ATNP/WG3

WP/9-4a

05/03/97

ATSMHS SARPs Validation Report

Presented by Jean-Yves Piram (SG1 Chairman)

Prepared by Jean-Marc Vacher

Version 2.0a

Appendix G: ATSMHS SARPs Validation report

Appendix G: ATSMHS SARPs Validation report

Table of Contents

1. INTRODUCTION

1.1. Scope

Since the start of the development of the draft ATSMHS SARPs, there have been a number of validation exercises that have been performed, thanks to the efforts of a number of organisations and states. The purpose of this document is to report on the results of those exercises that have reported their ATSMHS-related results so far, and to draw conclusions on the level of validation of the draft ATSMHS SARPs which has been achieved.

Furthermore, the ATS Message Handling System specified in the draft ATSMHS SARPs makes use of standards which have been stable and mature for long, with numerous known independent industry implementations. Thus, benefit is fully taken from using ISO MHS standards and ISPs that are pre-validated, i.e. studied and approved by national standards bodies, implemented and for which interoperability has been demonstrated between independent implementations.

For this reason, a number of related initiatives concerning the use of MHS standards are reported in this document, giving their inherent credit to the ATSMHS SARPs validation.

Note.- The terms « base standard » and « base ISP » used hereafter in this document refer to the ISO/IEC MHS Standard or ISO/IEC MHS ISP which are relevant in the context in which they are employed.

1.2. Background

The ATSMHS SARPs were placed under configuration control at the 6th meeting of WG3 (Brussels, April 1996), and since that time a detailed change record has been included in the configuration sheet which is part of the SARPs document. A table of all comments and defect reports received from a number of parties has been established and maintained as a separate Working Paper, including cross-reference to each comment and position adopted with respect to the comment.

The document change history since the baseline version is as follows:

Date	Version	Comments
04/02/96	proposed 1.0	input to Brisbane WG3 meeting
25/03/96	1.0a (1st amended proposal)	incorporation of the Brisbane WG3 meeting conclusions: important editorial changes, limited technical changes
15/04/96	1.0b (2nd amended proposal)	output of SG1 Brussels Meeting, input to the sixth WG3 meeting (Brussels)
23/04/96	1.0z (WG3 baseline version)	start of configuration control, output of the sixth WG3 meeting (Brussels)
21/06/96	1.1 (proposed 2.0)	some changes for overall editorial SARPs consistency, refinement of AMHS logging provisions, upgrade of Chapter 3.1.3 (ATN Pass-Through Service), input to the seventh WG3 meeting (Munich)
27/06/96	1.2 (proposed 2.0)	Munich WG3 meeting interim version
04/07/96	1.3 (approved 2.0 with change-bars)	output of the seventh WG3 meeting (Munich), approved for distribution as version 2.0 after adoption changes
04/07/96	2.0a	output of the seventh WG3 meeting (Munich), with adoption of all revisions Baseline version submitted to ICAO
15/10/96	amendment proposal to ATNP/2	output of ATNP/WG3 Alexandria meeting (Version 2.0a plus defects up to 1st October 1996)
12/11/96	ICAO Version 1.0	Output of ATNP/2, with adoption of all amendments proposed to the meeting
20/02/97	proposed ICAO Version 1.1	input to ATNP WGOW/1 Thailand meeting (ICAO version 1.0 plus defects up to 13th January 1997)

2. HIGH LEVEL VALIDATION OBJECTIVES

The following are the high level validation objectives for the ATSMHS applications, based upon the WG3 common list of VOs for ATN applications.

VO	Description
SVO1	To determine which System Level Requirements are satisfied by the functional descriptions in combination with the user requirements and recommended practices of the SARPs.
SVO2	To determine if the CNS/ATM-1 Package applications specifications are mutually consistent.
FVO1	To determine if the functional descriptions in the SARPs are compatible with the technical requirements.
FVO2	To determine if the user requirements and recommended practices are compatible with the technical requirements.
FVO3	To determine if the SARPs are complete.
FVO4	To determine if the SARPs are unambiguous.
FVO5	To determine if the SARPs are consistent.
FVO6	To determine if there are requirements in the SARPs which would have no effect if removed.
FVO7	To determine if provision has been made to ensure that the SARPs are implementation independent.
TVO1	To determine if the protocol description supports the end-to-end services.
TVO2	To determine if the protocol description has any unacceptable behaviour.
TVO3	To determine if the abstract service interface parameters are mapped appropriately to PDU fields and/or communication service interface parameters, and vice versa.
TVO4	To determine if protocol errors in the peer application entity are correctly handled.
TVO5	To determine if the SARPs are consistent with the upper layer architecture to the extent that this is a requirement, e.g. use of the Dialogue Service, application of the control function.
TVO6	To determine if the APDUs are correctly specified.
TVO7	To determine if provision for QoS management has been addressed.
TVO8	To determine if provision for future migration has been addressed.
TVO9	To determine if efficiency requirements have been addressed, e.g. minimising size of data transfer, appropriate

