AMHS NDR Handling Advice

Guidance for Handling of Non-delivery Reports (NDR)	
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Executive Summary

This document provides guidance to be applied when a non-delivery report (NDR) is received in the AMHS network.

In addition, the consequences of message timers are considered.

Moreover, prevention of loop situations and reaction to such situations are discussed.

This guidance is oriented to minimize as much as possible the potential operational impact of NDRs in the traffic exchange.

This guidance does not preclude the necessity to perform other actions required by local procedures or other regulations.

Note.– In 2019 the ICAO EUR Aeronautical Fixed Service Group (AFSG) was replaced by ICAO EUR AFS to SWIM Transition Task Force (AST TF) according to COG/74&RCOG/11 Decision /4.

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References

ICAO Documentation

[1] Aeronautical Telecommunications, Annex 10, Volume II and Volume III

[2] Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications – ATS Message Handling Services (ATSMHS), ICAO Doc 9880

[3] EUR AMHS Manual, ICAO EUR Doc 020

[4] ATS Messaging Routing Directory (AMRD) – Part 1 – Documentation

Other Documentation

[5] ISO/IEC 10021-4:1999 (ITU-T Rec. X.411 06/1999)

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1 Introduction

1.1 Scope of the Document

1.1.1 This document provides guidance to be applied when a non-delivery report (NDR) is received in the AMHS network.

1.1.2 This guidance is oriented to minimize as much as possible the potential operational impact of NDRs in the traffic exchange.

1.1.3 This guidance does not preclude the necessity to perform other actions required by local procedures or other regulations.

1.2 Structure of the document

1.2.1 The AMHS NDR Handling Advice document consists of five Chapters and three Appendices:

Chapter 1: The Introduction covers the scope and the structure of the document.

Chapter 2: General description of NDR principles.

Chapter 3: Message timers.

Chapter 4: Loop situations.

Chapter 5: NDR handling advice.

Attachment A: Change control mechanism

Appendix A: List of abbreviations

Appendix B: List of NDR reason and diagnostic codes

Appendix C: List of NDR scenarios

Appendix D: NDR Handling Flow Diagram

2 AMHS NDR Principles

2.1 General

2.1.1 It is very important to understand that originators of messages retain certain responsibility for their messages, even after submission to the MTA. Reception of a non-delivery report (NDR) means that the subject message was not delivered to the recipient. It is the responsibility of the originator to respond to this situation.

2.1.2 An AMHS user who receives an NDR has to process the NDR in a correct way to avoid loss of information.

2.1.3 Depending on his placement in the network, the AMHS user is either a Direct User or a COM Centre Operator operating an AFTN/AMHS Gateway (see Figure 1~~Figure 1~~).

2.1.4 Therefore:

a) Direct Users have to know the meaning of an NDR and have to take actions to avoid loss of information.

b) COM Centre Operators have to know the meaning of an NDR. They have to take actions as required to avoid loss of information. Especially at an AFTN/AMHS Gateway, NDRs may occur in complex scenarios which require detailed analysis and careful, coordinated actions.

