

AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL

Working Group 3 (Applications and Upper Layers)

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Adding the METAR service to the CNS/ATM-1 FIS Application

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SUMMARY

Chapter 7 of the ICAO Manual of ATS Data Link Applications [1] describes the operational requirements related to the FIS(METAR) service identified by the ADS Panel.

This Working Paper comments the current description of the METAR service and identifies the areas where more detailed information are required to allow ATNP to start the upgrade of the FIS Application to support the METAR service.

The second part of the document evaluates the changes required to the FIS SARPs to support the METAR Service. It shows that the design of the FIS Application is such that only a change in the ASN.1 description is needed.

WG3 is invited to note these comments and to request ADSP to take them into account when producing the next version of the ADSP Manual.

Reference:

- [1] Draft ICAO Manual of ATS Data Link Applications – Version: Working Draft – 1 April 1998.

1. Introduction

The METAR data link service provides automation assistance in requesting and delivering reports of meteorological conditions at aerodromes world-wide. Chapter 7 of the ICAO Manual of ATS Data Link Applications describes the way the FIS(METAR) service is intended to be provided by data link to the operational users.

The FIS application developed by ICAO to provide in the first instance the ATIS service can be very easily upgraded to support the METAR service. Indeed, the METAR exchange is a variant of the FIS Demand Contract operating the same protocol but with other user data.

As for the other applications, the ADSP Manual will be used as the baseline document for the production by ATNP of SARPs for METAR. However, the current version of this document does not contain all the information needed to start the specification of the FIS(METAR) application.

Chapter 2 points out the sections of the ADSP Manual where more specifications are expected.

Chapter 3 identifies and evaluates the changes required in the current SARPs to introduce METAR as a FIS service.

2. Review of the METAR service Description

The current version of the METAR service description produced by the ADSP is appended to this document in Annex C. In line with the description of the other data link services, this description provides an overview of the expected operational benefits, the current operating method without data link, the operating method with data link and a description of the information exchanges. The METAR service is a variant of the FIS service described in section 3 of the ADSP Manual.

2.1 Deferring a Demand Contract

The description of the processing of a FIS Demand Contract in section 3.2.2 of the ADSP Manual describes how a FIS demand contract request can be deferred by the ground FIS system by sending a PROCESSING message before sending the FIS Report.

However, this FIS procedure is not described in the section related to the METAR service. Section 7.4.1 only allows the ground system to send back either a METAR Report Message or a SERVICE NOT AVAILABLE response. It is proposed that section 7.4.1 describes that the ground system can also send a PROCESSING message - using as example the ATIS service description in section 6.4.1.

If the previous comment is accepted, the PROCESSING message should appear explicitly in the figures of section 7.5 (Time Sequence Diagram) and in Table 7-1.

The ADSP must confirm that the FIS demand contract as defined for ATIS is fully applicable to METAR, except for the contents of the data.

2.2 Operating Method With Data Link

Section 7.4 describes the operational procedures for aircrew to request METAR and for ground systems to generate METAR reports.

As it is done in the section describing the ATIS service,

- it should be an explicit requirement in the ADSP Manual stating that METAR must support

the Demand mode only.

- It should be a statement requiring that content of voice and data link METAR should be identical.
- Section 7.4 and Figure 7-1 do not refer to the METAR Termination message, defined in Table 7-1. It is proposed that the message be removed from Table 7-1.

2.3 Definition of the Exchanged Information

Section 7.6 specifies the contents of the messages exchanged during a METAR dialogue:

- The contents of the METAR Report messages must be detailed. The relationships between fields must be explicitly described. For instance, an exhaustive list of METAR fields must be defined for each METAR report type. It is expected that the definitions of the MET fields in the ATIS are also applicable for METAR.
- Internationally agreed ranges and resolutions for each METAR parameter must be provided, as well as presence conditions. It is expected that the range and resolutions of the MET fields in the ATIS are also applicable for METAR.
- In the METAR Request, the meaning of the field "Message Type" must be clarified (SPECI, METAR, SIGMET,...).
- The use of the message "METAR Termination" defined in Table 7-1 is not described in the text. However, the definition of such a message is not required since the exchange is closed on reception of the METAR message.
- There is no METAR message data glossary. It should provide the containment rules of the different METAR fields.

2.4 Miscellaneous

The following questions need to be answered by ADSP.