	maintenance of dialogue.
TVO10	To determine that the functionality described in the SARPs is implementable.
TVO11	To determine that independent implementations built in accordance with the SARPs will be able to interoperate.

3. VALIDATION MEANS

The following generic means of validation have been identified for all ATN applications:

a) Two or more independently developed interoperating implementations, validated by two or more States/ Organisations.

b) Two or more independently developed interoperating implementations, validated by one State/ Organisation.

c) One implementation, validated by more than one State/ Organisation.

d) One implementation, validated by one State/ Organisation.

e) Partial implementation, validated by one or more State/ Organisation.

f) Simulation, analysis using tools e.g. ASN.1 compiler, modelling tools.

g) Analysis and inspection.

For the sake of the ATSMHS validation, an additional validation means has been defined as follows, based on the definition of means "a":

a-) Two or more independently developed interoperating partial implementations, validated by two or more States/ Organisations.

4. APPLICATION FUNCTIONALITY VALIDATION ACHIEVED BY STATES / ORGANISATIONS

The following table summarises the validation activities that have been completed to date or are expected to be completed shortly. The letters in the table correspond to the validation means given in section 3. The ATS Message Service (AMHS) and ATN Pass-Through Service form two distinct parts of the SARPs, which together build the whole ATSMHS SARPs.

Application Functionality (group of « shalls » or part of the SARPs)	Participating States / Organisations								
	ATNP/ WG3/ SG1	Aena (Spain)	European region	FAA	Nortel Dasa	Sita	various industry suppliers	U.S. DoD / NATO (MMHS)	Summary
ATS Message Service (AMHS)	g	e (a: expected 3Q97)	g (a: expected 1Q98)				g		a- (see 5.9) e, g, (a: expected 3Q97)
ATS Message Server	g	e (d: expected 1Q97, a: expected 3Q97)	g(a: expected 1Q98)		(d: expected 1Q97, a: expected 3Q97)	e	a-,e,g	e	a- (see 5.9) e, g, (d: expected 1Q97, a: expected 3Q97)
ATS Message User Agent	g	e (d: expected 1Q97, a: expected 3Q97)	g (a: expected 1Q98)		(d: expected 1Q97, a: expected 3Q97)	e	a-,e,g		a- (see 5.9) e, g, (a: expected 3Q97)
AFTN/AMHS Gateway	g	e (d: expected 1Q97, a: expected 3Q97)	g (a: expected 1Q98)		e (d: expected 1Q97, a: expected 3Q97)		g		a- (see 5.9) e, g, (d: expected 1Q97, a: expected 3Q97)
ATN Pass-Through Service	g			d					d, g

AFTN/ATN Type A Gateway	g			d					d, g

5. SUMMARY OF ACTIVITIES SUPPORTING VALIDATION

The objective of this section is to briefly describe the activities undertaken by States / Organisations which have contributed to the ATSMHS SARPs validation.

5.1. ATNP/WG3/SG1

Inspection and analysis of the ATSMHS Draft SARPs has been performed by ATNP/WG3/SG1. This has involved close reading of the text with the specific aim of checking to make certain that there are no defects in the SARPs. Once the validation objectives listed in Section 2 were created, inspection has used these objectives as a measure of the validity of the Draft SARPs.

Requirements (« shall » statements) have been extracted and placed into a database, using automated word processing procedures. This has allowed to check the compliance with SARPs editorial rules, and the non-duplication of requirements.

This validation activity has generated a certain number of defect reports, among which those reported against the ICAO baseline version are listed in section 6.

5.2. Aena

For the improvement of its AFTN messaging system, and with a goal of future integration in its new communication centre, Aena (public entity of Spanish Airports and Air Navigation) started to develop an AFTN/ATN Type B Gateway, as specified in the Manual for ATS Message Handling endorsed by ATNP/1.

