International Civil Aviation Organization

THE FIRST MEETING OF AERONAUTCAL COMMUNICATION SERVICE (ACS) IMPLEMENTATION CO-ORDINATION GROUP OF APANPIRG (ACSICG/1)

Seoul, Republic of Korea, 13 - 16 May 2014

Agenda Item 11: **Any Other Business**

RECOMMENDED PROCESSING RELATED TO AFTN ACKNOWLEDGEMENT MESSAGES

(Presented by United States of America)

SUMMARY

This working paper presents a discussion from AFSG regarding a problem that may occur in the generation of an IPN/RN, when routing diversion has been activated in a mixed AFTN/AMHS environment.

1.   Introduction

1.1   The attached paper, presented at the Aeronautical Fixed Services Group (AFSG) meeting in April 2014, discusses a possible scenario in which AFTN SS Acknowledgement messages may be lost. Potential changes to ICAO specification are discussed to deal with the matter. The intent of presentation here is to ensure awareness and obtain feedback outside of the European Region.

2.   Discussion

2.1   See Attachment A.

3.   Action by the Meeting

3.1   The meeting is invited to:

a)   note the information contained in this paper; and

b)   discuss any relevant matters as appropriate.

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AERONAUTICAL FIXED SERVICES GROUP (AFSG)
of the European Air Navigation Planning Group (EANPG)

EIGHTEENTH MEETING

(Paris, 7 – 11 April 2014)

Agenda Item 2:   Operational Network matters

RECOMMENDED PROCESSING RELATED TO AFTN ACKNOWLEDGEMENT MESSAGES

(Presented by the AFSG Operations and Planning Groups)

SUMMARY
This Working Paper highlights a problem that may occur in the generation of IPN/RN, when routing diversion has been activated in a mixed AFTN/AMHS environment.
Potential courses of action are considered and proposed.

1.   Introduction

1.1   The AFSG Operations Group (OG) discussed specific operational observations with respect to the processing of special categories of AFTN messages in MTCUs. Three operational scenarios were presented:

- Diverted SVC QTA MIS

- AFTN Service messages passing the MTCU

- AMHS Interpersonal Notification (IPN/RN) processing in case of traffic diversion

1.2   In these scenarios, a non-delivery of the message to the intended recipient occurred. The processing of the concerned "lost" AFTN messages in the MTCU was conformant to ICAO Doc 9880. The result contradicted to the operational expectations.

1.3   The Operations Group created a WP for the AFSG Planning Group to present the preferred operational solutions and to provide input for a respective Amendment Proposal to Doc 9880 and a Change Proposal to the EUR AMHS Manual.

1.4   The result of the Planning Group discussion regarding the "*Handling of AFTN Service messages (SVC) in the AFTN/AMHS Gateway*" is presented at AFSG/18 as an Amendment Proposal to Doc 9880 and a Change Proposal to the EUR AMHS Manual (CP-AMHSM-14-002).

(8 pages)

1.5   Concerning the *"Processing of AMHS Interpersonal Notification (IPN/RN)"* the Operations Group and the Planning Group could not reach complete agreement on the most appropriate course of action.

2.   **Discussion**

2.1   In normal situations, when traversing AFTN/AMHS/AFTN, an AFTN distress message (SS) and the corresponding AFTN Acknowledgement message (SS ACK) are routed over the same path in opposite directions (symmetric routing);
the AFTN SS message transported as urgent IPM through the AMHS island and converted back to an AFTN SS message to be delivered to its intended recipient who is an AFTN user;
the corresponding SS ACK message is converted into an IPN/RN, forwarded and then converted back into an SS ACK message in the AFTN/AMHS Gateway which has handled the original AFTN SS message (subject message).

2.2   As network outages may occur occasionally, it cannot be ensured that the routing through an AMHS island is always symmetric. In some traffic diversion situations, due to the fact that the subject message has not passed the AFTN/AMHS Gateway which is responsible for converting the IPN/RN to the, SS ACK message, this conversion cannot be performed. In such case, an NDR is produced and the event is reported to the Gateway operator (Doc 9880).

2.3   Examples of the above normal and exceptional situations are documented in detail in Attachment A to the present WP.