- The FIS-cancel-contracts service as currently defined in the SARPs allows the FIS-air-user to cancel with a single service invocation all the contracts of a given type with a given FIS server. If METAR is added to the FIS application, the FIS-air-user will be allowed to cancel all METAR contracts in one shot. Is this requirement consistent with the operational procedure for METAR ?
- For ATIS, requirements were stated related to the presentation of the ATIS fields to the pilots. Are there similar requirements for METAR information ?

3. Required Modifications to Doc. 9705 to support METAR

The FIS Application has been designed to allow new FIS services to be added with a minimal impact on the current specification.

3.1 FIS Protocol Version Number

As the protocol needed to support the METAR exchanges is already supported by the FIS ASE, and because the FIS service negotiation is part of the FIS protocol, **there is no need to upgrade the protocol version number.**

The main change is the addition of METAR related fields in the current ASN.1 description. Thus, two ASN.1 descriptions could be implemented in airborne and ground FIS systems. The "old" ASN.1 description is the one specified in Doc. 9705 Edition 1. This description supports the ATIS service only. The "new" ASN.1 description is the "old" one, extended to support also the METAR data (see in Annex A the draft of the "new" ASN.1).

Protocol Version 1 compliant FIS systems can implement either of the 2 descriptions.

The extensibility feature of the ASN.1 specification and the FIS service negotiation feature proposed to the FIS-users by the current FIS protocol guarantee the interoperability between all these systems regardless the requested/provided FIS services (ATIS only, METAR only or both ATIS and METAR).

The interoperability is illustrated in Figure 1. This figure shows the 4 possible types of FIS systems:

- Systems A and 1 implement the "old" ASN.1 described in Doc. 9705 Edition 1, that is only ATIS is supported. They provide an ATIS interface to the pilot and the FIS Server.
- All other systems implement the "new" ASN.1, that is both ATIS and METAR are supported. Systems B and 2 support both services, Systems C and 3 support ATIS only and Systems D and 4 support METAR only.

Any aircraft system can inter-operate with any ground system, as follows:

- ATIS requests initiated by the aircraft (A-1, A-2, A-3, B-1, B-2, B-3, C-1, C-2, and C-3) correctly handled since the ATIS is implemented the same way in the "old" and "new" ASN.1".
- ATIS requests initiated by the aircraft to a ground system supporting only METAR (A-4, B-4, C-4). The FIS-demand-contract indication containing the ATIS Request is rejected by the FIS-ground-user with the reason "service not supported".
- METAR requests initiated by the aircraft to a ground system supporting METAR (D-2, B-2, D-4, B-4) are correctly handled.

