AERONAUTICAL TELECOMMUNICATION NETWORK PANEL (ATNP)

THIRD MEETING

Montreal, 7 to 18 February 2000

Agenda Item 1: Review of recent AFTN, CIDIN and ATN facility upgrades, development or implementation activities

REPORT ON AGENDA ITEM 1

The attached constitutes the report on Agenda Item 1 and should be inserted at the appropriate place in the yellow report folder.
Agenda Item 1: Review of recent AFTN, CIDIN and ATN facility upgrades, development or implementation activities

1.1 GENERAL

1.1.1 The meeting was informed of activities related to development, validation, planning, trials, demonstrations and implementation of various elements and applications of the aeronautical telecommunication network (ATN) by States and organizations.

1.1.2 A summary of the above-mentioned activities as reported to the meeting is provided below.

1.2 The ATN plan of the Caribbean/South American (CAR/SAM) Regions

1.2.1 As shown in the report of the Third Caribbean/South American Regional Air Navigation Meeting (1999) (CAR/SAM/3 RAN Meeting, Buenos Aires, 5 to 15 October 1999), the introduction of the ATN in the CAR/SAM Regions would entail the following phases:

a) **Phase I** — Considering present and future requirements, improve current aeronautical fixed service (AFS) infrastructure by implementing modern digital communication circuits and networks. This would also facilitate the interconnection of future ATN routers in the region.

   *Note.*— *This phase has already started.*

b) **Phase II** — Implement ATS message handling system (AMHS) and ATS inter-facility data communications (AIDC) in specific ATN routing domains. The aeronautical fixed telecommunication network (AFTN) would still be in wide use in this phase and thus needs to be interfaced with AMHS through AFTN/AMHS gateways.

c) **Phase III** — Deploy the full regional ATN employing ground and air-ground subnetworks, ground-ground and air-ground applications agreed upon in support of air traffic management in region(s).

1.2.2 Furthermore, the initial plan for the ground portion of the ATN has been developed and included in the draft facilities and services implementation document (FASID) showing location/type of end systems (ESs)/intermediate systems (ISs), AFTN/AMHS gateways, applications (on ESs), connections to other routers and the planned implementation dates which range from 2004 to 2007.
1.3  ATN-RELATED ACTIVITIES IN GERMANY

1.3.1 Deutsche Flugsicherung GmbH (DFS), the air traffic services (ATS) provider in Germany, recognizes air-ground data link and the ATN as enablers for the improvement of air traffic management (ATM) procedures providing additional airspace capacity. As part of the organization’s strategy development process, DFS has developed a national data link strategy which is closely aligned with European and global developments. This strategy takes into account the ongoing implementation of initial data link applications including data link automatic terminal information service (D-ATIS) — departure clearance (D-DCL) on international German airports and it foresees the implementation of non-time critical data link services from 2005. Depending on operational need, the implementation of time-critical data link services starting from 2007 is under consideration.

1.3.2 Over the past years, DFS has focussed its ATN-related effort on validation and standardization. The Demonstrator and ATN Research Test Bed (DART) has actively been used for various evaluation activities. DFS also actively participates in the Prototype ATN (ProATN) including ATN standardization/validation and infrastructure activities. A still on-going activity with significant German involvement is the European air-ground data link server.

1.3.3 DFS is also an active participant in the current phase of the European LINK2000+ programme. This data link implementation programme will seek for endorsement and approval of national and international management boards in the course of the year 2000.

1.4  ATN-RELATED ACTIVITIES IN JAPAN

1.4.1 An AMHS system, which fully complies with ICAO provisions, has been developed in Japan, as the future replacement of the current AFTN system. As a first phase, AFTN/AMHS gateway function is being implemented to facilitate smooth transition from AFTN to AMHS in the Asia/Pacific Region. The implementation will be completed by March 2000 and the system will become ready for connection and operation in April 2000.

1.4.2 The first AMHS operational connection was planned with the United States using ATN boundary intermediate systems (BIS). This will also facilitate future data exchange of ATN applications other than AMHS. The AMHS trial will be conducted from July to September 2000 and AMHS operational service will commence in October 2002. Other than the United States, AMHS trials are planned with Airservices Australia, Hong Kong (China) and Germany. AMHS operational connections are also planned with the Republic of Korea and China. A block diagram showing present and future United States-Japan AMHS connections is shown below.
1.4.3 Basic ATN research was undertaken by the Electronic Navigation Research Institute (ENRI) in 1991. The continuation of the research resulted in successful ATN router connections with the European Organisation for the Safety of Air Navigation (EUROCONTROL) and Airservices Australia in 1998 and 1999 respectively. Those established connections presently support controller-pilot data link communications (CPDLC) and will be further developed to support ADS and AIDC in the current year. The block diagram of the ENRI ATN simulation testbed (EAST) used in the test is shown below.
1.4.4 The ATN Implementation Planning Committee (ATNIC) was established under the leadership of the Japan Civil Aviation Bureau (JCAB) in August 1999. Other participants in this committee are some major airlines, aeronautical communication service providers, manufacturers/vendors and individual experts. The mission of the committee is to provide, for the implementation of the ATN, the following:

