken not to issue clearances or instructions to a flight via CPDLC when it is under the control of another ATS sector/ATSU.

4.3 CPDLC CONNECTION SEQUENCE

A CPDLC connection attempt can only occur after the AFN logon has been completed. The CPDLC connection is initiated by sending the **CONNECTION REQUEST** message by the ATSU and is established when the **CONNECTION CONFIRM** message is received from the aircraft:

a) If there is no existing connection, the avionics will accept this connection as the active connection.

b) If there is an existing connection, the avionics will check that the initiating ATSU has been established as the next data authority. If so, the avionics will accept this connection as the non-active connection.

c) In all other situations, the avionics will reject the connection request.

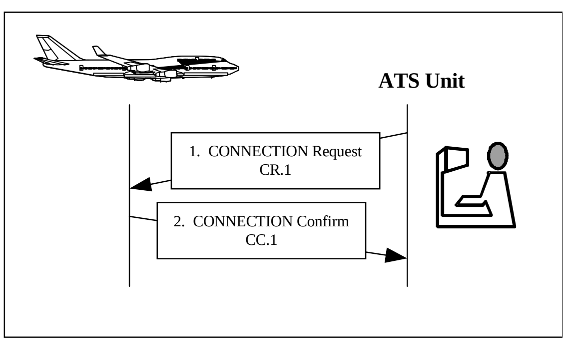

Figure 3: CPDLC Connection Sequence

4.4 ACTIVE AND INACTIVE CPDLC CONNECTIONS

A CPDLC connection established between an aircraft and an ATSU is either active or non-active.

a) A connection is active when CPDLC messages can be exchanged.
b) A connection is non-active when CPDLC messages cannot be exchanged.

FANS-1/A aircraft can have two CPDLC connections established, each with a different ATSU. Only one of these connections can be active at any given time. A non-active connection becomes active as soon as the active connection is terminated.

4.4.1 Determination of an active CPDLC connection

When the aircraft had a CPDLC connection with the previous ATSU, there are two ways for the controller to know if the CPDLC connection is active:

a) To send a message with the risk of receiving a **NOT CURRENT DATA AUTHORITY** error message if the connection is not yet active; or

b) To wait until a CPDLC message is received from the pilot.

5 NEXT DATA AUTHORITY NOTIFICATION

5.1 PURPOSE OF THE NDA MESSAGE

The ATSU holding the active connection with the aircraft is known as the 'Data Authority'.

The purpose of the Next Data Authority (NDA) message is to advise the avionics of the next ATSU to become the Data Authority.

The sending of the NDA message is the first step in the CPDLC transfer sequence between an aircraft and two ATSUs. The avionics will only accept a CPDLC connection request from the ATSU quoted in the NDA message.

5.2 PROCEDURE FOR THE NDA NOTIFICATION

The ATSU with the current active connection notifies the avionics of the NDA by sending a **NEXT DATA AUTHORITY [icaofacilitydesignation]** message.

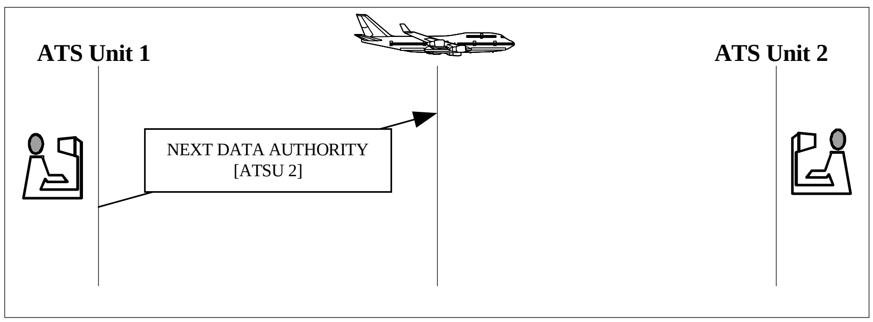

Figure 4: Next Data Authority Notification

5.2.1 Sequence of the NDA and FN_CAD messages

The CPDLC connection sequence can be initiated by automated systems immediately following the AFN logon. The NDA message should be sent prior to the **AFN CONTACT ADVISORY** (FN_CAD) to avoid a rejection of the connection. The avionics must receive the NDA prior to receiving a connection request message; otherwise the connection request will be rejected.

5.2.2 Change of the NDA

If the NDA should change after the NDA message has been sent (e.g., an aircraft re-route due to weather), a new NDA message must be sent. This new NDA will supersede the original NDA message in the avionics and will disconnect any inactive connection already established by the unit that had been previously designated as the NDA.

In the following diagram, an inactive connection that is established with ATSU 2 would be dropped when a new NDA designating ATSU 3 is received.

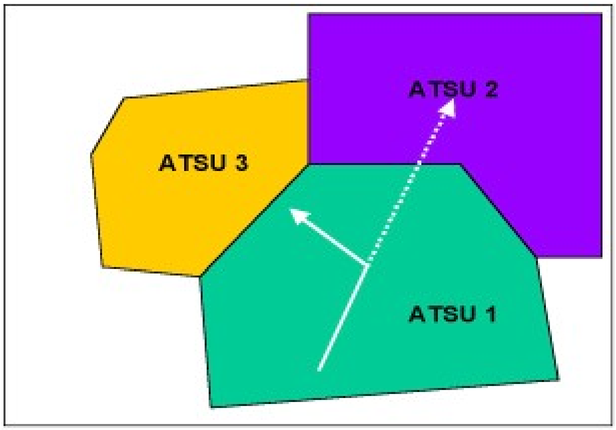

Figure 5: Subsequent Next Data Authority Notification

5.3 ABNORMAL CASES RELATING TO THE NDA NOTIFICATION

If the NDA message (containing the correct NDA designation) is not received by the avionics before receiving the **CONNECTION REQUEST** message sent by the subsequent ATSU, the connection request message will be rejected. The pilot has no indication that the **CONNECTION REQUEST** has been rejected.

5.3.1 Unsuccessful NDA delivery

When the NDA delivery has not been successful, the controller should instruct the pilot to manually initiate an AFN logon with the subsequent ATSU after termination of the CPDLC connection. An **END SERVICE** message is not required in this case.

The phraseology to be used via CPDLC or voice will be:

Controller	**CONTACT [icaounitname] [frequency]** Select ATC Com Off then Logon to [ATSU name] ***(Note: When via CPDLC, this last element will be free text)***
Pilot	**WILCO**

The [ATSU name] is the relevant four character ICAO code.

5.3.2 Duplication of the NDA message

Receipt by the aircraft of a second NDA message will disconnect the non-active CPDLC connection, even if the NDA message specifies the same (non-active) ATSU that is already connected. Therefore, duplicate NDA messages should not be uplinked.

6 AFN LOGON TRIGGERED BY ADDRESS FORWARDING

6.1 PURPOSE AND PROCEDURE

The address forwarding process is initiated by the ground system and consists of an ATSU sending an **AFN CONTACT ADVISORY** message (FN_CAD) to the avionics. The FN_CAD instructs the avionics to automatically perform an AFN logon to the ATSU address included in the message. Address forwarding is used to allow a subsequent ATSU to establish an inactive CPDLC connection and ADS contracts, and to allow adjacent ATSUs to establish ADS contracts for monitoring purposes.

Note: The FN_CAD message should be sent at least 30 minutes prior to the estimated time of arrival at the FIR boundary.

6.2 AN AIRCRAFT TRANSFERRING FROM ONE DATA LINK AREA TO ANOTHER

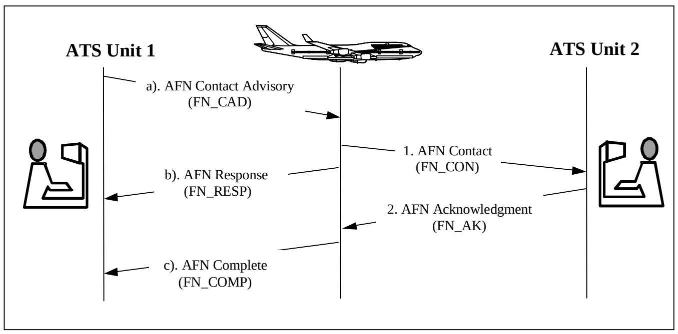

Figure 6: Transfer between areas where data link is provided

The address forwarding process is invisible to the flight crew. As a result, the flight crew does not receive an indication whether or not the FN_CON or FN_AK messages have been delivered correctly. However, the crew does receive an indication of a change to the active ATSU following a successful CPDLC connection transfer.

6.3 AIRCRAFT TRANSITING DATA LINK AREAS

When an ATSU will only have jurisdiction over a data link connected aircraft for a relatively short duration (e.g. less than 30 minutes flying time), the requirements for the aircraft should be coordinated with the controlling unit, or covered in appropriate letters of agreement between all affected ATSUs. If the ATSU concerned requires ADS contracts to monitor the transit of the aircraft across a portion of the FIR, but the transfer of CPDLC is not required, the controlling unit should perform address forwarding in the order of priority described by the following diagram.

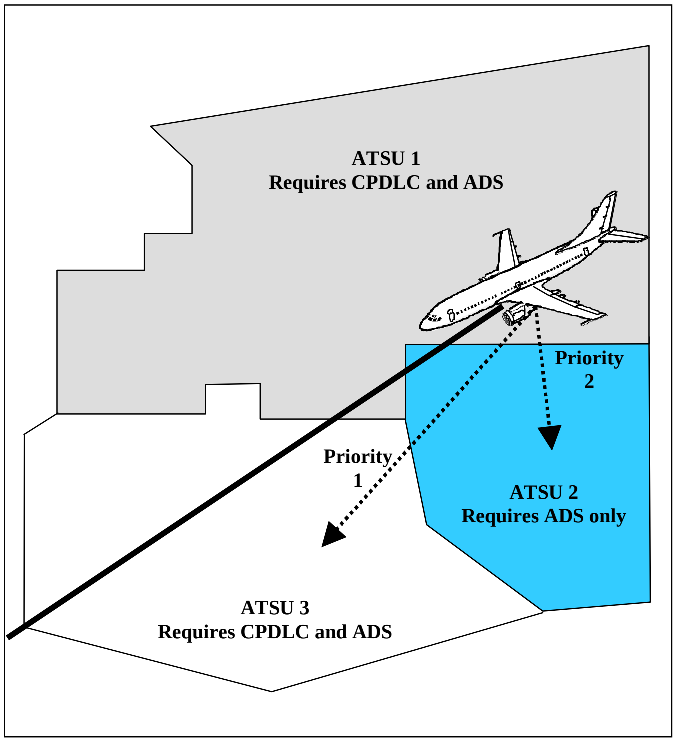

Figure 7: Transiting data link areas

ATSU 1 should address forward to ATSU 3 (Priority 1) to ensure that a CPDLC connection and ADS contracts are established prior to address forwarding to ATSU 2 (Priority 2) so that ADS contracts can be established for monitoring the transit of the aircraft across the relevant portion of the FIR.

6.3.1 Options for initiating the AFN logon

The AFN logon may be initiated by one of the following options.

a) *Option 1* **-** *Initial AFN LOGON:* CPDLC should cease between the aircraft and ATSU 1. The aircraft will enter ATSU 2 using voice. The pilot should initiate an initial AFN logon to ATSU 3 between 15 and 45 minutes prior to the estimated time at the FIR boundary.

b) *Option 2* **-** *AFN LOGON triggered by address forwarding:* Address forwarding may be used to "jump" the connections past an FIR not requiring a CPDLC connection when agreed by the appropriate ATSUs. In this circumstance the controller should inform the pilot of this intention by uplinking the freetext message EXPECT NEXT CENTER [ATSU name]. CONTACT WITH [ATSU name] NOT REQUIRED.

7 END OF SERVICE AND CPDLC CONNECTION TRANSFER

7.1 PURPOSE AND PROCEDURES

Under normal conditions, the current ATSU initiates the CPDLC connection termination sequence by sending an **END SERVICE** uplink message. In response to an **END SERVICE** message:

- The avionics will downlink a **DISCONNECT** message. The avionics will consider the aircraft to be disconnected as soon as the **DISCONNECT** message is sent.
- The current connection will be terminated, activating the non-active connection. The subsequent ATSU will now be able to exchange CPDLC messages with the aircraft.

The success of the CPDLC transfer is dependent upon the next ATSU establishing its own CPDLC connection prior to the **END SERVICE** message being received by the aircraft. Failure of the next ATSU to establish a CPDLC connection before the **END SERVICE** reaches the aircraft will leave the aircraft without CPDLC connectivity.

There are two cases in which the avionics will terminate established CPDLC connections.

- When any uplink messages remain open and the aircraft receives an End Service.
- When the **END SERVICE** element is part of a multi-element message where none of the elements require a **WILCO** response.

In both cases an error message will be generated to both ATS systems.
If any downlink messages remain open when the aircraft receives an **END SERVICE** message, the avionics will close the messages and terminate the CPDLC connection with the current ATSU. This will not affect the CPDLC connection with the next ATSU.

7.1.1 Uplink messages to be closed before the END SERVICE

The controller should ensure that no open uplink CPDLC messages exist prior to uplinking of an **END SERVICE** message.

7.1.2 Synchronizing the CPDLC and voice transfer

If the CPDLC **MONITOR (OR CONTACT) [icaounitname] [frequency]** message element and the **END SERVICE** message element are to be sent as separate uplink messages, the **END SERVICE** message should be sent as soon as possible after the receipt of the **WILCO** response. This is to ensure synchronization of the CPDLC and the voice communication transfers.

7.1.3 Timing of the transfer of communications

The **MONITOR (OR CONTACT) [icaounitname] [frequency]** and **END SERVICE** message elements should normally be sent after receipt of the last position report before crossing the FIR boundary, but not less than 5 minutes prior to the FIR boundary. This allows the next ATSU's connection to be active when the aircraft crosses the FIR boundary.

7.1.4 Aircraft entering VHF coverage

For aircraft entering airspace where radar and air-ground VHF are provided, and the aircraft will not cross an FIR boundary, it is not necessary to send an **END SERVICE** message to disconnect CPDLC. In this case, the CPDLC connection will remain active until termination of flight. If subsequent control sectors within the system do not have CPDLC capability, and local instructions do not exist to the contrary, the controller with jurisdiction for CPDLC must ensure that CPDLC clearances or instructions are not issued to the aircraft while it is under the control of another sector.

7.1.5 Timing of the CPDLC connection

Under normal circumstances the CPDLC connection should be established with the NDA prior to the connection between the aircraft and the data authority being terminated.

Either of the following options may be utilized to complete the CPDLC connection transfer process:

a) *Option 1* The **MONITOR (OR CONTACT) [icaounitname] [frequency]** and **END SERVICE** message elements are sent in the same CPDLC uplink message.

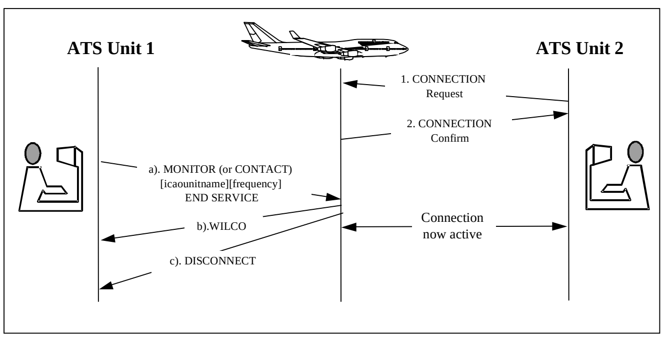

Figure 8: CPDLC connection transfer - Option 1

b) *Option 2:* The **MONITOR (OR CONTACT) [icaounitname] [frequency]** and the **END SERVICE** message elements are sent as separate CPDLC uplink messages. The **END SERVICE** is sent as soon as possible after the receipt of the **WILCO** response to the **MONITOR (OR CONTACT)** instruction.

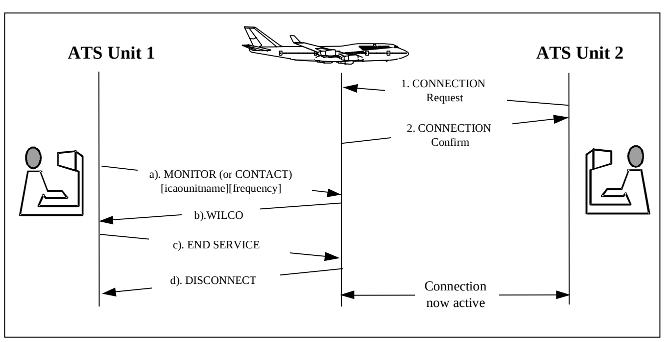

Figure 9: CPDLC connection transfer - Option 2

7.2 ABNORMAL CASES AT THE TIME OF THE CONNECTION / DISCONNECTION

7.2.1 Non-delivery of END SERVICE message

There may be unusual situations where a CPDLC connection cannot be automatically terminated (e.g., if the **END SERVICE** message does not trigger the disconnection, or if the **END SERVICE** message is not delivered to the avionics). If the controller is aware that the **END SERVICE** message has been unsuccessful, the pilot will be instructed by voice to terminate the connection. Voice will be used until a CPDLC connection with the next unit has been established. The pilot should advise the controller when the connection has been established.

The voice phraseology to be used will be:

Controller	Select ATC Com Off then Logon to [ATSU name]
Pilot	Roger

The [ATSU name] is the four character ICAO code.

7.2.2 Non-automatic termination of the connection

If the CPDLC connection with the current ATSU does not terminate automatically at the appropriate time (i.e., before a first position report is sent to the subsequent ATSU at the FIR boundary), then the pilot should:

- Manually disconnect from the current ATSU and logon to the subsequent ATSU, and
- Send a CPDLC position report at the FIR boundary to the subsequent ATSU.

If the CPDLC transfer is intended to be delayed until after the aircraft has passed the FIR transfer point, the controller should notify the pilot of the intended delay with the free text message EXPECT CPDLC TRANSFER AT [time].

If the aircraft crosses the FIR boundary prior to the time notified in the free text uplink, the boundary position will be sent to the ATSU with the active connection.

If the CPDLC transfer has not been completed by the time notified in the uplink message, the pilot is entitled to manually disconnect from the active ATSU and logon to the subsequent ATSU.

GUIDANCE MATERIAL ON CNS/ATM OPERATIONS
IN THE ASIA/PACIFIC REGION

PART III – SYSTEM OPERATIONS

TABLE OF CONTENTS

CHAPTER 3 - CPDLC PROCEDURES

CHAPTER 3

CPDLC PROCEDURES

1 MEANS OF COMMUNICATION

1.1 GENERAL

Generally, when a CPDLC aircraft is operating within a CPDLC FIR beyond the range of VHF voice communications, and other local rules do not apply, then:

- CPDLC will be the primary means of communication, and
- Voice will be used as the backup communication medium (for example VHF, direct HF, third party HF, SATVOICE).

1.2 VOICE COMMUNICATIONS

1.2.1 Notification of frequencies to the preceding ATSU

ATSUs should advise frequencies to the preceding ATSU, in accordance with the appropriate letters of agreement.

1.2.2 Notification of HF frequencies by CPDLC

The uplink CPDLC message elements (#117) **CONTACT [icaounitname] [frequency]** and (#120) **MONITOR [icaounitname] [frequency]** can accommodate only one frequency variable. Due to this limitation, the controller will insert the primary HF frequency in these messages. In the **CONTACT** and **MONITOR** messages RADIO is not an option for the **[icaounitname]** field. Therefore CENTER will be used to identify a RADIO facility.

2 CPDLC CAPABILITY

2.1 NOTIFICATION OF CPDLC CAPABILITY

CPDLC capability of an ATS system and its AFN logon address should be published in the appropriate AIP. An aircraft's CPDLC capability should be notified in the flight plan.

2.2 DOWNLINK MESSAGES

As a minimum, ATS systems must be capable of handling all the FANS-1/A downlink message elements contained in the Appendix 1.

2.3 UPLINK MESSAGES

For various reasons some States may not have implemented specific FANS-1/A uplink message elements contained in the message set Appendix 1 (e.g., uplink message element 33 **CRUISE [altitude]**. These individual exceptions should not impact overall operations.

3 USE OF PRE-FORMATTED AND FREE TEXT MESSAGES

3.1 PREFERRED USE OF PRE-FORMATTED MESSAGES

Free text messages should be used only when an appropriate pre-formatted message element does not exist. In particular, the creation of a clearance request and the issuing of a clearance should be performed by the use of pre-formatted message elements only. The use of pre-formatted message elements allows on board data processing, such as the automatic insertion of the clearance information into the FMC. It also allows the controller to respond more quickly when the ATS system has the capability to automatically link a pre-formatted request to a pre-formatted response. Additionally, this process minimizes the risk of input errors.

When a free text message is required, standard ATC phraseology and format should be used. Non-essential words and phrases should be avoided. Abbreviations should only be included in free text messages when they form part of standard ICAO phraseology, e.g. ETA.

3.2 STANDARDIZED FREE TEXT MESSAGES

While pre-formatted message elements are required to be used whenever possible, there are occasions where frequent use of freetext allows the meaning and appropriate response to be standardized. The standard free text message set is shown at Appendix 2.

3.3 STORING FREE TEXT MESSAGES

ATSUs capable of storing free text messages should select those message elements from the standard free text message set (Appendix 2) appropriate to their particular environments. When the storage of free text messages is not possible, controllers should use the same message formats when typing free text messages.

4 EXCHANGE OF CPDLC MESSAGES

4.1 MESSAGE ASSURANCE

The FANS-1/A system does not provide for <u>end-to-end</u> message assurance. Therefore, there can be no guarantee provided by the ground system or the avionics that the message has been delivered to the controller or pilot. However:

- The ATS system will receive a network acknowledgment (MAS Message Assurance) to an uplink message indicating that the message has been delivered to the aircraft's ACARS MU, and
- The avionics will receive a network acknowledgment to a downlink message indicating that the message has been delivered to the communication service provider's system.

4.2 AMBIGUOUS DIALOGUES

In the case of a controller or pilot having any doubt as to the intent of a message, or if any other ambiguity exists, clarification should be sought through the use of voice communication.

4.3 INTERRUPTION OF A CPDLC DIALOGUE

If a CPDLC dialogue is interrupted by a system shutdown, the entire dialogue should be re-commenced by voice communication.

4.4 APPROVAL OF REQUEST OR CLEARANCE/INSTRUCTION

4.4.1 Affirmative response to a clearance/instruction

The **WILCO** downlink message indicates that the pilot will comply fully with the clearance/instruction contained in the associated uplink message. The readback of a clearance or instruction issued by CPDLC is not required.

4.4.2 Affirmative response to a clearance request

The **ROGER** or **AFFIRM** uplinks are not appropriate responses to a clearance request and should not be used for this purpose. The controller should only approve a clearance request by uplinking a message containing an actual clearance.

4.4.3 Conditions relating to a specific clearance

Terms or conditions relating to a specific clearance should be included in the clearance uplink message. They should not be sent as a separate message.

