International Civil Aviation Organization

ATN Seminar and Third ATN Transition Task Force Meeting

Singapore, 26-30 March 2001

Agenda Item 6: Planning and Implementation Considerations

ATN INDUSTRIAL DEVELOPMENT STATUS UPDATE

(Presented by Australia)

SUMMARY

This information paper provides a Status Update on some ATN Development Programs from an Industrial point of view

1. INTRODUCTION

This Information Paper provides a status update on a number of ATN Industrial Development Programs from an industrial point of view. Indeed, after preliminary studies and ATN prototyping gave initial results on ATN implementation benefits, the Industry is now targeting at developing Pre-operational and Operational products for future implementation. This Information Paper will focus in particular on :

- the Australian INCA Program,
- the European AFAS Program,
- FANS/ATN Transition Approach,
- CAERAF Validation platform.

2. DISCUSSION

2.1. The Australian INCA Program :

2.1.1. ATN in Australia

Airservices Australia has funded two ATN Programs since 1996 :

- ✓ Program 1 - ASIATN Project (1996 - 1998)

- Collaborative Research and Development Agreement was signed with TRAC (Airsys ATM Pty Ltd) in October 1996
- Project was formally Completed in August 1998

✓ Program 2 - Investigation of Networked CNS/ATM Applications (INCA) (1998 - 2000)

- Started in July 1998
- Completed as scheduled in July 2000

2.1.2. INCA Program Objectives and Achievements

Industrial partners have been extensively involved in the development of prototypes (ATN Ground and Airborne End System and Router, as well as AMHS platform). The Objectives of the INCA Program were to :

✓ Continue the work performed by the ASIATN Project

- Satellite Data Link Exploitation
- Report available on Airservices TNS Intranet site

✓ Expand ATN Validation Platform to include:

- A VDL Mode 2 Subnetwork
- An AMHS and AMHS/AFTN Gateway Functionality

✓ Perform VDL Flight Trials

✓ Conduct an ATN Cost Benefit Analysis Study

The Major Findings of the Program were :

✓ 80% Improvement in end-to-end transit delay performances over FANS-1

- Transit Delay Performances over Satcom were better than anticipated. When using high speed channels, transit delays of less than 10 seconds on average were being recorded.

✓ Overall reliability of communications improved by the use of the ATN transport layer

- Integrity Checking
- Automatic Reordering and Retransmissions
- End-to-End Acknowledgments

✓ Cost for ATN routing services and application data delivery was evaluated

- Common Costs - routing information exchanges and logon.
- ADS Costs - Periodic and Event Reporting.
- CPDLC Costs - Dialogues and Transport Connection.

Particular attention was given to VDL Mode 2 Live Trials (see Appendix A for platform configuration) :

✓ Airservices Beech 350 Special Mission Aircraft used for flight trials.

- Required rehosting of CMU/Bridge and Airborne Router computer platforms and EVR 750 radio set.
- **Trials conducted over two days (May 24 & 25) around Brisbane area with connection via PSN back to Canberra ATN Validation Platform**

- ✓ Round trip times were measured on average to be around 2 - 3 seconds.
- ✓ PSN introducing a 1 second delay when compared to Lab results - Satellite Link and Digital Data Service

2.2. The European AFAS Program

This Program consists in developing CNS / ATM means for **A320 aircraft** to meet ATM 2005 requirements for Europe Core Area. The Program is expected to last from April 2000 to August 2003.

It includes Systems specification, development and integration in a certification type of environment of a CNS/ATM package fully compliant with ICAO standardisation of the ATN ,. The package will be evaluated in connection with ground platforms to assess the potential of the developed CNS/ATM services in a typical ATM gate to gate environment.

The CNS/ATM needs for Europe are driven by an Air/Ground co-operative ATM concept where news means of A/G communication will allow strategic co-ordination of the different elements describing an efficient flight path for the aircraft.

