AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL
WORKING GROUP 3 MEETING

Rio de Janeiro, Brazil 16 - 20 March 1998

Agenda Item 4: Air-ground Applications

CM Addressing Paper Included in AEEC Minutes

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1. An action was placed upon WG3/SG2 to produce a paper describing some different options for how an initial CM address would be input into the avionics. This paper was to be introduced at an AEEC meeting which took place in Orlando, Florida, at the end of January, 1998.

2. The attached paper was included in the meeting minutes, and will be presented as strawman material for inclusion in AEEC Specification 638 at the Systems Subcommittee meeting, 20-23 April in Annapolis, MD, USA. It is intended that ATN working group members will participate in forthcoming AEEC meetings and report actions to the next ATN working group meetings in Utrecht.

AIRLINES ELECTRONIC ENGINEERING COMMITTEE

DLK USERS FORUM

Orlando, Florida
January 28 - 29, 1998

ATN Context Management Application Addressing

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SUMMARY

This paper describes the initial CM address entry issue along with some possible options for implementations. Additional information regarding CM concepts can be found in the ICAO Comprehensive ATN Manual, Part III. Author contact information: Greg Saccone, Raytheon Systems Canada Ltd, 1 604 821-5182, email gsaccone@ccgate.hac.com

Introduction

The ATN Context Management (CM) application is responsible for exchanging addressing and version number information of data link applications between an aircraft and a ground system. This allows the aircraft and ground system to determine the data link capabilities of their peer users and gives all of the information needed to initiate those data link capabilities. CM is in some ways functionally equivalent to the AFN function in FANS-1/A.

As the concept of CM evolved, it was determined that a flight plan alone may not provide sufficient information to allow a ground system to initiate the CM functions. Since CM could not be initially ground-initiated, the aircraft was involved and was responsible for initiating the CM function with the first ground system. This is the case for both FANS-1/A and ATN applications. Both AFN and CM require a user (e.g. pilot) to input the address of the first ground system with which the aircraft will exchange application information.

One of the differences between CM and AFN is the inherent addressing schemes of the ATN and ACARS. AFN requires the input of the four character facility designation, which is subsequently mapped to the seven character facility address by the service provider. The ATN's addressing scheme is based on more advanced routing protocols, and requires a CM application address to be supplied. This CM application address can be from 18 to 19 octets in length. The longer address allows users to take advantage of many of the advanced features of the ATN, including priority, congestion management, and policy-based routing. After initial entry into the avionics, the aircrew are not required to input subsequent CM application addresses; that is handled transparently to the aircrew by the CM application. There may be special cases where a second CM address may be required to be entered (e.g., for an aircraft flying through alternating ATN/non-ATN support areas). However, that would be dependent upon specific implementations, and a ground-forward or CM-contact capability can mitigate a number of those cases.

In addition, CM application addresses may occasionally change due to software updates, equipment changes, etc. From an aircraft initiation standpoint, this means there will be need to be a provision for periodically entering a new CM application address. However, a ground implementation should be designed so that minimal address changes are required.

ATN Development

Development of the CM SARPs for the CNS/ATM-1 package has been completed, and initial implementations are being built. The ICAO ATN Panel Working Group of the Whole noted the request that a standardized means should be established to more precisely describe or specify how the ground system's initial CM application address could be entered into the aircraft avionics. This is beyond the remit of the SARPs, but has implications for ease of interoperability and implementation methods.

Possible Solutions

There are a number of ways to accomplish the initial CM application address entry. Some possible options are:

- An on-board table look-up or database function that maps a 4-8 character facility designation with the proper CM application address,

- A list of pre-set addresses in the aircraft for regional or global CM application address file servers,
- A ground system (e.g. airline AOC) supplies a locally stored address to the aircraft, which is automatically input to the avionics,
- The pilot enters a country code and a short (e.g. three letter) local address code which specifies an external addressing database, and the proper addresses are then determined by the external database and returned to the avionics,
- The navigation systems of the aircraft automatically select the proper CM ground system address based upon current position, and
- Manual input by the pilot from a list of addresses contained in an AIP or like document.

Note that this list may not be exhaustive.