4.4.4 Affirmative response to a negotiation request

AFFIRM is an appropriate response to an uplinked negotiation request message that is acceptable (e.g., **CAN YOU ACCEPT [altitude] AT [time]**).

4.5 NEGATIVE RESPONSE TO A DOWNLINK REQUEST

4.5.1 Negative response to a clearance request

When a clearance request is denied, the controller should use the element **UNABLE** (not **NEGATIVE**) in the uplink response.

4.5.2 Re-statement of a clearance

When a change to a clearance requested by the pilot is unable to be accommodated by the controller, the request will be denied by the use of the **UNABLE** response. The aircraft's current clearance should not be re-stated.

4.5.3 Explanation of negative response

Pre-formatted elements such as **DUE TO TRAFFIC** (or a free text element) should be added to the response message if clarification is considered necessary. Additional elements (including free text elements) in the form of an explanation must be included when responding to a multiple clearance request where some, but not all clearance requests can be granted.

4.6 NEGATIVE RESPONSE TO AN UPLINK REQUEST

NEGATIVE is an appropriate response to an uplink negotiation request that is not acceptable (e.g., **CAN YOU ACCEPT [altitude] AT [time]**).

4.7 TIME PERIOD BETWEEN RECEIVING AND RESPONDING TO A MESSAGE

The controller and the pilot should respond to incoming requests as soon as practicable to avoid duplicate messages entering the system.

4.7.1 Delays in responding

The controller and the pilot should consider that it takes up to one minute for a message to be received, time for the pilot (or the controller) to take action and respond, and up to one minute for the reply to be received. Nevertheless, they should be aware that extra delays could occur in the transmission of any response to a CPDLC message.

4.7.2 Delay expected after receiving a "STANDBY" message

If the **STANDBY** response is received, a further response can be expected within 10 minutes. The message remains open. If the pilot (or the controller) does not respond within this time, the next message should be in the form of an inquiry, not a duplicated request.

4.8 RE-SENDING MESSAGES

4.8.1 Re-sending a message when no alert received

When the pilot (or the controller) elects to re-send a message after a reasonable period of time has passed and no error message has been received indicating the non-delivery of the message, the message should be sent as a query message. Alternatively, voice communication may be used.

Example:

Pilot	REQUEST CLIMB [level]

Pilot	WHEN CAN I EXPECT [level]

4.8.2 Re-sending a message when an alert has been received

When an error message indicating the non-delivery of the message has been received at the flight deck or at the controller work station, the pilot (or the controller) may elect to re-send an identical message. Alternatively, voice communication may be used.

4.9 DUPLICATE REQUESTS RECEIVED

4.9.1 Second identical request after an uplink "STANDBY" message

If a second identical downlink request is sent by the pilot after a reasonable period (more than 10 minutes) has passed since receiving a **STANDBY** response to an earlier request, the controller should respond with **UNABLE REQUEST DEFERRED**. This will close out the second message, inform the pilot that the reply will take longer, and will leave only one open message requiring a response.

4.9.2 Multiple identical requests

All messages requiring a response must be answered. If the controller (or the pilot) receives a second identical CPDLC request prior to having answered the first, they should respond to both of the messages to ensure message closure. On rare occasions, the first uplink message may generate an "invalid reference number" error message, in the avionics.

4.10 ALTITUDE CHANGE CLEARANCES

4.10.1 Issuing conditional altitude change clearances

The potential exists for the restriction "**AT**" contained at the beginning of the following conditional clearances to be missed by aircrew and consequently the clearance may be executed prematurely.

- UL# 21 **AT [time] CLIMB TO AND MAINTAIN [altitude]**
- UL# 22 **AT [position] CLIMB TO AND MAINTAIN [altitude]**

- UL# 24 **AT [time] DESCEND TO AND MAINTAIN [altitude]**
- UL# 25 **AT [position] DESCEND TO AND MAINTAIN [altitude]**

Controllers should precede UL# 21, 22, 24 and 25 with UL# 19 **MAINTAIN [altitude]** indicating to aircrew to maintain their present altitude until the condition of the clearance is satisfied.

4.10.2 Appending report reaching to climb or descent clearances

If a CPDLC level report is required, controllers should append UL# 175 **REPORT REACHING [altitude]** to any vertical change clearance so that flight crews have access to the pre-formatted downlink report.

If no **REPORT REACHING [altitude]** is received, the crew has no requirement to report reaching the cleared flight level.

Example: Clearance issued to a flight currently cruising at FL310 requesting climb to FL350 when the climb can not be executed until the aircraft is at 150W
MAINTAIN FL310, AT 150W CLIMB TO AND MAINTAIN FL350, REPORT REACHING FL350

Note:

1. *Some States do not require this report in ADS airspace.*
2. *Pilots leveling and maintaining the wrong FL has produced errors that have shown a risk approaching or exceeding the Target Level of Safety for RVSM airspace. In RVSM airspace States should ensure adherence to the assigned flight level by appending Report Reaching to altitude change clearances or using appropriate ADS contracts to verify aircraft are flying at the assigned level.*

4.10.3 Canceling block altitude clearances

When a controller wishes to cancel a previously issued block clearance and limit the aircraft to one specific level within the block; the controller should issue an appropriate vertical instruction such as:

- UL# 19 **MAINTAIN [altitude];**
- UL# 20 **CLIMB TO AND MAINTAIN [altitude];** or
- UL# 28 **DESCEND TO REACH [altitude] BY [time].**

In a non-ADS environment the controller should also add UL# 75 **REPORT REACHING [altitude]**.

The **WILCO** response to the vertical clearance uplink cancels any previously issued block clearance.

4.11 REQUESTING AN AIRCRAFT'S SPEED

When the aircraft's Mach number or indicated airspeed is requested, the controller should use the pre-formatted message element **CONFIRM SPEED**.

4.12 ADVISING A WAKE TURBULENCE OFFSET

In the event of a pilot initiating a wake turbulence offset in RVSM airspace (up to 2NM either side of track) for which the controller is not required to issue a clearance, the pilot should advise the controller. The following data or voice phraseology should be used:

Pilot	Wake Dev [direction] *Direction L or R (left or right) as appropriate*

5 MULTI-ELEMENT REQUESTS

5.1 AVOIDING MULTIPLE ELEMENT CLEARANCE REQUESTS

To avoid potential ambiguity, pilots should, where possible, avoid sending multiple clearance requests in the one downlink message.

5.2 RESPONDING TO MULTIPLE ELEMENT CLEARANCE REQUESTS

5.2.1 Multiple clearance requests in one message: All approved

Where a multiple clearance request is received and all clearance request elements can be approved, each clearance request element should be specifically addressed in the response.

Example

Pilot	REQUEST CLIMB TO [level] REQUEST DIRECT TO [position]
Controller	CLIMB TO AND MAINTAIN [level] PROCEED DIRECT TO [position]

5.2.2 Multiple clearance requests in one message: All not approved

If the response to a multi-element message is **UNABLE** then the reply applies to all elements of the original message.

Example

Pilot	REQUEST CLIMB TO [level] REQUEST DIRECT TO [position]
Controller	UNABLE

5.2.3 Multiple clearance requests in one message: Some approved/Some not approved

When a multi-element clearance request is received and part of it can be granted and part of it cannot, the uplink should not contain the single word **UNABLE** and a clearance. If **UNABLE** is used within a clearance message, it must contain a qualifier to remove any ambiguity.

The following examples illustrate **correct** ATC responses.

First correct example:

Pilot	REQUEST CLIMB TO [level] REQUEST DIRECT TO [position]
Controller	UNABLE Higher altitude

Controller	PROCEED DIRECT TO [position]

Second correct example:

Pilot	REQUEST CLIMB TO [level] REQUEST DIRECT TO [position]
Controller	UNABLE Higher altitude PROCEED DIRECT TO [position]

The ATC response in the following example is **incorrect and should never be used**:

Pilot	REQUEST CLIMB TO [level] REQUEST DIRECT TO [position]
Controller	~~UNABLE~~ ~~PROCEED DIRECT TO [position]~~

6 MESSAGE CLOSURE

6.1 GENERAL

Definitions:

- A message requiring a response remains **open** until a referenced response is received.
- A message is **closed** when either a response is not technically required, or after a referenced response other than **STANDBY** or **REQUEST DEFERRED** has been received.

A normal downlink free text message (based on downlink message element #67) does not require a response from the controller to close the CPDLC exchange. However, a downlink free text message based on downlink message element #68 (distress attribute) does require a response and the message will remain open until a referenced response is received.

Any uplink message containing only free text requires a **ROGER** response. The message will remain open until a referenced response containing **ROGER** is received.

6.2 ANSWERING AN UPLINK FREE TEXT

When the controller sends a message containing only free text, or a free text element combined with elements that do not require a response, the pilot must respond to the free text with a **ROGER** response before responding to the actual contents of the message.

6.3 DIALOGUE COMMENCED VIA CPDLC AND CONTINUED VIA VOICE

If a CPDLC message requiring a closure response is subsequently negotiated by voice, a CPDLC closure response message is still necessary to ensure the proper synchronization of ground and aircraft systems.

7 POSITION REPORTING

7.1 GENERAL

To harmonize waypoint position reports by either voice or data, the "Position" and "Next Position" should only contain compulsory reporting points unless requested otherwise by ATC. The "Ensuing Significant Point" may be either the compulsory or non-compulsory reporting point after the "Next Position" (Refer AIREP form DOC 4444, Appendix 1).

7.2 DOWNLINK OF POSITION REPORT

When a CPDLC connection exists in a procedural, non-ADS environment, pilots should ensure that position reporting is conducted via CPDLC. A CPDLC position report should be sent whenever an ATC waypoint is passed over, or passed abeam when offset flight is in progress. ATC expects position reports based on downlink message #48 **- POSITION REPORT**.

7.3 FLEXIBLE TRACK POSITION REPORTS

All waypoints published for an independent flex track are compulsory reporting points. However, when the flex track follows a published ATS route, position reports are not required at any non-compulsory waypoints defined for that ATS route.

7.4 FIRST POSITION REPORT

Pilots should downlink a CPDLC position report (ATC waypoint) to the next ATSU after the completion of:

- An initial CPDLC connection (when inbound from an area not providing CPDLC services);
- A CPDLC connection transfer; or
- When crossing an FIR boundary.

7.5 SENDING OF ATC WAYPOINTS ONLY

Additional non-ATC waypoints may be sequenced by the FMC, however information relating to these waypoints is not of interest to ATC. It is the pilot's responsibility to report only at ATC waypoints.

7.6 UPDATING A WAYPOINT ESTIMATE

When it is necessary to update a waypoint ETA a free text message should be sent in the form of – Revised ETA [position] [time].

7.7 NON-RECEIPT OF A SCHEDULED POSITION REPORT

If a scheduled position report is not received via CPDLC, the use of voice communication by the controller is not mandatory. The controller may obtain the report by uplinking message #147 **- REQUEST POSITION REPORT**.

7.8 SEQUENCING 'ABEAM' WAYPOINTS IN EXCESS OF FMC PARAMETERS

When an aircraft passes abeam a waypoint in excess of the defined sequencing parameter for the aircraft type, the FMC will not sequence the active waypoint on the Legs and Position Report pages. Operators should develop appropriate airborne procedures to ensure correct waypoint sequencing.

Note: Some ATS systems use current GPS position that is included in the ATC position report to update their ground systems.

7.9 ARINC 424 FIX NAMES

Crews should be aware that ATC ground systems can not process latitudes and longitudes encoded as fix names in the ARINC 424 format. Example 10N40 (indicates lat/long of 10N140W).
Any downlink containing such fix names will be rejected by ATC systems.

APPENDIX 1 – FANS-1/A CPDLC MESSAGE SET AND INTENT

This Appendix contains a complete listing of the message intent for all FANS-1/A CPDLC messages as defined by the ICAO ADS Panel. Additional comments provided by ISPACG are displayed in italics.

Response Requirements Key:

TYPE	CLOSURE RESPONSES
W/U	WILCO, UNABLE, will close the uplink message.
A/N	AFFIRM, NEGATIVE, will close the uplink message.
R	ROGER, will close the uplink message.
NE	Most messages with an NE attribute require an operational response. Only the correct operational response is presented to the pilot. The uplink message is considered to be closed on sending and does not require a response to close the dialogue. The WILCO, UNABLE, AFFIRM, NEGATIVE, ROGER, and STANDBY responses are not enabled for pilot selection.
Y	Response required.
N	Response not required

Note: Under some circumstances, an ERROR message will also close an uplink message.

Uplink - Responses and Acknowledgements

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
0	UNABLE	Indicates that ATS cannot comply with the request.	NE
1	STANDBY	Indicates that ATS has received the message and will respond. *The pilot is informed that the request is being assessed and there will be a <u>short-term delay</u> (within 10 minutes). The exchange is not closed and the request will be responded to when conditions allow.*	NE
2	REQUEST DEFERRED	Indicates that ATS has received the request but it has been deferred until later. *The pilot is informed that the request is being assessed and a <u>long-term delay</u> can be expected. The exchange is not closed and the request will be responded to when conditions allow.*	NE
3	ROGER	Indicates that ATS has received and understood the message..	NE
4	AFFIRM	Yes	NE
5	NEGATIVE	No	NE

Uplink - Vertical Clearances

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
6	EXPECT [altitude]	Notification that a level change instruction should be expected.	R
7	EXPECT CLIMB AT [time]	Notification that an instruction should be expected for the aircraft to commence climb at the specified time.	R
8	EXPECT CLIMB AT [position]	Notification that an instruction should be expected for the aircraft to commence climb at the specified position.	R
9	EXPECT DESCENT AT [time]	Notification that an instruction should be expected for the aircraft to commence descent at the specified time.	R
10	EXPECT DESCENT AT [position]	Notification that an instruction should be expected for the aircraft to commence descent at the specified position.	R
11	EXPECT CRUISE CLIMB AT [time]	Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified time. *Due to different interpretations between the various ATS units this element should be avoided.*	R
12	EXPECT CRUISE CLIMB AT [position]	Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified position. *Due to different interpretations between the various ATS units this element should be avoided*	R
13	AT [time] EXPECT CLIMB TO [altitude]	Notification that an instruction should be expected for the aircraft to commence climb at the specified time to the specified level.	R
14	AT [position] EXPECT CLIMB TO [altitude]	Notification that an instruction should be expected for the aircraft to commence climb at the specified position to the specified level.	R
15	AT [time] EXPECT DESCENT TO [altitude]	Notification that an instruction should be expected for the aircraft to commence descent at the specified time to the specified level.	R
16	AT [position] EXPECT DESCENT TO [altitude]	Notification that an instruction should be expected for the aircraft to commence descent at the specified position to the specified level.	R
17	AT [time] EXPECT CRUISE CLIMB TO [altitude]	Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified time to the specified level. *Due to different interpretations between the various ATS units, this element should be avoided.*	R

Uplink - Vertical Clearances Continued

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
18	AT [position] EXPECT CRUISE CLIMB TO [altitude]	Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified position to the specified level. *Due to different interpretations between the various ATS units, this element should be avoided.*	R
19	MAINTAIN [altitude]	Instruction to maintain the specified level.	W/U
20	CLIMB TO AND MAINTAIN [altitude]	Instruction that a climb to the specified level is to commence and the level is to be maintained when reached.	W/U
21	AT [time] CLIMB TO AND MAINTAIN [altitude]	Instruction that at the specified time, a climb to the specified level is to commence and once reached the specified level is to be maintained.	W/U
22	AT [position] CLIMB TO AND MAINTAIN [altitude]	Instruction that at the specified position, a climb to the specified level is to commence and once reached the specified level is to be maintained.	W/U
23	DESCEND TO AND MAINTAIN [altitude]	Instruction that a descent to the specified level is to commence and the level is to be maintained when reached.	W/U
24	AT [time] DESCEND TO AND MAINTAIN [altitude]	Instruction that at the specified time a decent to the specified level is to commence and once reached the specified level is to be maintained.	W/U
25	AT [position] DESCEND TO AND MAINTAIN [altitude]	Instruction that at the specified position a descent to the specified level is to commence and when the specified level is reached it is to be maintained.	W/U
26	CLIMB TO REACH [altitude] BY [time]	Instruction that a climb is to commence at a rate such that the specified level is reached at or before the specified time.	W/U
27	CLIMB TO REACH [altitude] BY [position]	Instruction that a climb is to commence at a rate such that the specified level is reached at or before the specified position.	W/U
28	DESCEND TO REACH [altitude] BY [time]	Instruction that a descent is to commence at a rate such that the specified level is reached at or before the specified time.	W/U
29	DESCEND TO REACH [altitude] BY [position]	Instruction that a descent is to commence at a rate such that the specified level is reached at or before the specified position.	W/U
30	MAINTAIN BLOCK [altitude] TO [altitude]	A level within the specified vertical range is to be maintained.	W/U
31	CLIMB TO AND MAINTAIN BLOCK [altitude] TO [altitude]	Instruction that a climb to a level within the specified vertical range is to commence.	W/U
32	DESCEND TO AND MAINTAIN BLOCK [altitude] TO [altitude]	Instruction that a descent to a level within the specified vertical range is to commence.	W/U

Uplink - Vertical Clearances Continued

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
33	CRUISE [altitude]	Instruction that authorizes a pilot to conduct flight at any altitude from the minimum altitude up to and including the altitude specified in the clearance. further, it is approval for the pilot to proceed to and make an approach at the destination airport. *Due to different interpretations between the various ATS units, this element should be avoided.*	
34	CRUISE CLIMB TO [altitude]	A cruise climb is to commence and continue until the specified level is reached. *Due to different interpretations between the various ATS units, this element should be avoided.*	W/U
35	CRUISE CLIMB ABOVE [altitude]	A cruise climb can commence once above the specified level. *Due to different interpretations between the various ATS units, this element should be avoided.*	W/U
36	EXPEDITE CLIMB TO [altitude]	The climb to the specified level should be made at the aircraft's best rate.	W/U
37	EXPEDITE DESCENT TO [altitude]	The descent to the specified level should be made at the aircraft's best rate.	W/U
38	IMMEDIATELY CLIMB TO [altitude]	Urgent instruction to immediately climb to the specified level.	W/U
39	IMMEDIATELY DESCEND TO [altitude]	Urgent instruction to immediately descend to the specified level.	W/U
40	IMMEDIATELY STOP CLIMB AT [altitude]	Urgent instruction to immediately stop a climb once the specified level is reached.	W/U
41	IMMEDIATELY STOP DESCENT AT [altitude]	Urgent instruction to immediately stop a descent once the specified level is reached.	W/U
171	CLIMB AT [vertical rate] MINIMUM	Instruction to climb at not less than the specified rate.	W/U
172	CLIMB AT [vertical rate] MAXIMUM	Instruction to climb at not above the specified rate.	W/U
173	DESCEND AT [vertical rate] MINIMUM	Instruction to descend at not less than the specified rate.	W/U
174	DESCEND AT [vertical rate] MAXIMUM	Instruction to descend at not above the specified rate.	W/U

Uplink - Crossing Constraints

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
42	EXPECT TO CROSS [position] AT [altitude]	Notification that a level change instruction should be expected which will require the specified position to be crossed at the specified level.	R
43	EXPECT TO CROSS [position] AT OR ABOVE [altitude]	Notification that a level change instruction should be expected which will require the specified position to be crossed at or above the specified level.	R
44	EXPECT TO CROSS [position] AT OR BELOW [altitude]	Notification that a level change instruction should be expected which will require the specified position to be crossed at or below the specified level.	R
45	EXPECT TO CROSS [position] AT AND MAINTAIN [altitude]	Notification that a level change instruction should be expected which will require the specified position to be crossed at the specified level which is to be maintained subsequently.	R
46	CROSS [position] AT [altitude]	The specified position is to be crossed at the specified level. This may require the aircraft to modify its climb or descent profile.	W/U
47	CROSS [position] AT OR ABOVE [altitude]	The specified position is to be crossed at or above the specified level.	W/U
48	CROSS [position] AT OR BELOW [altitude]	The specified position is to be crossed at or below the specified level.	W/U
49	CROSS [position] AT AND MAINTAIN [altitude]	Instruction that the specified position is to be crossed at the specified level and that level is to be maintained when reached.	W/U
50	CROSS [position] BETWEEN [altitude] AND [altitude]	The specified position is to be crossed at a level between the specified levels.	W/U
51	CROSS [position] AT [time]	The specified position is to be crossed at the specified time.	W/U
52	CROSS [position] AT OR BEFORE [time]	The specified position is to be crossed at or before the specified time.	W/U
53	CROSS [position] AT OR AFTER [time]	The specified position is to be crossed at or after the specified time.	W/U
54	CROSS [position] BETWEEN [time] AND [time]	The specified position is to be crossed at a time between the specified times.	W/U
55	CROSS [position] AT [speed]	The specified position is to be crossed at the specified speed and the specified speed is to be maintained until further advised.	W/U
56	CROSS [position] AT OR LESS THAN [speed]	The specified position is to be crossed at a speed equal to or less than the specified speed and the specified speed or less is to be maintained until further advised.	W/U
57	CROSS [position] AT OR GREATER THAN [speed]	The specified position is to be crossed at a speed equal to or greater than the specified speed and the specified speed or greater is to be maintained until further advised.	W/U

Uplink - Crossing Constraints Continued

58	CROSS [position] AT [time] AT [altitude]	The specified position is to be crossed at the specified time and the specified level.	W/U
59	CROSS [position] AT OR BEFORE [time] AT [altitude]	The specified position is to be crossed at or before the specified time and at the specified level.	W/U
60	CROSS [position] AT OR AFTER [time] AT [altitude]	The specified position is to be crossed at or after the specified time and at the specified level.	W/U
61	CROSS [position] AT AND MAINTAIN [altitude] AT [speed]	Instruction that the specified position is to be crossed at the specified level and speed and the level and speed are to be maintained.	W/U
62	AT [time] CROSS [position] AT AND MAINTAIN [altitude]	Instruction that at the specified time the specified position is to be crossed at the specified level and the level is to be maintained.	W/U
63	AT [time] CROSS [position] AT AND MAINTAIN [altitude] AT [speed]	Instruction that at the specified time the specified position is to be crossed at the specified level and speed and the level and speed are to be maintained.	W/U

Uplink - Lateral Offsets

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
64	OFFSET [direction] [distance offset] OF ROUTE	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction.	W/U
65	AT [position] OFFSET [direction] [distance offset] OF ROUTE	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction and commencing at the specified position.	W/U
66	AT [time] OFFSET [direction] [distance offset] OF ROUTE	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction and commencing at the specified time.	W/U
67	PROCEED BACK ON ROUTE	The cleared flight route is to be rejoined.	W/U
68	REJOIN ROUTE BY [position]	The cleared flight route is to be rejoined at or before the specified position.	W/U
69	REJOIN ROUTE BY [time]	The cleared flight route is to be rejoined at or before the specified time.	W/U
70	EXPECT BACK ON ROUTE BY [position]	Notification that a clearance may be issued to enable the aircraft to rejoin the cleared route at or before the specified position.	R
71	EXPECT BACK ON ROUTE BY [time]	Notification that a clearance may be issued to enable the aircraft to rejoin the cleared route at or before the specified time.	R
72	RESUME OWN NAVIGATION	Instruction to resume own navigation following a period of tracking or heading clearances. May be used in conjunction with an instruction on how or where to rejoin the cleared route.	W/U