The development is being upgraded to implement an AFTN/AMHS Gateway compliant with the ATN SARPs. This is being done in two phases, Phase 1 which is aligned on Version 1.0z of the SARPs and Phase 2 which will be aligned on the ICAO Version. Phase 1 has been completed in January and Phase 2 will be completed by June. An ATS Message Server and ATS Message User Agents have also been implemented as part of the Aena AMHS implementation.

These developments have been validated by Aena in January and February 1997. Almost 90% of the “shall” statements in the AMHS have been implemented in Phase 1. These have been fully validated by means of 108 tests performed by Aena.

The same developments have also been used for interoperability trials with another independent AMHS implementation by SITA (see 5.9).

The implemented systems include the capability to operate over both the ATN Internet Communication Services and over non-ATN compliant lower layer protocol architectures. Due to time constraints, validation trials have been performed using the latter architecture.

The traditional AFTN is expected to be substituted by ATSMHS messaging in accordance with ATNP/2 during 1997 and 1998. It will use the private X.25 PDN (called REDAN) implemented since 1994 by Aena in order to evolve to ATN. This network will be fully in operation (national coverage) by the middle of 1997.

5.3. European region

In the course of the 8th WG3 meeting, Eurocontrol, France and Germany informed the meeting of their intention to launch very shortly a call for tender aiming at the development of an AFTN/AMHS Gateway, for the purpose of developing gateway software, prototype and operational implementations, and with the possibility of allowing interoperability testing between independent implementations.

In the course of the 10th SG1 meeting, it was indicated that the projects called ANDRA and ARMOR, for Germany and France respectively, have now been launched and are in the tender process.

5.4. FAA

The FAA has contracted with Open Network Solutions, Inc. to implement and validate the ATN Pass Through Service SARPs. The implementation is complete and ready for interoperability testing at this time. However it has not been possible to fully test it against another independent implementation due to the lack of a second complete system.

The ATN Pass Through Service implementation consists of:

- Message Transfer and Control Unit (MTCU),
- ATN Component, and
- AFTN Component.

The MTCU fully implements the requirements as specified in the SARPs, including address stripping and logging. The MTCU interfaces with the AFTN and ATN components.

The ATN Component is a complete implementation of the Upper Layer SARPs and has been used for interoperability testing for validation of those SARPs.

The AFTN Component is a subset of traditional AFTN services and has been tested against operational AFTN equipment.

5.5. Nortel Dasa

The company Nortel Dasa (Germany) developed an ATS information/communication system (named FSInfoSysBw) for operation by the German Air Forces. The system´s internal communication between the switching centre and user´s workstations is based on the ATS message protocol (stack B) which was approved by the ATNP/1 in 1994. For interworking with neighboured systems AFTN and CIDIN communication are supported.

The mutual internetworking between the AFTN, CIDIN and the stack B complies with the gateway facilities defined by the ICAO, i.e.: AFTN/ATN gateway Type B (ATNP/1) and the CIDIN application entity AFTN for conveyance of AFTN formatted messages across the CIDIN. The internetworking between the CIDIN and the stack B is achieved by a link between the AFTN/ATN gateway Type B, and the CIDIN application entity AFTN. (The same principle may be applied to the design of a CIDIN/AMHS gateway for AFTN-formatted messages.)

In the summer of 1996 the project has passed a rigorous factory acceptance test. After a site acceptance test (autumn 1996) the system is ready for operation at the beginning of 1997. Ongoing upgrades of the software product underlying to the FSInfoSysBw addresses two subjects: ATN internet communication service and Basic ATS Message Service as proposed for ATNP/2**.** Both upgrades will be performed by the first quarter of 1997 and permit participation in interoperability tests in spring 1997.

5.6. Sita

SITA has partial implementations (e) of the following AMHS systems which may currently operate over an OSI Transport Service:

1. ATS Message Server (in two configurations comprising a Message Transfer Agent only, and comprising an Message Transfer Agent and a Message Store, respectively). These systems provide a fully operational CCITT-1988 compliant MHS Message Transfer and Message Store service respectively.

2. ATS Message Server (comprising a Message Transfer Agent only). This system, upon which development is due to be completed in early 1997, is intended to provide an enhanced ISP-conformant 1992 MHS Message Transfer Service including full support for the "AMHS Traffic Logging upon origination" requirement.

3. ATS Message User Agent (which supports the MHS CCITT-1988 Message Store Access protocol). This system provides fully operational access to any 1988 or later MHS Message Store service. It allows users to manually enter the "ATS-Message-Header".

In the context of the ATSMHS SARPs validation, implementations 1 and 3 above have been used by SITA to perform interoperability trials with Aena as described in section 5.9.

