International Civil Aviation Organization

# REGIONAL WORKSHOP ON AMHS

## Implementation Strategy

**(Dakar, 28-29 May 2013)**

# Outline

- ATN History
- ACP
- Annex 10 Amendment
- Transition Requirements
- Implementation Strategy
- Other Issues
- IPS Implementation
- Implementation Schedule
- AIDC
- Future Trends
- Conclusions

# ATN History

- Concept of Aeronautical Telecommunication Network was developed by the SSR Improvement and Collision Avoidance Panel in the late eighties.
- ICAO Air Navigation Panel established ATN Panel (ATNP) to continue this task in 1993
- Creation of ATNP was in response to Recommendation 4.1 of the Third Meeting of ICAO Special Committee on Future Air Navigation Systems (Phase II) (FANS II)
  - Recommendation 4/2 – Means to monitor the development and implementation of the aeronautical telecommunication network (ATN)
  - *That ICAO designate an appropriate body to monitor the development and implementation of ATN and explore related issues, specifically to:*
  - *Define end-to-end performance requirements, network security, network management and other feature; and*
  - *Contribute to the planning of the migration to the ATN on a global basis*

# ATN History

- SARPs for ATN were developed by the Second meeting of ATNP in 1998 and were introduced in ICAO Annex 10 in 2000. These SARPs prescribed ISO/OSI protocols.
- *Manual of Technical Provisions for the ATN* (Doc 9705) was published in 1998. The manual is being updated and published as *Manual on detailed technical specifications for the Aeronautical Telecommunication Network (ATN)* (Doc 9880)
- ATNP is also developed *Comprehensive ATN Manual* (Doc 9739) in 2000.
- Regular updates on these documents are available on ICAO website *www.icao.int/anb/panels/acp*
- In 2003, ANC agreed to merge Aeronautical Telecommunication Network Panel (ATNP) and Aeronautical Mobile Communications Panel (AMCP) in to Aeronautical Communication Panel (ACP)
- AMCP/8 in 2003 created work programme *"to consider the use of Internet Protocol Suite (IPS) protocols in the provision of aeronautical internetworking"* Revised SARPs including ATN over IPS were circulated through Amendment 83 to Annex 10 on 20 July 2008.

# Aeronautical Communications Panel (ACP)

- Aeronautical Communication Panel (ACP) was created in 2003 by the Air Navigation Commission, after merging the Aeronautical Mobile Communications Panel (AMCP) and the Aeronautical Telecommunications Network Panel (ATNP).

- ACP develops Standards and Recommended Practices, as well as Guidance Materials for air - ground and **ground – ground aeronautical communications**, both voice and data.

- It also develops the draft ICAO position for ITU Radio Communication Conferences and coordinates the ICAO input to meetings of ITU Study Groups and Regional Telecommunication Organizations.

# ICAO Annex 10, Vol.III, Amendment No.83

- Annex 10, Vol.III, Paragraph 3.4.1 requires that ATN shall either use International Organization for Standardization **(ISO) communication standards** for Open System Interconnection (ISO) or use the Internet Society (ISOC) communications standards for **the Internet protocol Suite (IPS)**
- Amendment No.83 introduced Internet Protocol Suite (IPS) in the Aeronautical Telecommunication Network (ATN), and focused on keeping high level Standards in Annex 10 necessary to secure the global interoperability of the ATN
- Annex 10, Vol.III, Paragraph 3.3.2 requires that **implementation of the ATN shall be made on the basis of regional air navigation agreements**. These agreements shall specify the area in which the communication standards for **ATN/OSI or the ATN/IPS** are applicable.