2.1.5 To process NDRs it is necessary to analyse the reasons and undertake appropriate actions.

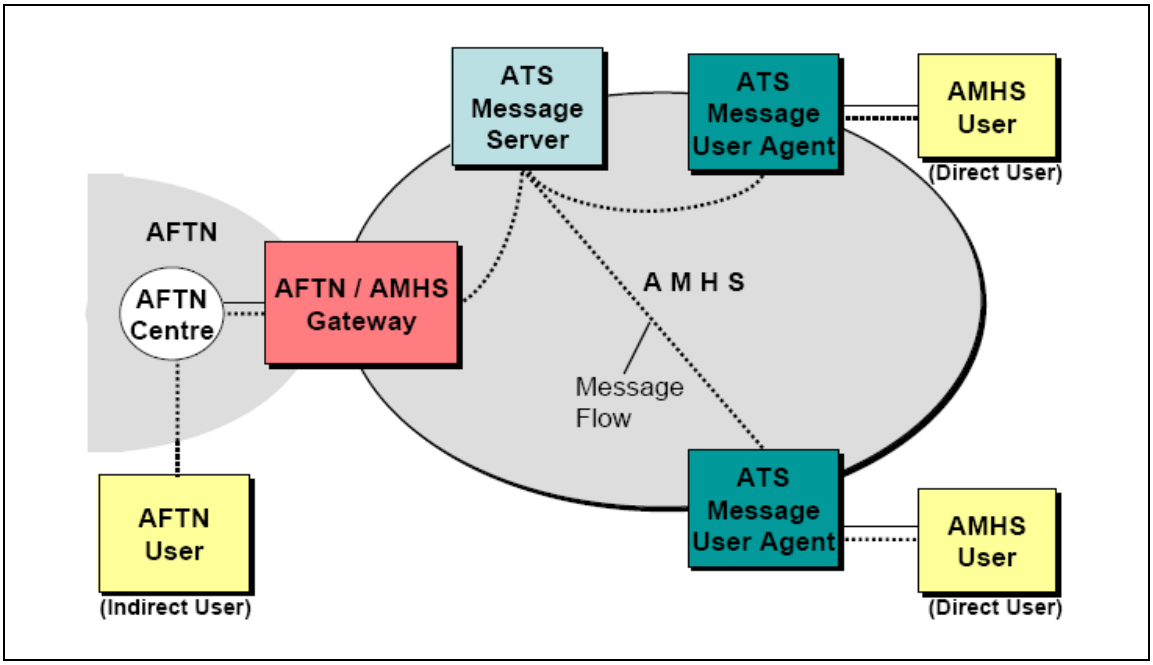


Figure 1: Communication scenarios AMHS-AMHS and AMHS-AFTN

2.2 Potential operational impact of NDRs

2.2.1 An NDR informs that the related message was not delivered to one or more of the intended recipient(s). The reason for the "Non-delivery" is included in the NDR thus appropriate actions can be initiated.

2.2.2 The operational impact depends on the actions taken. Additionally, an important parameter is the timeframe between the submission of the original message, reception of the NDR and initiation of actions by the NDR recipient. Consequently the impact could be:

- at best a delay
- at worst a loss of message

2.2.3 The particular operational impact of SVC ADS UNKNOWN messages being translated to NDRs and then back to SVC ADS UNKNOWN messages, when traversing through AFTN/AMHS/AFTN, has been analysed separately ([3~~]~~3]). Appropriate recommendations which should limit/eliminate occurrence of such NDRs have been included in [3~~]~~3].

3 Message timers

3.1 Message timers and NDRs

3.1.1 As stated in the previous paragraph, the time period between submission of a message and reception of an NDR is an important factor to avoid loss of information. The user needs to know until when an NDR related to a particular message should be expected.

3.1.2 Timers at two different levels can cause non-delivery of a message. The 'MTS message lifetime' and the Element of Service 'Latest Delivery' may cause non-delivery.

3.2 MTS message lifetime

3.2.1 If the MTS cannot deliver a message within a determined period of time, an NDR will be returned to the originator. This message lifetime may be different per priority and potentially different at each MTA.

3.2.2 The Element of Service 'Latest Delivery' may be set per message by the Direct User. If the MTS cannot deliver the message by the time specified, the message is cancelled and an NDR is returned.

3.2.3 AMHS users have to take into account these timers. To generate predictable results, it is necessary that the same timer values are used in the whole AMHS network.

3.2.4 Values for 'MTS message lifetime' are recommended in [3~~[3~~]. This ensures predictable results for the AMHS users.

3.3 Latest delivery designation

3.3.1 As specified in [2~~[2~~], an MTCU shall never set the 'latest delivery' element.

3.3.2 The Direct User might set the optional Element of Service 'latest delivery'. The user should set this value individually for each message, as appropriate to the message content. Expiry of the 'latest delivery' time should only occur to obsolete messages.

4 Loop situations

4.1 Consequences of loop routing

4.1.1 If the MTS discovers that a message is looping, this message is removed from the network. The MTA, which detects the message looping generates an NDR addressed to the originator. It is important to highlight that inconsistent routing causing a loop results in non-delivery of messages and reports.

4.1.2 A loop situation could also cause the non-delivery of NDRs itself. Therefore, it is important that COM Centre Operators respond quickly upon notification of such situation.

4.2 Causes of loop routing

4.2.1 A loop routing occurs due to misconfigured routing tables as follows:

(1) Within one COM Centre (looping between the AFTN component and the MTA),
(2) Between two COM Centres, or
(3) Between more than two COM Centres.