Uplink - Route Modifications

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
73	[predepartureclearance]	Notification to the aircraft of the instructions to be followed from departure until the specified clearance limit.	W/U
74	PROCEED DIRECT TO [position]	Instruction to proceed directly from the present position to the specified position.	W/U
75	WHEN ABLE PROCEED DIRECT TO [position]	Instruction to proceed, when able, directly to the specified position.	W/U
76	AT [time] PROCEED DIRECT TO [position]	Instruction to proceed, at the specified time, directly to the specified position.	W/U
77	AT [position] PROCEED DIRECT TO [position]	lnstruction to proceed, at the specified position, directly to the next specified position.	W/U
78	AT [altitude] PROCEED DIRECT TO [position]	Instruction to proceed, upon reaching the specified level, directly to the specified position.	W/U
79	CLEARED TO [position] VIA [route clearance]	Instruction to proceed to the specified position via the specified route.	W/U
80	CLEARED [route clearance]	Instruction to proceed via the specified route.	W/U
81	CLEARED [procedure name]	Instruction to proceed in accordance with the specified procedure.	W/U
82	CLEARED TO DEVIATE UP TO [direction] [distance offset] OF ROUTE	Approval to deviate up to the specified distance from the cleared route in the specified direction.	W/U
83	AT [position] CLEARED [route clearance]	Instruction to proceed from the specified position via the specified route.	W/U
84	AT [position] CLEARED [procedure name]	Instruction to proceed from the specified position via the specified procedure.	W/U
85	EXPECT [route clearance]	Notification that a clearance to fly on the specified route may be issued.	R
86	AT [position] EXPECT [route clearance]	Notification that a clearance to fly on the specified route from the specified position may be issued.	R
87	EXPECT DIRECT TO [position]	Notification that a clearance to fly directly to the specified position may be issued.	R
88	AT [position] EXPECT DIRECT TO [position]	Notification that a clearance to fly directly from the first specified position to the next specified position may be issued.	R
89	AT [time] EXPECT DIRECT TO [position]	Notification that a clearance to fly directly to the specified position commencing at the specified time may be issued.	R
90	AT [altitude] EXPECT DIRECT TO [position]	Notification that a clearance to fly directly to the specified position commencing when the specified level is reached may be issued.	R
91	HOLD AT [position] MAINTAIN [altitude] INBOUND TRACK [degrees][direction] TURN LEG TIME [leg type]	Instruction to enter a holding pattern with the specified characteristics at the specified position and level.	W/U

Uplink - Route Modifications Continued

92	HOLD AT [position] AS PUBLISHED MAINTAIN [altitude]	Instruction to enter a holding pattern with the published characteristics at the specified position and level.	W/U
93	EXPECT FURTHER CLEARANCE AT [time]	Notification that an onwards clearance may be issued at the specified time.	R
94	TURN [direction] HEADING [degrees]	Instruction to turn left or right as specified onto the specified heading.	W/U
95	TURN [direction] GROUND TRACK [degrees]	Instruction to turn left or right as specified onto the specified track.	W/U
96	FLY PRESENT HEADING	Instruction to continue to fly on the current heading.	W/U
97	AT [position] FLY HEADING [degrees]	Instruction to fly on the specified heading from the specified position.	W/U
98	IMMEDIATELY TURN [direction] HEADING [degrees]	Instruction to turn immediately left or right as specified onto the specified heading.	W/U
99	EXPECT [procedure name]	Notification that a clearance may be issued for the aircraft to fly the specified procedure.	R
178	TRACK DETAIL MESSAGE	*Message not defined.*	

Uplink - Speed Changes

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
100	AT [time] EXPECT [speed]	Notification that a speed instruction may be issued to be effective at the specified time.	R
101	AT [position] EXPECT [speed]	Notification that a speed instruction may be issued to be effective at the specified position.	R
102	AT [altitude] EXPECT [speed]	Notification that a speed instruction may be issued to be effective at the specified level.	R
103	AT [time] EXPECT [speed] TO [speed]	Notification that a speed range instruction may be issued to be effective at the specified time.	R
104	AT [position] EXPECT [speed] TO [speed]	Notification that a speed range instruction may be issued to be effective at the specified position.	R
105	AT [altitude] EXPECT [speed] TO [speed]	Notification that a speed range instruction may be issued to be effective at the specified level.	R
106	MAINTAIN [speed]	The specified speed is to be maintained.	W/U
107	MAINTAIN PRESENT SPEED	The present speed is to be maintained.	W/U
108	MAINTAIN [speed] OR GREATER	The specified speed or a greater speed is to be maintained.	W/U
109	MAINTAIN [speed] OR LESS	The specified speed or a lesser speed is to be maintained.	W/U
110	MAINTAIN [speed] TO [speed]	A speed within the specified range is to be maintained.	W/U
111	INCREASE SPEED TO [speed]	The present speed is to be increased to the specified speed and maintained until further advised.	W/U

Uplink - Speed Changes Continued

112	INCREASE SPEED TO [speed] OR GREATER	The present speed is to be increased to the specified speed or greater, and maintained at or above the specified speed until further advised.	W/U
113	REDUCE SPEED TO [speed]	The present speed is to be reduced to the specified speed and maintained until further advised.	W/U
114	REDUCE SPEED TO [speed] OR LESS	The present speed is to be reduced to the specified speed or less and maintained at or below the specified speed until further advised.	W/U
115	DO NOT EXCEED [speed]	The specified speed is not to be exceeded.	W/U
116	RESUME NORMAL SPEED	Notification that the aircraft need no longer comply with the previously issued speed restriction.	W/U

Uplink - Contact/Monitor/Surveillance Requests

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
117	CONTACT [icaounitname][frequency]	The pilot is required to call the ATS facility on the specified frequency.	W/U
118	AT [position] CONTACT [icaounitname] [frequency]	At the specified position the ATS unit with the specified ATS unit name is to be contacted on the specified frequency.	W/U
119	AT [time] CONTACT [icaounitname] [frequency]	At the specified time the ATS unit with the specified ATS unit name is to be contacted on the specified frequency.	W/U
120	MONITOR [icaounitname][frequency]	The pilot is required to monitor the specified ATS facility on the specified frequency. *The Pilot is not required to check in.*	W/U
121	AT [position] MONITOR [icaounitname] [frequency]	At the specified position the ATS unit with the specified ATS unit name is to be monitored on the specified frequency.	W/U
122	AT [time] MONITOR [icaounitname] [frequency]	At the specified time the ATS unit with the specified ATS unit name is to be monitored on the specified frequency.	W/U
123	SQUAWK [beacon code]	The specified code (SSR code) is to be selected.	W/U
124	STOP SQUAWK	The SSR transponder responses are to be disabled.	W/U
125	SQUAWK ALTITUDE	The SSR transponder responses should include level information.	W/U
126	STOP ALTITUDE SQUAWK	The SSR transponder responses should no longer include level information.	W/U
179	SQUAWK IDENT	The 'ident' function on the SSR transponder is to be actuated.	W/U

Uplink - Report/Confirmation Requests

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
127	REPORT BACK ON ROUTE	Instruction to report when the aircraft is back on the cleared route.	R
128	REPORT LEAVING [altitude]	Instruction to report when the aircraft has left the specified level. *Either a level that has been maintained, or a level passed through on climb or descent.*	R
129	REPORT LEVEL [altitude]	Instruction to report when the aircraft is in level flight at the specified level. *Some States do not to use this message in order to avoid confusion because it does not comply with existing voice phraseology*	R
175	REPORT REACHING [altitude]	Instruction to report when the aircraft has reached the specified level. *To be interpreted as "Report reaching an assigned level."*	R
180	REPORT REACHING BLOCK [altitude] TO [altitude]	Instruction to report when the aircraft is within the specified vertical range.	R
130	REPORT PASSING [position]	Instruction to report when the aircraft has passed the specified position.	R
181	REPORT DISTANCE [to/from] [position]	Instruction to report the present distance to or from the specified position.	NE
131	REPORT REMAINING FUEL AND SOULS ON BOARD	Instruction to report the amount of fuel remaining and the number of persons on board.	NE
132	CONFIRM POSITION	Instruction to report the present position.	NE
133	CONFIRM ALTITUDE	Instruction to report the present level.	NE
134	CONFIRM SPEED	Instruction to report the present speed.	NE
135	CONFIRM ASSIGNED ALTITUDE	Instruction to confirm and acknowledge the currently assigned level.	NE
136	CONFIRM ASSIGNED SPEED	Instruction to confirm and acknowledge the currently assigned speed.	NE
137	CONFIRM ASSIGNED ROUTE	Instruction to confirm and acknowledge the currently assigned route.	NE
138	CONFIRM TIME OVER REPORTED WAYPOINT	Instruction to confirm the previously reported time over the last reported waypoint.	NE
139	CONFIRM REPORTED WAYPOINT	Instruction to confirm the identity of the previously reported waypoint.	NE
140	CONFIRM NEXT WAYPOINT	Lnstruction to confirm the identity of the next waypoint.	NE
141	CONFIRM NEXT WAYPOINT ETA	Instruction to confirm the previously reported estimated time at the next waypoint.	NE
142	CONFIRM ENSUING WAYPOINT	Instruction to confirm the identity of the next plus one waypoint.	NE
143	CONFIRM REQUEST	The request was not understood. It should be clarified and resubmitted.	NE

Uplink - Report/Confirmation Requests Continued

144	CONFIRM SQUAWK	Instruction to report the currently selected transponder code.	NE
145	CONFIRM HEADING	Instruction to report the present heading.	NE
146	CONFIRM GROUND TRACK	Instruction to report the present ground track.	NE
182	CONFIRM ATIS CODE	Instruction to report the identification code of the last ATIS received.	NE
147	REQUEST POSITION REPORT	Instruction to make a position report. *To be used if the controller does not receive a scheduled position report.*	NE

Uplink - Negotiation Requests

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
148	WHEN CAN YOU ACCEPT [altitude]	Request for the earliest time at which the specified level can be accepted.	NE
149	CAN YOU ACCEPT [altitude] AT [position]	Instruction to report whether or not the specified level can be accepted at the specified position.	A/N
150	CAN YOU ACCEPT [altitude] AT [time]	Instruction to report whether or not the specified level can be accepted at the specified time.	A/N
151	WHEN CAN YOU ACCEPT [speed]	Instruction to report the earliest time when the specified speed can be accepted.	NE
152	WHEN CAN YOU ACCEPT [direction] [distance offset] OFFSET	Instruction to report the earliest time when the specified offset track can be accepted.	NE

Uplink - Air Traffic Advisories

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
153	ALTIMETER [altimeter]	ATS advisory that the altimeter setting should be the specified setting.	R
154	RADAR SERVICES TERMINATED	ATS advisory that the radar service is terminated.	R
155	RADAR CONTACT [position]	ATS advisory that radar contact has been established at the specified position.	R
156	RADAR CONTACT LOST	ATS advisory that radar contact has been lost.	R
157	CHECK STUCK MICROPHONE [frequency]	A continuous transmission is detected on the specified frequency. Check the microphone button.	R
158	ATIS [atis code]	ATS advisory that the ATIS information identified by the specified code is the current ATIS information.	R

Uplink - System Management Messages

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
159	ERROR [error information]	A system generated message that the ground system has detected an error.	NE
160	NEXT DATA AUTHORITY [facility designation]	Notification to the avionics that the next data authority is the specified ATSU.	NE
161	END SERVICE	Notification to the avionics that the data link connection with the current data authority is being terminated.	NE
162	SERVICE UNAVAILABLE	Notification that the ground system does not support this message.	NE
163	[icao facility designation] [tp4Table]	Notification to the pilot of an ATSU identifier.	NE

Uplink - Additional Messages

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
164	WHEN READY	The associated instruction may be complied with at any future time.	NE
165	THEN	Used to link two messages, indicating the proper order of execution of clearances/ instructions.	NE
166	DUE TO TRAFFIC	The associated instruction is issued due to traffic considerations.	NE
167	DUE TO AIRSPACE RESTRICTION	The associated instruction is issued due to airspace restrictions.	NE
168	DISREGARD	The indicated communication should be ignored. *The previously sent uplink CPDLC message shall be ignored. DISREGARD should not refer to a clearance or instruction. If DISREGARD is used, another element shall be added to clarify which message is to be disregarded.*	R
176	MAINTAIN OWN SEPARATION AND VMC	Notification that the pilot is responsible for maintaining separation from other traffic and is also responsible for maintaining Visual Meteorological Conditions.	W/U
177	AT PILOTS DISCRETION	Used in conjunction with a clearance or instruction to indicate that the pilot may execute when prepared to do so.	N
169	[free text]	*Normal urgency attribute*	R
170	[free text]	*Distress urgency attribute*	R

Downlink - Responses

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
0	WILCO	The instruction is understood and will be complied with.	N
1	UNABLE	The instruction cannot be complied with.	N
2	STANDBY	Wait for a reply. *The controller is informed that the request is being assessed and there will be a short term delay (within 10 minutes). The exchange is not closed and the request will be responded to when conditions allow.*	N
3	ROGER	Message received and understood. *ROGER is the only correct response to an uplink free text message. Under no circumstances will ROGER be used instead of AFFIRM.*	N
4	AFFIRM	Yes *AFFIRM is an appropriate response to an uplinked negotiation request message (e.g. CAN YOU ACCEPT [altitude] AT [time]).*	N
5	NEGATIVE	No *NEGATIVE is an appropriate response to an uplinked negotiation request message (e.g. CAN YOU ACCEPT [altitude] AT [time]).*	N

Downlink - Vertical Requests

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
6	REQUEST [altitude]	Request to fly at the specified level.	Y
7	REQUEST BLOCK [altitude] TO [altitude]	Request to fly at a level within the specified vertical range.	Y
8	REQUEST CRUISE CLIMB TO [altitude]	Request to cruise climb to the specified level. *Due to different interpretations between the various ATS units, this element should be avoided.*	Y
9	REQUEST CLIMB TO [altitude]	Request to climb to the specified level.	Y
10	REQUEST DESCENT TO [altitude]	Request to descend to the specified level.	Y
11	AT [position] REQUEST CLIMB TO [altitude]	Request that at the specified position a climb to the specified level be approved.	Y
12	AT [position] REQUEST DESCENT TO [altitude]	Request that at the specified position a descent to the specified level be approved.	Y
13	AT [time] REQUEST CLIMB TO [altitude]	Request that at the specified time a climb to the specified level be approved.	Y
14	AT [time] REQUEST DESCENT TO [altitude]	Request that at the specified time a descent to the specified level be approved.	Y

Downlink - Lateral Off-Set Requests

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
15	REQUEST OFFSET [direction] [distance offset] OF ROUTE	Request that a parallel track, offset from the cleared track by the specified distance in the specified direction, be approved.	Y
16	AT [position] REQUEST OFFSET [direction] [distance offset] OF ROUTE	Request that a parallel track, offset from the cleared track by the specified distance in the specified direction, be approved from the specified position.	Y
17	AT [time] REQUEST OFFSET [direction] [distance offset] OF ROUTE	Request that a parallel track, offset from the cleared track by the specified distance in the specified direction, be approved from the specified time.	Y

Downlink - Speed Requests

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
18	REQUEST [speed]	Request to fly at the specified speed.	Y
19	REQUEST [speed] TO [speed]	Request to fly within the specified speed range.	Y

Downlink - Voice Contact Requests

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
20	REQUEST VOICE CONTACT	Request for voice contact.	Y
21	REQUEST VOICE CONTACT [frequency]	Request for voice contact on the specified frequency.	Y

Downlink - Route Modification Requests

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
22	REQUEST DIRECT TO [position]	Request to track from the present position direct to the specified position.	Y
23	REQUEST [procedure name]	Request for the specified procedure clearance.	Y
24	REQUEST [route clearance]	Request for a route clearance.	Y
25	REQUEST CLEARANCE	Request for either a pre-departure or route clearance.	Y
26	REQUEST WEATHER DEVIATION TO [position] VIA [route clearance]	Request for a weather deviation to the specified position via the specified route.	Y
27	REQUEST WEATHER DEVIATION UP TO [direction] [distance offset] OF ROUTE	Request for a weather deviation up to the specified distance off track in the specified direction.	Y
70	REQUEST HEADING [degrees]	Request a clearance to adopt the specified heading.	Y
71	REQUEST GROUND TRACK [degrees]	Request a clearance to adopt the specified ground track.	Y

Downlink - Reports

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
28	LEAVING [altitude]	Notification of leaving the specified level.	N
29	CLIMBING TO [altitude]	Notification of climbing to the specified level.	N
30	DESCENDING TO [altitude]	Notification of descending to the specified level.	N
31	PASSING [position]	Notification of passing the specified position.	N
78	AT [time] [distance] [to/from] [position]	At the specified time, the aircraft's position was as specified.	N
32	PRESENT ALTITUDE [altitude]	Notification of the present level.	N
33	PRESENT POSITION [position]	Notification of the present position.	N
34	PRESENT SPEED [speed]	Notification of the present speed.	N
35	PRESENT HEADING [degrees]	Notification of the present heading in degrees.	N
36	PRESENT GROUND TRACK [degrees]	Notification of the present ground track in degrees.	N
37	LEVEL [altitude]	Notification that the aircraft is maintaining the specified level.	N
72	REACHING [altitude]	Notification that the aircraft has reached the specified level.	N
76	REACHING BLOCK [altitude] TO [altitude]	Notification that the aircraft has reached a level within the specified vertical range.	N
38	ASSIGNED ALTITUDE [altitude]	Read-back of the assigned level.	N
77	ASSIGNED BLOCK [altitude] TO [altitude]	Read-back of the assigned vertical range.	N
39	ASSIGNED SPEED [speed]	Read-back of the assigned speed.	N
40	ASSIGNED ROUTE [route clearance]	Read-back of the assigned route.	N
41	BACK ON ROUTE	The aircraft has regained the cleared route.	N
42	NEXT WAYPOINT [position]	The next waypoint is the specified position.	N
43	NEXT WAYPOINT ETA [time]	The ETA at the next waypoint is as specified.	N
44	ENSUING WAYPOINT [position]	The next plus one waypoint is the specified position.	N
45	REPORTED WAYPOINT [position]	Clarification of previously reported waypoint passage.	N
46	REPORTED WAYPOINT [time]	Clarification of time over previously reported waypoint.	N
47	SQUAWKING [beacon code]	The specified (SSR) code has been selected.	N

Downlink - Reports Continued

48	POSITION REPORT [position report]	Reports the current position of the aircraft when the pilot presses the button to send this message. *ATC expects position reports based on this downlink message*	N
79	ATIS [atis code]	The code of the latest ATIS received is as specified.	N
80	DEVIATING [direction] [distance offset] OF ROUTE	Notification that the aircraft is deviating from the cleared route by the specified distance in the specified direction.	N

Downlink - Negotiation Requests

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
49	WHEN CAN WE EXPECT [speed]	Request for the earliest time at which a clearance to the specified speed can be expected.	Y
50	WHEN CAN WE EXPECT [speed] TO [speed]	Request for the earliest time at which a clearance to a speed within the specified range can be expected.	Y
51	WHEN CAN WE EXPECT BACK ON ROUTE	Request for the earliest time at which a clearance to regain the planned route can be expected.	Y
52	WHEN CAN WE EXPECT LOWER ALTITUDE	Request for the earliest time at which a clearance to descend can be expected.	Y
53	WHEN CAN WE EXPECT HIGHER ALTITUDE	Request for the earliest time at which a clearance to climb can be expected.	Y
54	WHEN CAN WE EXPECT CRUISE CLIMB TO [altitude]	Request for the earliest time at which a clearance to cruise climb to the specified level can be expected.	Y

Downlink - Emergency Messages

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
55	PAN PAN PAN	Urgency prefix.	N
56	MAYDAY MAYDAY MAYDAY	Distress prefix.	N
57	[remaining fuel] OF FUEL REMAINING AND [souls on board] SOULS ON BOARD	Notification of fuel remaining and number of persons on board.	N
58	CANCEL EMERGENCY	Notification that the pilot wishes to cancel the emergency condition.	N
59	DIVERTING TO [position] or DIVERTING TO [position] VIA [x]	Notification that the aircraft is diverting to the specified position via the specified route.	N
60	OFFSETTING [direction] [distance offset] OF ROUTE	Notification that the aircraft is deviating the specified distance in the specified direction off the cleared route and maintaining a parallel track.	N
61	DESCENDING TO [altitude]	Notification that the aircraft is descending to the specified level.	N

Downlink -System Management Messages

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
62	ERROR [error information]	A system generated message that the avionics has detected an error.	N
63	NOT CURRENT DATA AUTHORITY	A system generated denial to any CPDLC message sent from a ground facility that is not the Current Data Authority.	N
64	[icao facility designation]	Notification to the ground system that the specified ATSU is the current data authority.	N
73	[version number]	A system generated message indicating the software version number.	N

Downlink -Additional Messages

DL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
65	DUE TO WEATHER	Used to explain reasons for aircraft operator’s message.	N
66	DUE TO AIRCRAFT PERFORMANCE	Used to explain reasons for aircraft operator's message.	N
74	MAINTAIN OWN SEPARATION AND VMC	States a desire by the pilot to provide his/her own separation and remain in VMC.	N
75	AT PILOTS DISCRETION	Used in conjunction with another message to indicate that the pilot wishes to execute the request when the pilot is prepared to do so.	N
67	[free text]	*Normal urgency attribute*	N
67b	WE CAN ACCEPT [altitude] AT [time]	We can accept the specified level at the specified time.	N
67c	WE CAN ACCEPT [speed] AT [time]	We can accept the specified speed at the specified time.	N
67d	WE CAN ACCEPT [direction] [distance offset] AT [time]	We can accept a parallel track offset the specified distance in the specified direction at the specified time.	N
67e	WE CANNOT ACCEPT [altitude]	We cannot accept the specified level.	N
67f	WE CANNOT ACCEPT [speed]	We cannot accept the specified speed.	N
67g	WE CANNOT ACCEPT [direction] [distance offset]	We cannot accept a parallel track offset the specified distance in the specified direction.	N
67h	WHEN CAN WE EXPECT CLIMB TO [altitude]	Request for the earliest time at which a clearance to climb to the specified level can be expected.	N
67i	WHEN CAN WE EXPECT DESCENT TO [altitude]	Request for the earliest time at which a clearance to descend to the specified level can be expected.	N
68	[free text]	*Distress urgency attribute*	Y

APPENDIX 2 – FANS-1/A CPDLC STANDARD FREE TEXT MESSAGES

This appendix contains a complete listing of the standard free text messages and intent for FANS-1/A CPDLC.

RESPONDING TO A STANDARDIZED FREE TEXT

When a free text uplink message has been received, the pilot should respond with the QUICK RESPONSE from the table before responding to the message.