# ICAO Annex 10, Vol.III, Amendment No.83

- Annex 10, Vol.III, Paragraph 3.4.2 stipulates that AFTN/AMHS gateway shall ensure the interoperability of AFTN and CIDIN stations and network with the ATN. *This envisages that the AFTN applications will continue to be supported.*

- Annex 10, Vol.III, Paragraph 3.4.6 requires that ATN shall provide communication in accordance with the prescribed Required Communication Performance (RCP) (*Manual on Required Communication Performance (RCP)* Doc 9869 *refers)*

- ATN shall be capable of supporting the following AIDC applications:
  - ATS Inter-facility Data Communication (AIDC) and
  - ATS Message Handling Services Applications (ATSMHS)

# Transition Requirements

- The end goal for the development of SARPs is to achieve an ATN that is solely based on Standards forming IPS with IPv6 protocol. But in the interim, implementations are taking place with OSI and IPv4.
- Interoperability between ATN/OSI networks can be achieved through implementing standard gateways (e.g. through RFC 1006 for IPv4 networks, or RFC 2126 for IPv6 networks).
- Another way of achieving interoperability between ATN/OSI and ATN/IPS subnets is through an SNDCF (sub-network dependent converging functions) wherein the ATN/OSI packets are encapsulated in an IP packet to enable them to be sent over an IP network. In this case, dual stack will be required.
- Gateways are necessary for linking ATN (either OSI or IPS) to the AFTN and CIDIN. Such gateway exist for ATN/OSI.

# Other Issues

- Applications
  - Currently the applications specified in Doc 9880 are specific to the ATN/OSI. Investigations are on to use these applications and amending them if required for use in ATN/IPS. Recommend to use available (application layer) IETF standards without modifications. Most of the current material most likely not native to the ATN/IPS. Hence the applications are not using the full benefits of IPv6.

- Security
  - ATN network layer security is to be based on the IPsec protocol suite. However, implementation of IPsec is based on system threat and vulnerability analysis. The ATN, in principle is a closed network, and hence may not require implementation of security to be mandatory. Application specific security protocols may be added.

# ATN Infrastructure

- ATN consists of two categories
  - Networks
    - Air-to-ground (A/G) Router Network and
    - Ground-to-ground (G/G) Router Network
  - Applications
    - Air Traffic Services (ATS) Inter-facility Data Communication (AIDC)
    - ATS Message Handling System (AMHS)
    - AMHS and Aeronautical Fixed Telecommunications Network (AMHS/AFTN) Gateway
    - Controller Pilot Data Link Communication (CPDLC)
    - Directory Service

# Strategy for ATN Implementation in AFI

- In order to assist States in the implementation of the ground-to-ground ATN it was agreed to develop a strategy for the region.
- APIRG/9 adopted Decision 9/33 *(Planning for the introduction of the ATN), requesting the CNS/ATM/IC/SG and the COM/SG)*
  - ***to undertake the necessary studies related to the technical, administrative, operational and institutional aspects to ensure the timely cost-effective introduction of ATN in the AFI Region.***
- COM/SG/4 (Nairobi, 1998) established an Aeronautical Fixed Service Task Force (AFS/TF)
  - ***to formulate proposals for the migration of the AFI AFTN to the ground-ground element of the ATN.***
- COM/SG/5 (Dakar, 2000), based on the report of the AFS/TF
  - ***identified sub-tasks to be achieved in the planning for the ground portion of the ATN, and***
  - ***established an AFI Aeronautical Telecommunication Network Planning Task Force (COM/SG/ATN/TF) (Decision 5/9) to plan for ATN implementation in order to meet CNS/ATM system performance requirements and capacity.***

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# Strategy for ATN Implementation in AFI

## AFI ATN Planning Task Force Work Programme

**Task 1: Develop ATN Routing Architecture - Drafting of:**

- ATN Routing Architecture
- ATN Ground/Ground Transition Plan
- FASID ATN Router Plan
- ATN IDRP Routing policy
- ATN Ground/Ground Interface Control Document (G/G ICD)
- ATN Air/Ground interface control document (A/G ICD)