4.3 Measures to avoid loop routing

4.3.1 In the ATS Messaging Routing Directory (AMRD), Part 1 – Documentation [4]~~[4]~~ causes of internal loops are discussed. Local procedures should be established to avoid such situations (1).

4.3.2 Loops between two COM Centres (2) or between more than two COM Centres (3) can be avoided by adhering to the AMC Routing Tables and by complying with the AMHS QSP Procedures defined in [4]~~[4]~~.

5 NDR handling advice

5.1 General NDR handling advice

5.1.1 At an MTCU any received NDR should be logged and archived for offline analysis.

5.1.2 A Direct User should log and archive any received NDR for offline analysis.

5.1.3 Archived NDRs should be reviewed periodically to analyse the reasons. Appropriate measures should be taken to avoid occurrence of similar NDRs in the future.

5.1.4 Information should be shared between CCC Operators, COM Centre Operators and Direct Users.

5.2 NDR diagnostic – maximum time expired

5.2.1 Provided that the values for the MTS message lifetime timer are set as recommended in [3~~]3~~] it is very unlikely that NDRs with the diagnostic code "maximum time expired" will occur.

5.2.2 However, an AMHS Direct User may have set the element of service 'latest delivery' to a much lower value in comparison. Therefore, AMHS Direct Users should decide individually for each subject message, if it needs to be resubmitted after reception of an NDR. In most cases, resubmission will not be required, because the Direct User decides to use the 'latest delivery' option upon creation of the message, so by the time the NDR is received, the NDR subject message is probably obsolete.

5.2.3 In case of MTA message queues, the COM Centre Operator can act in accordance with established procedures thus avoiding NDRs. Consequently, COM Centre Operators are normally not required to respond to this type of NDRs.

5.3 NDR diagnostic – loop detected

5.3.1 Immediate action is required upon detection of a loop and respectively upon reception of NDRs with the non-delivery-reason (0) "transfer-failure" and non-delivery-diagnostic-code (03) "loop-detected".

5.3.2 A Direct User should report this NDR immediately to the local AMHS COM Centre. Resubmission of the not delivered message(s) is useful only after restoration of correct routing in the network. This could be achieved by human coordination, or alternatively by sending probes periodically to the affected recipient addresses.

5.3.3 The Operator of a COM Centre should avoid further NDRs (and consequently potential loss of messages) and start immediately the following actions:

- Workaround to pause/suspend further non-delivery by:
    - Stop AFTN messages before they are forwarded to the MTCU (1).
    - Close incoming and outgoing MTA associations, which are involved in the loop (2)/(3).

5.3.4 Then, the COM Centre Operator should start coordination. Following steps are recommended:

- Analyse the anomaly by:
    - Determining which recipient addresses are subject to non-delivery
    - Determining the next hop of the affected recipient addresses
- Coordinate via telephone the actual routing arrangements with the next hop COM Centre:
    - Both COM Centres should report which route addresses are routed to each other.
    - Both COM Centres should compare their actual routing with the tables provided by the AMC.
- Correct the routing tables if routing contradictions are detected, or revert to the published routes.

5.3.5 In case the loop routing involves more than two COM Centres further coordination is required. Each COM Centre should contact the next hop of the non-delivered messages and perform the steps recommended in 5.3.4.

Attachment A: Change Control Mechanism of the EUR AMHS Documentation document

A.0.1 The change control mechanism provides two categories:

- Defect Report (DR), and
- Change Proposal (CP)

A.0.2 Proposals to introduce changes to the EUR AMHS Documentation document itself may arise from users, implementers or manufacturers.

A.0.3 The procedure for submission and processing of a Defect Report (DR) or a Change Proposal (CP) involves the following steps:

A.1 Procedure for Defect Report (DR)

A.1.1 A problem is detected, which is reflected in the EUR AMHS Documentation and may be attributed to implemented procedures and/or inconsistencies in this document.

A.1.2 The problem is reported to the Rapporteur of the Operations Group of AST TF (AST OG), by submission of a defect report (DR). A standard reporting format is used (see attached template in A.3).