   a) solutions to problems encountered;
   
   b) the necessary feasibility studies;
   
   c) step-by-step scenario; and
   
   d) the actual plan.

1.4.5 Initial and final reports of the committee will be issued in March 2000 and March 2001 respectively. The committee will support all future ATN activities.
1.5 IMPLEMENTATION OF AMHS IN SPAIN

1.5.1 Validation testing of the AFTN/AMHS gateway using a testbed was completed by Aeropuertos españoles y navegación aérea (Aena) in March 1998. As shown in the figure below, the gateway allows dual and simultaneous AFTN-AMHS operation.

![Gateway functionality](image)

1.5.2 Since June 1998, the COM Centre in Madrid area control centre (ACC) has offered the possibility of AFTN/CIDIN/AMHS interconnections and telex, facsimile and AFTN services over an X.25 network.

1.5.3 The migration of AFTN-based users/procedures to the AMHS has already started and will be completed for all Spanish ACCs and airports by May 2000 and September 2000 respectively.

1.5.4 The AMHS network in Spain is composed of seventeen message transfer agents (MTAs) and an AFTN/CIDIN/AMHS gateway connected via the REDAN X.25 network. The network makes use of ITU-T X.500 Standard for providing directory service.

1.6 UNITED KINGDOM PROGRAMME OF ATN-RELATED ACTIVITIES

1.6.1 In the United Kingdom, ATN research and development activity continues. Simulation activities at National Air Traffic Services’ (NATS’) Air Traffic Management Development Centre (ATMDC) has investigated human machine interface and controller workload issues for both the European pre-operational data link applications (EOLIA) project and for the operational ATN data link scenarios developed by the ICAO North Atlantic Implementation Management Group (NAT IMG). Further, NATS participated in the European-air ground data link (EURO-AGDL) project, which had specified an ATN data
link server and had continued the automatic dependent surveillance (ADS) trial work, where a fully compliant CNS/ATM-1 system had been successfully deployed.

1.6.2 NATS has also developed a data link strategy which would indicate the phased introduction of various data link applications in the United Kingdom from the initial operational introduction of flight information services through to planned full implementation of CPDLC in domestic airspace projected to occur in 2010.

1.6.3 In addition, NATS has two operational ATN projects in progress. The first, deployment of an ATN-compliant oceanic flight data processing system (FDPS) is expected to be in operation in 2002. The second project is the deployment of an ATN communications infrastructure, initially in support of the Oceanic FDPS. This project has just entered the procurement phase and is expected to deliver an operational infrastructure during 2000.

1.7 ATN-RELATED ACTIVITIES IN THE RUSSIAN FEDERATION

1.7.1 The Russian Federation is jointly carrying out with Germany a project to implement the aeronautical telecommunication network (ATN) in the Russian Federation. The project is supported by the European Union within the framework of the scientific and technical cooperation programme.

1.7.2 The main objective of the above-mentioned project is the development of ways and methods for implementation of a unified ATN information environment for all groups of aeronautical users in Western Europe and the Russian Federation.

1.7.3 In addition, the work is under way to integrate the X.25 network in the Russian Federation with data networks of adjacent States. In particular, tests of the integration of the federal aeronautical data interchange network (FADIN) of the Russian Federation and the X.25 data network (RAPNET) of Germany are already scheduled for the first half of 2000.

1.8 ATN-RELATED ACTIVITIES IN THE UNITED STATES

1.8.1 Current activities of the United States’ Federal Aviation Administration (FAA) are primarily in:

a) controller-pilot data link communications (CPDLC);

b) next generation communications (NEXCOM); and

c) joint router testing with the Japan Civil Aviation Bureau (JCAB).