5.7. Industry suppliers

Since they were approved as a baseline version by WG3 (i.e. post Brussels WG3 meeting, April 1996), the ATSMHS Draft SARPs (versions 1.0z and 2.0a) have been distributed to a number of industry suppliers involved in the development and marketing of AFTN and of MHS Systems. Questions and defect reports have been received from some of these suppliers, demonstrating the inspection of the SARPs performed by these organisations.

Furthermore, numerous products are available which have independently implemented the MHS base standards and profiles. Such products may be used as a basis for both the ATS Message Server (MTA products) and the ATS Message User Agent (UA products).

The differences between these products and the systems specified in the SARPs reside mostly in the few following points:

- logging requirements which are specific to the AMHS,

- ATS-Message-Header to be constructed at an ATS Message User Agent, which is specific to the AMHS,

- use of the ATN Internet Communications Services. However, implementations of MHS over TP4/CLNP lower layers are available as COTS products.

Commercial services based on the MHS standards are also operated by a number of telecommunication service providers.

Registers of products conformant with the MHS base standards are maintained by conformance testing laboratories and certification bodies such as AFNOR, NCC, NIST.

Interoperability trials have been performed in Europe and reported in the framework of the EuroSInet interoperability workshops. These workshops have demonstrated a high level of interoperability between such products independently developed by 5 to 10 suppliers (depending on product type).

5.8. U.S. DoD / NATO

The U.S. Department of Defense in conjunction with NATO has developed a messaging system called MMHS which is based on X.400. This messaging system will be used to replace the AUTODIN system, which is very similar to AFTN. As a part of this messaging system, DoD has developed a gateway to translate between AUTODIN to/from MMHS.

This system has undergone extensive validation and working systems are now available.

Further work is underway to compare this gateway with the AFTN/AMHS Gateway to show what elements are common and therefore already validated.

5.9. AMHS Interoperability Trials

Under the aegis of ATNP/WG3/SG1, interoperability trials have been performed between two independent AMHS implementations by Aena and SITA, and with the co-ordination ensured by STNA, for the sake of the AMHS SARPs validation.

The trials were performed between :

- an ATS Message Server (MTA) and ATS Message User Agents operated by SITA, and
- an ATS Message Server , an AFTN/AMHS Gateway and ATS Message User Agents developed and operated by Aena (Spain).

The configuration has allowed to partially test the Gateway to Gateway communication, by means of redirection providing a gateway-to-gateway configuration, with the same gateway being used twice in the end-to-end communication.

The tests have allowed to validate a high proportion of the SARPs requirements for section 3.1.2 of the SARPs (ATS Message Service provided by the AMHS). Despite severe time constraints and some limitations in the compliance with the SARPs, it has been possible to completely or partly check more than 75% of the shall statements in this section of the SARPs (60% of the "shalls" were entirely tested and more than 15% partly).

The tested implementations were practically compliant with the SARPs as far as upper layers and MHS layers were concerned. With respect to lower layers, although both implementations have the theoretical capability to operate over TP4/CLNP, it has been decided, due to the aforementioned time constraints and to the available functionalities in

presence, to perform the trials upon an architecture based on a lower layer protocol architecture not complying with the ATN SARPs.

The results of the performed trials have allowed to gain a very high level of confidence in the validity of the ATSMHS SARPs (AMHS Section).

6. DEFECT REPORT SUMMARY

The following Table is a summary of defect reports raised during the validation programme against the ICAO baseline version 1.0.

Note.- Change proposals are made against closed defect reports and presented to ATNP WGOW/1 in the Proposed Amendments to the Draft SARPs.

DR ref.	Status	Version	Section	Summary
ATSMHS-027	CLOSED	v2.1inf 15/10/96	3.1.2.3.5.4.1.1-3	The proposed solution (generation of a repeat AFTN Service Message) will generally result in a never ending AFTN->AMHS loop.
ATSMHS-029	CLOSED	v2.1inf 15/10/96	3.1.2.3.5.4.4	This should be deleted because it would result in an endless AFTN -> AMHS loop.
ATSMHS-030	CLOSED	v2.1inf 15/10/96	3.1.3.3.2.4.21	A Note should be added with the same wording as the Note under 3.1.3.3.2.4.20.
ATSMHS-031	CLOSED	v2.1inf 15/10/96	Table 3.1.2-6 (Part 2/4.4)	The content-return-request EoS is one of the PerMessageIndicators and cannot thus be excluded (X) by the AFTN/AMHS Gateway.
ATSMHS-044	CLOSED	ICAO version1.0	3.1.1 Note 2	typo "internationl"
ATSMHS-045	CLOSED	ICAO version1.0	3.1.2.2.3.2	typo "IA5"
ATSMHS-046	CLOSED	ICAO version1.0	3.1.2.3.3.2.1.1	typo "maintained by in"
ATSMHS-047	CLOSED	ICAO version1.0	Table 3.1.2-5	missing line/element 1
ATSMHS-048	CLOSED	ICAO version1.0	3.1.2.3.4.2.3.17	wrong reference to "CCITT"
ATSMHS-049	CLOSED	ICAO version1.0	3.1.2.3.4.3.1.5	typo "take" instead of "takes"
ATSMHS-050	CLOSED	ICAO version1.0	3.1.2.3.5.2.4.5Note	text not italicised in a Note
ATSMHS-051	CLOSED	ICAO version1.0	3.1.2.3.5.4.1.3	ambiguous "has any other abstract-value"
ATSMHS-052	CLOSED	ICAO version1.0	Table 3.1.2-6 (Part 1/1.1.11.1 and 1.1.11.2), 3.1.2.3.4.2.3.8 to 3.1.2.3.4.2.3.11	useless specification of extension message transfer envelope parameters (see full text in WG3 WP/9-59)

DR ref.	Status	Version	Section	Summary
ATSMHS-054	CLOSED	ICAO version1.0	3.1.2.3.2.1.4, 3.1.2.3.2.1.5, 3.1.2.3.2.1.7, 3.1.2.3.2.1.12, 3.1.2.3.2.5.2, 3.1.2.3.4.1.1, Table 3.1.2-10, 3.1.2.3.5.2.2.6.2, 3.1.2.3.5.3.2.5, 3.1.2.3.5.3.2.6, Table 3.1.2-16, 3.1.3.1.8.1	erroneous cross-references to Annex 10, Volume II due to change in section numbers caused by Amendment 71 to Annex, Volume II

7. ANALYSIS AND CONCLUSIONS

7.1. SVO1

VO Description: To determine which System Level Requirements are satisfied by the functional descriptions in combination with the user requirements and recommended practices of the SARPs.

The following System Level Requirements are fulfilled by the Draft SARPs for ATS Message Handling Services:

OSI Standards

The ATS Message Service is based on ISO OSI Standards for Message Handling Services (ISO/IEC 10021) and on the associated International Standardized Profiles (ISO/IEC ISP 10611 and 12062). The ATN Pass-Through Service is based on ISO OSI Standards, using the ATN Upper Layer Architecture which itself meets this requirement.

AFTN Transition to ATN

The ATS Message Service is an essential piece in the AFTN to ATN transition strategy. It offers a level of service and functionality which is at least equivalent to that of the AFTN, and includes transparent conversion mechanisms at AFTN/AMHS Gateways to make interworking possible between AMHS users and AFTN users (and vice-versa), as well as to allow the transparent conveyance of AFTN messages from an AFTN station to another through the ATN. The ATN Pass-Through Service contributes to the AFTN to ATN transition by the transparent encapsulation of AFTN messages at AFTN/ATN Type A Gateways. Therefore it may allow isolated AFTN islands to communicate over the ATN Internet with other AFTN users.

Policy Based Routing	The AMHS being a store-and-forward messaging service, routing is also performed at the application level. AMHS Routing is policy based between AMHS Management Domains.
Authorized Paths	No preference is expressed in terms of ATS traffic types for the ATSC communications in the ATS Message Service and the ATN Pass-Through Service, as allowed by the ATN, since these applications employ only ground subnetworks and are therefore not subject to major bandwidth restrictions.
Priorities	The ATS Message Service includes a priority mechanism at the application level allowing to prioritize message transmission based on the category of communications to which the message pertains. The AFTN/ATN Type A Gateway maps the priority indicator of the AFTN message onto the QoS (Priority) parameter of the Dialogue Service, to select an appropriate transport priority.
Peer Information Exchange	The ATN Pass-Through Service enables the peer-to-peer exchange of AFTN messages over the ATN Internet, when an authorized path exists between two AFTN/ATN Type A Gateways.
Store-and-forward Information Exchange	The ATS Message Service enables the store-and-forward exchange of information when authorized paths exist between the ATS Message Servers and, if required, the AFTN/AMHS Gateways forming the AMHS.
Lack of Path Notification	In the ATS Message Service, the service user, either a human at a user interface or an Application Process at an API is informed of a message non-delivery by means of a non-delivery report. Positive acknowledgements are also transferred for messages with the highest priority.
Unambiguous Addressing	In the ATS Message Service, all involved systems, either ATS Message User Agents, ATS Message Servers or AFTN/AMHS Gateways, are ATN End Systems addressed as such by means of NSAPs and transport, session and presentation selectors. Furthermore every user of the ATS Message Service is individually identified at the application level by means of an O/R name. AFTN/ATN Type A Gateways are also part of the ATN Addressing scheme.
Originator Identification	In the ATS Message Service, the originator identification accompanies the ATS message and it is given to the message recipient by means of the originator O/R name indication. In the ATN Pass-Through Service, the encapsulated AFTN message includes the originator indicator.
Addressing and Name Assignments	At the application level, the AMHS is organized in Management Domains of two categories respectively named Administrative Management Domains (ADMD) and Private Management Domains (PRMD) within which the aforementioned O/R names are assigned.

ATSMHS Associations	The applications defined in these SARPs are the actual CNS/ATM-1 applications for ATS Message Handling Services.
UTC Reference	All dates and times referenced in the ATS Message Service are expressed as UTC.

7.2. SVO2

VO Description: To determine if the CNS/ATM-1 Package applications specifications are mutually consistent.

This validation objective may be considered as being achieved, with the conclusion that the applications specifications in the SARPs are consistent with other applications, since there is no direct relationship with other CNS/ATM-1 Package applications, and thus no risk of inconsistency (g).

7.3. FVO1

VO Description: To determine if the functional descriptions in the SARPs are compatible with the technical requirements.

This validation objective may be considered as being achieved, with the conclusion that the functional descriptions in the SARPs are compatible with the technical requirements. Upon completion of the SARPs inspection and analysis process by several parties, no incompatibility has been reported, nor has any defect report been generated in this area (g).

7.4. FVO2

VO Description: To determine if the user requirements and recommended practices are compatible with the technical requirements.

This validation objective may be considered as being achieved, with the conclusion that the user requirements and recommended practices are compatible with the technical requirements. Upon completion of the SARPs inspection and analysis process by several parties, no incompatibility has been reported, nor has any defect report been generated in this area (g).

For the AFTN/AMHS Gateway, the use of the ISPICS Proforma included in the base ISPs has allowed an easy verification of the compatibility between the gateway specification and the technical requirements related to the use of the base standards (g).

Note.- There is no formal description of user requirements in the ATSMHS SARPs. However, the AFTN/AMHS Gateway specification and the AFTN/ATN Type A specification include a description of the gateway dynamic behaviour which is similar, from a communication standard perspective, to a set of user requirements as expressed e.g. in ATN Air-Ground Application SARPs.

7.5. FVO3

VO Description: To determine if the SARPs are complete.

This validation objective may be considered as being achieved. Upon completion of the SARPs inspection and analysis process by several parties, the comments/defect reports expressed in relation with this VO, have been duly analysed and taken into account where appropriate (a-, g).

For the ATS Message Server and the ATS Message User Agent, the use of the basic requirements of the ISPs complemented by the necessary parameter specification and Optional Functional Group specification has allowed to concentrate the verification on the support of the elements necessary for AFTN interworking (g).

For the AFTN/AMHS Gateway, the use of the ISPICS Proforma included in the base ISPs has allowed an easy verification that all applicable ISPICS have been properly taken into account (g).

7.6. FVO4

VO Description: To determine if the SARPs are unambiguous.

This validation objective may be considered as being achieved, with the conclusion that the SARPs are unambiguous. Upon completion of the SARPs inspection and analysis process by several parties, the comments/defect reports expressed in relation with this VO have been duly analysed and taken into account where appropriate (a-, g).

7.7. FVO5

VO Description: To determine if the SARPs are consistent.

This validation objective may be considered as being achieved, with the conclusion that the SARPs are consistent. Upon completion of the SARPs inspection and analysis process by several parties, the comments/defect reports expressed in relation with this VO have been duly analysed and taken into account where appropriate (a-, g).

7.8. FVO6

VO Description: To determine if there are requirements in the SARPs which would have no effect if removed.

This validation objective may be considered as being achieved, with the conclusion that there are no requirements in the SARPs which would have no effect if removed. Upon completion of the SARPs inspection and analysis process by several parties, no defect has been reported in this area (g).

7.9. FVO7

VO Description: To determine if provision has been made to ensure that the SARPs are implementation independent.