Uplink - Free Text Report/ Confirmation Requests

	FREE TEXT MESSAGE	**QUICK RESPONSE**
Controller	REPORT SIGHTING AND PASSING OPPOSITE DIRECTION [traffic description] ETP [time] *The traffic description is to be inserted by the controller and shall include the aircraft identification (callsign), flight level and aircraft type. ETP = Estimated Time of Passing.* *Example of the traffic description: SIA228 B747 FL370*	
Pilot Response	[traffic identification] SIGHTED AND PASSED *Example - SIA228 SIGHTED AND PASSED* **Or** [traffic identification] NOT SIGHTED	**ROGER**
Message Intent	The controller is requesting that the pilot notify when the specified traffic has been seen by visual contact and passed. The level specified in the traffic description is the level being maintained by the opposite direction aircraft.	

	FREE TEXT MESSAGE	**QUICK RESPONSE**
Controller	REPORT GROUND SPEED	
Pilot Response	G/S [speed] *Example - G/S 490*	**ROGER**
Message Intent	The controller is requesting that the pilot report the present ground speed.	

	FREE TEXT MESSAGE	**QUICK RESPONSE**
Controller	REQUEST PREFERRED FLIGHT LEVEL	
Pilot Response	FL [altitude] *Example - FL 350*	**ROGER**
Message Intent	The controller is requesting that the pilot advise the preferred flight level for the flight.	

Uplink - Free Text Report/ Confirmation Requests Continued

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	REPORT ESTIMATE [place name / waypoint] *Example - REQUEST ESTIMATE BILBO*	
Pilot Response	[place name / waypoint] [time] *Example - BILBO 0413*	**ROGER**
Message Intent	The controller is requesting an estimate for the specified waypoint.	

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	WHEN WILL YOU MAINTAIN FL [altitude]	
Pilot Response	FL [altitude] AT [time] *Example - FL 350 AT 2317*	**ROGER**
Message Intent	The controller is requesting from the pilot the time at which the aircraft will maintain the specified level.	

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	AT WHAT DISTANCE [position / waypoint] WILL YOU MAINTAIN FL [altitude]	
Pilot Response	FL [altitude] AT [distance] NM [direction] [position / waypoint] *Example - FL 350 AT 26 NM W IPEMA*	**ROGER**
Message Intent	The controller is requesting the distance from the specified position or waypoint at which the aircraft will maintain the specified level. The pilot shall include the direction from the waypoint as a cardinal point, e.g. N, NE, NW, S, SW, SE, E or W.	

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	REPORT RADIAL AND DISTANCE [to/from] [position]	
Pilot Response	[radial] R [distance] NM [to/from] [position] *Example - 320 R 26 NM FROM MCY*	**ROGER**
Message Intent	The controller is requesting that the pilot report the radial on which the aircraft is proceeding and the distance from the specified VOR.	

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	REQUEST VOICE CONTACT [frequency]	
Pilot Response		**ROGER**
Message Intent	The controller is requesting that the pilot makes voice contact / radio check call on the specified frequency.	

Uplink - Free Text Instructions

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	CHECK ATC LOG PAGE FOR OPEN MESSAGES	
Pilot Response		**ROGER**
Message Intent	The controller has detected that uplink messages exist that the pilot has not yet responded to. The pilot is required to check the ATC log page and to respond to unanswered uplink messages.	

Uplink - Freetext Advisories

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	EXPECT SELCAL CHECK HF [frequency]	
Pilot Response		**ROGER**
Message Intent	The controller is notifying the pilot that a selcal check will be made on the specified HF frequency.	

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	EXPECT CPDLC TRANSFER AT [time]	
Pilot Response		**ROGER**
Message Intent	The controller is notifying the pilot that the CPDLC transfer process will not be completed at the FIR boundary and will be delayed until the specified time. If the CPDLC transfer is not completed by the specified time, the pilot shall manually disconnect and logon to the next centre.	

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	EXPECT NEXT CENTER [ATSU name]. CONTACT WITH [ATSU name] NOT REQUIRED	
Pilot Response		**ROGER**
Message Intent	The controller is notifying the pilot that CPDLC connection is not required by the next FIR (where the flight's transition time of that FIR is short) and CPDLC connection will be transferred to the subsequent FIR.	

The [ATSU name] is the relevant four character ICAO code.

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	TRAFFIC IS [traffic description]	
Pilot Response	(optional) TRAFFIC SIGHTED	**ROGER**
Message Intent	The controller is notifying the pilot of traffic significant to the flight. The description will include the aircraft type and any other relevant information to assist the pilot in sighting the traffic. The pilot may respond that the traffic has been sighted.	

Uplink - Freetext Advisories continued

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	SECONDARY HF [frequency]	
Pilot Response		**ROGER**
Message Intent	The controller is notifying the pilot of the secondary HF frequency for the area.	

Uplink - Free Text Speed Messages

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	EXPECT TO MAINTAIN [speed] UNTIL [time / position]	
Pilot Response		**ROGER**
Message Intent	The controller is notifying the pilot that a speed instruction may be issued to be effective until the specified time.	

Uplink - Free Text Emergency Acknowledgment

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	ROGER MAYDAY	
Pilot Response		**ROGER**
Message Intent	The controller has acknowledged receipt of a MAYDAY downlink message. The controller shall attempt to make voice contact with the pilot. The pilot should only respond with ROGER if or when able to do so. If the aircraft is inbound to an airport within the FIR, a ROGER response is not required.	

	FREE TEXT MESSAGE	QUICK RESPONSE
Controller	ROGER PAN	
Pilot Response		**ROGER**
Message Intent	The controller has acknowledged receipt of a PAN downlink message. The controller shall attempt to make voice contact with the pilot. The pilot should only respond with ROGER if or when able to do so. If the aircraft is inbound to an airport within the FIR, a ROGER response is not required.	

Downlink - Free Text Advisories

	FREE TEXT MESSAGE	RESPONSE
Pilot	WAKE DEV [direction] *Direction L or R (left or right) as appropriate*	
Controller Response		**ROGER**
Message Intent	The pilot is offsetting due wake turbulence in accordance with RVSM procedures (offset will not exceed 2nm). The controller is not required to respond or issue a clearance.	

	FREE TEXT MESSAGE	RESPONSE
Pilot	REVISED ETA [position] [time]	
Controller Response		**ROGER**
Message Intent	The pilot is advising ATC of an update a waypoint ETA.	

GUIDANCE MATERIAL ON CNS/ATM OPERATIONS
IN THE ASIA/PACIFIC REGION

PART III – SYSTEM OPERATIONS

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CHAPTER 4 - ADS PROCEDURES

CHAPTER 4

ADS PROCEDURES

1 INTRODUCTION

In the CNS/ATM environment, surveillance is provided by automatic dependent surveillance (ADS). The implementation of ADS provides surveillance capability in oceanic and en-route continental airspace and is intended to replace CPDLC and verbal position reporting in areas where non-radar separation is currently applied. In non-radar airspace, the effective use of ADS in the provision of air traffic services enhances flight safety, facilitates the reduction of separation minima and better accommodates user-preferred flight profiles.

ADS allows the establishment of communication contracts between ground systems and an aircraft's avionics system. An ADS contract that establishes the requirements for ADS data reporting and the frequency of the ADS reports.

2 ADS DESCRIPTION

Three types of ADS contracts can be established with an aircraft. Each of these contracts operates independently from the others. These contracts are the:

- Periodic;
- Event; and
- Demand.

The establishment of ADS contracts is initiated by the ground system and does not require pilot action providing that the airborne system is armed. The pilot has the ability to cancel all contracts by turning off ADS.

2.1 THE PERIODIC CONTRACT

The periodic contract allows an ATSU to specify the reporting frequency, to request that optional data groups be added to the basic ADS report, and to specify the frequency at which the optional groups are to be included in the reports.

The periodic reporting rate can generally be altered by the controller to allow for situations such as traffic density where a higher (or lower) reporting rate may be required. Only one periodic contract can be established between a ground system and a particular aircraft at any one time. Whenever a new periodic contract is established, the previous periodic contract is replaced. The periodic contract will remain in effect until it is modified or cancelled.

2.2 THE EVENT CONTRACT

An event contract specifies a request for reports to be transmitted by the aircraft whenever a defined “event” occurs. Only one event contract can be established between a ground system and a particular aircraft at any one time, however the event contract can contain multiple event types.

Once an event contract has been established, it remains in effect until the specific event requests are fulfilled, or it is cancelled by the ground system.

The **Vertical Rate Change Event** is triggered when the aircraft's vertical rate is either less than or greater than a parameter defined in the contract.

The **Lateral Deviation Change Event** is triggered when the aircraft's actual position exceeds a lateral distance parameter from the aircraft's expected position on the active flight plan.

The **Altitude Range Change Event** is triggered when the aircraft's altitude exceeds the altitude ceiling or floor defined in the contract by the ground system.

Once a vertical rate change, lateral deviation change, or altitude range event trigger has occurred, a recurrence of this event no longer triggers an event report. The ground system must initiate a new event contract every time that one of these specific events occurs.

The **Waypoint Change Event** is triggered by a change to the next or the next-plus-one waypoints. Such a change normally occurs due to routine waypoint sequencing. However, it will also be triggered by a change to a non-ATS waypoint entered by the pilot for operational reasons. Unlike the other event contracts, the waypoint change event trigger remains in effect for all waypoint changes.

2.3 THE DEMAND CONTRACT

The demand contract is a "one-off" request from the ground system for the FMS to provide an ADS report containing specific data as defined in the request. A demand contract can be requested by the ground system at any time. The demand contract request will not affect any existing contracts.

2.4 EMERGENCY MODE

The emergency mode can only be activated by the pilot and is normally cancelled by the pilot. While it is possible for some ground systems to cancel the emergency mode status, most ground systems do not have this capability. Some ground systems can, however, control the "display" of the emergency mode status to the controller. The pilot normally activates the ADS emergency mode automatically by sending a CPDLC emergency message. In some circumstances, the ADS emergency mode can be set independently. When the ADS emergency mode is set, the FMS immediately sends a message that contains an emergency flag that is interpreted by all ground systems that currently have periodic or event contracts established with that aircraft. The aircraft does not automatically send an ADS report at the time that the emergency mode is set.

The Boeing implementation of ADS in the 747-400, 757, 767 and 777 aircraft sets a default periodic reporting rate at five minutes if a periodic contract is not already in place with the ground system. If a periodic contract is already in place, the FMS will add an emergency flag to the periodic contract reports and the periodic reporting rate will remain unchanged. Existing contracts are unaffected.

When the pilot cancels the emergency mode, the FMS sends a cancel emergency mode message to each ground station receiving the emergency mode reports. Existing contracts are unaffected by the emergency cancellation.

3 FACTORS TO BE CONSIDERED WHEN USING ADS

3.1 VERTICAL AND LATERAL VARIATIONS

Where the Altitude Range Change Event and Lateral Deviation Event contracts are established, the controller will only be alerted to vertical or lateral variations that exceed the associated tolerances.

3.2 FIGURE OF MERIT (FOM) DATA IN ADS REPORTS

ADS reports contain FMS information relating to the Figure of Merit (FOM), ACAS/TCAS and the aircraft's navigational redundancy. Some automated ground systems use the FOM value received in an ADS report to determine whether to display the report to controllers, or to display a "high" or "low" quality ADS symbol.

FOM data is **not** required for the use of current separation standards. However, where the separation standard being applied requires specific navigational accuracy, such as RNP, controllers should rely on pilot advice as to the extent of any navigational degradation and should adjust separation accordingly.

3.3 FLIGHT CREW MODIFICATION OF ACTIVE ROUTE

The flight crew will often insert non-ATS waypoints into the active flight plan in the FMS for flight system monitoring, or will modify the active route for planning purposes. Once the change is activated, a waypoint event report will be triggered. Non-ATS waypoints included in the active flight plan will be reflected in the Predicted Route Group, which may result in the next, or next-plus-one waypoints from the report differing from the waypoints expected based on the ATS flight plan or flight data record.

4 ADS CONNECTION MANAGEMENT

4.1 PRIORITY FOR THE ADS CONNECTION

FANS-1/A equipped aircraft can have up to five ADS connections. One of the five connections is reserved for use by the AOC. The aircraft has the capacity to report to four different ATSUs simultaneously using ADS.

The FANS-1/A system does not assign any technical priority to ADS connections; therefore the controlling ATSU may not be aware of other connections established with the aircraft. As a result, a procedural hierarchy controlled by the address forwarding process (FN_CAD message) has been established.

4.1.1 Allocation of ADS connections

Using the address forwarding process, the current controlling authority should allocate ADS connection priority to the next ATSU that will have ATC responsibility for the aircraft. The priority for the allocation of ADS connections should be in accordance with the following list:

1. The Current Data Authority,
2. The Next Data Authority,
3. An ATSU requiring a connection for monitoring operations close to a boundary,
4. Airline AOC
5. Other miscellaneous connections.

4.2 NEAR BOUNDARY ADS CONNECTIONS

4.2.1 Monitoring of an aircraft operating close to an airspace boundary

When an aircraft will operate within the defined coordination parameter of the boundary with an adjacent ADS-capable FIR, controllers should determine during coordination whether that ATSU requires an ADS contract to monitor the aircraft's progress near the boundary.

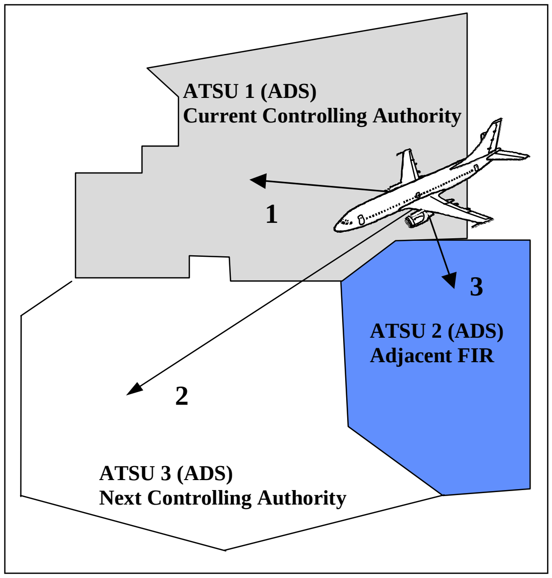


Figure 1: Priorities for ADS connections

An ADS contract is required by ATSU 2 to monitor the aircraft's progress near the FIR boundary. To ensure that the next unit with direct control responsibility for the aircraft has priority over the ADS connections, address forwarding to ATSU 3 will be initiated by ATSU 1 prior to address forwarding to ATSU 2.

4.2.2 Other ground facilities requesting ADS contracts

All ground facilities, that seek an ADS contract with a specific aircraft and do not have a requirement for direct control or monitoring of that aircraft (e.g., for ADS test purposes) must coordinate with the controlling authorities and the operator prior to the departure of the flight.

4.3 ADS CONNECTIONS NOT AVAILABLE

When all available ADS connections with a particular aircraft have been established (see Figure 2), any other ATSUs attempting to connect with the aircraft will receive an ADS DISCONNECT REQUEST message with "reason code 1" (Congestion).

When an ADS DISCONNECT REQUEST is received by an ATSU which would normally have priority for an ADS connection, the current controlling authority should be notified. The controlling authority should resolve the situation.

The controlling authority has a number of options available, such as coordination with the previous ATSU or other adjacent ATSUs to ensure that existing ADS connections are still required, or when considered absolutely necessary, instructing the pilot to turn the ADS application off and turn it on again. The latter option will terminate all current ADS contracts;

therefore, the controlling authority should consider the operational effect on other ATSUs prior to employing this method.

Once all contracts have been terminated, the controlling authority should allocate priority for the connections to other ATSUs via the address forwarding process. Only ATSUs with direct control or monitoring responsibilities should re-establish contracts with the aircraft.

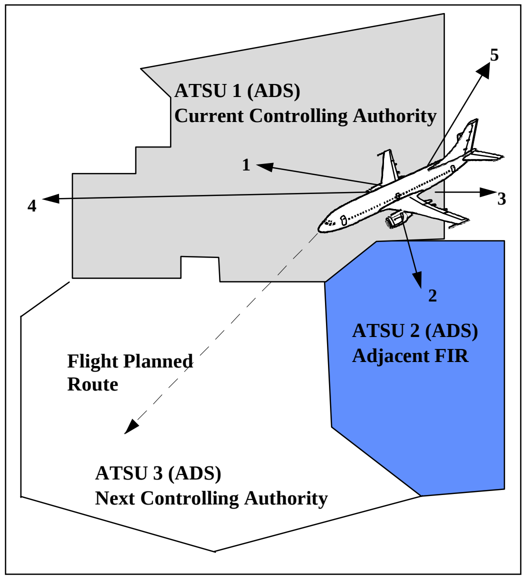


Figure 2: ADS connection not available

The aircraft has ADS connections with four ground facilities and the airline AOC:
Connection: 1 - *with ATSU 1,*
2 - *with ATSU 2,*
3 - *with the previous controlling authority,*
4 - *with the airline AOC,*
5 - *with a ground facility collecting test data.*

ATSU 3, the next controlling authority, is unable to establish an ADS connection with the aircraft due to congestion.

4.4 GROUND SYSTEM TERMINATION OF ADS CONNECTIONS

The termination of ADS contracts with an aircraft, whether performed automatically or manually, should be strictly monitored to avoid situations leading to congestion. ADS contracts and connections should be terminated by the ground system when the:

- Aircraft has crossed an FIR boundary and has passed beyond the normal “back coordination” parameter; or
- Aircraft’s flight plan has been cancelled or has finished; or
- Previous ATSU, the controlling authority or an adjacent ATSU has no further surveillance or monitoring requirements for a particular flight.

5 REPORTING RATES

5.1 GENERAL

There are a number of situations where a controller may consider the use of a reporting rate other than that used as the default in the periodic reporting contract. Some automated systems have the capability of defining reporting rates that can automatically change from one area to another along the route segment to take into account changes in traffic density along the route.

Where the ground system does not contain the ability to automatically change the reporting rate, the controller should take action, where possible, to manually change the periodic reporting rate when operationally required. Some examples where a change to the rate may be required are:

- When the aircraft is approaching a crossing route on which there is other traffic;
- When the aircraft is approaching areas of known significant weather;
- During periods of turbulence; or
- When an unauthorized deviation from the clearance is detected.

5.2 APPROPRIATE REPORTING RATES

ATSUs should ensure that the periodic reporting rate in use is in accordance with the position reporting requirements of the separation standard being used. When not required for the application of a particular separation standard, or other factors, ATSUs should consider using less frequent periodic reporting rates for individual aircraft to reduce overall costs to the system.

5.3 AVOID HIGH PERIODIC REPORTING RATES

Arbitrarily selecting high periodic reporting rates adds undue economic costs and unnecessarily loads the data link system.

5.4 OTHER FACTORS TO BE CONSIDERED

Depending on individual circumstances, the controlling authority should limit the periodic reporting rate to not more frequently than five (5) minutes. Adjacent ATSUs with ADS contracts established with the same aircraft should restrict the periodic reporting rate to not more frequently than 15 minutes unless coordination is performed with the controlling authority and the controlling authority agrees to reduce any relatively high reporting rate currently in effect.

5.5 DEFAULT PERIODIC REPORTING RATES

When setting a default periodic reporting rate, ATSUs should take into account factors such as conformance with ATC clearance requirements, traffic levels, alerting service requirements, and separation standard requirements.

6 SEPARATION

ADS may be used for the application of procedural separation within a mixed surveillance environment, such as airspace where position reports are provided by a mixture of ADS, CPDLC and voice. For example, ADS may be used to determine separation between two or more aircraft reporting by ADS, between ADS and non-ADS aircraft, between ADS aircraft and an aircraft identified on radar, and to ensure separation between ADS aircraft and special use airspace, such as military restricted areas.

NOTE: States should consult the latest ICAO provisions prior to implementing procedures for the use of ADS.

6.1 APPROPRIATE ADS REPORTING REQUIREMENTS

When position reporting is being provided via ADS, to ensure that estimates being used for the application of separation are accurate ATSUs should establish appropriate:

- ADS contracts; and
- Periodic reporting frequencies.

6.2 APPROPRIATE SEPARATION STANDARD

A separation standard to be applied in a mixed surveillance environment must be appropriate to the communications and navigational capability of the relevant aircraft. In the case of separation being applied between ADS and non-ADS aircraft, the separation standard must be appropriate to the capabilities of the non-ADS aircraft.

6.3 VERTICAL SEPARATION

6.3.1 Vertical tolerance consistency

Where practical, the tolerances used to determine whether a specific level is occupied by an ADS reporting aircraft within the airspace of a specific ATSU should be consistent with other tolerances used throughout the airspace. For example, the vertical tolerances for ADS should be consistent with vertical tolerances used for level adherence monitoring by other forms of surveillance, such as radar.

6.3.2 Application of vertical tolerances

Where other vertical tolerances do not exist, the vertical tolerances to be applied for ADS should be (±) 300 feet. However, an individual ATSU may specify in local instructions and the AIP that a tolerance of not less than (±) 200 feet will be used to provide consistency with other vertical tolerances applied within the FIR.

6.3.3 ADS level information does not satisfy vertical tolerance

If displayed ADS level information does not satisfy the required tolerance for an individual ATSU then the pilot should be advised accordingly and requested to confirm the aircraft's level. If following confirmation of the level the displayed ADS level information is still beyond the required tolerance, another method of separation or another method of determining level information may need to be applied.

6.3.4 Use of ADS level information

When displayed ADS level information is within the specified tolerance of the expected or cleared flight level, the ADS level information may be used for the application of vertical separation, and to determine that an aircraft has reached or is maintaining a specified level.

6.3.5 Passing or leaving a level

An aircraft can be considered to have left a specified level when the displayed ADS level information indicates that the aircraft has passed the level in the required direction by more than the required tolerance.

6.4 LONGITUDINAL SEPARATION

6.4.1 Limitations on the use of tools
ATSUs that use approved or integrated measurement tools for the purpose of determining screen-based separation should publish any limitations on the use of such tools for the establishment and monitoring of separation standards in local documentation.

6.4.2 Establishing longitudinal separation
ADS reports may be used to establish and monitor longitudinal time and distance separation standards.

6.4.3 Using extrapolated or interpolated positions
Some ground systems display an extrapolated or interpolated ADS symbol between the receipt of ADS reports. Providing that the periodic reporting rate in use is in accordance with any reporting rate required by the separation standard, separation may be determined between the extrapolated/interpolated symbols by the use of screen-based measurement tools, or by the use of automated conflict detection tools.

6.4.4 Validity of displayed information
When extrapolated or interpolated ADS symbols are being used to provide separation and any doubt exists as to the integrity or validity of the information being presented, the controller should send a Demand Contract Request to update the relevant information. If doubt still exists, the controller should consider use of an alternative method of separation.

6.4.5 Time-based separation
Ground system flight data systems updated by ADS reports may be used in the application of appropriate time-based separation standards. Methods of determination may include reference to:

- Estimates at actual waypoints;
- Calculated estimates for positions not contained in the ATS flight plan;
- Screen-based measurement tools; or
- Automated conflict detection tools.