2.4   Study of these situations leads to the following observations and conclusions:

2.4.1   The probability that an SS ACK message may not reach its intended recipient when traversing AFTN/AMHS/AFTN is low. Nevertheless, there is such a possibility in case the path used for delivering the SS ACK/IPN-RN is different to the one used for delivering the subject AFTN SS message - i.e. in case diversion of traffic via an alternate route has been activated in the meantime.

2.4.2   The transmission of a distress message is of utmost importance and conversion between AFTN and AMHS must not interrupt its progression towards its destination. Similarly, the acknowledgment of a distress message must also reach its destination without delay, regardless of whether the message needs to be converted to AFTN or AMHS.

2.4.3   There seems to be a dissymmetry in the specification of the behaviour of the AFTN/AMHS Gateway between the conversion from AFTN to AMHS and the conversion from AMHS to AFTN. In particular:

–   ICAO Doc 9880 (Part II Paragraph 4.4.3.1.1) specifies that an AFTN SS ACK is converted to an IPM conveyed with particular message transfer envelop when received by an AFTN/AMHS Gateway which has no trace of the corresponding subject message.

–   ICAO Doc 9880 (Part II Paragraph 4.5.3.1.1) specifies that the conversion procedure of an IPN/RN at an AMHS/AFTN gateway is terminated if the subject IPM has not passed through it (ref. ICAO Doc 9880, Part II Paragraph 4.5.3.1.1).

–   in both cases, logging of the error situation and reporting to the AFTN/AMHS Gateway control position is foreseen, but in the latter actual operator action is necessary so that the originator of the AFTN SS may be informed of its reception by the intended recipient.

2.4.4   The Operator of the AFTN/AMHS Gateway may need to perform time consuming tracing to determine exactly where in the network traffic diversion was initiated, so as to appropriately address a free text urgent message acknowledging receipt of the AFTN SS.

2.4.5   The handling of distress messages and acknowledgements of such messages, either in AFTN or in AMHS, is of a global nature. Therefore, it must be performed in the same manner everywhere and the reactions must be predicable in any situation.

2.4.6   For the EUR Region, the problem of an IPN RN not being converted to the corresponding AFTN SS ACK, when the subject has not passed the AFTN/AMHS Gateway is considered as temporary. This problem is expected to disappear when only AMHS is used at the international level.

2.5   In order to avoid the potential risk of a delay/loss of an AFTN Acknowledgement message in a mixed AFTN/AMHS environment, the Operations Group proposed the inclusion in the EUR AMHS Manual of a recommendation for all AFTN Acknowledgement messages to be conveyed as IPMs.

2.6   In this manner, both messages (the AFTN distress message and the AFTN Acknowledgement message) would be transported as IPM through an AMHS island, achieving the independency of the routing path within that island.

2.7   The draft text for the EUR AMHS Manual is presented in Attachment B to the present WP.

2.8   The Planning Group acknowledged the problem and the practicality of the proposed solution but was reluctant to accept the proposed change to the EUR AMHS Manual for institutional, operational and technical reasons such as:

- the EUR AMHS Manual is a Regional ICAO Document and its provisions should not contradict those of global ICAO Documents (Doc 9880) – an appropriate AP to Doc 9880 could be submitted if global support on the proposed solution is anticipated,

-the behaviour of AMHS/AFTN gateways should be as uniform as possible at the global level so that reactions are predictable and predetermined both for the systems and the operators involved,

- as distress messages and their corresponding acknowledgement of receipt messages may be originated in any Region, local arrangements in EUR AFTN/AMHS gateways would not effectively solve the problem,

- operational procedures could be established to manage this problem which will appear less and less as AMHS expands.

2.9   Both Groups agreed that this was an important issue and awareness should be raised in all COM centres within the Region as well as the other Regions. Feedback from other Regions on their observations and their approach for resolving the problem would be highly desirable.

3.   **Action by the Meeting**

3.1   The AFSG is invited to

    a)   note the presented information and provide comments;

    b)   agree to the appropriate publication of this information to raise awareness of EUR COM Centres;

    c)   agree to the circulation of this information to other ICAO Regions requesting comments towards a common solution;

    d)   task the AFSG Working Groups with potential further work on this subject.