The Data / Link capabilities required for European domestic ATM 2005 operations are:

- ✓ CPDLC, ADS-A, & FIS applications compliant with operational European requirements
- ✓ Enhanced FMS-ATSU mechanism for ATC inputs & requests of flight plan data
- ✓ Enhanced HMI for crew operations
- ✓ VDL Mode 2 for ATN communications
- ✓ Bilingual (ATN & ACARS) ATSU
- ✓ Customised FMS-4D trajectory predictions
- ✓ Improved FMS-4D time control accuracy
- ✓ New Multi-Mode Receiver (GPS, GLS, ILS)

Therefore, through the AFAS Program, both Avionics vendors and Ground ATC equipment providers will address the issues of ATN implementation.

The Approach chosen to address the Ground segment of ATN implementation is to develop an **Integrated Data Link Server**. This Integrated Data Link Server will address several issues :

- ✓ Different air/ground data communication technologies are available to exchange data between ground ATC systems and the aircraft
- ACARS/FANS, ATN, VDL Mode 4, Mode S Specific Services
- ✓ (Co-)existence of these technologies cannot be neglected

This lead to the development of a unique centralised system providing a transparent interface between air/ground data communication technologies and the controller (see Appendix B).

Extensive interoperability testing of that IDLS with the different type of aircraft embedding CNS/ATM functions will be performed.

The advantages of such architecture are to :

- ✓ Minimise the impact of data / link integration in the ATC system
- ✓ Take care of the entire communication segment
- ✓ Transparently select the proper air/ground data link medium
- ✓ Offer a transparent interface with the ATC system
- ✓ Can be connected to any type of ATC system
- ✓ Support the implementation and upgrade of the Air/Ground communication standards

2.3. The FANS/ATN Transition

Once Aircraft will be equipped with ATN capabilities, Airlines will ask for ATN interoperability capacity from the ATC Ground equipment. In order to anticipate this requirement, some ATC Ground equipment providers are developing transition strategy to allow ATC Service Providers to offer both FANS and ATN capacity.

Especially in airspaces where FANS has been deployed, the accommodation of ATN equipped aircraft have to be considered carefully by the operators.

In this regard, development to allow upgrade of current FANS-capable ATC systems with ATN functionality is being performed. Such development is fully consistent with architecture relying on Integrated Data Link Server.

Early demonstration of the FANS/ATN Integrated Data Link Server was performed at the ATN2000 Conference in London.

2.4. CAERAF Validation Platform

EUROCONTROL, the European Organisation for the Safety of Air Navigation, has signed the Site Acceptance Tests of the Common American European Reference Aeronautical Telecommunication Network Facility (CAERAF).

This event took place in Airsys ATM's unit of Bagneux (France), two years and three months after the Contract signature between EUROCONTROL and AIRSYS ATM, in co-operation with the US Federal Aviation Administration (FAA). This Europe and US partnership towards ATN implementation was the first of its kind and will benefit to the aviation community as a whole.

CAERAF is a reference platform being used for the validation of the new Aeronautical Telecommunication Network (ATN) components and applications**.** It is a fundamental requirement that the ATN system is totally compatible throughout the world**. Hence the need to have a joint programme between the European States and the United States, sponsored by EUROCONTROL and the FAA respectively as one of the key steps in this respect.**

The CAERAF platform provides a flexible test-bed integrating the CTS (Conformance Tests Suite), developed for ATNSI, and controlled ATN reference components,i.e., routers and terminals, all being managed through a coherent set of supervision, configuration and test managers. It will provide:

- a graphical user interface for the supervision, configuration and test managers; and

- appropriate tools to create libraries with test scripts.

The proposed CAERAF platform architecture distinguishes three levels of functionality, each with appropriate platform components:

- the operations level, with the supervision, configuration and test managers,
- the reference level, with the full ATN protocol stacks, and
- the tests and acquisition level, with a database of test scripts exercised against an ATN SUT (System Under Test) directly interconnected to the platform.

All components of the proposed CAERAF platform will be interconnected through different communication means, including Ethernet LANs, OSI LANs and X.25 switch.

This platform is then designed to meet EUROCONTROL's objective to use the CAERAF for ongoing ATN SUT validation through the execution of scenario-type tests.