6.4.6 Distance-based separation
ADS reports may be used for the application of appropriate longitudinal distance standards. Methods of determination may include:

- The use of automated system tools to measure the displayed positions of two or more aircraft reporting by ADS;
- Comparing the displayed position of an ADS aircraft with the position of another aircraft determined by an alternative form of surveillance; or
- The use of automated conflict detection tools.

6.5 LATERAL SEPARATION

6.5.1 Areas of lateral conflict
ADS reports can be used to determine whether an aircraft is within or beyond an area of lateral conflict. Where lateral conflict calculations are not made by automated conflict detection tools, an ADS report or extrapolated symbol observed outside an area of lateral conflict displayed or calculated on the screen is confirmation that the aircraft is outside the area of conflict.

7 AIR TRAFFIC CLEARANCE MONITORING

ADS reports can be used to monitor conformance with air traffic clearances. The pilot of an ADS aircraft observed to deviate significantly from its cleared flight profile should be advised accordingly. The controller should also take action as appropriate if such deviation is likely to affect the air traffic service being provided.

8 COORDINATION

8.1 DUTY OF CARE RESPONSIBILITY

ATSUs should be aware of Duty of Care responsibility issues when ADS and other technologies allow the surveillance of aircraft and the possible detection of conflicts inside another ATSU's airspace. Local ATS instructions and/or letters of agreement between units should detail the coordination response required from one ATSU in the case of a suspected conflict being detected in the adjacent ATSU's airspace.

8.2 COORDINATED DATA INCONSISTENT WITH ADS DISPLAYED DATA

The transferring controller should advise during coordination if the aircraft is currently at a level or on a route different from that intended for the boundary crossing. When the coordination information relating to the transfer of control is different from the displayed ADS information and the required advice has not been provided, the receiving controller should confirm the coordinated information with the transferring controller.

9 ALERTING SERVICE

For ADS-equipped aircraft, the provision of the alerting service should be based on the scheduled position reports provided by the periodic reporting contract.

9.1 LATE OR MISSING ADS REPORTS

Whenever an ADS report (either a periodic or waypoint report) is not received within a parameter of the expected time, the controller should initiate a demand contract request or establish a new periodic contract with the aircraft.

10 AIRCRAFT NAVIGATION

10.1 AIRCRAFT IN HEADING SELECT MODE

When the aircraft is in Heading Select Mode, the intent and predicted route information being transmitted by the aircraft will project towards the next FMS flight plan waypoint regardless of the actual position and heading of the aircraft. Predicted information is based on the FMS intent, which may not necessarily be the intent of the pilot.

If the aircraft is in Heading Select Mode, and the aircraft passes abeam a flight planned waypoint by more than a defined parameter the FMS will not sequence this or subsequent waypoints. The effect on a ground system of a waypoint that has not been sequenced is that the intent information, once the aircraft has passed the waypoint, will be directed back towards the non-sequenced waypoint. As a result, some ground systems may see an extrapolated symbol move in a different direction to the actual track of the aircraft.

10.2 SEQUENCING SUBSEQUENT WAYPOINTS

If a waypoint is passed abeam by more than the aircraft FMS parameter while flying in Heading Select Mode, the FMS must be re-programmed (e.g., to fly direct to the next relevant waypoint) to enable subsequent waypoints to be sequenced.
(See also CPDLC Sequencing “ABEAM” waypoints in excess of FMS parameters)

11 POSITION REPORTING

11.1 POSITION REPORTING REQUIREMENTS IN ADS AIRSPACE

ATSUs using integrated flight data processing systems (FDPS) automatically updated by ADS reports may promulgate in the AIP that ADS reports fulfill all normal position reporting requirements within the nominated FIR.

11.1.1 Publishing reporting requirements
ATSUs should publish ADS and CPDLC position reporting requirements in the AIP.

11.1.2 CPDLC report at FIR entry position
When an ATSU has nominated the use of ADS reporting only within the associated FIR, a CPDLC position report at the FIR entry position is still required to confirm that the ATSU holds the status of current data authority. Following the initial CPDLC report at the boundary, no further CPDLC or voice position reports will be required for operations within the FIR.

11.1.3 Updating waypoint estimates
States should publish in the AIP that pilots are not required to update estimates for waypoints when the aircraft is reporting by ADS in airspace where additional CPDLC or voice reports are not required. Exceptions to this rule are that updates to estimates are required when:

- An estimate previously advised by voice or CPDLC will change by more than 2 minutes; or
- A pilot-initiated action, such as a change in speed, will change the estimate for the next reporting point by more than 2 minutes.

11.1.4 Non-compulsory waypoints
When reporting by ADS only, the flight crew is **not** required to modify the route to remove non-compulsory waypoints. Waypoint event reports will be sent at all non-compulsory reporting points and will be reflected in the predicted route group.

11.2 DISCREPANCIES BETWEEN ADS AND CPDLC ESTIMATES

Controllers should be aware that CPDLC and ADS estimates received from the same aircraft for the same position may differ as a result of the ADS application reporting time to the second and the CPDLC application truncating time to the previous full minute. The pilot also has the ability to modify the estimate for the next position in the CPDLC position report. Any such modification will not be reflected in the ADS report.

11.2.1 Actions to be followed when there is an estimate discrepancy

When an ATSU is using both ADS and CPDLC reporting and a discrepancy of less than 3 minutes between the reports is detected, the ATSU should detail in local documentation the methods to be used by the controller for the reconciliation of the time difference. Where the time difference exceeds 3 minutes, the controller should query the estimate received in the CPDLC position report and request confirmation of the estimate for the waypoint in question.

GUIDANCE MATERIAL ON CNS/ATM OPERATIONS
IN THE ASIA/PACIFIC REGION

PART III – SYSTEM OPERATIONS

TABLE OF CONTENTS

CHAPTER 5 - EMERGENCY AND NON-ROUTINE PROCEDURES

CHAPTER 5

EMERGENCY AND NON-ROUTINE PROCEDURES

1 EMERGENCY PROCEDURES

An emergency CPDLC message such as **MAYDAY** or **PAN** does not require a response, however pilots have indicated a preference that the CPDLC emergency declaration be acknowledged by the controller

1.1 RESPONSE TO AN EMERGENCY MESSAGE

When a CPDLC or ADS emergency message is received, the controlling authority should immediately send an ON DEMAND contract to better assess the nature of the emergency situation. The controlling authority should also consider increasing the periodic contract reporting rate to 5 minutes.

1.2 CONFIRMATION OF EMERGENCY ACTIVATION

When the ADS emergency mode is activated without a CPDLC emergency message or voice confirmation, and the demand contract report appears to indicate that the aircraft is maintaining normal operations (e.g., the aircraft is not in descent or involved in abrupt maneuvers), the aircraft may be subject to unlawful interference. To check for covert or inadvertent activation of the ADS emergency contract the freetext uplink "Confirm ADS" should be appended to a routine data or voice request.

Example

Controller	CONFIRM POSITION Confirm ADS

The pilot should advise ATC if the emergency mode was activated inadvertently using the following freetext downlink:

Pilot	ADS reset

If the aircraft continues with the ADS emergency mode activated ATC should assume the aircraft is in emergency conditions and follow normal alerting procedures.

1.3 ACKNOWLEDGEMENT OF AN EMERGENCY MESSAGE

When an ADS emergency accompanied by a CPDLC emergency message is received, the controller should immediately acknowledge receipt of the emergency with the pilot by the most appropriate means (voice or CPDLC).

1.4 CPDLC ACKNOWLEDGMENT

A CPDLC acknowledgment should be in the form of a free text message using the words ROGER MAYDAY or ROGER PAN. This uplink free text message requires a response from the pilot to close the CPDLC exchange. Depending on the nature of the emergency, the free text message may or may not be acknowledged by the pilot.

1.4.1 Voice contact

When an emergency is acknowledged by CPDLC, controllers may also attempt to make voice contact with the aircraft.

1.5 RETAINING THE ACTIVE CONNECTION

If CPDLC is the best (or only) communications medium available between the aircraft and any ATSU, the ATSU with the active connection should maintain that connection until better assistance can be provided by another means. In this case, transfer of the connection should not occur to another unit, and any automatic transfer capability should be disabled, in order to improve the chances of the CPDLC connection being retained.

1.5.1 Communications responsibility

It is recognized that if a transfer of the CPDLC connection does not occur, then the responsibility for maintaining communications with the aircraft is retained by the current ATSU.

1.5.2 Executive control responsibility

In accordance with established procedures, the responsibility for the control of the flight rests with the ATSU within whose airspace the aircraft is operating. If the pilot takes action contrary to a clearance that has already been coordinated with another sector or ATSU and further coordination is not possible in the time available, then this action would be performed under the pilot's emergency authority.

1.6 NORMAL EMERGENCY PROCEDURES

After receipt of the emergency message is acknowledged, normal emergency response procedures should be followed.

1.7 COORDINATION IN THE CASE OF EMERGENCY

When the ADS emergency mode is observed by an ATSU that is not in control of the aircraft, that ATSU should coordinate with the controlling authority to ensure that the emergency report has been received. Adjacent ATSUs should not increase the reporting rate of the periodic contract.

2 DATA LINK CONNECTION FAILURES

2.1 DETECTED BY THE CONTROLLER

When the controller recognizes a failure of the data link connection, the controller should instruct the pilot to terminate the connection, by selecting ATC Com Off, and then initiate another AFN logon. Once the AFN logon is established, the ATS system will send a **CONNECTION REQUEST** message to re-establish the connection.

The voice phraseology to be used should be:

Controller	Data link failed. Select ATC Com Off then Logon again to [ATSU name]
Pilot	Roger

The [ATSU name] is the 4 character ICAO code.

2.2 DETECTED BY THE AIRBORNE SYSTEM

When the avionics/pilot recognizes a failure of the data link connection, the pilot should terminate the connection by selecting ATS Com Off and then initiate a new AFN logon (FN_CON).

2.3 INABILITY TO ESTABLISH THE DATA LINK CONNECTION

In situations where a data link connection cannot be established successfully, the ATS system should indicate to the controller that no connection has been established.

3 DATA LINK SYSTEM SHUTDOWNS

3.1 UNEXPECTED DATA LINK SHUTDOWNS

In the event of an unexpected data link shutdown, the relevant ATSU should inform:

- All currently connected FANS-1/A equipped aircraft via voice;

The voice phraseology to be used should be:

Controller	Data link failed. Select ATC Com Off. Continue on voice
Pilot	Roger

- The adjacent ATSUs by direct coordination; and
- All relevant parties via the publication of a NOTAM, if appropriate.

Pilots should terminate the data link connection and use voice communications until informed by the ATSU that the data link system has resumed normal operations.

3.2 PLANNED DATA LINK SHUTDOWNS

When a planned data link system shutdown of the communications network, or of the ATS system, occurs, a NOTAM should be published to inform all affected parties of the shutdown period. During that time period, voice should be used.

The following voice or data phraseology should be used to advise airborne aircraft prior to the commencement of the shutdown.

Controller	Data link will be shutdown. Select ATC Com Off. Continue on voice *(The pilot shall select ATC Com Off when the message is received)*
Pilot	Roger

3.3 RESUMPTION OF DATA LINK OPERATIONS

The following voice phraseology should be used to advise pilots that the data link system has resumed operations.

Controller	Data link operational Logon to [ATSU name]
Pilot	Logon [ATSU name]

The [ATSU name] is the 4 character ICAO code.

3.4 DATA LINK COMPONENT SHUTDOWN

Some ATSUs are not equipped with both CPDLC and ADS and consequently may experience shutdown of a single component of the data link system (i.e., CPDLC or ADS). For those ATSUs that have both CPDLC and ADS it is not likely that just one component will shutdown, however it is possible.

ATSUs experiencing a shutdown of either CPDLC or ADS should follow the procedures above for data link shutdowns as appropriate.

3.4.1 ADS only failure

When a shutdown of the ground component of the ADS system occurs, the ATSU affected should inform all other affected parties of the shutdown and likely period. During that time period, position reports (via CPDLC if available, or via voice communications) will be required.

If a CPDLC service is still available, a CPDLC free text message should be sent to the pilot notifying reporting requirements. The following phraseology should be used:

Controller	ADS shutdown revert to ATC data link position reports
Pilot	Roger

3.5 UNEXPECTED COMMUNICATION SERVICE PROVIDER SHUTDOWN

In the event of an unexpected communications service provider system shutdown, the communications service providers should inform ATSUs and airline dispatch of the situation. ATSUs should consequently inform:

- All currently connected FANS equipped aircraft via voice,

  The voice phraseology to be used should be:

Controller	Data link failed Select ATC Com Off. Continue on voice
Pilot	Roger

- The adjacent ATSUs by direct coordination,
- All relevant parties via the publication of a NOTAM, if appropriate.

Pilots should terminate CPDLC connections with the ATSU and use voice communications until informed by the ATSU that the system is again fully functional.

3.6 UNEXPECTED AVIONICS SYSTEM SHUTDOWN

In the event of an unexpected avionics data link shutdown, pilots should inform the ATSU of the situation using voice.

The voice phraseology to be used should be:

Pilot	Data link failed. Selecting ATC Com Off. Continuing on voice
Controller	Roger. Continue on voice

Pilots should continue to use voice until the functionality of the avionics can be re-established.

4 TOTAL COMMUNICATIONS FAILURE

The procedures covering complete communications failure (CPDLC and voice) should be in accordance with current ICAO procedures.

Agenda Item 4: Review and updating of the Asia/Pacific Regional Plan for the New CNS/ATM Systems in the light of new developments

4.1 **Asia/Pacific Regional Plan for the New CNS/ATM Systems**

4.1.1 The meeting recalled that the Asia/Pacific Regional Plan for the New CNS/ATM Systems contains, at Chapter 10, Tables of ATM operational enhancements for each of the major Geographic Traffic Flows. The Tables contain details of the aircraft and ground systems required to effect each ATM operational enhancement. The meeting considered the Tables and was of the opinion that updating and enhancement was required. Accordingly the meeting formed the following Decision:

Decision 7/3 – Tables of ATM Operational Enhancements

That, a Task Force be formed to review and update the Tables of ATM Operational Enhancements for each of the major Geographic Traffic Flows which are contained in Chapter 10 of the Asia/Pacific Regional Plan for the New CNS/ATM Systems. Specifically the Task Force shall:

i) Review and update the existing content of the Tables;

ii) Develop Section 6 (ATM) of the Generic Table to form part of appropriate Traffic Flow Tables;

iii) Develop a Generic Table for Terminal Operations;

iv) Develop one sample Terminal Operations Table based on a suitable location in the Asia Pacific Region, and;

v) Examine the feasibility of refocussing the Tables from the current statements of position to enable a more proactive planning oriented focus.

The Task Force shall co-ordinate this work with the ATS/AIS/SAR Sub-Group and report to the next meeting of the CNS/ATM/IC Sub-Group in the form of a draft amendment to the Asia/Pacific Regional Plan for the New CNS/ATM Systems.

The Task Force will comprise participation from Australia, China, Fiji, Hong Kong, China, India, Japan, Mongolia, Singapore, Thailand, United States, IATA and SITA.

4.2 **Amendment to Chapter 5 and Chapter 7 of the Plan**

4.2.1 The meeting noted that the third meeting of the ATN Panel (ATNP/3) had proposed to delete the provision of Pass-Through service (AFTN/ATN Gateway) from the SARPs. Based on the outcome of ATNP/3, a proposal was developed by the second meeting of ATN Transition Task Force held in March 2000 to update the information contained in Chapter 5 and Chapter 7 of the regional plan. The COM/MET/NAV/SUR SG/4 meeting endorsed the proposal made by the Task Force to reflect the changes in the plan based on the result of ATNP/3 and subsequent actions thereon by ANC and Council. In addition, the COM/MET/NAV/SUR SG/4 also endorsed a proposal made by the Task Force to update Issue 1 of the Guidance Material for Ground Element in ATN Transition incorporating consequential changes and to circulate the updated document.

4.2.2 The meeting reviewed the amendments proposed to Chapter 5 and Chapter 7 of the regional plan, proposed an additional amendment to Chapter 5 and endorsed the revised proposed amendment to the regional plan as shown in Appendix A to the Report on Agenda Item 4.

4.2.3 The meeting reviewed and updated the status of CNS/ATM system transition tables contained in Chapters 6 to 9 and proposed to amend the plan to incorporate the updated tables shown in Appendix B to the Report on Agenda Item 4. In view of the foregoing the meeting formulated the following draft Conclusion:

Draft Conclusion 7/4 - Amendment to the Regional Plan

That,

a) the amendments proposed to Chapters 5 and 7 and to the CNS/ATM system transition tables be adopted and incorporated in the plan; and

b) ICAO issue a new edition of the Regional Plan.

CHAPTER 5: CURRENT STATUS AND REGIONAL STRATEGY – CNS/ATM SYSTEMS

5.2.1.6 The present ground communications system, the Aeronautical Fixed Telecommunications Network(AFTN) is limited in throughput, data integrity, and the ability to handle bit oriented message ~~and data~~ exchanges. The evolution of the communications path to full Aeronautical Telecommunication Network(ATN) capability is seen as evolving by deploying ATN ground-ground routers. The ATN ground-ground router capability will be used to provide the establishment of ATN routing domains. By implementing AFTN/~~ATN~~ AMHS gateways over the ATN(bit-oriented) networks interconnected by ATN ground-ground routers, ground communications system resolves the shortcomings of AFTN, and will finally evolve in AMHS. Some ground ATN networks are used for the ground portion of Air-Ground data interchange by deploying ATN Air-Ground router situated at the ground end of Air-Ground data link, connected to ground network and exclusively used for Air-Ground data interchanges.

CHAPTER 7: COMMUNICATIONS

1) **7.2 Transition Guidelines**

7.2.1 Guidelines for transition to the future communications systems should be such as to encourage early equipage by users through the earliest possible accrual of the systems benefits. Although a transition period during which dual equipage, both airborne and ground, will be necessary in order to ensure the reliability and availability of the new systems, the guidelines are aimed at minimizing this period to the extent practicable. The Global Air Navigation Plan for CNS/ATM Systems ~~Global Plan, Vol. I, Chapter 5~~, Appendix B to Chapter 5 lists the guidelines that States, regions, users, service providers and manufacturers should consider when developing CNS/ATM systems or planning for implementation of such systems. The details of the guidelines are as follows:

a) States should begin to use data link systems as soon as possible after they become available

~~Early use of existing character oriented data systems will provide important experience to guide further development and implementation of new data communications systems. In addition, t~~The benefits of data link systems will become more apparent with early use.

f) ATN should be implemented in phases

~~Existing air-ground data communication links and associated ground based message processors should be used initially, where possible.~~ For ground-ground data communications, two levels of ATN Transition have to be identified; one is the interoperable ground internetworking based on ATN Internet SARPs, and the other is ground-ground communication services (e.g. AMHS, AIDC) over ATN internetworking. The ground internetworking is used for air-ground communication services, e.g. ADS, CPDLC, FIS, as well as ground-ground communication services. The first phase of the ATN is achieved by upgrading the ground internetworking capability ~~by implementing X.25 protocol, and~~ by deploying critical elements of the ATN, such as ATN ground-ground routers, and by providing ground-ground messaging service by deploying critical transition elements such as AFTN/~~ATN~~ AMHS gateways, targeting to migrate to AMHS as defined in ATN AMHS SARPs. The deployment and validation of the gateway and ATN ground routers is needed. The second phase of the ATN is achieved by implementing the air-ground ATN routers and associated SARPs compliant protocols, which also requires validation as well as by implementing air-ground data communication services (e.g. ADS, CPDLC, FIS) over ATN internetworking.

2) Additional amendments to paras e) and g) are proposed to comply with Appendix B to Chapter 5, Part 1, of the Global Air Navigation Plan for CNS/ATM Systems – First Edition 2000 as follows:

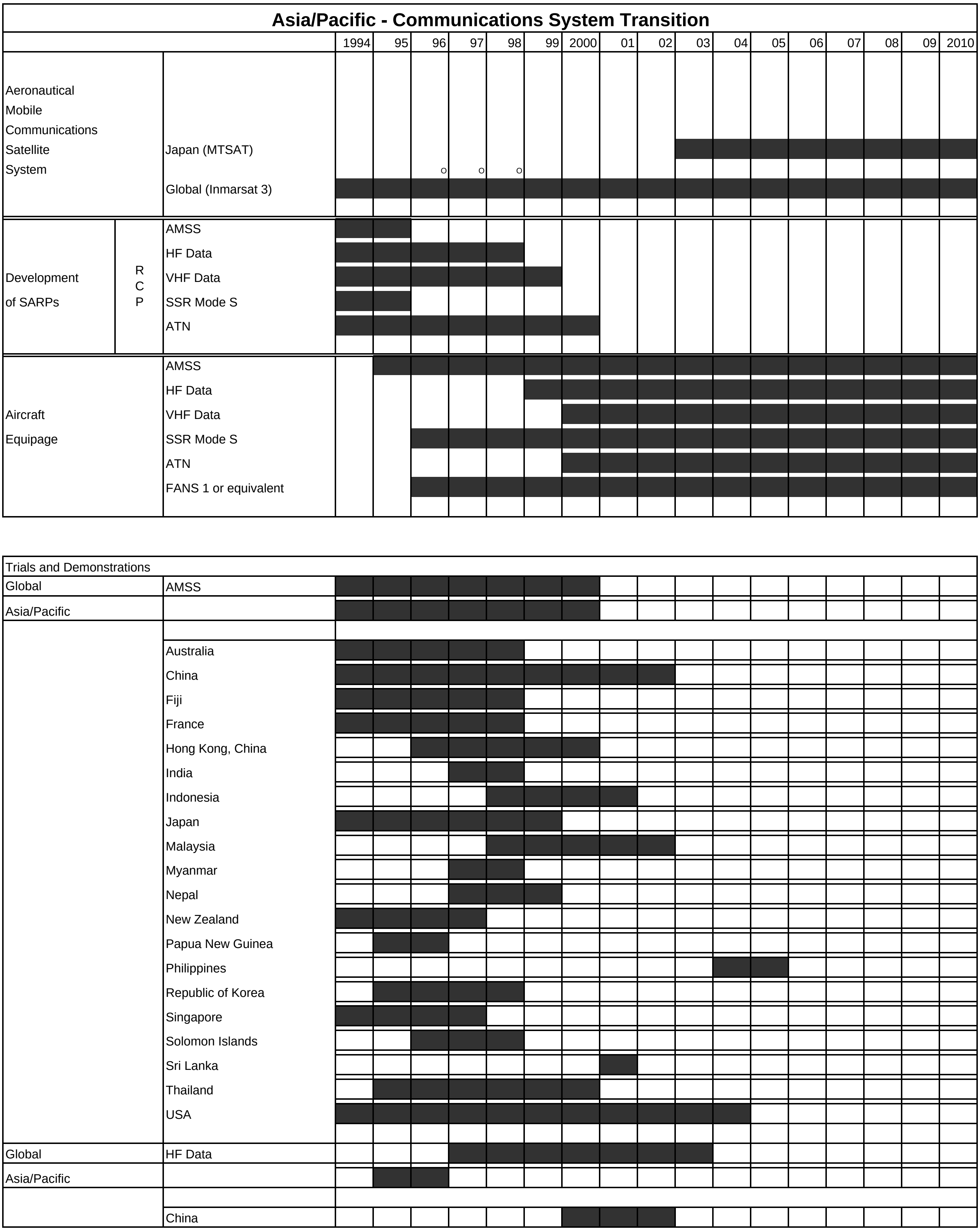
e) ~~Data Communication Connectivity~~ Communications networks between ATC facilities within a State and ATC facilities in adjacent States should be established, if they do not already exist.

~~g) New ATM System should support bit-oriented applications for communications with applications located in aircraft (A/G) or applications located in other ground systems (G/G)~~

g) If new application message processors and data link systems are implemented, they should support code-and byte-independent data transmission protocols in order to facilitate transition to the ATN.

3) 7.3.2 The transition to ATN is expected to start before the institutional issues involved in the administration of ATN have been fully agreed. ~~The initial ATN routers should be procured by some States as COTS products, and upgraded as newer versions of the software are available to implement all of the necessary ATN options and parameters. Where ground-to-ground ATN is not available to support trials and demonstrations, such as the ATS Interfacility Data Communications (AIDC) application, the existing AFTN should be used to exchange message/data units between those ATM systems.~~ The transition from AFTN circuit to ATN internetworking will be on a ~~circuit by circuit~~inter-domain connection basis, with time scales that ~~can~~ shall be ~~quite independent of the other~~prior to any deployments of elements of the new CNS/ATM systems. In order to migrate to ATN internetworking, there shall be clear identification of the domains to be interconnected. ~~And~~ ~~f~~Further more, in order to establish domain, State shall establish networks within its own domain, and understand these networks are interconnected via inter-domain connections. The determining factor will be the requirements placed on ATN communication services provided over the interconnected networks. Some ~~circuits~~ inter-domain connections may be fully converted to ATN Internetworking well before any ~~sole system~~ use of ATN communication services occurs in air-ground systems of the new CNS/ATM systems, other AFTN circuits may meet the service requirement by the continued use of AFTN well into the future in which case there is a need to provide gateway to communicate between ATN environment and AFTN environment.

TABLE 7-1


Asia/Pacific - Communications System Transition
1994
95
96
97
98
99
2000
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02
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04
05
06
07
08
09
2010
Aeronautical Mobile Communications Satellite System
Japan (MTSAT)
Global (Inmarsat 3)
Development of SARPs
RCP
AMSS
HF Data
VHF Data
SSR Mode S
ATN
Aircraft Equipage
AMSS
HF Data
VHF Data
SSR Mode S
ATN
FANS 1 or equivalent
Trials and Demonstrations
Global
AMSS
Asia/Pacific
Australia
China
Fiji
France
Hong Kong, China
India
Indonesia
Japan
Malaysia
Myanmar
Nepal
New Zealand
Papua New Guinea
Philippines
Republic of Korea
Singapore
Solomon Islands
Sri Lanka
Thailand
USA
Global
HF Data
Asia/Pacific
China

TABLE 7-1

Asia/Pacific - Communications System Transition

		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
	Indonesia	TBD																
	Thailand																	
Global	VHF Data																	
Asia/Pacific																		
	Australia																	
	China																	
	Fiji																	
	France																	
	Hong Kong, China																	
	India																	
	Indonesia																	
	Japan																	
	Malaysia																	
	Mongolia																	
	Myanmar																	
	Nepal																	
	New Zealand																	
	Papua New Guinea																	
	Philippines																	
	Republic of Korea																	
	Singapore																	
	Solomon Islands																	
	Sri Lanka																	
	Thailand																	
	USA																	
Global	SSR Mode S																	
Asia/Pacific																		
	China	TBD																
	Indonesia	TBD																
	Sri Lanka																	
Global	ATN (Ground - Ground)																	
Asia/Pacific																		
	Australia																	
	China	TBD																
	Fiji																	
	France																	
	Hong Kong, China																	
	Indonesia																	
								AFTN/AMHS G/W										
	Japan																	
	Republic of Korea																	
	Malaysia																	
	Mongolia																	
	Myanmar																	

TABLE 7-1

Asia/Pacific - Communications System Transition

		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
	Nepal																	
	New Zealand																	
	Papua New Guinea																	
	Singapore									■								
	Solomon Islands																	
	Sri Lanka									■								
								AIDC										
	Thailand		■	■	■	■	■	■	■									
	USA								■									
Global	ATN (Air - Ground)																	
Asia/Pacific																		
	China	TBD																
	Indonesia	TBD																
	Thailand	TBD																

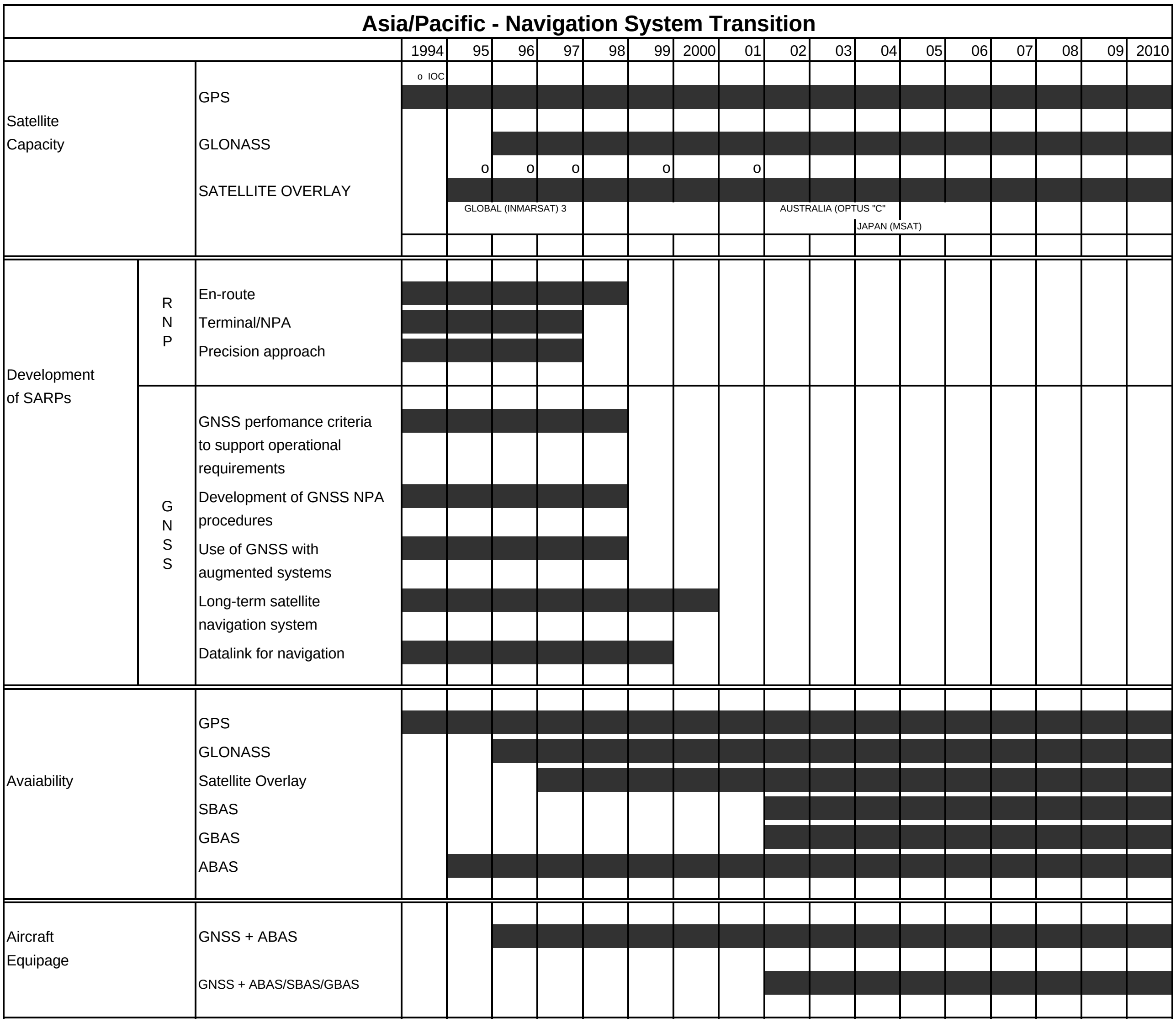
Implementation and Operational Use		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
Global	AMSS								■	■	■	■	■	■	■	■	■	■
Asia/Pacific			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Australia			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Brunei Darussalam						■	■	■	■	■	■	■	■	■	■	■	■
	China										■	■	■	■	■	■	■	■
	Fiji			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	France			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Hong Kong, China							■	■	■	■	■	■	■	■	■	■	■
	India				■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Indonesia								■	■	■	■	■	■	■	■	■	■
	Japan							■	■	■	■	■	■	■	■	■	■	■
	Malaysia										■	■	■	■	■	■	■	■
	Myanmar					■	■	■	■	■	■	■	■	■	■	■	■	■
	Nepal						■	■	■	■	■	■	■	■	■	■	■	■
	New Zealand		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Philippines												2nd QTR 2006		■	■	■	■
	Republic of Korea						■	■	■	■	■	■	■	■	■	■	■	■
			voice		data													
	Singapore		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Sri Lanka											■	■	■	■	■	■	■
	Thailand							■	■	■	■	■	■	■	■	■	■	■
	USA						■	■	■	■	■	■	■	■	■	■	■	■
Global	HF Data								■	■	■	■	■	■	■	■	■	■
Asia/Pacific		T	B	D														
	China										■	■	■	■	■	■	■	■
	Fiji									■	■	■	■	■	■	■	■	■
	Indonesia	TBD																
	Thailand							■	■	■	■	■	■	■	■	■	■	■
Global	VHF Data							■	■	■	■	■	■	■	■	■	■	■

TABLE 7-1

Asia/Pacific - Communications System Transition

		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
Asia/Pacific																		
	Australia																	
	Brunei Darussalam																	
	China																	
	Fiji																	
	France																	
	Hong Kong, China																	
	India																	
	Indonesia																	
	Japan																	
	Malaysia																	
	Mongolia																	
	Myanmar																	
	Nepal																	
	New Zealand																	
	Philippines																	
	Republic of Korea																	
	Singapore																	
	Sri Lanka																	
	Thailand																	
	USA																	
Global	SSR Mode S																	
Asia/Pacific																		
	China	TBD																
	Indonesia	TBD																
	Sri Lanka																	
Global	ATN (Ground - Ground)																	
Asia/Pacific																		
	China	TBD																
	Fiji																	
	Hong Kong, China																	
	Indonesia																	
											AFTN/ATN GW							
	Singapore																	
	Sri Lanka																	
							AFTN/ATN GW		AIDC									
	Thailand																	
Global	ATN (Air - Ground)																	
Asia/Pacific																		
	China	TBD																
	Indonesia	TBD																
	Thailand	TBD																

TABLE 8-1


Asia/Pacific - Navigation System Transition
1994
95
96
97
98
99
2000
01
02
03
04
05
06
07
08
09
2010
Satellite Capacity
GPS
o IOC
GLONASS
SATELLITE OVERLAY
GLOBAL (INMARSAT) 3
AUSTRALIA (OPTUS "C"
JAPAN (MSAT)
Development of SARPs
R N P
En-route
Terminal/NPA
Precision approach
G N S S
GNSS perfomance criteria to support operational requirements
Development of GNSS NPA procedures
Use of GNSS with augmented systems
Long-term satellite navigation system
Datalink for navigation
Avaiability
GPS
GLONASS
Satellite Overlay
SBAS
GBAS
ABAS
Aircraft Equipage
GNSS + ABAS
GNSS + ABAS/SBAS/GBAS

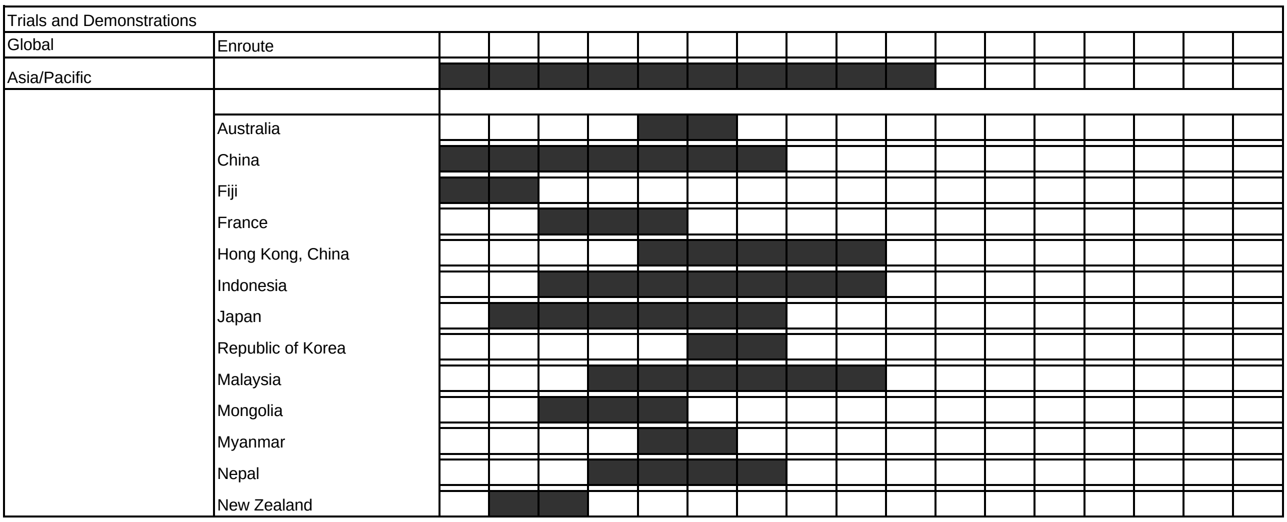

Trials and Demonstrations
Global
Enroute
Asia/Pacific
Australia
China
Fiji
France
Hong Kong, China
Indonesia
Japan
Republic of Korea
Malaysia
Mongolia
Myanmar
Nepal
New Zealand

TABLE 8-1

Asia/Pacific - Navigation System Transition

		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
	Papua New Guinea			■	■													
	Philippines								■	■	■							
	Singapore				Supplementary mode of operations					■								
	Sri Lanka							■	■									
	Thailand			■	■	■	■	■										
	USA	■	■	■	■	■	■	■	■	■	■	■	■					
Global	Terminal																	
Asia/Pacific																		
	Australia			■														
	Brunei Darussalam						■	■										
	China		■	■	■	■	■	■	■	■	■	■	■					
	Fiji	■																
	Hong Kong, China					■	■	■	■	■								
	Indonesia					■	■	■	■									
	Japan			■	■	■	■											
	Malaysia					■	■	■	■	■	■	■						
	Mongolia						■	■										
	Nepal			■	■	■	■											
	New Zealand	■	■															
	Papua New Guinea			■	■	■												
	Philippines								■	■	■							
	Republic of Korea					■	■											
	Singapore				Supplementary mode of operations					■								
	Thailand			■	■	■	■	■										
Global	Non Precision Approach																	
Asia/Pacific		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Australia			■	■	■												
	Brunei Darussalam						■	■										
	China		■	■	■	■	■	■	■	■	■	■	■					
	Fiji	■																
	Indonesia					■	■	■	■									
	Japan			■	■	■	■											
	Malaysia					■	■	■	■	■	■	■						
	Mongolia						■	■	■									
	Nepal			■	■	■	■											
	New Zealand					■	■	■	■									
	Papua New Guinea			■	■	■												
	Philippines								■	■	■							
	Republic of Korea					■	■											
	Singapore				Supplementary mode of operations					■								
	Sri Lanka											■						
	Thailand					■	■	■										
	USA		■	■	■	■	■	■	■	■	■	■	■					
Global	Precision Approach																	
Asia/Pacific																		
	Australia			■	■	■	■	■	■	■	■	■	■					
	China		■	■	■	■	■	■	■	■	■	■	■					
	Fiji	■	■	■	■													
	Hong Kong, China							CAT1 ■	■	CAT2 ■	■	■	CAT3 ■	■	■			

TABLE 8-1

Asia/Pacific - Navigation System Transition

		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
	India																	
	Indonesia																	
	Japan																	
	Malaysia																	
	New Zealand																	
	Philippines																	
	Republic of Korea																	
	Thailand	TBD																
	USA																	
Global	GNSS + ABAS																	
Asia/Pacific																		
	Indonesia	TBD																
	Singapore	TBD																
	Thailand	TBD																
Global	GNSS + ABAS + SBAS																	
Asia/Pacific																		
	Indonesia	TBD																
	Singapore																	
	Thailand	TBD																
Global	GNSS + ABAS + GBAS																	
Asia/Pacific																		
	Indonesia	TBD																
	Singapore	TBD																
	Thailand	TBD																

Implementation and Operational Use																		
Global	WGS-84																	
Asia/Pacific																		
	WGS-84 Survey																	
	Information Asia/Pacific																	
	by country																	
	China	TBD																
	Indonesia																	
Global	EN-ROUTE																	
Asia/Pacific																		
	Australia																	
	China																	
	Fiji																	
	France																	
	Hong Kong, China																	
	Indonesia																	
	Japan																	

TABLE 8-1

Asia/Pacific - Navigation System Transition																		
		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
	Malaysia																	
	Myanmar																	
	Mongolia																	
	Nepal																	
	New Zealand																	
	Philippines																	
	Republic of Korea																	
	Singapore					Supplementary mode of operations												
	Sri Lanka																	
	Thailand																	
	Tonga																	
	USA																	
Global	Terminal																	
Asia/Pacific																		
	Australia																	
	Brunei Darussalam																	
	China	TBD																
	Fiji																	
	Hong Kong, China																	
	Indonesia																	
	Japan																	
	Mongolia																	
	Nepal																	
	New Zealand																	
	Philippines																	
	Republic of Korea																	
	Singapore					Supplementary mode of operations												
	Thailand																	
	Tonga																	
	USA																	
Global	Non Precision approach																	
Asia/Pacific																		
	Australia																	
	Brunei Darussalam																	
	China	TBD																
	Fiji																	
	Hong Kong, China																	
	Indonesia																	
	Japan																	
	Malaysia																	
	Mongolia																	
	Nepal																	
	New Zealand																	
	Philippines																	
	Republic of Korea																	
	Singapore					Supplementary mode of operations												
	Sri Lanka																	
	Thailand																	
	Tonga																	
	USA																	

TABLE 8-1

Asia/Pacific - Navigation System Transition																		
		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
Global	Precision approach																	
Asia/Pacific																		
	Australia																	
	China	TBD																
	Fiji																	
	Hong Kong, China																	
	Indonesia																	
	Japan																	
	Philippines																	
	Singapore	TBD																
	Thailand	TBD																
	USA																	

TABLE 9-1

Asia/Pacific - Surveillance System Transition

			1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
Satellite System								O(1)					O(2)					O(3)	
		Japan (MTSAT)																	
					o	o													
		Global (Inmarsat3)																	
Development of SARPs	RSP	ADS																	
		ADS-B																	
		SSR Mode S																	
Aircraft Equipage		ADS																	
		ADS-FANS 1/A																	
		ADS-B								T	B	D							
		SSR Mode S																	

		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
Trials and Demonstrations																		
Global	ADS																	
Asia/Pacific																		
	PET/ISPACG																	
	Australia																	
	China																	
	Fiji																	
	France																	
				o FANS 1														
	Hong Kong, China																	
	India																	
	Indonesia																	
	Japan																	
	Malaysia																	
	Mongolia																	
	Myanmar																	
	Nepal																	
	New Zealand																	
	Philippines																	
	Republic of Korea																	
	Singapore																	
	Sri Lanka																	
	Thailand																	
	USA																	
	Service Providers																	
Global	ADS-B																	
Asia/Pacific		T	B	D														
	China	TBD																
	Indonesia	TBD																
	Singapore	TBD																
	Thailand	TBD																

TABLE 9-1

Asia/Pacific - Surveillance System Transition

		1994	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	2010
Global	SSR Mode S																	
Asia/Pacific																		
	Australia																	
	China	TBD																
	Hong Kong, China																	
	Indonesia	TBD																
	Japan																	
	Singapore	TBD																
	Sri Lanka																	

Implementation and Operational Use																		
Global	ADS																	
Asia/Pacific																		
	Australia																	
	China																	
	Fiji																	
	France																	
	Hong Kong, China																	
	India																	
	Indonesia																	
	Japan																	
	Malaysia																	
	Mongolia																	
	Myanmar																	
	Nepal																	
	New Zealand																	
	Philippines																	
	Republic of Korea																	
	Singapore																	
	Sri Lanka																	
	Thailand																	
	USA																	
Global	ADS-B																	
Asia/Pacific		T	B	D														
	China	TBD																
	Indonesia	TBD																
	Singapore	TBD																
	Thailand	TBD																
Global	SSR Mode S																	
Asia/Pacific																		
	Australia																	
	China	TBD																
	Hong Kong, China																	
	India																	
	Indonesia	TBD																
	Japan																	
	Malaysia																	
	Republic of Korea																	
	Singapore	TBD																
	Sri Lanka																	
	Thailand	TBD																
	USA																	

Note: Modern radar systems are capable of being upgraded to Mode S. Thailand and Hong Kong, China are planning to upgrade their current systems.

Agenda Item 5: Identification and review of CNS/ATM implementation priorities for the Asia/Pacific Region

5.1 **Implementation of WGS-84**

5.1.1 The meeting recalled that amendments to Annex 4, Annex 11, Annex14 (Parts 1 & 2) and Annex 15, adopted in early 1994, introduced the World Geodetic System 1984 (WGS-84) as the world-wide common geodetic reference datum. The amendments to these Annexes required all States to publish their relevant aeronautical data in WGS-84 on (or before) 1 January 1998.

5.1.2 In order to maintain a current status of WGS-84 implementation in the Asia Pacific Region the meeting reviewed and updated the WGS-84 Implementation Survey. The updated WGS-84 Implementation Survey is at Appendix A to the Report on Agenda Item 5.

5.1.3 IATA advised the meeting that it considered the full implementation of WGS-84 to be a high priority. Given the criticality of data in the aerodrome environment every effort should be taken to ensure the accuracy of the data used, including a full resurvey if any doubt exists. However, in the en-route environment where terrain is not a factor, a declaration of the current co-ordinates as WGS-84 would suffice for jet airways and boundaries.

5.1.4 The United States advised that should any State be experiencing difficulties with the transformation to WGS-84 there were many places that assistance could be sought, including ICAO technical assistance.

5.1.5 Australia advised that once transformation had been completed, States need to pay careful attention to protecting the information by the establishment of a data management system.

5.2 **Key Priorities for CNS/ATM Implementation**

5.2.1 The meeting noted the result of the review of Key Priorities conducted by the COM/MET/NAV/SUR/SG/4 meeting and updated the Key Priorities for CNS/ATM Implementation in the Asia/Pacific Region. The following major changes were proposed:

1) Amendment to “ATN Transition” - Item partially completed;

2) Deletion of “GNSS Augmentation Strategy” - Work has been completed;

3) Deletion of “GNSS Frequency Protection” - The described work has been completed;

4) Deletion of “Y2K and GPS Z Count”- Item has been completed and the time of applicability has now passed;

5) Deletion of “Updating of Major Geographical Areas”- This item is considered to be an on-going task and not considered appropriate for inclusion into the Key Priorities;

6) Deletion of “Parallel Offset Navigation” – The described work with respect to RVSM has been completed and the work with respect to the wider issue of parallel offset navigation is being addressed by RGCSP;

7) Addition of “Preparation for WRC-2003”

5.2.2 The meeting also recognized that, where possible, items entered, as Key Priorities should have definitive target dates and avoid the use of the term "on-going". In addition target dates should be realistic.

5.2.3 The meeting developed the following Draft Conclusion:

Draft Conclusion 7/5 – Key Priorities for CNS/ATM Implementation

That, the updated Key Priorities for CNS/ATM Implementation at Appendix B to the Report on Agenda Item 5, be adopted.

ICAO Asia/Pacific Regional Office WGS-84 Implementation Survey								
			If Conversion Completed			If Conversion Not Completed		ICAO
State	Conversion Completed		Is Data Published ?			Planned	Planned	SIP
	Yes	No	Yes	No	Effective	Transformation	Publication	Participant
					Date	Date	Date	
Australia	Yes		Yes		17-Jul-97			
Bangladesh	Yes		Yes		12-Aug-99			Yes
Bhutan	Yes			No	n/a	n/a	to be decided	
Brunei	Yes		Yes		1-Jan-98			
Cambodia	Yes		Yes		1-May-97			Yes
China		No				not adopted	not adopted	
Cook Islands	Yes		Yes		24-Apr-97			
DPR Korea		No					to be advised	Yes
Fiji	Yes		Yes		25-May-95			
French Polynesia	Yes main apts		Yes		1-Jan-98			
Hong Kong, China	Yes		Yes		25-Apr-96			
India	Yes		Yes		1-Jan-99			
Indonesia	Yes		Yes		1-Jan-99			
Japan	Yes		Yes		1-Jan-98			
Kiribati		No		No		Jun-99	to be advised	
Lao PDR	Yes partial						to be decided	Yes
Macau	Yes		Yes		2-Jan-97			
Malaysia	KUL FIR - partial; KK FIR - on-going							
Maldives	Yes		Yes		22-May-97			Yes
Marshall Islands	Yes		Yes		Unknown			
Micronesia	Yes		Yes		Unknown			

ICAO Asia/Pacific Regional Office WGS-84 Implementation Survey

State	Conversion Completed		If Conversion Completed Is Data Published ?			If Conversion Not Completed		ICAO SIP Participant
	Yes	No	Yes	No	Effective Date	Planned Transformation Date	Planned Publication Date	
Mongolia	Yes		Yes		Aug-97			Yes
Myanmar	Yes		Yes		1-Jan-98			Yes
Nauru		No		No		asap after conferring with consultant		
Nepal	Yes		Yes		15-Jan-98			
New Zealand	Yes		Yes		27-Feb-97			
New Caledonia	Yes		Yes		26-Feb-98			
Pakistan		No				31-Jul-02	31-Jul-02	
Palau	Yes		Yes		4-Sep-97			
Papua New Guinea	Yes		Yes		13-Jul-00			
Philippines	Yes partial							
Rep of Korea	Yes		Yes		1-Jan-98			
Samoa	Yes		Yes		Dec-99			
American Samoa Completed								
Singapore	Yes		Yes		1-Jan-98			
Solomon Islands		No		No		31-Mar-99	1-May-99	
Sri Lanka	Yes		Yes		30-Apr-98			Yes
Thailand	Yes		Yes		1-Jan-98			
Tonga	Yes		Yes		9-Oct-97			
United States	Yes		Yes		15-Oct-92			
Vanuatu	Yes (main apts)		Yes		25-Mar-99			
Viet Nam	Yes		Yes		1-Jan-98			

Key Priorities for CNS/ATM Implementation in the Asia Pacific Region

Key Priority	Description	Target Date	Sub-group	Status
ATN Transition	a) ~~The development of ATN transition guidance material and~~ b) ~~t~~The development of an ATN transition plan is required	a) ~~End 1999~~ b) 2001	~~COM/MET/NAV/SUR~~ COM/MET/NAV/SUR ATN Transition Task Force	~~Completed 1999~~ Under development
Incorporation of CNS/ATM Material into Regional ANP (FASID)	To reflect regional agreement for the implementation of CNS/ATM facilities and services and the determination of priorities for financing	On-going	All	CNS/ATM Material not yet mature enough for incorporation into FASID
~~GNSS Augmentation Strategy~~	~~To update the current regional strategy to reflect the present operational requirements, the state of technology and the stakeholders involved~~	~~APANPIRG/10 (1999)~~	~~COM/MET/NAV/SUR~~	~~Initial review undertaken in 1999. Final review in Jan. 2000at COM/MET/NAV/SUR SG/4. Completed~~
~~GNSS Frequency Protection~~	~~To ensure the aeronautical radio spectrum is available to satisfy future needs of international civil aviation and in particular to protect the GNSS frequency spectrum which is vital to the safe and efficient operation of the CNS/ATM system~~	~~On-going~~	~~All~~	~~Progressed by all Sub-groups and APANPIRG during 1999~~
~~Y2k & GPS Z Count~~	~~To alert States to the need to undertake activities, including training, to address the Y2k & GPS Z Count (week 1024 Rollover) issues with regard to aviation and associated systems. Also to ensure the establishment of mechanisms to ensure that appropriate inter-Regional and intra-Regional contingency planning is in place to cater for unforeseen problems~~	~~Immediate~~	~~All~~	~~GPS Z Count event has occurred. (users still need to check GPS receivers for Y2k compliance).~~ ~~Major Y2k effort underway.~~

Revised South China Sea ATS Route Implementation	Successful implementation of this important route structure alleviates airspace congestion and provides a project model for similar route structure activity elsewhere in the Region.	Immediate	ATS/AIS/SAR	Recent meetings between China and Viet Nam under ICAO auspices have taken place to explore proposals
~~Updating of Major Geographical Areas~~	~~The major geographical areas are the primary planning and implementation tools for CNS/ATM in the Region and therefore need to be current. The geographical area Tables of Operational Enhancements are designed to ensure the co-ordinated implementation of CNS/ATM systems resulting in a seamless environment for airspace users.~~	~~Each APANPIRG meeting~~	~~All~~	~~Tables updated 1999~~
WGS-84 Implementation	To achieve uniformity in aeronautical data publication across the Region in order to ensure a standard reference system for CNS/ATM.	Immediate (1 Jan 1998)	ATS/AIS/SAR	Implementation is monitored at each meeting
RVSM Implementation	To provide more efficient flight profiles and to increase airspace capacity in conjunction with the implementation of CNS/ATM.	~~24 Feb 2000 (Pacific)~~ Feb 2002 (Asia ~~South China Sea~~)	ATS/AIS/SAR	ICAO RVSM Task Force is co-ordinating implementation. RVSM implemented in the Pacific 24 Feb 2000
Reduced Separation Minima (Benefits)	To increase the efficient use of airspace and enhance the safety and efficiency of air traffic management.	Immediate	ATS/AIS/SAR	50NM lateral separation is implemented in most of the Pacific and being progressed to Asia (South China Sae & Bay of Bengal) ~~/~~50NM Longitudinal separation is being progressed by some States in the Pacific ~~progressively being implemented~~ 30NM separations await the oiutcome of RGCSP work~~/30~~

				~~work by ISPACG being monitored~~
Human Factors Training	To ensure that the introduction of new technology and equipment recognizes the Human Factors aspects.	On-going	All	Human Factors ADS/CPDLC Seminars planned for Oct 2000 and 2001.~~in the provision of ATS Seminar planned for 1999 deferred to 2000 due Y2k effort~~
RNP Implementation	Global standard for navigation is seen as a prerequisite for many CNS/ATM implementation activities.	On-going	ATS/AIS/SAR & CNS/ATM/IC	RNP is implemented in NOPAC, CENPAC, CEP & Tasman Sea. Planned ~~for CEP and~~ South China Sea and Bay of Bengal. RNP/RNAV seminar held in June 2000 and planned for 2001~~1999/2000~~
The implementation of ADS for the enhancement of ATM & Safety	Standards, concept of operations and operating procedures are required immediately to enable the utilization of ADS functionality currently in place and planned both on the ground and in the air.	Jun 2000	ATS/AIS/SAR	~~Work in initial stage~~Revised Regional CNS/ATM Guidance Material developed containing ADS section.~~s~~
~~Parallel Offset Navigation~~	~~To ensure that the use of parallel offset navigation practices are safely catered for in the implementation of CNS/ATM and RVSM.~~	~~Immediate~~	~~ATS/AIS/SAR~~	~~Wake turbulence offset under RVSM analysed by RVSM Task Force~~
Guidance Material for Certification of Ground-Based and Airborne Equipment	Guidance material is required for ATS providers, regulators and airspace users regarding the certification of CNS/ATM ground-based and airborne equipment. Consideration should also be given to the need for guidance material for end-to-end certification of CNS/ATM systems.	On-going	All	~~Work yet to commence~~The development of Guidance Material at a global level is progressing. The ATN Transition Task Force has also developed some material. Tri~~a~~ials and demonstrations by States is a

				useful mechanism to collect such information.
Civil Military Co-operation	There is a need to ensure joint civil/military participation in the planning and implementation of CNS/ATM to ensure the future compatibility of integrated civil/military operations and to encourage both civil and military to work together to balance mission needs with available airspace.	On-going	All	Civil Military Co-operation seminar held 1998. States encouraged to bring military representatives to meetings.
Air Traffic Management	A regional concept of operations for ATM needs to be developed in order to achieve optimization of service, to meet the demands of air traffic and safety.	~~APANPIRG/11 (2000)~~ APANPIRG/12	ATS/AIS/SAR	~~Work yet to commence~~Some work in this area has been undertaken by the revision of the Asia Pacific CNS/ATM Operations Guidance Material and additionally in Chapter 10 of the Regional CNS/ATM Plan (Generic Table, Part 6). Further work is required.
Regional Approach to CNS/ATM Training	A Regional approach to CNS/ATM training is required in order to achieve a seamless regional implementation of the new technology.	On-going	All	CNS/ATM Training & Human Resources Development Task Force formed and Regional Strategy Developed 1999. Awaiting outputs from ANC Study Group prior to deciding upon further action required.
Technical Co-operation in Regional CNS/ATM Planning & Implementation	The continuation and enhancement of ICAO's co-ordinating role of technical co-operation in CNS/ATM planning and implementation, in close co-operation with all partners and taking into account the regional approach, is required.	On-going	All	CNS/ATM Seminars planned
Preparation for	The cooperative participation of States is required with	On-going until	All	AMCP WG-F now meeting in

WRC2003	their respective communications authority, regional groups such as the APT~~TP~~ and at the WRC, preparatory meetings and study groups to ensure that aviation spectrum requirements are fulfilled.	WRC2003		August APT commencing preparation in Sept. 2000.

Agenda Item 6: Identify, monitor and facilitate the transfer of CNS/ATM systems expertise, equipment, trials, data etc. between States and the identification of planning and cost/benefit analysis needs within the Region

6.1 **Business Case Task Force**

6.1.1. The meeting was advised that APANPIRG/10 considered that it was necessary to develop a framework for the implementation of CNS/ATM systems in the region and to define the scope of work. APANPIRG/10 (Conclusion 10/44) therefore decided to establish a Business Case Task Force (BCTF) to undertake the task. The First Meeting of the Business Case Task Force (BCTF/1) was held in Bangkok from 3 - 5 May 2000 at the ICAO Asia/Pacific Office.

6.1.2 The BCTF developed a:

i) Framework for developing a business case;
ii) Methodology for the study & scope of work; and
iii) Prioritization of case studies based on the established traffic flows.

6.1.3 The meeting noted that the BCTF considered that most parts of the Asia/Pacific Region were well advanced in terms of having CNS/ATM plans and therefore the primary need was for improved integration between State plans.

6.1.4 It was also noted that business cases would concentrate on international flight operations while taking into account the operational characteristics of domestic services.

6.2 **Aviation Environment Management**

6.2.1 Australia advised the meeting that Airservices Australia has developed a nationally networked database to assist in the implementation of an environment management system. The system assesses risks from noise, emissions and ground operations such as fuel storage and was developed in alignment with International Standard ISO 14001.

6.2.2 The system is structured on the principles of due diligence, that is, risk identification, risk management and documentation of risk identification and risk management. A major feature of the system is that it has the capacity to assess business risk associated with an actual or potential environmental impact. The system is about to be used for the business risk and environmental assessment of the noise and emissions impacts resulting from changes in air route and airspace design.

6.2.3 The meeting was advised that Australia is placing both safety and the environment before commercial considerations.

6.2.4 IATA advised the meeting that in its opinion, environmental issues will become a significant agenda item in the future. Through the use of existing aircraft technology, such as FMS arrival and departure procedures, it was possible to mitigate environmental effects to some extent. FMS arrival procedures, for example, allowed a controlled idle descent along a precise flight path with noise and fuel at an absolute minimum.

6.3 IFR GPS Approvals

6.3.1 Australia advised the meeting of the approach it had taken to authorizing the use of GPS for IFR operations. The current approvals have been based on the use of the US FAA Technical Service Order C-129 (TSO C-129) receiver design. With the issue of the next generation TSO for GNSS based operations, additional approvals are being investigated.

6.3.2 The TSO C129 receiver contains a receiver autonomous integrity algorithm (RAIM) to ensure integrity of the GPS signals as well as a prediction program to determine if sufficient satellites are available to support the RAIM requirements. The RAIM algorithm in the C-129 receiver is limited to fault detection (FD) and does not provide fault detection and exclusion (FDE).

6.3.3 As a consequence of the limitations of the TSO C129 receiver design, any approvals for the use of GPS for non precision approaches using this receiver require the use of conventional aids for any alternate approach requirement.

6.3.4 Australia now has some 140 GPS non precision approaches in place with an ongoing design program adding some 30-40 approaches per year. These straight in approaches overcome the safety concerns associated with existing circling designs.

6.3.5 Using the TSO C129 receiver, Australia has developed a primary means domestic enroute approval to provide GPS navigation in domestic airspace.

6.3.6 Post implementation reviews of the GPS standards have not revealed any safety issues with the standards nor with the basic GPS service provided by the US. However some human factor and compliance concerns have been noted. These include the use of unapproved GPS receivers, poor installation and the deskilling of pilots due to over reliance on GPS. Also noted has been the need for ongoing education to ensure proper use of GPS.

6.4 First Combined Pacific Oceanic Airspace FANS Interoperability Teams Report

6.4.1 The meeting was presented with data gathered by the FANS Interoperability Teams (FIT) regarding the current usage of controller-to-pilot data link communication (CPDLC) and automatic dependent surveillance (ADS) in the Pacific.

6.4.2 The South Pacific (SOPAC) FANS Interoperability Team was established as a sub-group of the Informal South Pacific ATS Coordinating Group (ISPACG) to monitor end-to-end performance of data link systems, and to recommend operational enhancements that provide benefits to FANS-1/A-equipped aircraft. The success of the SOPAC FIT during its first three years of operation led to the formation of a separate FIT, which is a sub-group of the Informal Pacific ATC Coordinating Group (IPACG). Boeing continues to act as the Central Reporting Agency (CRA) for the SOPAC FIT and has begun to fill this role for the United States FAA element of the IPACG FIT.

6.4.3 When the ADS/CPDLC operational trial commenced in 1997 within the Tokyo FIR, the Japan Civil Aviation Bureau (JCAB) established a data link operations review group to monitor data link operations within Japanese airspace and to enhance the operation. The JCAB will upgrade their data link operations review group to a CRA. The JCAB CRA will be responsible for providing the CRA functions for aircraft flying in Japanese airspace and will liaise closely with CRA personnel at Boeing.

6.4.4 Some operational and technical problems continue to be experienced in the SOPAC

Flight Information Regions, but the rate of receipt of problems has fallen. End-to-end system performance is high and relatively stable; monitoring continues.

6.4.5 Ground system enhancements have enabled operational use of Automatic Dependent Surveillance (ADS). The South Pacific Operations Manual, has been amended to reflect the operational use of ADS in a procedural environment.

6.4.6 Significant operating benefits continue to be slow to evolve. Dynamic airborne rerouting on receipt of updated wind data has been used little in the SOPAC owing to the increases in dispatcher workload. User-preferred routing from entry of oceanic airspace offers increased benefits and trials are under way in the SOPAC. Full implementation of these procedures are scheduled to occur in October 2000. It is hoped that similar procedures will prove to be beneficial in other FANS 1/A operations areas. The SOPAC Central and North Pacific FITs are also working on reduction of separation minima based on ADS/CPDLC equipage.

6.4.7 As of 27 July 2000, the status of problems reported to the CRA by FANS-1/A operators in the north, central and south Pacific is as follows:

- 317 Problem Reports have been received by the CRA.
- 43 Problem Reports remain open (2 with analysis in progress, and 5 with analysis complete and waiting for information)
- 249 Problem Reports have been closed (including some that were duplicates).
- 25 Problem Reports have been defined as "Lessons Learned". Some of these were closed (but are not included in the "closed" total above) while others cannot be dealt with economically or practically.
- All Problem Reports are now assigned a category "Procedural", "Technical" or "Other". Of the 309 submitted reports which were not duplicates, 70 have been classified "Procedural", 222 "Technical", and 17 "Other". These categories will assist in clarifying the root cause of the problem and will allow easier analysis of data for trend identification.

6.4.8 However, some variability in performance continues and the need for close monitoring and reporting of the data continues.

6.5 Bay Of Bengal ADS/CPDLC Trial

6.5.1 IATA presented the meeting with information collected from airlines following the recent two-week ADS/CPDLC trial (1-14 July 2000) over the Bay of Bengal. The airspace designated for this data collection exercise was for all routes west of Bangkok in the Bangkok FIR and the Calcutta and Yangon FIRs. IATA advised the meeting that currently the Bay of Bengal has no formal Central Reporting Agency (CRA) for the tracking and analysis of CNS/ATM related problem reports. Until such time as a CRA was formally put in place, Boeing, ARINC and SITA had agreed to assist in the major problem solving effort. The data submitted by airlines to IATA, which did not represent the total data available, showed a log-on success rate of approximately 42%.

6.5.2 SITA presented the meeting with details of the data it had received from the trial and analysis of its logs. SITA received a total of 79 Problem Reports (PRs). Some of these PRs contained up to four parts. There were no problems detected with SITA's VHF and Satellite AIRCOM service and there were seven PRs in which traffic was sent through a Co-DSP, preventing SITA from analyzing this in detail. In summary SITA was aware of 105 total problems of which

ATS Provider problems accounted for 104 and aircraft problems for one.

6.5.3 Boeing advised the meeting that an initial analysis of the data submitted by ATS providers and airlines had failed to identify any new problems and that it would take time to work through the issues identified so far.

6.5.4 In reviewing the data the meeting was of the opinion that in implementation programs such as this there was an absolute need for some form of central reporting agency. It was also necessary to have a system for collecting data, a continuous collection of data and the definition of system performance criteria against which the data could be compared. The States present from the Bay of Bengal area advised the meeting that they had recently formed a FANS Action Team for the Bay of Bengal (FAT-BOB) to facilitate these tasks. Boeing advised the meeting that they had offered to undertake CRA responsibilities for this team subject to approval of their higher management. The FAT-BOB had developed Terms of Reference and an initial Work Programme, which was presented to the meeting and is contained at Appendix A to the Report on Agenda Item 6.

6.5.5 The meeting was advised that the CRA will facilitate the analysis of existing problems and the next stage of this implementation. The CRA also agreed to assist States by responding to their problem reports in a timely manner. It was noted that e-mail or fax was the preferred means of communication for this reporting purpose. It was agreed that the ICAO Secretariat would co-ordinate between the parties as required.

TERMS OF REFERENCE FOR THE FANS ACTION TEAM FOR THE BAY OF BENGAL (FAT-BOB)

The FANS Action Team for the Bay of Bengal (FAT-BOB) shall oversee the end-to end monitoring process to ensure the FANS-1/A system continues to meet its performance, safety, and interoperability requirements and that operations and procedures are working as planned.

FAT-BOB shall:

a) Review de-identified problem reports and determine appropriate resolution;

b) Develop interim operational procedures to mitigate the effects of problems until such time as they are resolved;

c) Monitor the progress of problem resolution;

d) Prepare summaries of problems encountered and their operational implications;

e) Assess system performance based on information in Central Reporting Agency periodic reports;

f) Authorize and coordinates system testing;

g) Work to implement operational benefits derived from FANS 1/A technology.

Composition of FAT-BOB

FAT-BOB consists of the following CNS/ATM partners:

- Bay of Bengal States with CNS/ATM Work Stations (India, Indonesia, Malaysia, Myanmar, Singapore, Sri Lanka, Thailand);
- Datalink Service Providers (DSPs) ARINC, SITA & INMARSAT;
- Aircraft manufactures Boeing & Airbus;
- ICAO & IATA;
- Representatives of participating airlines

Reporting

In order for the FAT-BOB to achieve its important goals of problem resolution, system performance assurance, and planning and testing of operations that will enable benefits, work must be done on a daily basis. As a result, and based on other FANS Interoperability Teams experiences, FAT-BOB will require the help of a dedicated sub-team called the Central Reporting Agency (CRA) to facilitate team meetings and carry out daily work. The CRA will report all problem report analysis, system performance data, and annual meeting summaries to FAT-BOB and ICAO.

FAT-BOB will convene meetings as required under the auspices of ICAO. ICAO will submit reports to appropriate Sub-Groups of APANPIRG

Near term FAT-BOB work plan

1. Develop and sign a data confidentiality agreement between Bay of Bengal States, airlines using FANS 1/A in the Bay of Bengal, Data link Service Providers and the CRA. This agreement ensures that team members can submit identified problem reports to the CRA for provision of problem resolution and that all problem reports will be de-identified before dissemination to the entire FAT-BOB team.

   Action - CRA / States / Airlines / DSPs

2. Adopt the Problem Reporting form contained in the ICAO Guidance Material on CNS/ATM Operations in the Asia / Pacific Region.

   Action - Team / States / participating airlines / DSPs

3. Adopt the Air Traffic Service Unit (ATSU) Monthly Monitoring Reporting form contained in the ICAO Guidance Material on CNS/ATM Operations in the Asia / Pacific Region and submit monthly monitoring data to the CRA.

   Action - States to provide dates when software applications or procedural tools will be in place to facilitate system monitoring.

4. Adopt system performance requirements outlined in the ICAO Guidance Material on CNS/ATM Operations in the Asia / Pacific Region.

   Action - Team

5. Resolve issues identified during the last FANS 1/A trial before commencing a more comprehensive trial.

   Action:

   Establish a target date when Bangkok FIR will use CPDLC and ADS.

   Establish a target date when Yangon FIR will be ready for a more comprehensive trial.

   Establish a target date when the Calcutta FIR will transition to the next generation system.

6. Ensure controllers are trained to operate their respective FANS 1/A workstations using the ICAO Guidance Material on CNS/ATM Operations in the Asia / Pacific Region as a basis for developing training.

   Action - States

7. Ensure participating airline flight crews are trained to operate their respective FANS 1/A systems using the ICAO Guidance Material on CNS/ATM Operations in the Asia / Pacific Region as a basis for developing training. Participating airlines should also review FAA document "Controller-To-Pilot Data Link Communication Operational Approval Information Package" dated 25 February 1999. This document will assist airlines to obtain operational approval for FANS 1/A from their regulatory authorities.

   Action - Airlines / IATA

8. Based on dates provided in Item 6 above, establish a target date when FANS 1/A operations can become operational. Co-ordinate a start date for an extended trial covering all Bay of Bengal airspace and publish NOTAMs when appropriate.

   Action - Team / States

9. Co-ordinate with all FANS 1/A equipped airlines prior to the start of the next trial and urge them to participate in the trial.

   Action - IATA

10. Work with other Bay of Bengal States developing FANS 1/A workstations to resolve issues and test systems prior to in-service operation. A small group of experts visiting States may be a suitable mechanism to facilitate resolution of problems.

Agenda Item 7: Review and effect co-ordination of the plans of States, international organizations, airlines and industries for the implementation of the Asia/Pacific Regional Plan for the New CNS/ATM Systems

7.1 **Civil/Military Co-ordination**

7.1.1. The United States advised the meeting that due to design limitations of certain aircraft, some State aircraft cannot meet RVSM or CNS/ATM requirements. Military authorities should therefore be encouraged to make those aircraft that are capable, compliant with applicable minimum aircraft system performance specifications (MASPS) as far as practicable. Some States may be equipping or planning to equip State aircraft to meet CNS/ATM requirements, but due to sheer numbers of aircraft and budget constraints, it may take longer than those experienced by the airlines.

7.1.2 In order to achieve the optimum joint use of airspace, The United States considered that all users should be given access based on a "flexible use of airspace" concept, rather than on a system based on the strict segregation of airspace. Airspace requirements of State aircraft (e.g., for the training of military operational traffic or humanitarian flights) should be accommodated to the greatest extent possible. Close coordination between civil and military airspace users is a fundamental requisite for a flexible use of airspace.

7.1.3 The United States requested that States take into consideration the capabilities of State aircraft and provide exemptions, as necessary, to permit their safe operation within international airspace.

7.2 **CNS/ATM Implementation Plan in the Philippines**

7.2.1 The Philippines with assistance from the Japanese Government, recently developed a Master Plan for CNS/ATM systems. High priority projects were identified, and project implementation is expected to be completed in 2006.

7.2.2 Under the Master Plan the Manila ATM Center will combine the Manila ACC, Mactan Sub-ACC and all Approach Control Units. It will provide airspace management functions, air traffic management functions, search and rescue coordination, weather forecast functions, and system maintenance functions.

7.2.3 The ATM automation system will be an integrated system consisting of data processing sub-systems, data acquisition sub-systems, consoles, displays, etc. The ATM automation system will include such functions as Air Traffic Management Functions, Safety Measure Function, Weather Information Functions and Data Recording. The communications system will utilise the ATN, D-ATIS, AMHS and VSAT. The navigation system will utilise SBAS and GBAS while the surveillance system will utilise ADS and three new SSR radars.

7.3 **CNS/ATM Implementation Plan in Brunei Darussalam**

7.3.1 Brunei Darussalam advised the meeting of its main initiatives leading towards full implementation of CNS/ATM. These include an Airspace Transition Plan to the CNS/ATM requirements for a busy TMA, an Advanced Air Traffic System, an Airspace Classification System, WGS-84 Implementation, ATN, Co-ordination with Malaysia sharing the common FIR with Brunei Darussalam and Human Resource Development & Human Factors studies.

7.4 **APEC Transportation Working Group**

7.4.1 The meeting was advised that the APEC Group of Experts on GNSS implementation held its first meeting in Singapore 17 and 18 August 2000 to progress the implementation of GNSS within APEC economies.

7.4.2 The meeting was informed that the Group noted the GNSS strategies developed by the COM/MET/NAV/SUR Sub-Group and agreed that its task would complement the work carried out by the Sub-Group.

7.4.3 It was also noted that the Group of Expert agreed that in order to progress the implementation of GNSS work on APEC Economies, the first initiative was to implement GNSS as a supplementing means of navigation for en-route, terminal and non-precision approaches during 2001. To assist the Economies, the Group endorsed the need to conduct a five-day workshop on GNSS implementation in February 2001. The Group endorsed the need to engage a suitable consultant to conduct a study for regional GNSS for all mode of transport.

7.4.4 It was noted that the above recommendations would be forwarded by the Expert Group to the SN&C Advisory Committee of APEC at its 18th meeting to be held form 16-21 October 2000 in Japan, for consideration.

7.5 Progress of CNS/ATM Study & Trials in Hong Kong, China

7.5.1 Hong Kong, China advised the meeting regarding the current progress of the satellite-based CNS/ATM study and trials carried out by Hong Kong, China. Hong Kong will implement the project in three phases. Phase 1 comprises of System Study & Analysis (now-2004), Phase 2 comprises of CNS/ATM Trials & Evaluation (2000-07) and Phase 3 will comprise of CNS/ATM Implementation & Transition (2003-16).

7.5.2 Studies have been initiated on the latest CNS/ATM developments and systems available for trials and evaluation under different Hong Kong, China operational scenarios. Major CNS/ATM systems manufacturers have been invited to present their CNS/ATM systems including Human Machine Interface (HMI) demonstrations.

7.5.3 To facilitate the progress of the project, a Hong Kong China CNS/ATM Committee was set up in March 2000. The Committee meets every two months to discuss and coordinate issues relating to the study, trials and subsequent implementation of the CNS/ATM Systems for Hong Kong, China.

7.5.4 So far, trials have been organised for ADS/CPDLC, Digital-ATIS (D-ATIS) and Digital-VOLMET (D-VOLMET). Favourable comments and responses have been received from the airlines. Subject to further data integrity checks, the D-ATIS and D-VOLMET will be declared for operational use to enhance service to the airlines. In addition, Hong Kong China is now working closely with the equipment suppliers and plan to launch a Pre-Departure Clearance (PDC) trial using datalink in September/October this year. Next trial systems will include SSR Mode S, ATN, AMHS, etc.

7.6 The Implementation of CNS/ATM in Mongolia

7.6.1 Mongolia advised the meeting of the situation pertaining in Mongolia with reference to the implementation of CNS/ATM.

7.6.2 Under the National Air Navigation Development Project of Mongolia the first phase of modernization of the ATS system was implemented. A decision was made to adopt the ICAO

CNS/ATM implementation plan which included the preparation of a domestic GPS route structure; the equipping of the domestic fleet with GPS; the introduction of GPS non-precision approaches at the regional airports to supplement NDB only guidance; the construction of a new Area Control Centre and Control Tower; the provision of ADS workstations capable of utilising CPDLC; and an extensive network of RCAG and VSAT stations around the country to provide the necessary communications and coordination facilities.

7.6.3 Most of this work is now complete, ADS workstations are operational with the flight progress of all suitably equipped aircraft monitored; CPDLC has been trialed and is tested on a regular basis; the use of GPS as a primary means of navigation has been approved by the CAA and is in full operation on the domestic network; GPS procedures are being drafted for Ulaanbaatar International airport and the regional airports and will be approved on completion of flight-testing; en-route controllers have received training in ADS procedures; and a simulator has been commissioned which will enable advanced training in the CNS/ATM field to be implemented. In addition to this work Mongolia is taking part in a large regional project to evaluate the use of ADS-B.

7.6.4 Mongolia advised the meeting that what it requires now is further guidance and leadership from ICAO in the implementation of its facilities in a practical, operational, sense. Standards and Recommended Practices are urgently required covering the operational use of ADS and CPDLC. ADS based separation standards are required, as a matter of urgency, to be incorporated into ICAO provisions.

7.6.5 Mongolia also advised the meeting that it requires assistance, in the regional sense, to assist it in implementing a better, more flexible, regional route structure which implementation of the new technology will make feasible.

7.7 CNS/ATM Implementation in Vanuatu

7.7.1 Vanuatu advised the meeting that it was investigating the implementation of new ground/ground communication systems and ADS. Cost was a significant factor but every effort was being made to implement appropriate CNS/ATM systems.

7.8 ATN Developments in Australia

7.8.1 Australia provided the meeting with an update on the current development and research activities that have been carried out in Australia on the ATN. These activities have been managed through a Research and Development program called Investigation of Networked CNS/ATM Applications (INCA). The INCA project is a collaborative agreement between Airservices Australia and Airsys ATM Pty Ltd. The aim of the project is to continue trials and acquire reliable information about the deployment of (CNS/ATM) applications and associated data communication network services in Australia. This is to be achieved through the continued operation and extension of Airservices' ATN Validation Platform and the development of a detailed cost benefit analysis study.

7.8.2 One of the activities involved investigating the issues associated with the AMHS and the AMHS/AFTN gateway services. A detail report on the results of the AMHS was produced by the project. In summary the major findings from the report showed that the AMHS provides a reliable fault tolerant message delivery system. Tests were conducted in an attempt to lose, corrupt and duplicate messages traveling within the AMHS. The AMHS recovery procedure automatically recovered all messages without messages or data being lost, corrupted or duplicated. Also higher capacity circuits are required to obtain the full benefit from the AMHS functionality. This is due to the additional message overhead, which provides the high reliability of message integrity within the

AMHS, that higher capacity circuits are required to convey the same amount of user data as that currently transmitted via the AFTN.

7.9 **Australian ATM Strategic Planning**

7.9.1 Australia advised the meeting that ATM Strategic planning within Australia is being re-focussed to adopt a 'benefits and application' approach to define 'WHAT' is required in terms of ATM services to effect air traffic management in the near, mid, and long-term. All key ATM stakeholders within Australia are collaborating in the development of an Australian ATM Strategic Plan that defines the development path for ATM within the Australia FIRs in terms of ATM services. The determination of what capabilities are needed to delivery the new and/or enhanced ATM services will define the CNS/ATM technologies and associated procedures and practices required.

7.9.2 The Australian ATM Strategic Plan will determine any input Australia has into the Asia/Pacific Regional Plan for the New CNS/ATM System.

7.10 **CNS/ATM implementation in Sri Lanka**

7.10.1 Sri Lanka advised the meeting that installation of CNS/ATM systems at Colombo ACC was commenced in May 2000 and completed in mid July 2000. Site Acceptance Tests in respect of ADS/CPDLC systems and RDP/FDP systems were successfully completed in August 2000. The Sri Lanka ACC now has the capability of providing services using ADS, CPDLC, Flight Plan Air Situation Display and Flight Data Processing.

7.10.2 Since mid July 2000, several trials have been carried out and Colombo Area Control Centre continues to carryout "trials" with aircraft able to log-on between 1600 – 2100 UTC daily.

7.10.3 The system is expected to be fully operational by September 2000 and ADS/CPDLC facilities will be available on 24-hour basis from 1st November 2000. Sri Lanka requested all FANS 1/A equipped aircraft to "log-on" with Colombo Area Control Centre (Address: VCCC) when overflying Colombo airspace.

7.11 **CNS/ATM Implementation Plan in Indonesia**

7.11.1 Indonesia advised the meeting that the period 1999-2003 was scheduled for development of CNS/ATM systems, while the period 2004-2010 was scheduled for the implementation of CNS/ATM systems. Within the longer term the Indonesian airspace will be reorganised from four to two FIRs and will be controlled by Jakarta and Ujung Pandang (Makassar) ACCs.

7.11.2 In 2002, ADS/CPDLC will be implemented in phases, especially for international routes within the Jakarta FIR. Ujung Pandang (Makassar) ACC is scheduled to be in operation in 2004.

7.12 **CNS/ATM Implementation in Malaysia**

7.12.1 Malaysia advised the meeting that it is focusing on the implementation of ADS/CPDLC in the Bay of Bengal and South China Sea areas where there is no radar coverage. Malaysia has undertaken ADS/CPDLC trials in 1997 but there was no activity from 1998 until the middle of 2000 due to the economic recession, Y2K and air traffic services privatization issues.

7.12.2 An ADS/CPDLC pre-operational system trial and evaluation will take place from

October 2000 – December 2001. Following that ADS/CPDLC system integration will take place from January 2002 – December 2003.

7.13 **Status of CNS/ATM Implementation in Tahiti**

7.13.1 French Polynesia advised the meeting that as an active member of the Informal South pacific ATS Co-ordination Group (ISPACG) and of the ISPACG FANS Interoperability Team (FIT), the SEAC PF (Service d'Etat de l'Aviation Civile en Polynesie Francaise) is continuing CNS/ATM implementation in conjunction with its South Pacific partners.

7.13.2 Flextracks between Los Angeles and Sydney and Los Angeles and Auckland have been implemented in 1995. This first step led to the installation of VIVO 1, which was the traffic situation display. The second step, VIVO 2, with CPDLC implementation took place in March 1996, in view of the dynamic airborne re-routing programme (DARPS) phase 1 that was implemented in July 1998. ADS was implemented with VIVO 3 installation in March 1999 and RVSM was implemented on February 24th, 2000. Implementation of a limited subset of AIDC messages set is still under discussion with neighbouring FIRs.

7.14 **ADS/CPDLC Planning Matrix**

7.14.1 IATA advised the meeting that it felt it might be beneficial to develop a planning matrix for the Asia/Pacific Region, which showed the state of implementation of ADS/CPDLC systems on an FIR by FIR basis. The Secretariat noted the suggestion and agreed to work on this with IATA.

Draft Conclusion 7/6 - ADS/CPDLC Planning Matrix

That, the Secretariat develop and maintain a matrix listing all Asia/Pacific FIRs and their status of implementation of ADS/CPDLC.

7.15 **ADS/CPDLC Implementation in Singapore**

7.15.1 Singapore provided the meeting with an update on its ADS/CPDLC implementation, which commenced operations in February 1997. In February 1999 ADS/CPDLC was integrated with the Singapore ATC system and in July 2000 was upgraded to work with B777 aircraft in addition to the current B744 aircraft.

7.16 **ADS/CPDLC Operations in Japan**

7.16.1 Japan provided the meeting with information regarding the current status of ADS/CPDLC operations being conducted at Tokyo ACC. The datalink operation (ADS/CPDLC) within the Tokyo FIR commenced in October 1997 using the ODP-2.5 system. This was upgraded to a new system (ODP-3) which became operational in June 2000. The ODP-3 system includes an electronic strip display and conflict probe functions. CPDLC is currently the primary means of communications within the Tokyo oceanic airspace with HF as a back-up. Some 15 airlines and some 60 datalink capable aircraft per day use ADS/CPDLC. Japan intends to apply 50 NM longitudinal separation for RNP-10 or better certified aircraft at cruise, when the new MTSAT-1 becomes operational.

7.16.2 The Air Traffic Flow Management Center in Fukuoka will be upgraded to an air traffic management center in 2005. The new ATM Center will expand its function to include management of both domestic and international traffic flows within the Tokyo and Naha FIRs.

Management of military training airspace, currently co-ordinated through individual ACCs, will also be provided by the new ATM Center. Oceanic control, presently being provided by Tokyo and Naha oceanic sectors, will be transferred to the new ATM Center.

7.17 **Use of ADS/CPDLC by Pilots and Controllers**

7.17.1 In discussing the operation of ADS/CPDLC particularly with respect to the training of pilots and controllers, China advised the meeting that it recommended the use of simulation and had previously made use of simulation facilities available at avionics manufacturers and airlines for training purposes.

7.17.2 IFALPA advised the meeting that there was no reluctance from pilots to participate in trials, but that the existence of and conditions for trials needed to be clearly communicated to pilots by way of NOTAM/AIP Supplements. IFALPA also advised that the issue of standardization, from a pilot perspective, across the Airbus and Boeing fleets was important as pilots routinely move from one aircraft type to another and their training therefore needed to be transferable.

Agenda Item 8: Review and co-ordination of amendments to the Regional Air Navigation Plans to ensure adoption of the new CNSA/TM requirements including basic operational requirements and planning criteria

8.1 The meeting noted that some elements of CNS/ATM have been incorporated into the Asia/Pacific FASID, which has been circulated to States and International Organizations as an amendment to the Asia/Pacific Air Navigation Plan.

Agenda Item 9: Intra & Inter Regional Co-ordination

9.1 The Secretariat advised the meeting that an inter-regional co-ordination meeting between the ICAO Asia Pacific, Middle East and European Offices will be held in Bangkok in October 2000. The purpose of this meeting, as a first step, is to develop a framework for inter-regional co-ordination along the major traffic flows from Asia to Europe.

Agenda Item 10: Shortcomings and Deficiencies in the Air Navigation Field

10.1 The meeting recalled that APANPIRG/10 strongly reiterated the need for States, Providers, Users and International Organizations in the region to cooperate fully in providing information on shortcomings and deficiencies so that appropriate remedial action could be taken.

10.2 Based on information currently available at the ICAO Regional Office, an updated list of air navigation shortcomings and deficiencies in the ATS/AIS/SAR and COM/MET/NAV/SUR fields was reviewed by the meeting. India provided updated information on the status of ATS routes which would be taken into consideration by the Secretariat.

Agenda Item 11: Consideration of the Report of the APANPIRG Sub-Group Work Programme

11.1 **APANPIRG Sub-Group Work Programme Review Task Force**

11.1.1 The Chairperson introduced the paper drawing the attention of the meeting to the achievements of the Sub-Group and the developments which had led APANPIRG/10 to form a Sub-Group Work Programme Review Task Force. The Working Paper being considered by the meeting was the report of the Review Task Force to APANPIRG.

11.1.2 The meeting noted that both the COM/MET/NAV/SUR/SG and ATS/AIS/SAR/SG had also reviewed this report and would be reporting separately to APANPIRG/11.

11.1.3 Following considerable discussion on the value of the CNS/ATM/IC Sub-Group, the meeting considered that the Sub-Group was still performing a very useful function. The Sub-Group was enabling States to share information and highlight new developments and progress with CNS and ATM projects.

11.1.4 It was also noted that this meeting had considered several papers which had demonstrated the valuable contribution in the co-ordination functions of its charter.

11.1.5 The meeting in noting the report of the Review Task Force considered that the earlier concern about the Sub-Group not being able to fully perform the “co-ordination” function may in part be due to the agenda content. This was considered to be a matter of restructuring the agenda and not solely attributable to the future purpose of the Sub-Group.

11.1.6 The meeting felt that while the purpose and achievements of the Sub-Group should be reviewed it would be premature to dissolve the Sub-Group at this time.

11.1.7 The meeting noted that the proposed revised Terms of Reference for the other two Sub-Groups could remain unaltered, however, it would be not be desirable to incorporate the proposed renaming of the Sub-Groups if the CNS/ATM/IC Sub-Group remained.

Agenda Item 12: Development and proposal to APANPIRG of an appropriate future work programme

12.1 **Terms of Reference and Work Programme**

12.1.1 The Terms of Reference were considered to be appropriate, but process problems do exist. The Sub-Group recognized a need to focus on the key words in the TOR's. One of the key TOR's is the intent to educate, gather and share information between States and ATS Providers. In this regard it would be helpful to develop and maintain a library of specific papers or discussions held during various CNS/ATM related meetings. Another important TOR is to help resolve or mitigate problems raised by the States in their deliberations. The CNS/ATM IC should take a look at what mechanisms are available or should be available to help resolve problems identified.

12.1.2 More attention should be placed on the development of the Agenda by States and the secretariat. The agenda should be published as far in advance to provide Sub-group participants an opportunity to develop their papers, but hopefully, the agenda should be available 90 days in advance. This should result in working papers being submitted at least 30 days in advance.

12.1.3 Issues in the Key Priorities List that are at a point of development should be scheduled on the agenda. Use of electronic media for information transfer and storage including a Web Page that is maintained dynamically by the secretariat, would be very important to the success of the meeting.

12.1.4 States are encouraged to send papers to ICAO early so that they could be published on the Web prior to the meeting. Large papers must be available on the WEB prior to the meetings.

(A Sample Agenda will be developed in co-ordination with Australia, Japan, IATA the United States and the Secretariat for the information of APANPIRG).

Agenda Item 13: Any other business

13.1 **Safety Management System in Australia**

13.1.1 Australia provided the meeting with information relating to Airservice Australia's Safety Management System which can be defined as the management actions necessary to secure and demonstrate high standards of safety within the systems that Air Navigation Service (ANS) providers plan, provide and operate. As such, safety management affects all parts of an ANS provider's organization.

13.1.2 The Airservices Safety Management System has the following key components:

- Policy
- Accountabilities
- System Requirements
- Procedures
- Measurement of Success.

13.1.3 Successful implementation of the Airservices Safety Management System and the development of a safety culture throughout Airservices required, and has been given, demonstrable support from senior managers. For a safety management system to be effective it must be based on the **culture** of an organization. Only when it is instinctive, will safety seem to be invisible, yet implicit in the things that are done and the decisions that are made.

13.1.4 Some of Airservices Safety Information Management Systems include an Electronic Submitted Incident Report (ESIR), a HAZLOG and a System Action Improvement Report (SAIR).

13.2 **Safety Management Training in Australia**

13.2.1 Australia advised the meeting that an essential element of a safety management system is the provision of safety management training. Airservices Australia has established a modular training programme so that safety management training delivery can be as flexible as possible. The programme consists of six modules containing a wide range of topics which are designed to be delivered to a number of different levels with the organization from senior management down.

13.3 **Regulatory Reform in Australia**

13.3.1 Australia advised the meeting that on Government direction, the Civil Aviation Safety Authority of Australia (CASA) is undertaking a program of regulatory reform to replace the existing regulations. The object of the program is to modernize the existing regulations, align requirements where possible with accepted international practice and to allow changes in the method of regulating various functions. Significant areas within the plan include a revised classification of operations that will align with the ICAO definitions, the use of self administering organizations such the Glider Federation of Australia to undertake the administration of specific sectors of the industry, and introduction of rules that may allow 'contestability' (or commercial competition) for such functions as the provision of ATS services, navigation aids, instrument approach design and meteorological services.

13.3.2 These new regulations will amend the manner in which certain services are regulated and at the same time may provide the opportunity for other methods of provision other than by direct Government supply.

13.4 **Restructuring in Japan**

13.4.1 Japan advised the meeting that from January next year the Ministry of Transport and Ministry of Construction will be combined into a single Ministry. The Civil Aviation Bureau will unaffected.

Agenda Item 14: Date and Venue for next meeting

14.1 The meeting was of the opinion that the Sub-Group should meet at a similar time in 2001. The meeting was also generally of the opinion that the CNS/ATM/IC Sub-Group should meet approximately one month prior to APANPIRG in order to permit States to review the report of the CNS/ATM/IC Sub-Group prior to the full APANPIRG meeting.