NACC/DCA/2-IP/12
23/09/05

International Civil Aviation Organization
North American, Central American and Caribbean Office
Second Meeting of North American, Central American and Caribbean Directors of Civil Aviation (NACC/DCA/2)
Tegucigalpa, Honduras, 11 – 14 October 2005

Agenda Item 3: Air Navigation Services –
3.1 CNS/ATM

THE CURRENT STATUS OF THE ATS MESSAGE HANDLING SYSTEM (AMHS) ANDATN ROUTER ELEMENTS

(Presented by the United States of America)

SUMMARY

This information paper presents a technical synopsis and status report of the FAA's Aeronautical Telecommunication Network (ATN) Architectural Components in the U.S. National Airspace System (NAS), including the ATS Message Handling System (AMHS) and the FAA ATN Router component. Highlighted are the U.S. and Japan AMHS trials, the current operational FAA AMHS Gateway, the FAA AMHS program and the FAA ATN Router component.

1. Introduction

1.1 The Aeronautical Telecommunications Network (ATN) is designed to be an Internet that enables seamless communications between ground users (e.g. Civil Aviation Authorities, Airlines) and aircraft. The ATN comprises application entities and communications services that allow ground, air-to-ground, and avionics data subnetworks to interoperate. The ATN accomplishes this by adopting common interface services and protocols. Currently, ATN standards are based on the International Organization for Standardization (ISO) Open Systems Interconnect (OSI) reference model and components that include end systems, intermediate systems, and subnetworks. However, International Civil Aviation Organization (ICAO) standards are being modified to include Transmission Control Protocol/Internet Protocol (TCP/IP) for possible future implementation in the aviation environment.

1.2 In order to effectively make use of past network investments and make full use of the existing networks; it is the intent of the FAA ATN Architecture Plan (AAP) to use the current routers and gateways between existing networks. Currently, multiple ATN components are in various stages of development and implementation in the U.S. National Airspace System (NAS). This information paper will focus on two of those elements: the *Air Traffic Services (ATS) Message Handling System (AMHS)* and the *ATN Router.*

1.3 The Aeronautical Fixed Telecommunications Network (AFTN), functioning as both a dedicated telecommunications infrastructure and a special purpose messaging protocol, evolved to provide a ground-to-ground infrastructure supporting message exchange between aeronautical fixed stations. AMHS – defined in the current set of ICAO Standards And Recommended Practices (SARPs)

and adopted in ICAO 9705, 2002, Edition 3, Sub-volume III – is the ICAO standard for ground-to-ground message communications and the replacement for the current AFTN. Ground-to-ground systems connect international airports, Air Traffic Control facilities, and international airline companies, thus ensuring the telecommunications necessary for the safety, regularity, and efficiency of domestic and international flight. AMHS allows for the exchange of ATS messages between service users and provides generic message services over the ATN. It is based on the International Telecommunications Union (ITU) X.400 messaging standards, which provides the core messaging framework that extends AMHS to support aeronautical applications.

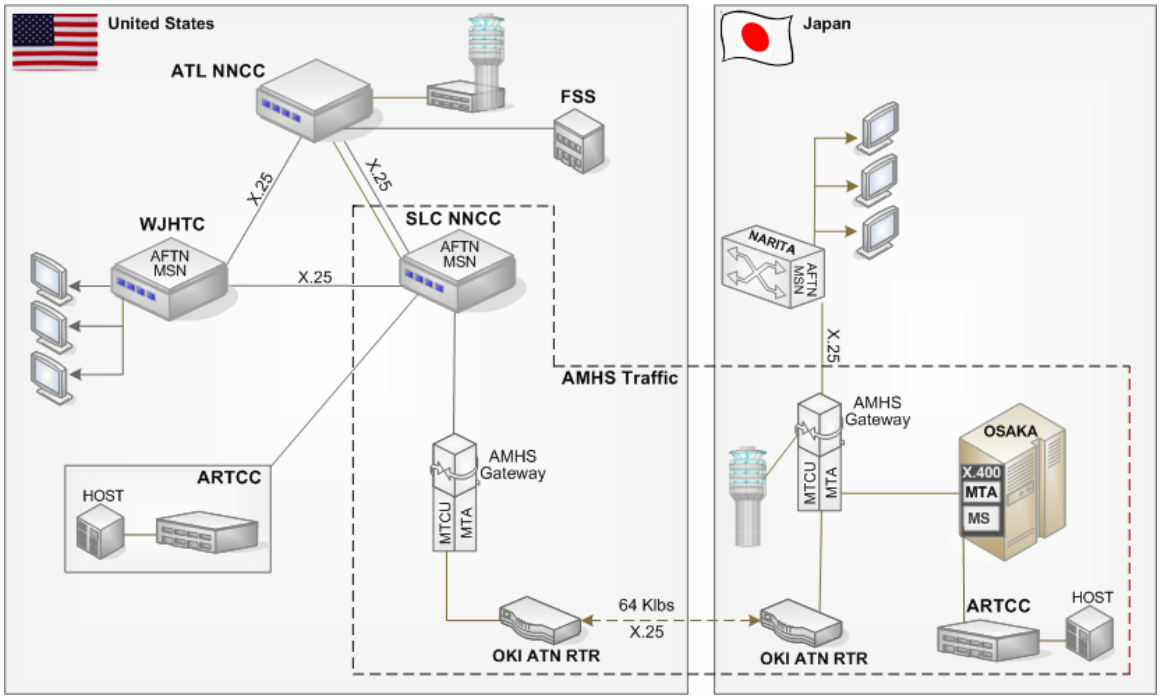
2. Japan and the United States AMHS Trials

2.1 Throughout the past several years the Japan Civil Aviation Bureau (JCAB) and the FAA have conducted technical and pre-operational trials of the AMHS application via ATN routers. Following the successful completion of these interoperability connection tests, Japan and the United States proceeded to transition to an AMHS service to replace the existing Japan–United States AFTN service, running over a new 64kbps dedicated leased line connection.

2.2 JCAB and the FAA have implemented ATN routers and AFTN/AMHS gateways compliant with ICAO Doc 9705 (the ATN SARPs). Testing was successfully conducted between JCAB's test system at its SDECC (Systems Development, Evaluation and Contingency Management Center) facility in Osaka and the FAA's system at the National Network Control Center (NNCC) in Salt Lake City, Utah. Subsequently, JCAB and the FAA developed and defined guidelines necessary for a successful transition from AFTN service to AMHS service, and transition process procedures were agreed upon. Testing was conducted and the United States-Japan AMHS service became operational in March 2005.

2.3 Configuration of the operational AMHS System between the United States and Japan is depicted in Figure 2-1.

Figure 2-1 AMHS Traffic (U.S. & Japan)



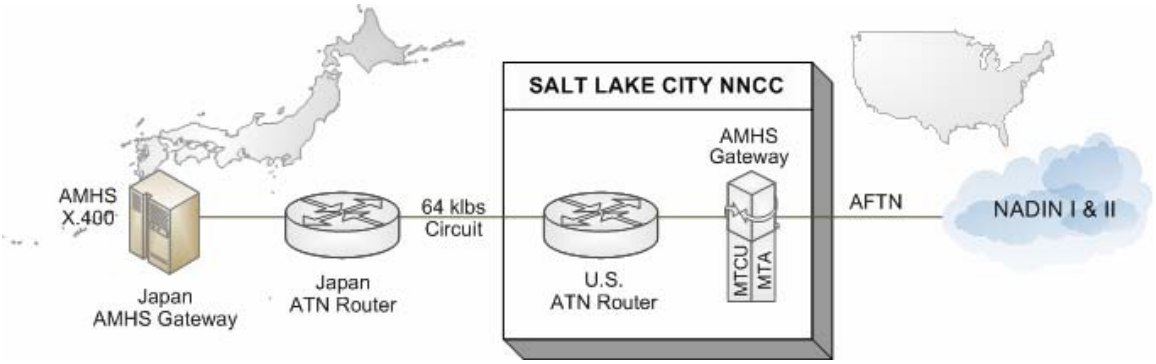
3. Current Operational FAA AMHS Gateway

3.1 The functional objects of an AMHS model are Message Transfer Agents (MTA), User Agents (UA), the Message Transfer Control Unit (MTCU), Message Stores (MS), and Access Units (AU). For Basic ATS Message Service, the following AMHS entities include:

- ATS Message Server -- An X.400 MTA (optionally one or more MSs)
- ATS Message User Agent – An X.400 UA
- AFTN/AMHS Gateway – An MTA and an AFTN specific AU, referred to as Message Transfer and Control Unit (MTCU) and a Control Position.

3.1.2 The U.S. FAA AMHS system in Salt Lake City consists of an AFTN/AMHS Gateway that allows the transition of AMHS traffic from Japan to AFTN traffic and vice versa. The FAA AMHS Gateway in Salt Lake City is an application that provides the conversion function to/from AFTN and AMHS. Currently, an OKI ATN Router in Salt Lake City is being used to support AMHS operations between the FAA and JCAB. The exchange of AMHS messages is accomplished via the OKI ATN Routers. See Figure 3-1 below for an AMHS Gateway depiction.

Figure 3-1 AMHS Traffic (U.S. & Japan)



3.1.3 The current AMHS system consists of the following components:

- MTA (Asia/Pac AMHS ICD)
- AFTN/AMHS Gateway (Asia/Pac ICD)
- UA
- Control Position
- X.25 Interfaces To AFTN
- LAN Interfaces To ATN Router
- 64 klbs Circuit From the United States To Japan For AMHS Traffic

3.1.4 The MTA and control position perform multiple functions including flow control, X.25 status monitoring, probes and non-delivery report generation and monitoring, statistics logging, and storage. The MTA function is manipulated using the Control Position. The AMHS system provides for full redundancy and automatic switchover upon hardware failure.

3.1.5 Although the FAA AMHS system currently operating in Salt Lake City is compliant with ICAO Document 9705, 2002, Edition 2, it is a functional prototype system. This ATN Router/AMHS prototype system uses a point-to-point circuit.