**Tasks 2 and 4: ATN applications (AMHS, AIDC) - Drafting of:**

- AMHS Naming Plan
- AMHS ICD
- FASID AMHS Routing Plan
- AMHS Message Transfer Agent Routing Policy
- AMHS Address Registration Form
- FASID AIDC Circuit Plan

# Strategy for ATN Implementation in AFI

**Task 3: Develop ATN addressing plan**

**- Drafting of:**

- ATN NSAP Addressing Plan
- ATN NSAP Registration Form

**Task 5: Develop guidance material**

**- Drafting of:**

- Guidance on Ground Elements ATN Transition
- Overview of the ATN

# Strategy for ATN Implementation in AFI

- APIRG/14 (2003)
  - agreed that ATN implementation in the AFI Region might necessitate a major planning of the transition from the AFTN, and that it was necessary to have available precise information on the planning by States of ATN ground-to-ground applications (AIDC and AMHS).
    - *Decision 14/13 collect of information on schedules of implementation by States of ATS inter-facility data communications (AIDC).*
    - *Conclusion 14/14: conduct a survey on States plans for the implementation of the AMHS application to be supported by the ATN infrastructure*
- APIRG/15 (2005)
  - ATN/TF **Draft ATN Routing Architecture**
    - To be circulated to States for comments and completion of tables
  - ATN/TF **Draft ATN Network Service Access Point (NSAP) Addressing Plan**

# Strategy for ATN Implementation in AFI

- APIRG/17 (2010)
  - recommended a cooperative approach and regional coordination in implementing AMHS in the AFI Region
  - established an **AMHS Implementation Task Force (AMHS/I/TF)** (Conclusion 17/17 refers).
- **Terms of reference of AFI AMHS Implementation Task Force**
  - Conduct a comprehensive review of ICAO Standards and Recommended Practices for the Aeronautical Message Handling System (AMHS) application as specified in Annex 10 Volume II[3], Chapter 4.6 and Annex 10 Volume III, Part I[26], chapter 3.5.3) and ICAO Doc.9880 Part IIB[5];
  - Collect and analyze information on the status of AFI ANSP Aeronautical Message Handling System plan processing systems including ongoing upgrades to existing systems;

# Strategy for ATN Implementation in AFI

**Terms of reference**

- On the basis of the above, and in accordance with relevant additional ICAO provisions, develop a coordinated AFI transition strategy and plan with associated timelines to enable the streamlined coordinated implementation of AMHS.

**Considerations**

- In addressing these terms of reference, the Task Force should consider, *inter alia,* the following aspects:
- The implemented systems in the AFI Region could differ from systems in other ICAO Regions and accordingly provide recommendable Regional action with global goals;
- Inter and intra regional issues;
- Personnel training for operational migration from AFTN to AMHS;
- AFS network backbone capability;

# Strategy for ATN Implementation in AFI

**Considerations**

- Contingency arrangements for States that cannot comply by the due date;
  - *Way to handle staged implementations by States,*
  - *Expectations across ANSPs with different implementation dates*
- Systems that transition early will need to be capable of handling both new and current instructions.
- Inter-system exchanges need to take account of differing automation capabilities in order to avoid excessive message rejection;
- Establishment of an Information Management system to track implementation timelines for various States/systems;
- Impacts to users (compliance to new flight plan format);
- Appropriately timed withdrawal of existing systems specific requirements to ensure consistency with new instruction.
- Existing ICAO guidance material

# Strategy for ATN Implementation in AFI

**Considerations**

- The requirement for a robust ground-to-ground Aeronautical Telecommunication Network (ATN) to meet growing need for a digital data communication to support the Air Traffic Management Operational Concept;
- The availability of ICAO SARPs and Technical Manual for implementation of ATN;
- The awareness generated in States for replacement of the present AFTN with digital data network by conducting various seminars and meetings;
- The availability of several guidance material, interface control documents (ICD) required to assist States to ensure harmonization of procedures and protocol to assure inter-operability within the region;
- The agreement in EUR region to provide gateways to support ATN protocol suites implemented in adjacent regions;