These activities are briefly described below:
1.8.2 CPDLC

1.8.2.1 Air traffic service providers, airspace users, manufacturers, and commercial communications service providers committed to the early implementation of ATN data communications capabilities have agreed to a baseline subset of functions to be supported. Known as Baseline 1, these ATN applications are documented in a safety and performance requirements (SPR) document produced by a joint RTCA and European Organisation for Civil Aviation Equipment (EUROCAE) Committee SC189/WG53. Baseline 1 is being managed jointly by the early implementation stakeholders through the preliminary EUROCONTROL test of air/ground data link (PETAL) integration team (PIT). In order to facilitate adoption of the Baseline 1 set of functionality by other providers, users, and manufacturers, the early implementation stakeholders are working through a joint RTCA/EUROCAE committee, SC189/WG53, to document the interoperability, safety, performance, and operational characteristics of Baseline 1. This work will be extended beyond the initial capabilities included in Baseline 1 to a broader set of functionality intended for international deployment. This broader set is known as Baseline 2.

1.8.2.2 The United States’ CPDLC implementation is planned in three phases. The first two phases directly relate to Baseline 1 while the third phase relates to Baseline 2. The United States FAA’s Build 1 and Build 1A will implement context management (CM) and a limited set of CPLDC messages in domestic en-route airspace. Build 1, with a very limited CPDLC message set, is planned for an initial operational capability at Miami en-route air traffic control centre in June 2002. Build 1A will build upon the lessons learned from Build 1 and implement approximately forty-two CPDLC messages at the twenty domestic United States’ en-route air traffic control centres during 2004. Build 2 will expand the data link services into all operational domains and will be coordinated with international programmes, such as the European Link 2000+.

1.8.3 NEXCOM

1.8.3.1 The FAA will initially use a service provider’s VHF digital link (VDL) Mode 2 subnetwork to support air-ground (A-G) communications. The FAA plans to migrate to a VDL Mode 3-based, FAA-operated service (NEXCOM) in the CPDLC Build 2 timeframe.

1.8.4 Joint router testing

1.8.4.1 The FAA Airway Facilities Division (AOP) is participating with the Japan Civil Aviation Bureau (JCAB) in supporting trial testing activities to implement the AFTN/AMHS gateway and AMHS services. Trials will be conducted between Japan and the United States in the year 2000. The agreed specifications and schedules are documented in a technical memorandum of cooperation (TMC). The TMC covers the AFTN/AMHS gateway functions systems and requirements for the ATN boundary intermediate systems (BIS) in compliance with ICAO provisions.
1.9 THE SPACE PROJECT IN EUROPE

1.9.1 The study and planning of AMHS communications in Europe (SPACE) project has been established by EUROCONTROL, France, Germany, Spain and the United Kingdom to define the plan for implementation of the AMHS in Europe. The plan will define the transition strategy from current AFTN/CIDIN environment to the AMHS. Fifty per cent of the funding for the project has been provided by the European Commission and the remaining fifty per cent is provided by States/organizations involved.

1.9.2 The project has four phases:

a) Phase 1 — Definition of an European AMHS addressing plan;

b) Phase 2 — Technical design for the European AMHS;

c) Phase 3 — Overall implementation plan including the definition of the transition strategy; and

d) Phase 4 — Final report and validation.

France is the project leader for SPACE and as such bears the overall responsibility of proper project completion with respect to the European Commission. In this role, France has also been responsible for the scoping (phase 0) of the project. The progress to date is shown below:

<table>
<thead>
<tr>
<th>Phase 0: Project scoping</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed work package descriptions</td>
<td>Completed</td>
</tr>
<tr>
<td>Inventory of current related activities</td>
<td>Completed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 1: Definition of an European AMHS addressing plan</th>
<th>In progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define user identification method</td>
<td>Completed</td>
</tr>
<tr>
<td>Identification of trans-European users and applications</td>
<td>Completed</td>
</tr>
<tr>
<td>Identification of national users in SPACE participating States</td>
<td>Completed, except for one State</td>
</tr>
</tbody>
</table>

| Current addressing plans of existing users (AFTN, CIDIN, etc.) | Completed |
| Define guidelines for AMHS addressing plan development       | 80% Completed |
| Produce AMHS addressing plan                                  | To be started upon completion of the guidelines defined above |
Define AMHS Management Domains | Completed
---|---
Addressing plan report. | In progress

**Phase 2:** Technical design for the European AMHS

*Note.— This phase also includes institutional, security and network management aspects.*

Phase 3: Overall implementation plan including the definition of the transition strategy | Not yet started

Phase 4: Final report and validation | Not yet started

1.10 **THE EUROPEAN ACCESS PROJECT**

1.10.1 The ATN Compliant Communications — European Strategy Study (ACCESS) project was undertaken by National Air Traffic Services (NATS), the Service Technique de la Navigation Aérienne (STNA) of France and the Deutsche Flugsicherung GmbH (DFS) of Germany. This project, which was fifty per cent funded by the European Commission, undertook the development of an ATN architecture and an implementation plan for a European core area, and planned AMHS interoperability and validation trials. The final report of ACCESS, which was published in March 1999, is being used as key input data to the EUROCONTROL Link 2000+ programme.