3.2 FAA AMHS System Program.

3.2.1 The FAA has recently established an AMHS program wherein software development will be provided in-house (hardware will be commercial-off-the-shelf), in order to deliver a maintainable, operational AMHS system. The AMHS system will be delivered and installed at the Salt Lake City (SLC) National Network Control Center (NNCC) and Atlanta NNCC in order to satisfy our international commitments with Japan – that is, replacing the prototype AMHS Gateway in SLC with the longer-term, more sustainable solution of AMHS service. This operational system deployment will also provide access for future international AMHS service requests and will replace the OKI ATN Router with the FAA ATN Router.

4. ATN Router Component

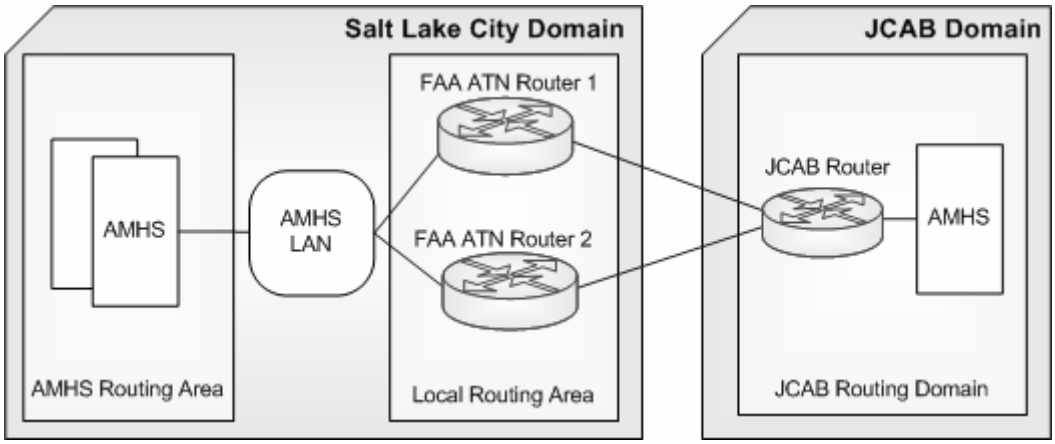
4.1 In order to facilitate ATN services and interoperability, ATN ISO/OSI compliant routers are utilized to support the exchange of data within the communications environment. The FAA ATN Router provides routing and relaying functionality necessary to support the delivery of ATN formatted data. The FAA Router is an ATN Intermediate System that in an ISO/OSI environment. Under the FAA Next Generation Air/Ground Communications Program (NEXCOM), an FAA ATN Router was developed to support standards validation activities.

4.2 The FAA ATN Router software has undergone extensive testing to verify its functional and operational capabilities. As a result of testing with the Japan Civil Aviation Bureau (JCAB), additional enhancements were subsequently added and were also formally tested at the FAA William J. Hughes Technical Center (WJHTC). In addition to the formal testing mentioned above, the FAA ATN Router has also undergone formal and informal interoperability testing with several other ATN Routers. The FAA ATN Router has successfully interoperated with the OKI ATN Router, the ACI ATN Router, and the Rockwell-Collins Airborne ATN Router.

4.3 Based on these successful test results, there is a plan to integrate the FAA ATN Router into the maintainable AMHS in Salt Lake City and Atlanta NNCC's. The FAA ATN Router will be used to replace the OKI ATN Router in the early-2006 timeframe. Prior to this replacement, integration and interoperability testing between the FAA ATN Router and the AMHS End System components will be performed to ensure compatibility during normal and degraded operations, in addition to integration and interoperability testing with JCAB. Once the FAA ATN Router is installed Site Acceptance Testing (SAT) will be conducted.

4.4 A potential implementation of the FAA ATN Router in the AMHS environment is shown below in Figure 4-1. For redundancy/backup purposes, two FAA ATN Routers are included, with each having an X.25 interface to the Router in the JCAB domain as well as an Ethernet interface to the AMHS system over a LAN**.**

Figure 4-1 FAA ATN Router In AMHS Environment



5. Conclusion

5.1 The FAA AMHS Gateway in Salt Lake City, Utah, is an application that provides the conversion function to/from AFTN and AMHS. Although the FAA AMHS system currently operating in Salt Lake City is in compliance with ICAO Document 9705, 2002, it is a functional prototype system. The FAA has established an AMHS program and plans to deploy a maintainable operational system at the Salt Lake City and Atlanta National Network Control Centers.

5.2 As a precursor to the AMHS installation in Salt Lake City, the FAA will first replace the OKI ATN Router in the Salt Lake City prototype AMHS with the FAA ATN Router in the 2006 calendar year. In 2007, the maintainable, operational AMHS is scheduled to replace the prototype AMHS. The FAA ATN Router has undergone both formal and informal testing and is slated for deployment in 2006. The FAA can provide information and participate in discussions within ICAO to support AMHS and ATN Router-development and testing efforts with member States.

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