A.1.3 The Rapporteur assigns a number and priority to the defect report and introduces it to the agenda of an upcoming meeting of the OG. If necessary, he refers to the Planning Group (PG) Rapporteur.

A.1.4 The OG evaluates the report and either adopts it as a working item or rejects it. The party, which submitted the defect report, is notified accordingly.

A.1.5 Experts of the OG are assigned to the problem if the status of the DR is set to accepted and milestone dates are set. Outside expertise may be invited to participate, as appropriate.

A.1.6 The OG develops proposals for resolving the problem and submits them to the AST TF for approval.

A.1.7 The AST TF approves or rejects the presented proposals. In case of the latter, the subject is referred back to the OG (step A.1.5) or discarded.

A.1.8 The OG drafts appropriate text for amendment of the EUR AMHS Documentation and submits it to the AST TF for approval.

A.1.9 The AST TF approves or rejects the proposed material. In case of the latter, the subject is referred back to the OG (step A.1.8).

A.1.10 Solutions are implemented.

Note.– Steps A.1.6 and A.1.8 may run in parallel.

A.2 Procedure for Change Proposal (CP)

A.2.1 The same structured procedure, with the exception of steps (A.1.6) and (A.1.7) applies in case of proposed enhancements to the EUR AMHS Documentation or inconsistencies with relevant existing documentation.

A.2.2 In this case, a change proposal (CP) should be submitted to the OG. The format of the CP is similar to that of the DR.

A.3 Template for Defect Reports / Change Proposals

TEMPLATE FOR DEFECT REPORTS / CHANGE PROPOSALS

DR-NDRA-yy-nnn **_CP-NDRA-yy-nnn_**

Title:	Short, indicative textual name
Reference:	Number assigned by the OG Rapporteur
Originator reference:	Provided by the originator
Submission date:	
Submitting State/Organisation:	
Author:	
Contact Information:	e-mail, fax, telephone and postal address
Experts involved:	
Status:	Assigned by the OG Rapporteur
Priority:	Assigned by the OG Rapporteur
Document reference:	Affected section(s) of the EUR AMHS Documentation document
Description of defect:	Nature of the problem in detail Reason(s) for requesting changes
Assigned expert(s):	
Task history:	Working Papers and Information Papers Produced on the subject
Proposed solution:	Including amendments to the text, if feasible

DR/CP STATUS control sheet				
Event	**Date**	**Status**		**Remark**
DR or CP received submission date		Set to submitted		
discussion at OG/ …		Set to accepted	Set to rejected	
Date for development of proposals/ solutions				Responsible:
discussion at OG/ …		Set to resolved		
presentation to AST TF/ …		Set to adopted	Set to rejected	
Date for development of amendment to the EUR AMHS Documentation document				Responsible:
discussion at OG/		Set to approved		
presentation to AST TF/ …		Set to approved for application		
Additional DATES and comments				

- END of Attachment A -

A Appendix A: List of Abbreviations

AFTN	Aeronautical Fixed Telecommunication Network
AFSG	Aeronautical Fixed Service Group
AMHS	ATS Message Handling System
AST OG	Operations Group of AST TF
AST PG	Planning Group of AST TF
AST TF	AFS to SWIM Transition Task Force
CCC	Co-operating COM Centre
COM	Communication
CP	Change Proposal
DR	Defect Report
MTA	Message Transfer Agent
MTCU	Message Transfer And Control Unit (AFTN/AMHS Gateway)
MTS	Message Transfer System
NDR	Non-delivery Report
NDRA	NDR Handling Advice document
OG	Operations Group (see AST OG)
PG	Planning Group (see AST PG)

B Appendix B: List of NDR Reason Diagnostic and codes

B.1 Non-Delivery Reasons

Code	Decoded
0	transfer-failure
1	unable-to-transfer
2	conversion-not-performed
3	physical-rendition-not-performed
4	physical-delivery-not-performed
5	restricted-delivery
6	directory-operation-unsuccessful
7	deferred-delivery-not-performed
8	transfer-failure-for-security-reason
9 … 32767	-