1.11 **ATN-BASED DATA LINK ACTIVITIES WITHIN EUROCONTROL**

1.11.1 The introduction of data link services and the supporting communication infrastructure have been identified in the ATM2000+ strategy as a key enabler for the necessary evolution of ATM in Europe to increase capacity and improve safety levels.

1.11.2 Over the last years, the agency has been involved as coordinator or as technical advisor in a number of activities and projects addressing operational and technical aspects of air-ground data link. There has been close cooperation between the operational side, responsible for the definition and validation of operational scenarios and services, and the technical side, responsible for the supporting communication infrastructure.

1.11.3 In the operational requirements and data processing domain, the preliminary EUROCONTROL test of air-ground data link (PETAL) trials and European pre-operational data link applications (EOLIA) projects have validated the operational concept of using air-ground data link to support controller-pilot communications.

1.11.4 In the communications domain, the supporting services and infrastructure have been proven. EOLIA has demonstrated the feasibility of modifying ATC data processing systems and airborne systems
to accommodate end-to-end communication services. Prototype ATN (PROATN) and ATN trials infrastructure (ATIF) have demonstrated the feasibility of an ATN Internet meeting the requirements of air-ground data communications. The EURO VHF digital link (VDL) project is validating the use of the VDL Mode 2 sub-network. These projects are a coordinated effort by the European ATC service providers, airspace users, industry, communication service providers, EUROCONTROL and the European Commission.

1.11.5 As a result of this work, the concepts, applications and supporting services have been validated using a combination of trial, prototype and pre-operational systems. There is now a clear opportunity to implement data link services supported by a mobile communication infrastructure in the European Region in close coordination with the United States. To this effect, LINK 2000+ the programme for operational air-ground data link implementation, has been created. The objective of the LINK 2000+ programme is the implementation of operational air-ground data link services for ATC in the near and medium term based on the aeronautical telecommunication network (ATN) over VDL Mode 2.

1.11.6 The geographical scope (shown in the figure below) comprises a number of area control centres (ACCs) and airports where data link is expected to provide the highest capacity and safety benefits, and that will have ATC systems that are technically capable of supporting air-ground data link in the target time scales.

Figure 1-4. EUROCONTROL LINK2000+ implementation
1.11.7 The aircraft equipage will be based on voluntary carriage of air-ground data link communication equipment by airspace users encouraged by incentives.

1.11.8 It is expected that air traffic service providers, communication service providers and airlines will commit to the programme by November 2000 during the EUROCONTROL provisional council meeting.

1.12 THE “MEDITERRANEAN FREE FLIGHT” PROGRAMME IN ITALY

1.12.1 The Italian Agency for Air Navigation Services (ENAV) has recently completed the definition of a research, development and trial (RD&T) programme “Mediterranean Free Flight”. The aim of this programme is to address operational requirements for improved ATM through the definition of free flight applications. New CNS/ATM technologies and applications will be evaluated, during the five-year span of the programme, from technical, operational and safety viewpoints as applicable to free flight scenarios in the Mediterranean area.

1.12.2 Specific objectives of the programme are:

a) to define the operational requirements based on the new operational concepts concerned with free routing and free flight operations;

b) to analyse in a realistic scenario the operational and technical aspects connected with the essential integration of the CNS/ATM technologies enabling free routing and free flight in Mediterranean area;

c) to investigate the relevant operational procedures through simulations and flight trials employing suitably-fitted aircraft and controller working positions; and

d) to define the guidelines to implement free routes and free flight operations across convenient air spaces when it will be feasible.

1.12.3 Main phases of the programme are:

a) definition of operational requirements in the Mediterranean area;

b) definition of technological and operational scenarios including global navigation satellite system (GNSS), ADS/CPDLC, ATN and applications/functions of ground ATM and airborne systems;

c) simulation trial, both fast time and real time; and

d) flight trials.
Considering the programme objectives previously stated, the expected positive spin-off would be the following:

a) to eliminate the bottlenecks in the air-routes, by adopting common operational procedures allowed by CNS/ATM system;

b) to establish new more direct, non-congested routes towards African countries and Indian Ocean;

c) to improve flight economy through flight operations more linked with airline needs;

d) to support trade growth and human capital mobility in Mediterranean area by making flight more efficient and safer; and

e) to support local economies by applying the results of the programme as useful guidance regarding the deployment of new ANS infrastructure/facilities, wherever beneficial or necessary.

The results of the studies performed under the programme will be made available to the international civil aviation community in due course.

1.13 INVESTIGATION OF NETWORKED CNS/ATM APPLICATIONS (INCA) PROJECT IN AUSTRALIA

1.13.1 Airservices Australia, in a joint venture with Airsys ATM Pty Ltd., has been carrying out a research and development ATN project called Investigation of Networked CNS/ATM Applications (INCA) since July 1998. The project is to be completed in July 2000. The main objectives of the project are:

a) to carry out an exploitation test on the performance of the AMSS Data 3 subnetwork using the current ATN validation platform;

b) to enhance the ATN validation platform to include an AMHS and AMHS/AFTN gateway ground applications and to implement a VDL Mode 2 subnetwork;

c) to carry out exploitation tests on both the AMHS application and VDL Mode 2 subnetwork;

d) to conduct in flight ATN trials; and

e) to conduct a cost/benefits analysis study into implementing ATN in Australia.

1.13.2 The project has currently completed the exploitation testing on the AMSS Data 3 service which was performed over the Inmarsat Pacific Ocean Region (POR) satellite. By the end of 1999, the project successfully completed the integration and testing of its AMHS and VDL Mode 2 onto the ATN
validation platform. Exploitation of the mentioned systems is scheduled to start in March 2000. Performance testing will also include switching between the two subnetworks: VDL Mode 2 and Satellite Data 3 service.

1.13.3 In flight ATN trial is expected to occur in April/May 2000. In addition to this activity, ATN trials with the Japan Civil Aviation Bureau (JCAB) are also being carried out in four stages over the remaining period of the project. Lastly, the report of the cost/benefit analysis (CBA) study into implementation of ATN in Australia is scheduled to be completed by July 2000.

1.14 IMPLEMENTATION OF AMHS IN THAILAND

1.14.1 ATN-related activities in Thailand started in 1993 and, to date, a country-wide digital communication network provides the infrastructure for the ground-ground portion of the ATN which has been successfully implemented and is used for domestic operations. The system connects Bangkok area control centre (ACC) with eleven approach control centres and twenty-eight airport control towers.

1.14.2 A new message switching system and an ATN-pass through service (for transmission of AFTN messages) have been developed and put in operation. AIDC is also under development and expected to be ready for trial in mid 2000. The aim of these development and implementation activities is to achieve improved performance and higher reliability in aeronautical ground-ground communications. A block diagram of the system implemented is shown below.
Figure 1-5. New AFTN message switching terminal
1.15 **INDUSTRY AND AIRLINES’ ACTIVITIES**

1.15.1 According to news obtained from the Airlines Electronic Engineering Committee (AEEC) data link users forum held in Orlando, Florida in early February 2000, both Boeing and Airbus have announced programmes and schedules for delivery of new aircraft equipped with ATN (mainly for CPDLC application) and Boeing/Honeywell have announced a programme for bringing the 777 aircraft in compliance with the United States FAA’s Build 1A phase of the CPDLC and EUROCONTROL’s Link 2000+ programmes.

1.15.2 It is well known that American Airlines has committed four 767-300s and twenty-four 737-800s to preliminary EUROCONTROL test of air-ground data link (PETAL) and the United States FAA’s Build 1 phase of the CPDLC programme. Also, Swissair has added one Airbus A320 to the PETAL. Furthermore, United Airlines is targeting the approval of a business case for retrofit of approximately 135 Airbus aircraft for the United States FAA’s Build 1A phase of the CPDLC programme.

1.16 **CONCLUSION**

1.16.1 Noting the wealth of information provided under this agenda item, the meeting made an observation that when it comes to ATN and its associated applications, the tide has now swung from development/validation/trial to real operational implementation.

1.16.2 The meeting agreed that the civil aviation community has crossed the threshold and the question is no longer “whether ATN is needed or not” as proven by various implementation programmes. It was further agreed that operational benefits were in fact emerging from existing implementation programmes and that significantly more benefits would be obtained when improvements to the handling of aeronautical messages could be made through the global implementation of the ATN.

1.16.2.1 As examples for the above, CPDLC and AMHS were identified as two ATN applications which would yield significant operational benefits, both in air and ground domains, when implemented on a global or at least regional scale.

1.16.3 In conclusion, it was agreed that every opportunity should be used to invite wider participation in implementation programmes by States, service providers, aircraft operating agencies and other interested parties.

— END —