This validation objective may be considered as being achieved for the ATS Message Service, with the conclusion that the SARPs are implementation independent (a-, e, g).

The existence of off-the-shelf MHS products already provides a high level of independence. Certification bodies exist in several countries, and some of these products are partly certified as conformant to the base standards (i.e. conformant to the initial version of the base standards known as X.400-84). The certification of certain implementations against the whole base standards is known as being underway, under the aegis of the aforementioned certification bodies. Thus, the

potential dependencies are restricted only to the few additional requirements expressed in the SARPs, with a limited risk of dependence (e).

Upon completion of the SARPs inspection and analysis process by several parties, no defect has been reported in this area (g).

The implementation and validation of an AFTN/AMHS Gateway by Aena has demonstrated that there are no implementation-related constraints in the SARPs (e).

7.10. TVO1

VO Description: To determine if the protocol description supports the end-to-end services.

This validation objective may be considered as being achieved for the ATS Message Service, with the conclusion that the protocol description supports the end-to-end services. This is an intrinsic feature of the base standards (e, g).

The same validation objective may be considered as being achieved for the ATN Pass-Through Service, with the conclusion that the protocol description supports the end-to-end services, as demonstrated by the FAA prototype implementation. Upon completion of the SARPs inspection and analysis process by several parties, no defect has been reported in this area (d, g).

7.11. TVO2

VO Description: To determine if the protocol description has any unacceptable behaviour.

This validation objective may be considered as being achieved for the ATS Message Service, with the conclusion that the protocol description has no unacceptable behaviour. This is an intrinsic feature of the base standards, which furthermore has been demonstrated by interoperability testing (a-, e, g).

This validation objective may be considered as being achieved for the ATN Pass-Through Service, with the conclusion that the protocol specification has no unacceptable behaviour, as demonstrated by the FAA prototype implementation. Upon completion of the SARPs inspection and analysis process by several parties, the comments/defect reports expressed in relation with this VO have been duly analysed and taken into account where appropriate (d, g).

7.12. TVO3

VO Description: To determine if the abstract service interface parameters are mapped appropriately to PDU fields and/or communication service interface parameters, and vice versa.

This validation objective may be considered as being achieved for the ATS Message Service, with the conclusion that the abstract service interface parameters are mapped appropriately to PDU fields and/or communication service interface parameters, and vice-versa. This is an intrinsic feature of the base standards, which furthermore has been demonstrated by interoperability testing (a-, e, g).

The same validation objective may be considered as being achieved for the ATN Pass-Through Service, with the conclusion that the mapping is appropriately performed. Upon completion of the SARPs inspection and analysis process by several parties, the comments/defect reports expressed in relation with this VO have been duly analysed and taken

into account where appropriate. The development and test of the FAA prototype implementation has confirmed this analysis (d, g).

7.13. TVO4

VO Description: To determine if protocol errors in the peer application entity are correctly handled.

This validation objective may be considered as being achieved for the ATS Message Service, with the conclusion that protocol errors in the peer application entity are correctly handled. This is an intrinsic feature of the base standards, which furthermore has been demonstrated by interoperability testing (a-, e, g).

The same validation objective may be considered as being achieved for the ATN Pass-Through Service, with the conclusion that protocol errors in the peer application entity are correctly handled. Upon completion of the SARPs inspection and analysis process by several parties, the comments/defect reports expressed in relation with this VO have been duly analysed and taken into account where appropriate. The development and test of the FAA prototype implementation has confirmed this analysis (d, g).

7.14. TVO5

VO Description: To determine if the SARPs are consistent with the upper layer architecture to the extent that this is a requirement, e.g. use of the Dialogue Service, application of the control function.

This validation objective may be considered as being achieved for the ATS Message Service, with the conclusion that there is no possible inconsistency since it is not a requirement for the ATS Message Service to use the ATN Upper Layer Communications Service. The ATS Message Service uses a full functionality OSI Upper Layer Architecture, in compliance with the MHS base standards (g).

The same validation objective may be considered as being achieved for the ATN Pass-Through Service, with the conclusion that the SARPs are consistent with the upper layer architecture. Upon completion of the SARPs inspection and analysis process by several parties, the comments/defect reports expressed in relation with this VO have been duly analysed and taken into account where appropriate. The development and test of the FAA prototype implementation has confirmed this analysis (d, g).

7.15. TVO6

VO Description: To determine if the APDUs are correctly specified.

This validation objective may be considered as being achieved for both the ATS Message Service and the ATN Pass-Through Service (a-, e, g).