Table 1: Non-Delivery Reasons

B.2 Non-Delivery Diagnostics

Code	Decoded
0	unrecognized-OR-name
1	ambiguous-OR-name
2	mts-congestion
3	loop-detected
4	recipient-unavailable
5	maximum-time-expired
6	encoded-information-types-unsupported
7	content-too-long
8	conversion-impractical
9	implicit-conversion-prohibited
10	implicit-conversion-not-subscribed
11	invalid-arguments
12	content-syntax-error
13	size-constraint-violation
14	protocol-violation
15	content-type-not-supported
16	too-many-recipients
17	no-bilateral-agreement
18	unsupported-critical-function

Code	**Decoded**
19	conversion-with-loss-prohibited
20	line-too-long
21	page-split
22	pictorial-symbol-loss
23	punctuation-symbol-loss
24	alphabetic-character-loss
25	multiple-information-loss
26	recipient-reassignment-prohibited
27	redirection-loop-detected
28	dl-expansion-prohibited
29	no-dl-submit-permission
30	dl-expansion-failure
31	physical-rendition-attributes-not-supported
32	undeliverable-mail-physical-delivery-address-incorrect
33	undeliverable-mail-physical-delivery-office-incorrect-or-invalid
34	undeliverable-mail-physical-delivery-address-incomplete
35	undeliverable-mail-recipient-unknown
36	undeliverable-mail-recipient-deceased
37	undeliverable-mail-organization-expired
38	undeliverable-mail-recipient-refused-to-accept
39	undeliverable-mail-recipient-did-not-claim
40	undeliverable-mail-recipient-changed-address-permanently
41	undeliverable-mail-recipient-changed-address-temporarily
42	undeliverable-mail-recipient-changed-temporary-address
43	undeliverable-mail-new-address-unknown
44	undeliverable-mail-recipient-did-not-want-forwarding
45	undeliverable-mail-originator-prohibited-forwarding
46	secure-messaging-error
47	unable-to-downgrade
48	unable-to-complete-transfer
49	transfer-attempts-limit-reached
50	incorrect-notification-type
51	dl-expansion-prohibited-by-security-policy
52	forbidden-alternate-recipient
53	security-policy-violation
54	security-services-refusal
55	unauthorised-dl-member
56	unauthorised-dl-name
57	unauthorised-originally-intended-recipient-name
58	unauthorised-originator-name

Code	**Decoded**
59	unauthorised-recipient-name
60	unreliable-system
61	authentication-failure-on-subject-message
62	decryption-failed
63	decryption-key-unobtainable
64	double-envelope-creation-failure
65	double-enveloping-message-restoring-failure
66	failure-of-proof-of-message
67	integrity-failure-on-subject-message
68	invalid-security-label
69	key-failure
70	mandatory-parameter-absence
71	operation-security-failure
72	repudiation-failure-of-message
73	security-context-failure
74	token-decryption-failed
75	token-error
76	unknown-security-label
77	unsupported-algorithm-identifier
78	unsupported-security-policy
79 … 32767	-