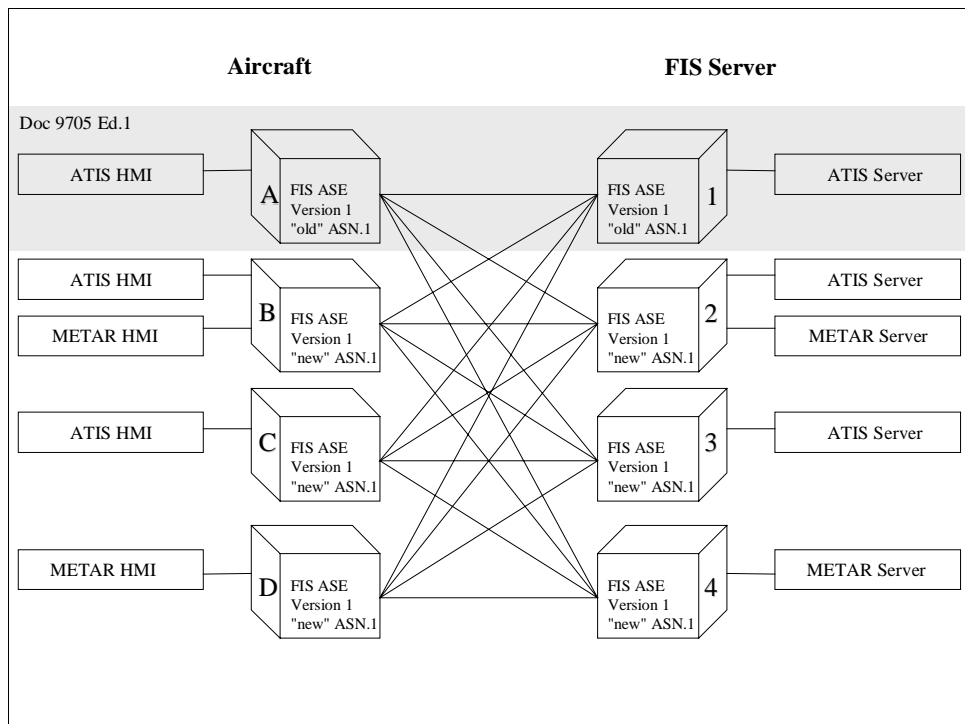


Figure 1: Interoperability between "Old" and "New" ASN.1

- METAR requests initiated by the aircraft to a ground system supporting only ATIS.
- D-1, B-1: the FIS-demand-contract indication containing a non-decoded data is rejected by the FIS-ground-user with the reason "service not supported".
 - D-3, B-3: the FIS-demand-contract indication containing the METAR Request is rejected by the FIS-ground-user with the reason "service not supported".

3.2 Impact on the FIS SARPs

The following table evaluates for each SARPs chapter the modifications required to add the METAR service.

SARPs Chapter	Impact	Required Changes
Chapter 2.4.1 INTRODUCTION	Minor	The description of the FIS Demand contract function must list the METAR related fields in the FIS-demand-contract and FIS-report messages
Chapter 2.4.2 GENERAL REQUIREMENT	None	
Chapter 2.4.3 THE ABSTRACT SERVICE	Minor	The FIS service primitives are not impacted by the introduction of the METAR service. The only change concerns the notes which specify that only ATIS information can be requested in a FIS Demand contract.
Chapter 2.4.4 FORMAL DEFINITIONS OF MESSAGES	Major	The part describing the FIS Data Unit is modified to allow METAR information to be requested in the FIS Request and to be returned in the FIS Report. The part describing the ATIS fields is not modified at all. A new part specifying the METAR fields is added. See Annex A.
Chapter 2.4.5 PROTOCOL DEFINITION	None	The same protocol is carried out by the FIS ASEs to provide users with the METAR service.
Chapter 2.4.6 COMMUNICATION REQUIREMENTS	None	ATIS and METAR require the same Quality of Service parameters (application message priority, residual error rate and routing class)
Chapter 2.4.7 FIS USER REQUIREMENTS	Minor	A new section "METAR Service Requirements" will be added to formalise the requirements stated in the ADSP Manual. For instance, the user shall be prohibited from invoking a FIS update contract for METAR.
Chapter 2.4.8 SUBSETTING RULES	Minor	The subsetting rules should allow airborne and ground version 1 compliant FIS systems to support either the ATIS service only, the METAR service only or both.

Since the FIS protocol will not be impacted by the introduction of the METAR service, the validation activities will be drastically reduced compared with what was done for the CNS/ATM-1 Package air-ground applications.

3.3 Impact on the ULCS SARPs

An AE-Qualifier value for the METAR application shall be defined in Table 4.3.2 of Doc. 9705

Edition 1 Sub-Volume 4. A Proposed Defect Report (PDR) has been issued for that purpose (see Annex B).

4. Conclusion

WG3 is invited to forward the material presented in this WP to ADSP. Some of the issues identified need to be addressed and documented before ATNP can start the specifications of the METAR service as part of the ATN Flight Information Services, in particular:

- The use of a PROCESSING message. ADSP shall indicate that the FIS Demand contract exchanges defined for ATIS are fully applicable also to METAR.
- The definition of the range and resolution of the fields present in the METAR Request message and the METAR Report message.

Once these information made available to ATNP, WG3/SG2 will be able to produce very quickly the specifications of the FIS(METAR) application fully compatible with the Package-1 FIS(ATIS) application.