# Strategy for ATN Implementation in AFI

**Considerations**

- f) The feasibility of introducing SARPs compliant air-ground application in a secured network without prolonged delay;
- g) *The lack of SAPRs for an alternative TCP/IP protocol for immediate use and introduction of material on the use of TCP/IP for air-ground application, require significant technical work, which is not likely to be completed in the near future for amendment to Annex 10 SARPs and associated technical provision in ATN documents.*
- h) The need to migrate to Binary Universal form of representation of meteorological data (BUFR) coded OPMET messages; the emerging need to use lower case letters in NOTAM messages
- i) The trial and demonstrations conducted by several States in the AFI Region for implementation of ATN/AMHS and actions taken by States for introduction of ATN/AMHS

# Strategy for ATN Implementation in AFI

- Based on experience gained in other ICAO Regions, the following general strategy should be considered for the implementation of the ATN Infrastructure and associated G/G applications in the AFI Region :
  - Implementation should be in full compliance with Annex 10 SARPs, PANS, ICDs and guidance materials to be adopted by APIRG;
  - In the Asia/Pacific region ground-to-ground ATN will initially support the implementation of ATS Message Handling System (AMHS) to replace AFTN
  - Strategically deploy the ATN infrastructure with a limited number of ATN Backbone routers to support other ground-to-ground and air-ground applications
  - During the transition, some AFTN system may remain in operation. A reasonable time frame should be established for their replacement with AMHS.

# Strategy for ATN Implementation in AFI

- Message Transfer Agent (MTA) sites should provide AFTN/AMHS gateways during the transition phase;
- States should work co-operatively to assist each other on a multinational basis to implement the ATN expeditiously and to ensure system inter-operability
- States should organize training of personnel to provide necessary capability to maintain and operate the ground-to-ground ATN infrastructure and applications
- Upon successful deployment of ground-to-ground ATN infrastructures and applications within the region, States gradually introduce ATN air-ground infrastructures and applications

# IPS Implementation Strategy

- Based on experience gained in other ICAO Regions, the following strategy should be considered for the implementation of ATN/IPS in the AFI Region:
  - All States having Backbone Boundary Intermediate Systems (BBIS) in the Region should continue to implement ATN/OSI FASID Tables CNS-1B and CNS-1C);
  - For States with Boundary Intermediate System (BIS), deployment of IPS based AMHS and/or inter State ATN circuits may be considered depending on the impact on the regional ATN network connectivity and redundancy, and the agreement with the adjacent States;
  - For AFS interface to adjacent regions, communication with States with only one connection to the region can use IPS on a bilateral basis. States in adjacent regions that have multiple connections to the region are recommended to continue to support ATN/OSI.

# IPS Implementation Strategy

- The region should construct an effective regional ATN ground network that supports both OSI and IPS based services. This could be achieved by upgrading inter-State circuits to support IPS as well as OSI communication and introducing IPS routers alongside BIS Routers.
- Any subsequent new services or AMHS Message Transfer Agent should be able to support dual stack to assist future transition to “ICAO compliant” IPS implementation documentation.

# Implementation Schedule

- The ICAO Manual for ATN using IPS Standards (Doc 9896) is available. ICAO SARPs provide for IPS utilizing IPv6 protocol version, however implementation of IPv4 has been considered a regional issue and will be based on the regional agreement.
- AFTN is likely to continue in the foreseeable future, though AMHS implementation will continue.
- A Survey needs to be conducted in the AFI Region to assess the investment already made/committed by the States hosting Backbone Boundary Intermediate Systems (BBIS) in the implementation of ATN/OSI.

# Conclusions

- Moving from manual “store and forward” process to dynamic network-based AMHS has not been an easy task.
- Implementation of AMHS service in the region requires full cooperation of member States and coordination between different implementing agencies.
- Implementation problems should be solved as and when they are being experienced.

# Questions?

# Thank you