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    -Attachment A

    -Attachment B

Attachment A

Analysis of situations entailing conversion of AFTN SS ACK into IPN/RN

1.   Introduction

1.1   During the conformance testing activities of the AMHS system in Denmark, the COM CENTRE COPENHAGEN reviewed in detail the AMHS Conformance Test Case CT507 of the EUR AMHS Manual, Appendix D. The test case indicates that for an IPN/RN arriving at an AFTN/AMHS Gateway containing a fictitious value for the subject IPM (i.e. the subject IPM did not pass the AFTN/AMHS Gateway), the AFTN/AMHS Gateway will log the error situation, report to a control position, store the IPN/RN for appropriate action and return an NDR to the originator (ref. ICAO Doc 9880, Part II Paragraph 4.5.3.1.1).

1.2   Denmark has noted that this behaviour could have implications in the operational environment where the IPN/RN is transmitted over a path other than the one over which the urgent subject IPM was transmitted (asymmetric routing).

1.3   Denmark and the UK have simulated a realistic diversion of IPN/RN and they each demonstrated that the transmission of IPN/RN (or the corresponding AFTN Acknowledgement message) towards its destination could be prevented in a mixed AFTN and AMHS environment.

2.   Scenario 1 – Normal situation

2.1   The first test describes the normal situation when an AFTN User sends an AFTN distress message (SS) to another User, which returns the standard acknowledgment of a distress message (AFTN SS ACK), in a mixed AFTN and AMHS environment.

2.2   An AFTN SS message is sent from AFTN User D to COM Centre D, which is then relayed to the AFTN/AMHS Gateway of COM Centre B. COM Centre B converts the message and sends the urgent IPM to the AFTN/AMHS Gateway of COM Centre A. COM Centre A converts the IPM and delivers the AFTN SS message to AFTN User A. See Figure 1, black arrows.

2.3   Following the delivery of the AFTN SS message, AFTN User A returns an AFTN SS ACK to COM Centre A. COM Centre A converts the message and sends the IPN/RN to the AFTN/AMHS Gateway of COM Centre B. COM Centre B converts the IPN/RN and sends to COM Centre D the AFTN SS ACK, which is finally delivered to AFTN User D. See Figure 1, green arrows.

2.4   In case the destination of the AFTN SS message is an AMHS user (AMHS User A), COM Centre A relays the urgent IPM to AMHS User A without conversion. AMHS User A responds by submitting an IPN/ RN to COM Centre A, which relays the IPN/RN to COM Centre B. The IPN/RN is converted at the AFTN/AMHS Gateway of this COM centre to an AFTN SS ACK which is then forwarded to COM Centre A to reach its intended recipient (originator of the AFTN SS message) which is AFTN user D at COM Centre D. See Figure 1
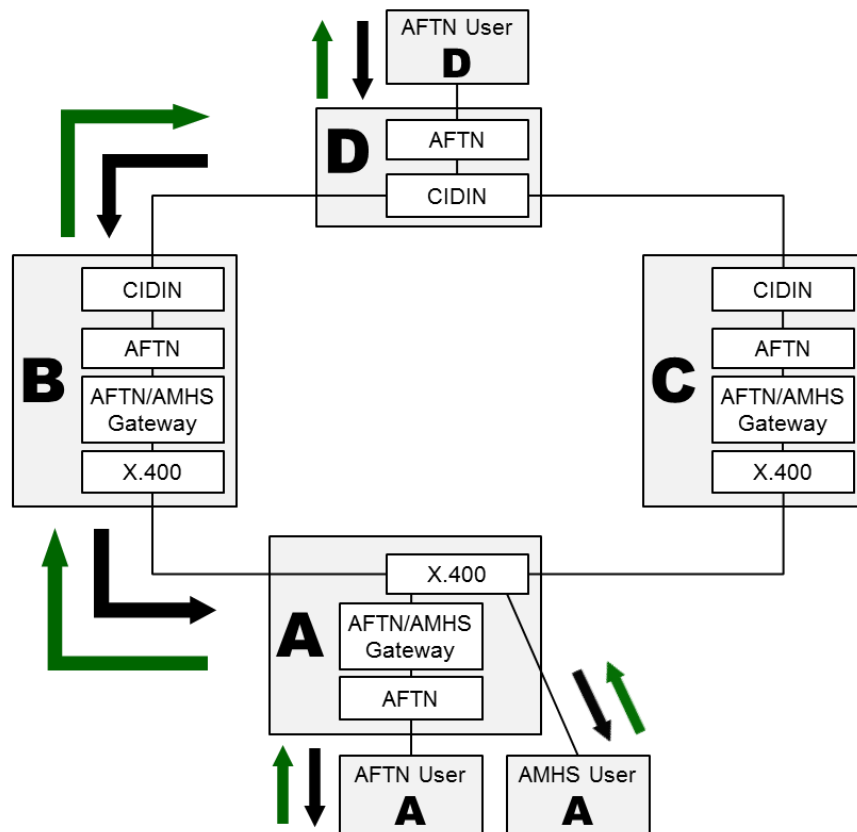
Figure 1

