International Civil Aviation Organization

ATN Seminar and Third ATN Transition Task Force Meeting

Singapore, 26-30 March 2001

Agenda Item 1: Basic ATN Concept

AN OVERVIEW OF THE AERONAUTICAL TELECOMMUNICATION NETWORK (ATN)

(Presented by Jack McConnell, USA)

ATN Presentation

FAA

March 2001

AOP-600

An Overview of the Aeronautical Telecommunication Network (ATN)

Presented by

Jack McConnell

March 26-27, 2001

Why the ATN?

- Demand for Air Transport Services are expected to increase dramatically over the next 10 years:
  - we are running out of airspace
  - we are running out of capacity

ICAO Activities

- 1980 - Recognized limitations of present air navigation systems and need for improvements to take civil aviation into the 21st Century.
- 1983 - Established special committee on Future Air Navigation Systems (FANS) to study, identify, and assess new concepts and technology towards a co-ordinated evolution of air navigation for the next 25 years (2010 timeframe).
- NEED for GLOBAL CONSISTENCY and INTERNATIONAL INTEROPERABILITY

ICAO Activities (cont)

- 1988 - Completed system concept for development of CNS:
  - Communications (Satellite - GNSS)
  - Navigation (MLS as ICAO Standardized approach/Precision Landing)
  - Surveillance (SSR & Digital Data Links // ADS)
- 1993 - Developed a Global co-ordinated plan for CNS/ATM. Completed 9/93
  - Endorsed by 10th Air Navigation Conference in 9/91
  - Endorsed by 29th ICAO Assembly in 1992

ICAO Activities (conclusion)

- ***NEED for GLOBAL CONSISTENCY and INTERNATIONAL INTEROPERABILITY to enable evolution of improved Air Traffic Management (ATM)***

Overview of the ATN

- **Who are the primary Users of the ATN?**
  - Air Traffic Service Provider Organizations
  - Aircraft Operators
  - Military
  - Airport Operators

Overview of the ATN

- **What are the initial applications?**
  - The CNS/ATM-1 Package defines SARPS for the following applications:
    - Automatic Dependent Surveillance (ADS)
    - Controller Pilot Data Link Communications (**CPDLC**)
    - Flight Information Services (FIS)
    - Inter Center Coordination (ICC)
    - Message Handling Service (MHS)

ATN Overview

- Defines an integrated communication and application structure to support both air-ground and ground-ground communication

ATN Documentation

- Standards and Recommended Practices (SARPs) found in ICAO Annex 10
- Technical Specifications found in ICAO Doc. 9705
- Guidance Material found in ICAO Doc. 9739

ATN Panel Organization

- Three working groups
  - Configuration Control Board (CCB)
  - WG A - Applications
  - WG B - Infrastructure

ATN Panel Organization

- ATN SARPs are grouped into 2 categories:
  - "**Applications**" - Application Layer
  - "**Infrastructure**" - Application, Presentation, Session, Transport & Network Layers
- The Data Link and Physical Layers are outside the scope of the ATN SARPs
  - These are the province on the ICAO **AMCP**
- The High Level Architecture may be described from two perspectives:
  - the individual ATN "components" &
  - the overall "Routing Framework"
- The individual components are interconnected within the context of the overall routing framework

ATN Panel Revisited

- ATNP/1 held June 1994, ATNP/2 held November 1997, ATNP WGOW held March 1998 . ATNP/3 held in March 2000. WGOW held in July 2000.
- Three Working Groups Formed:
  - **WG1** - Systems Planning and Concept Working Group
  - **WG2** - ATN Internet Working Group
  - **WG3** - Applications and Upper Layers Working Group
- SARPs based on satisfying operational requirements defined by ADS Panel
- SARPs were prepared as a series of packages with CNS/ATM-1 Package SARPs and Guidance Material planned for approval at ATNP/2 in late 1996.
- Package-1 SARPs targeted at operational implementations.

ATN Package 2

- Materials for defining CNS/ATM-2 Package reviewed by ATNP/3.
  - Security
  - System Management
  - Directory

<u>Validation is still under way</u>

- Annex 10, Volume 3, Part 1, Chapter 3
- 1200 page ICAO Doc 9705 “Manual of Technical Provisions for the ATN”
- The second edition available effective 5 November 1999
- ATNP CCB in place to regulate changes

A Guided Tour of the ATN SARPs

Guidance Material
1.0 Introduction & System Level Requirements

Guidance Material
2.0 Air/Ground Applications

Guidance Material
2.1 CM Application

Guidance Material
2.2 ADS Application

Guidance Material
2.3 CPDLC Application

Guidance Material
2,4 FIS (ATIS) Application

Guidance Material
3.0 Ground/Ground Applications

Guidance Material
3.1 ATSMHS Application

Guidance Material
3.2 ICC (AIDC) Application

Guidance Material
4.0 Upper Layer Communications Service

Guidance Material
5.0 Internet Communications Service

A Guided Tour of the ATN SARPs

Guidance Material

6.0
ATN System Management

Guidance Material

7.0
ATN Directory Service

Guidance Material

8.0
ATM Security Service

Guidance Material

9.0
ATN Registration

Sub-volume 1 - Introduction & System Level Requirements

- Sub-Volume 1 introduces the CNS/ATM-1 Package SARPs and explains the organization of the material.