<u>Discussion of Each Possible Solution</u>

An on-board table look-up or database function that maps a 4-8 character facility designation with the proper CM application address.

What it means:

This method would involve a function within the avionics that would take a pilot-input 4-8 character facility designation and match it with the correct 19 - 20 octet CM application address. The CM application address would then be used to establish the initial CM connection with the proper ground facility.

Pros:

- Pilot interface very similar to existing FANS-1/A environment
- Virtual logical addressing
- Pilot input is checked by the avionics for proper addressing

Cons:

- Maintenance of the addresses (changing/adding facilities in the aircraft database) would be difficult
- Cannot have multiple addresses corresponding to a single facility designation
- CM addresses would need to be tightly controlled to minimize changes

A list of pre-set addresses in the aircraft for regional or global CM application address file servers.

What it means:

This implementation would take away the ambiguity of which facility to contact since there would be a limited number of CM application address servers. These CM application address servers would either contain or obtain all of the relevant data link application information that the aircraft's avionics would need to know, and return that information to the aircraft.

Pros:

- Simplified procedure for the pilot (e.g. push the 'Logon to A' button, with one button for each server, or simply enter a facility designation and let the CM server determine the proper addresses for that facility)
- Limited number of addresses for the avionics to handle

Cons:

- Dependent upon individual CM implementations (e.g. a particular country may not use a CM server, and only have a local CM address)
- CM servers would need complex functions (access to flight data, connectivity to the control centers it provides the information for, etc.)
- Changes to CM addresses cannot be easily accommodated
- Mandates ground CM server ground architecture

A ground system (e.g. airline AOC) supplies a locally stored address to the aircraft, which is automatically input to the avionics.

What it means:

This method implies the use of a data link or other device to automatically input the initial CM application address into the aircraft's avionics.

Pros:

- Pilot doesn't have to worry about inputting wrong address
- No data entry from the pilot
- Ground system databases are easier to maintain than airborne databases

Cons:

- Implementing new/additional data link functionality on the ground
- Reliance on a data link to start a data link
- Logon is a two step process (e.g. the first step is to get the address, and the second step is the actual logon)
- Could cause some delay in the logon process

The pilot enters a country code and a short (e.g. three letter) local address code which specifies an external addressing database, and the proper addresses are then determined by the external database and returned to the avionics.

What it means:

A subset of ATN addresses are set aside for CM application addresses. The pilot enters abbreviated information which correlates to the proper local external CM application address database.

Pros:

- Simplifies initial CM application address information
- Easier pilot input than a full CM application address

Cons:

- Pilot enters different data (i.e. not facility designation); different pilot interface
- Changes ATN addressing scheme; repercussions throughout the internet SARPs
- Limits the number of CM addresses
- Problem of a region not having a CM application address as an aircraft would assume, causing operational confusion
- Depending on implementation, may have the same problems as the regional/global CM application address server discussed above

The navigation systems of the aircraft automatically select the proper CM ground system address based upon current position.

What it means:

The avionics/navigation system can determine, based on the aircraft's current location, what CM system would need to be logged on to.

Pros:

- No pilot address input required
- Simple initiation procedure (push the single 'Logon' button)

Cons:

- More complexity in the aircraft (CM coverage boundaries would need to be defined)
- Possible ambiguity if function is activated in transition space (e.g. while airborne between two FIRs)
- Maintenance of the addresses (changing/adding facilities in the aircraft database) would be difficult
- CM addresses would need to be tightly controlled to minimize changes

Manual input by the pilot from a list of addressed contained in an AIP or like document.

What it means:

The pilot manually enters the 19 to 20 octet initial CM application address.

Pros:

- Easier to control changing CM application addresses

- May form a required backup method of CM application address entry (i.e. an unplanned equipment change results in a new CM application address which is not known in the aircraft database)
- Used as a last resort

Cons:

- Long, operationally-meaningless technical address to be input
- Possibility of typing errors
- Publication cycles of CM application addresses

Conclusion

A number of potential solutions to the issue of initial CM application address entry have been identified by the ATNP. Each has different advantages and disadvantages. The AEEC is invited to consider the different options presented in this paper, along with any additional solutions, in on-going discussions towards final resolution.