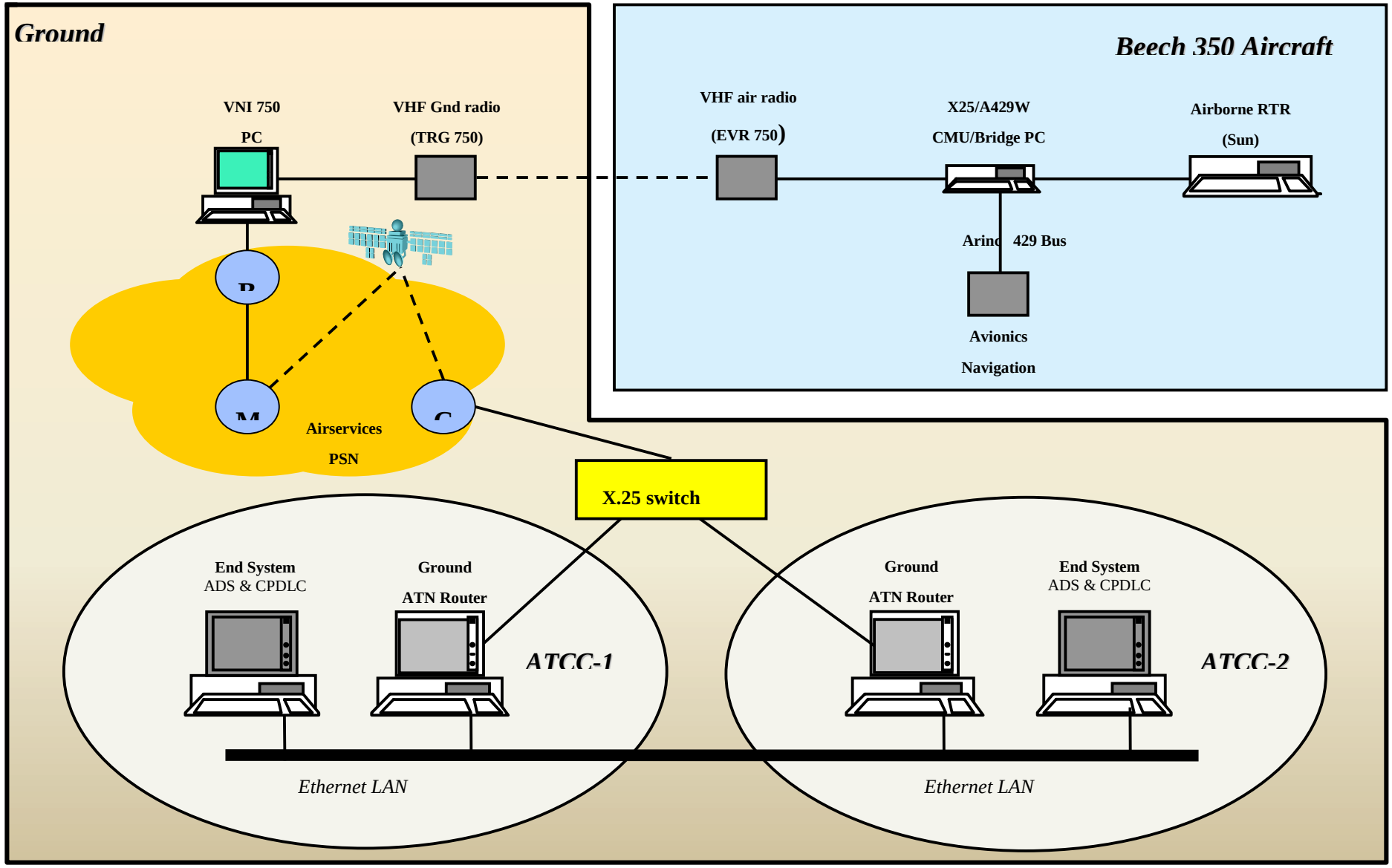
ACTION BY THE MEETING

The meeting is invited to :

a) Review and consider the information given in this Information paper.

b) Agree on the importance of FANS/ATN Transition Strategy

Appendix A - VDL Mode 2 – INCA Configuration



Appendix B – Integrated Data Link Server