- System level requirements derived from the operational requirements provided by the OPLINK (ADS) Panel are included in Sub-Volume 1.

Sub-Volume 2 - Air/Ground Application SARPs - Overview

- CNS/ATM-1 Package SARPs define four air/ground applications consistent with the ADS Panel guidance.
  - Context Management
  - Automatic Dependent Surveillance
  - Controller Pilot Data Link Communication
  - Flight Information Services
- The SARPs fully define the communication aspects of each application but do not address implementation specific options or operational procedures that may be required to support the operational use of the application by a given State or organization.

Sub-Volume 3 - Ground/Ground Application SARPs - Overview

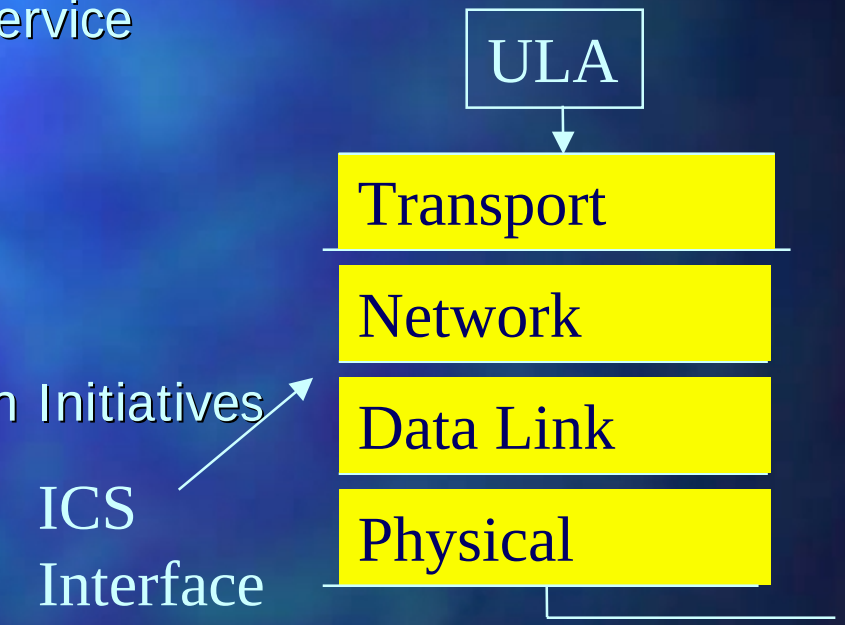
- CNS/ATM-1 Package SARPs define two categories of ground/ground applications consistent with existing ICAO annex and ADS Panel guidance.
  - ATSMHS (AMHS)
  - ICC (AIDC)
- The SARPs fully define the communication aspects of each application but do not address implementation specific options or operational procedures that may be required to support the operational use of the application by a given State or organization.

Sub-Volume 4 – Upper Layer Architecture (ULA)

- The ULA SARPs define the communication services above the internetwork necessary to support the needs of the user applications.
- The limited bandwidth of air-ground ATN subnetworks did not permit the use of traditional ISO (or ITU-T) upper layer protocols.
- ATNP members worked closely with ISO and ITU-T to gain acceptance of new international standards for an efficient upper layer architecture/protocols. ULA for ATN is based on this new architecture and the associated protocols.
- ULA SARPs define the protocols and mechanisms needed to provide:
  - a dialogue service between user applications
  - efficient coding of protocol headers and application user data
  - means to use the needed underlying internet services
- The defined ULA supports both air/ground and ground/ground ATN applications.
- Standards work completed for the Association Control Service Element (ACSE), edition 3.
- Added Security Application Service Object (SASO)