Table 2: Non-Delivery Diagnostics

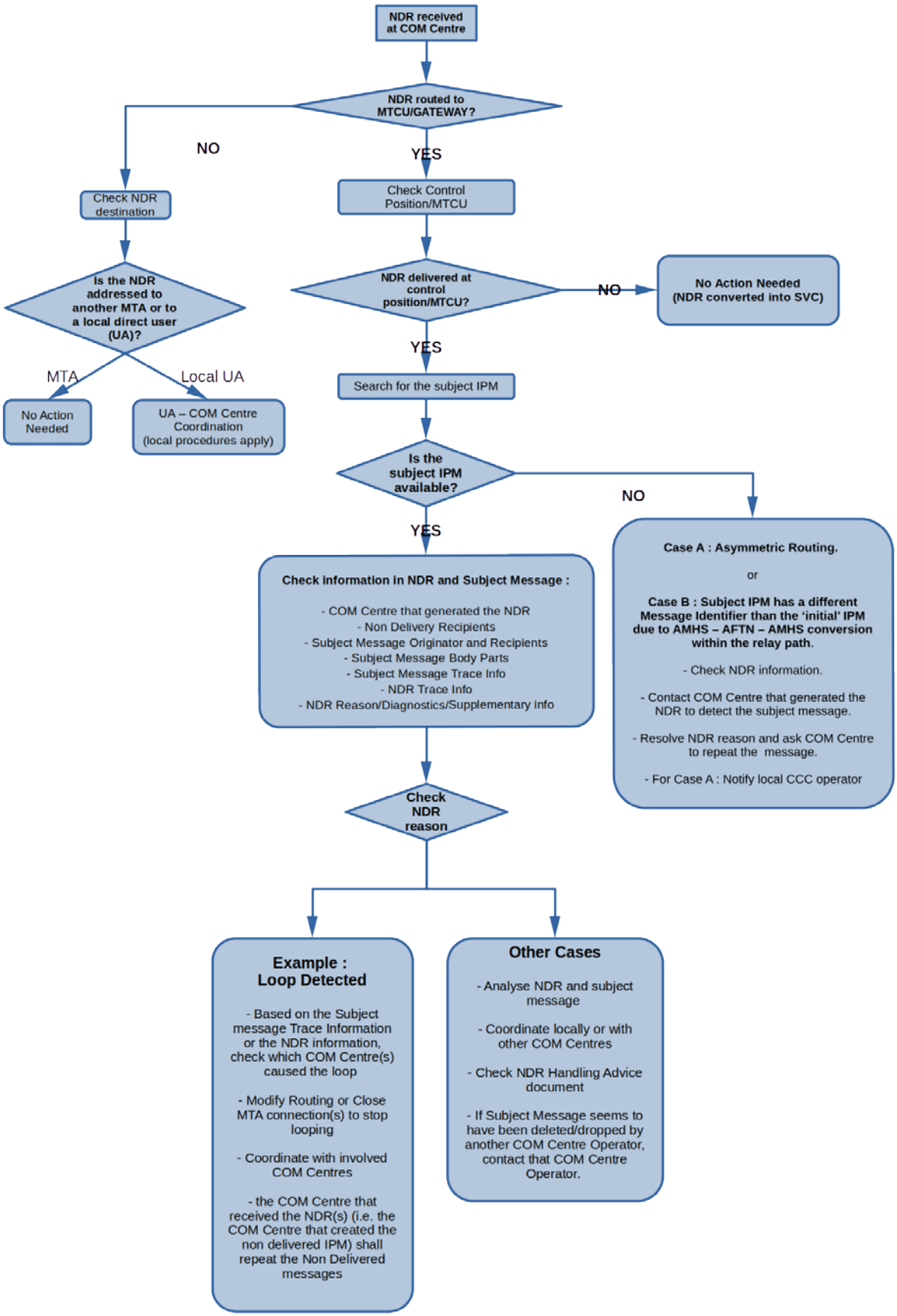
Note.- compare Module MTSAbstractService (X.411:06/1999)

C Appendix C: List of NDR scenarios

	scenario/situation	event/reason	action by the operator/user
1	A centre receives an NDR at its gateway for a message that passed through that gateway.	e.g. invalid message format	Check the original message and resubmit if no format errors are detected.
2	A centre receives an NDR at its gateway for a message that has not passed through that gateway.	caused by asymmetric routing	Report to CCC Operator, in order to resolve asymmetric routing by AMC.
3	A centre receives an NDR at its gateway for a message that has timeout in another gateway or MTA.	maximum-time-expired	No action
4	A Direct User receives an NDR for a message for which latest delivery time was set.	maximum-time-expired	No action – assuming that expiry of the 'latest-delivery' indicates the obsolescence of the subject message
5	A Direct User receives an NDR for a message for which latest delivery time was not set	maximum-time-expired	Resubmit the message if content still valid
6	A COM Centre receives an NDR at its gateway due to a message loop.	loop-detected	Stop AFTN messages going to the MTCU. Close MTA queues which are involved in the loop. Rectify the bogus routing in coordination with the involved COM Centres.
7	A direct user receives an NDR due to a message loop.	loop-detected	Call local COM Centre and report the NDR details. Resubmit the non-delivered messages only after confirmation of the COM Centre that the loop situation is resolved. Alternatively, the direct user could send a probe every 5 minutes to the affected recipient addresses.

8	A centre receives an NDR/SVC message that has been generated because of an unrecognisable address (addressee or originator.)	unrecognized-OR-name / May be generated due to incorrect configuration of the AMHS table inside or outside of the Region.	Check and if necessary correct the AMHS tables, inform the corresponding COM Centre Operator and CCC Operator.

D Appendix D.: NDR Handling Flow Diagram



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