3.   Scenario 2 – Network failure between COM Centre A and COM Centre B

3.1   The second test describes the situation where the connectivity between COM Centre B and the COM Centre A is disrupted (see Figure 2, red lightning) after AFTN User A received the AFTN SS message or AMHS User A received the urgent IPM, but before any response acknowledging its reception is issued (see Figure 2, black arrows).

3.2   AFTN User A acknowledges the reception of the AFTN SS message by transmitting an AFTN SS ACK to COM Centre A (see Figure 2, green arrow). This generates an IPN/RN at AFTN/AMHS Gateway A which is queued in COM Centre A, awaiting intervention from the operator at COM Centre A.

3.3   Respectively, AMHS User A acknowledges the reception of the urgent IPM by generating an IPN/RN also to be queued at COM Centre A.

3.4   The operator at COM Centre A diverts all traffic bound for COM Centre D via COM Centre C and the IPN/RN is then transmitted from COM Centre A to COM Centre C.

3.5   Independently of the type of User A, the following situation appears:

- The IPN/RN reaches the AFTN/AMHS Gateway at COM Centre C (see Figure 2, yellow arrow).

- Because the subject IPM was not generated by the AFTN/AMHS Gateway of COM Centre C, the IPN/RN conversion to AFTN SS ACK cannot be performed and therefore the provisions of ICAO Doc 9880 paragraph 4.5.3.1 apply:

  - an event is reported at the control position of the AFTN/AMHS Gateway at COM Centre C and the IPN/RN is stored for appropriate action. Such action could be for the operator to create an urgent free text message to the intended recipient (AFTN User D) stating that:

"Due to network issues, a Receipt for your SS message was not deliverable. However, please accept this message to acknowledge that your SS message has been delivered to the recipient."

   – an NDR for the AFTN/AMHS Gateway of COM Centre A is generated (see Figure 2, red arrow), with the following elements:

     i)   "unable-to-transfer" for the *non-delivery-reason-code*;

     ii) "invalid-arguments" for the *non-delivery-diagnostic-code*; and

     iii) "unable to convert RN to AFTN Ack service message due to misrouted RN" for the *supplementary-information*.