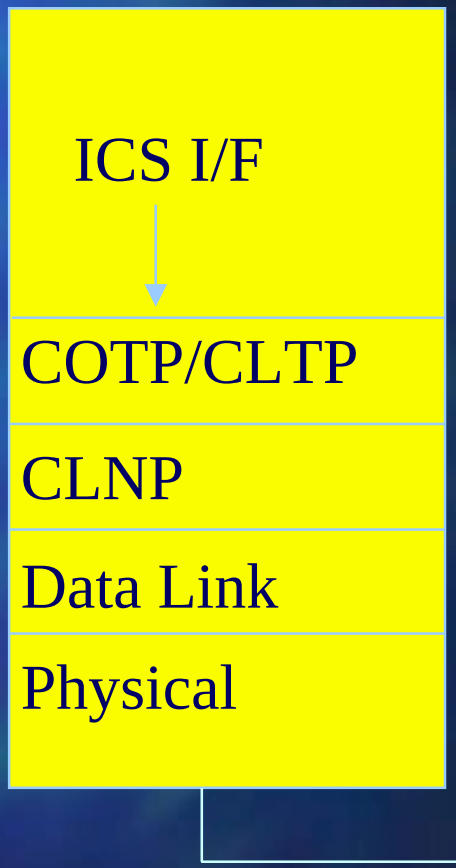
Sub-Volume 5 - Internet Communications Service

- **Objectives**
  - Scope of Internet Comms Service
  - Internet Components
  - Routing Architecture
  - Addressing Architecture
  - QoS/Security Mechanisms
  - Validation & Implementation Initiatives
- **The ICS provisions are defined in Sub-Volume V of CNS/ATM-1**
- **The ICS "User" is the Upper Layer Architecture (ULA)**



Sub-Volume 5 - Internet Communications Service

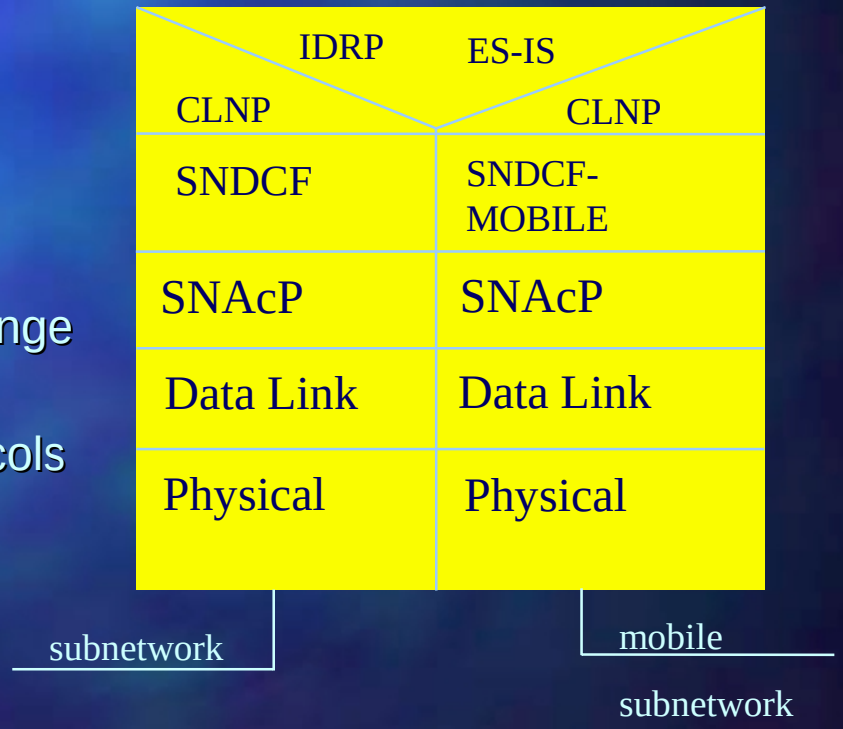
- **The components of the ICS are:**
  - End Systems
    - Fixed or mobile
  - Intermediate Systems (Routers)
    - Fixed or mobile
  - Subnetworks
    - Fixed (i.e. ground/ground)
    - Mobile (i.e. air/ground)
- **EndSystems support:**
  - Connection Oriented Transport Protocol Class 4 (ISO 8073) or the Connectionless Transport Protocol (ISO 8602)
  - Connectionless Network Protocol (ISO 8473)
  - ES-IS Routing Information Exchange Protocol (ISO 9542)
  - Data Link & Physical Layer protocols as appropriate



Sub-Volume 5 - Internet Communications Service

- **Intermediate Systems (Routers) support:**
  - Connectionless Network Protocol (ISO 8473)
  - Mobile SNDCF
  - Inter-Domain Routing Information Exchange Protocol (IDRP - ISO 10747)
  - ES-IS Routing Information Exchange Protocol (ISO 9542)
  - Data Link & Physical Layer protocols as appropriate

Intermediate System (ATN Router)



Conclusion

- Over the next 2 days you will find out much more detail about ATN and the applications
- Remember
  - ATN is the concept for global telecommunications
  - ATN SARPs are complete
  - ATN SARPs are ICAO-approved
  - World-wide ATN implementation is under way