For the ATS Message Service, this is an intrinsic feature of the base standards, which furthermore has been demonstrated by interoperability testing (a-, e, g).

For the ATN Pass-Through Service, user data is not encoded into specific APDUs but is passed directly to the Presentation Layer without additional protocol control information (g).

7.16. TVO7

VO Description: To determine if provision for QoS management has been addressed.

This validation objective may be considered as being achieved, with the conclusion that the QoS management has been addressed. Upon completion of the SARPs inspection and analysis process by several parties, no defect report has been generated in this area (g).

QOS management is not a function of the ATSMHS SARPs. The specifications in the SARPs have been inspected with the specific aim of checking that the QoS parameters to be passed to the ATN Transport Service are properly specified (g).

7.17. TVO8

VO Description: To determine if provision for future migration has been addressed.

This validation objective may be considered as being achieved, with the conclusion that provision for future migration has been addressed. Upon completion of the SARPs inspection and analysis process by several parties, no defect report has been generated in this area (g).

For the ATS Message Service, this is an intrinsic feature of the base standards, which have already been to subject to extensions from their initial version to the current version. Extension mechanisms are in place to allow for additional components to be integrated in the protocol elements or message body parts. Furthermore, interoperability has been demonstrated between two independent implementations among which each may include additional optional features (a-, e, g).

For the ATN Pass-Through Service, this is an inherent result of the use of the ATN Upper Layer Communication Services (g).

7.18. TVO9

VO Description: To determine if efficiency requirements have been addressed, e.g. minimising size of data transfer, appropriate maintenance of dialogue.

This validation objective may be considered as being achieved for the ATS Message Service, since the AMHS efficiency is pre-determined by the efficiency of the base MHS standards, and the requirements used have been limited to the ISP basic requirements (except when absolutely necessary) thus minimizing the exchange of information (e, g).

This validation objective may be considered as being achieved for the ATN Pass-Through Service, with the conclusion that efficiency requirements have been addressed. Upon completion of the SARPs inspection and analysis process by several parties, no defect report has been generated in this area (g).

7.19. TVO10

VO Description: To determine that the functionality described in the SARPs is implementable.

This validation objective may be considered as being achieved for the ATS Message Service, with the conclusion that the functionality described in the SARPs is implementable.

Implementations which cover at least 90% of the functions of the ATS Message Server and ATS Message User Agent, as specified in the SARPs, have been developed as indicated in section 4. The existence of off-the-shelf MHS products also provides a high level of assurance that these AMHS components may be implemented. Certification bodies exist in several countries, and some of these products are partly certified as conformant to the base standards (i.e. conformant to the initial version of the base standards known as X.400-84). The certification of certain implementations against the whole base standards is known as being underway, under the aegis of the aforementioned certification bodies. Furthermore interoperability has been demonstrated in the framework of appropriate workshops between independent suppliers (a-, e).

For the AFTN/AMHS Gateway, the implementation by Aena of a gateway complying with an earlier version of the SARPs (WG3 1.0z, since which there have been very few changes to Section 3.1.2 of the SARPs as may be seen in the document change history), which meets almost 90% of the SARPs requirements demonstrates that the SARPs are implementable. Furthermore, implementation of Phase 2 of the Aena AFTN/AMHS Gateway, which will comply with the ICAO SARPs Version is due to be completed by June 97. No particular implementation difficulty has been detected in the preparation of the development of this fully compliant gateway.

The existing gateway has also been tested in the framework of the AMHS interoperability trials between Aena and SITA (a-, e).

For the ATN Pass-Through Service, this validation objective may be considered as achieved on the basis of the FAA prototype implementation (d).

7.20. TVO11

VO Description: To determine that independent implementations built in accordance with the SARPs will be able to interoperate.

This validation objective may be considered as being achieved for the ATS Message Service, with the conclusion that independent implementations are able to interoperate, as it has been demonstrated in the course of the AMHS interoperability trials between Aena and SITA. Credit may also be taken from the results of the EuroSInet interoperability workshops which have demonstrated interoperability between off-the-shelf implementations by 5 to 10 independent suppliers (depending on product type). (a-, e, g)

This validation objective may be considered as being partly achieved for the ATN Pass-Through Service, with the conclusion that independent implementations will be able to interoperate. Upon completion of the SARPs inspection and analysis process by several parties, the comments/defect reports expressed in relation with this VO have been duly analysed and taken into account where appropriate (g).

The complete achievement of this VO for the ATN Pass-Through Service is subject to independent prototype implementations being developed and tested in an interworking configuration.