- The processing of the IPN/RN is stopped at the AFTN/AMHS Gateway of COM Centre C and AFTN User D does not receive the acknowledgment of the distress message it originated.
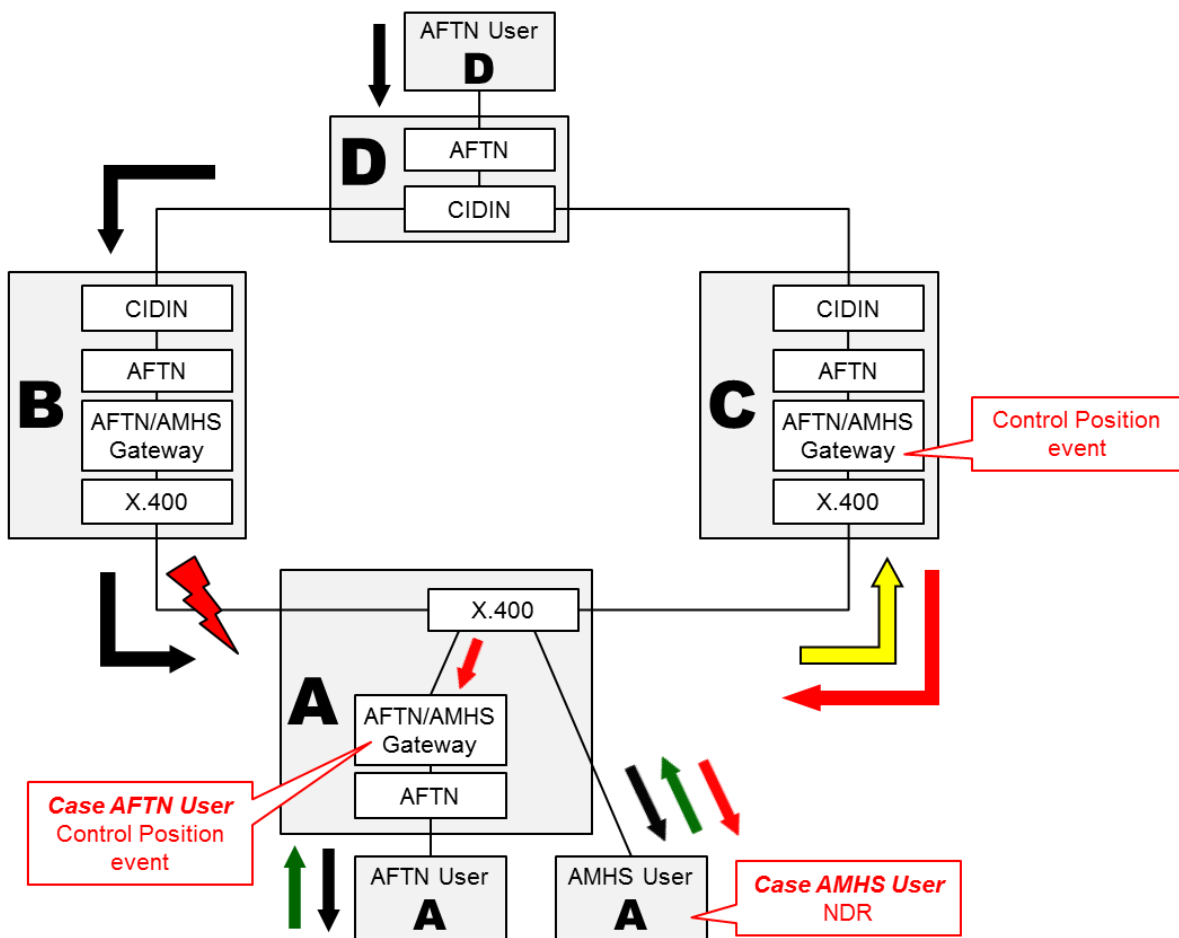

Figure 2

3.6   In case User A is an AFTN User, the following situation appears:

- An event is reported at the control position of the AFTN/AMHS Gateway at COM Centre A as a consequence of the NDR generated by the AFTN/AMHS Gateway of COM Centre C.

- On receipt of such an event at the control position of the AFTN/AMHS Gateway at COM Centre A, the operator could create an urgent IPM free text message to the intended recipient and using "QUOTE / UNQUOTE" procedure with the AFTN SS ACK text.

- AFTN User A does not receive indication that its AFTN SS ACK has not reached AFTN User D, unless it is informed by the Operator of COM Centre A .

3.7	In case User A is an AMHS User, the following situation appears:

- No events are reported to the operator at COM Centre A.

- AMHS User A receives the NDR in relation with the IPN/RN sent and may either re-submit the IPN/RN if the routing is restored or create a free text message conforming to the AFTN SS ACK expected.

- END of Attachment A-

Attachment B

Proposed draft text for inclusion in the main body of the EUR AMHS Manual

"   **8.4.4   Recommended processing related to AFTN Acknowledgement messages**

8.4.4.1   In order to avoid the potential loss of an AFTN Acknowledgement message (SS ACK) in a mixed AFTN/AMHS environment, each AFTN Acknowledgement message should be conveyed as an IPM and handled like other AFTN messages in an AFTN/AMHS Gateway.

8.4.4.2   To implement handling as above, the conversion of an AFTN Acknowledgement message into a Receipt-Notification as specified in ICAO Doc 9880, Part II, Section 4.4.3 should be deactivated.   "

- END of Attachment B-