ANNEX A: FIS ASN.1 changes to support METAR

FISMessageSetVersion2 DEFINITIONS ::=

BEGIN

```
EXPORT      Aerodrome,
            AltimeterSetting,
            ATISReport,
            Cloud,
            ContractNumber,
            ContractType,
            DateTimeGroup,
            FISCancelContracts,
            FISCancelContractsAccept,
            FISCancelUpdateAccept,
            FISCancelUpdateContract,
            FISProtocolErrorDiag,
            FISRejectReason,
            PresentWeather,
            Time
```

FROM FISMessageSetVersion1 ;

FISDownlinkAPDU ::= SEQUENCE

```
{
  time          DateTimeGroup,
  fisDownlinkAPDU DownlinkAPDU
}
```

FISUplinkAPDU ::= SEQUENCE

```
{
  time          DateTimeGroup,
  fisUplinkAPDU UplinkAPDU
}
```

DownlinkAPDU ::= CHOICE

```
{
  FISRequest          [0] FISRequest,
  FISCancelUpdateContract [1] FISCancelUpdateContract,
  FISCancelUpdateAccept [2] FISCancelUpdateAccept,
  FISCancelContracts [3] FISCancelContracts,
  FISAbort            [4] FISAbort,
  ...
}
```

UplinkAPDU ::= CHOICE

```
{
  FISAccept          [0] FISAccept,
  FISReject          [1] FISReject,
  FISReport          [2] FISReport,
  FISCancelUpdateContract [3] FISCancelUpdateContract,
  FISCancelUpdateAccept [4] FISCancelUpdateAccept,
  FISCancelContractsAccept [5] FISCancelContractsAccept,
  FISAbort            [4] FISAbort,
  ...
}
```

```

FISAbort ::= CHOICE
{
  -- Automatic Terminal Information Service (ATIS)
  -- (METAR)
  atisAndmetar          [0] FISProtocolErrorDiag,
  ...,
}

FISAccept ::= SEQUENCE
{
  contractNumber        ContractNumber,
  FISAcceptData         FISAcceptData
}

FISAcceptData ::= CHOICE
{
  accept                [0] FISReportData,
  positiveAcknowledgement [1] NULL
}

FISReject ::= SEQUENCE
{
  contractNumber        ContractNumber,
  FISRejectData         FISRejectData
}

FISRejectData ::= CHOICE
{
  updateFunctionNotSupported [0] NULL,
  updateFunctionNotSupportedWithReport [1] FISReportData,
  otherReasons               [2] FISRejectReason,
  ...
}

FISReport ::= SEQUENCE
{
  contractNumber        ContractNumber,
  FISReportData         FISReportData
}

FISReportData ::= CHOICE
{
  -- Automatic Terminal Information Service (ATIS)
  atis                  [0] ATISReport,
  ...,
  -- (METAR)
  metar                 [0] METARReport
}

FISRequest ::= SEQUENCE
{
  contractNumber        ContractNumber,
  contractType          ContractType DEFAULT demandContract,
  FISRequestData        FISRequestData
}

```



```
FISRequestData ::= CHOICE
{
  -- Automatic Terminal Information Service (ATIS)
  atis                [0] ATISRequest,
  ...,
  -- (METAR)
  metar                [0] METARRequest
}

METARReport ::= SEQUENCE (TBD based on ADSP input)
{
  aerodrome            Aerodrome,
  mETARTimeOfObservation Time,
  surfaceWind          SurfaceWind,
  visibility            Visibility,
  rvr                  RVR,
  presentWeather       PresentWeather,
  cloud                Cloud,
  airTemperature       Temperature,
  dewPointTemperature  Temperature,
  altimeterSetting     AltimeterSetting
  additionalMETARInfo  IA5String [??]
}

METARRequest ::= SEQUENCE (TBD based on ADSP input)
{
  messageType          ??
  aerodrome            Aerodrome
}
```

ANNEX B: ULCS PDR

Title: New AE-Qualifier for METAR

PDR Reference:
Originator Reference:
SARPs Document Reference: ULCS SARPs, Table 4.3-2
Status: SUBMITTED
PDR Revision Date:
PDR Submission Date: 24/09/98
Submitting State/Organization: STNA
Submitting Author Name: Picard, F
Submitting Author E-mail Address: PICARD_Frederic@stna.dgac.fr
Submitting Author Supplemental
Contact Information:
SARPs Date: ICAO 9705, 06/11/98
SARPs Language: English

Summary of Defect:

A new AE-qualifier value must be defined for identifying FIS Applications supporting the METAR service.

Assigned SME: Sub-Volume IV SME

Proposed SARPs amendment:

Add a new entry in Table 4.3.-2 as follows:

Aviation Routine Weather Report (METAR) MET(11)

SME Recommendation to CCB:

CCB Decision: