ATNP Working Group 2
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PROPOSED Doc 9705, SUB-VOLUME V (ICS) 3rd Edition
DRAFT VALIDATION REPORT
Version 0.3

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Summary

The attached draft Doc 9705 Sub-Volume V (ICS) 3rd Edition validation report is based on the Package-1 ICS validation report prepared by ATNP WG2 and submitted to ATNP/2 and subsequently to the Working Group of the Whole meeting in Phuket..  This draft validation report provides the framework for the reporting the Sub-Volume V validation results to ATNP/3 and the planned subsequent Working Group of the Whole meeting.

## 1. Introduction

The attached draft Doc 9705 Sub-Volume V (ICS) 3rd Edition validation report is based on the Package-1 ICS validation report prepared by ATNP WG2 and submitted to ATNP/2 and subsequently to the Working Group of the Whole meeting in Phuket.. Earlier drafts of the validation report were presented at the June and September 1999 WG2/IDG meetings.

## 2. Recommendation

It is proposed that WG2 baseline as version 1.0 the attached draft Sub-Volume V validation report for use as the basis for documenting the validation of the proposed third edition enhancements to Doc 9705, Sub-Volume V.  It is further proposed that the IDG be tasked with updating the draft validation report and submit it for review at the December Working Group of the Whole meeting.

AERONAUTICAL TELECOMMUNICATION NETWORK PANEL (ATNP)

THIRD MEETING

Montreal, February 2000

# Internet Communications Service Draft SARPs Validation Report

## *DRAFT Version 0.3*

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# 1.    Introduction

This report details the process employed and results obtained by the ATN Internet SARPs Validation Programmes that have been targeted at contributing towards the validation of the proposed 'Package-2' enhancements to the Internet Communications Service (ICS) technical provisions proposed for incorporation into the third edition of ICAO Doc 9705, Sub-Volume V.

A number of States and Organisations contributed to these validation programmes, namely:

- EUROCONTROL – *tbd*

- France – *tbd*

- The United States validation efforts performed by FAA William J. Hughes Technical Center with there Aeronautical Data Link Test Bead and by MITRE/CAASD with their Aeronautical Communications Engineering Testbed (ACET)

- *tbd*

As a result of the close co-operation and collaboration between the participants the programmes have proved to be successful highlighting the significant benefits that are achievable through such common initiatives.

The main body of this document presents the consolidated validation results of all Validation Initiatives that have been undertaken within the context of the respective validation programmes which are reported in Attachments E through *tbd*. Attachment A lists the set of WG2 agreed ATN Validation Objectives (AVOs) that have been used to focus the objectives of each of the Validation Initiatives. Attachment B provides high level summary descriptions of each Validation Tools (e.g. experimental systems, analysis work, simulations) employed by the various Validation Initiatives in a common format. Attachment C summarises in table form the coverage of Validation Objectives by Validation Exercises as reported in Attachments E to *tbd*.

With respect to the main body of the document:

- Section 1 provides introductory material, a brief resume of the background to ICS enhancements to the technical provisions (i.e., proposed Doc 9705 third edition of Sub-Volume V) development process including the role of the WG2 and the ATNP Configuration Control Board (CCB), and references to key ATNP/3 related Working Papers.

- Section 2 provides a brief description of the Validation Strategy that has been adopted by WG2 and used as the basis of the Validation Programme. This section includes a definitions section (defining the precise meaning of terms such as Validation Objectives, Validation Exercises, Validation Initiatives etc.), a brief resume of the various validation methods foreseen to be employed within the context of the overall WG2 Validation Strategy, and a description of the role of the ATN Requirements Database.

- Section 3 provides the consolidated validation results of all Validation Initiatives reported in Attachments E through *tbd*. In particular it reports on SARPs text consistency, the coverage of SARPs requirements by the implementations used in the various Validation Initiatives, confidence in SARPs implementations achieving interoperability, ATN deployment & large scale issues and finally an evaluation of the suitability of ATN characteristics and performance parameters necessary to support operational Air Traffic Management services.

- Section 4 reports on future validation work planned until the proposed ATNP WGW tentatively scheduled for May 2000.

- Section 5 documents the conclusions that have been drawn from the results of the Validation Initiatives that have been produced in terms of whether sufficient confidence has been acquired in order for the third edition of Doc 9705, Sub-Volume V to be recommended for adoption at ATNP/3.

## 1.1    Background

### 1.1.1    SARPs Development

The current ATN SARPs and the associated technical provisions for the Internet Communications Service (ICS) were published by ICAO in Amendment 73 to Annex 10 and in the first edition of Doc 9705 respectively. These documents resulted from recommendations reported out of ATNP/2 in November 1996. The configuration control board (CCB) of the ATNP subsequently, in 1999, produced an amendment 1 to Doc 9705 to correct defects found in the original document.  This resulted in the 1999 re-publication of Doc 9705 as the second edition.  ATNP/2 also tasked working groups with the development of enhancements to the ATN SARPs and technical provisions.  WG2 has progress the draft revisions to the ICS technical provisions through a number of iterations, which have resulted in a draft third edition of Doc 9705 Sub-Volume V.  This draft Sub-Volume comprises one significant element of the total set of draft ATN technical provisions, the other elements being concerned with System Level Requirements, Air/Ground Applications, Ground/Ground Applications, Upper Layers, System Management, Directory Services and Security Services.

The final draft version of the third edition of Doc 9705 Sub-Volume V has now been completed and were submitted to ICAO in early December 1999 in order to process the material for presentation to ATNP/3 which is scheduled to take place in February 2000.

### 1.1.2    Change Control Board

The draft third edition of Doc 9705 Sub-Volume V is the result of the evolution of the first and second editions of Doc 9705.  The first edition of Doc 9705 was published in 1998 and was subsequently amended and re-published as the second edition in 1999.  This second edition of Doc 9705 is the baseline from which the working group has developed the draft third edition of Doc 9705.

It was recognised at ATNP/2 that a process was needed to accept defect reports against the first edition of Doc 9705 and to incorporated any necessary changes to correct agreed upon defects.  In order to track reported defects and developed the necessary changes to the baseline first edition of Doc 9705, ATNP/2 created a set of formal procedures that required the operation of a "Change Control Board" (CCB).  The CCB subsequently produced Amendment 1 to the first edition of Doc 9705, which has resulted in the re-publication of Doc 9705 as the second edition.  The working groups have adopted the second edition of Doc 9705 (i.e., in effect the first edition with the inclusion of the Amendment 1 revisions) as the baseline from which to develop the draft third edition of Doc 9705.

## 1.2    Scope of the report

This Validation Report refers to the baseline ICS technical provisions which is the English version of the Second Edition of Doc 9705 Sub-Volume V.  This report describes the status and results of the validation activities undertaken for the draft third edition of Doc 9705 Sub-Volume as produced by ATNP WG2.  Since the draft third edition of Doc 9705 Sub-Volume

V was produced as a strike-out and red-line set of changes to the baseline (i.e., English) document, this validation report applies only to the English version of the text.

Proposed amendments to the draft third edition of Doc 9705 Sub-Volume V, based on additional validation activities, may be submitted to ATNP/3 or to the proposed subsequent Working Group of the Whole meeting. It is expected that any such proposed amendment will contain its own validation report statements or annexes, as appropriate to justify the changes proposed.

## 1.3    References

The Validation activity has generated a set of documentation that has been reviewed within WG2. This section only contains references to ATNP Working Papers made available to Panel members at ATNP WG meetings or at ATNP/3.

Validation Exercises Specification Documents, Configuration Specifications, Detailed Validation Reports are maintained by States and Organisations in charge of Validation Initiatives. They are traceable and referenced in summary reports given in the Attachments to this report.

| Ref. No. | Doc. Ref. | Title |
|:---:|:---|:---|
| 1. | ATNP/3-WP-*x* | Proposed Doc 9705 Sub-Volume V, Third edition |
| 2. | ATNP/3-WP-*x* | *tbd* |
| 3. | ATNP/3-WP-*x* | *tbd* |

# 2.    Validation Strategy

The strategy employed in the validation of the draft third edition of Doc 9705 Sub-Volume V incorporates a range of techniques, methods, procedures and tools. The strategy aims to ensure the completeness and traceability of the validation process. Each element of the validation strategy contributes towards these aims.

## 2.1    Definitions

The **Validation Report** (i.e. this document) is the consolidation of all the Detailed Validation Reports produced as the result of **Validation Initiatives.**

A **Validation Initiative** is a particular set of **Validation Exercises** carried out by one or several States/Organisations. Details of methods, specifications, tools, infrastructure and reports are under the responsibility of these States/Organisations.

**Validation Exercise** is the general term for a unit of validation activity. In order to facilitate the report consolidation, all validation exercises are defined with a reference to one or several **ATN Validation Objectives (AVOs)**. Depending on the type of validation, a Validation Exercise may correspond to:

- an Analysis case, e.g. document inspection, case study, etc.

- an Experiment with prototype and/or pre-operational systems

- a Simulation

**Validation Objectives** are statements which express the various verifications and evaluations required in order to declare related part of the draft third edition of Doc 9705 Sub-Volume V as validated. The comprehensive list of objectives provides the necessary traceability to the draft third edition of Doc 9705 Sub-Volume V through references to the **ATN Requirements Database**. The list of objectives has been assessed by WG2 as complete for this validation process.

## 2.2    Validation Methods and Tools

The following methods have been identified as applicable:

(a)    **Analysis of the draft third edition of the Doc 9705 Sub-Volume V** (i.e. a "paper" study which attempts to discover missing or inconsistent specification elements). The ATN Requirements Database is an essential tool for this;

(b)    **Analysis and review of documentation** that may be used in support of validation assessment. Such documentation may have been produced by developers or other teams for different purposes. For example: PICS, design specification, conformance test reports, qualification reports, etc.

(c)    **Simulation** of the aspects of the draft third edition of the Doc 9705 Sub-Volume V that require analysis on a large scale not suitable for validation implementation tools;

(d)    **Rapid prototyping of limited-scale ATN implementations**, with the goal of demonstrating that the ATN concept is technically sound and internally consistent;

(e)    **Rigorous prototyping of a limited-scale ATN**, a rigorous implementation for detailed validation of protocol requirements and operations, and with the goal of discovery of aspects of the draft third edition of the Doc 9705 Sub-Volume V that may lead to implementation difficulties;

(f)    **Target environment testing**: Trials including the key elements of a limited-scale ATN, with the goal of discovery of aspects of draft third edition of the Doc 9705 Sub-Volume V that may be only fully validated in an actual target environment. The target environment can be a ground-ground and a mobile environment.

The available Validation Tools have been surveyed so as to assess their suitability for validation. In some cases, tool modifications and new tool developments have been initiated in order to guarantee the proper validation coverage. The tools have to be assessed against the ARD to determine the coverage of the enhanced areas reflected in the draft third edition of the Doc 9705 Sub-Volume V implementation.

To ensure the traceability of the validation activities, it is important that tools used to conduct the validation exercises be properly documented. For each tool used in the validation exercises, a high level validation tool description is provided in Attachment B.

*Note: these tool descriptions are not intended to be the specifications of the tools' capabilities. These details can be obtained from the contact point / supplier, as given in the tool description.*

## 2.3    Enhanced ICS Requirements

The proposed high level functional enhancements to the baseline Sub-Volume V, Internet Communications Service, are shown in the following table.  The focus of the ICS validation is on the validation of these enhancements including validation of their interoperability with implementations based on the current ICS baseline (i.e., Second Edition of Doc 9705, Sub-Volume V).

| Label | Enhancement for 2nd Edition of ICS SARPs |
|---|---|
| ICS3-01 | Requirements for mobile subnetworks to issue Join and Leave Events within given latency intervals |
| ICS3-02 | Requirement for IS-SME to respect quarantine time before processing next Join event from mobile subnetworks having issued a Leave event |
| ICS3-03 | Use of adaptive retransmission timers in the Connection Oriented Transport Protocol |
| ICS3-04 | Route selection based on required support for additional mobile subnetwork types and additional criteria (e.g. service provider selection) |
| ICS3-05 | Requirements for ICS-related systems management consistent with the ATN systems management concept (i.e. draft Sub-Volume 6) |
| ICS3-06 | Requirements for enhanced IDRP security consistent with the ATN security architecture (i.e. draft Sub-Volume 8). |
| ICS3-07 | Deletion of the ATN NSAP address compression algorithm (ACA) |
| ICS3-08 | Suppression of re-advertisement of routes in the case of changing mobile subnetwork connectivity |
| ICS3-09 | Conveyance of data link capability parameter in air/ground ISH PDU exchanges to signal protocol capabilities which are beyond 1st edition of Doc 9705 between air/ground and airborne routers in a backwards compatible manner |
| ICS3-10 | Improved handling of the loss of TPDUs experienced during changes in subnetwork connectivity |
| ICS3-11 | Revised COTP acknowledgement (ACK) timer setting |
| ICS3-12 | Potential amendment of existing mobile SNDCF and/or development of additional mobile SNDCFs to include new subnetwork types |
| ICS3-13 | Potential enhancements to the DEFLATE algorithm to allow for the dynamic negotiation for the use of pre-stored dictionaries |
| ICS3-14 | Potential additional mobile SNDCF option to allow maintenance of DEFLATE history window when changing ground stations or air/ground routers respectively |
| ICS3-15 | Potential use of additional security tags to introduce new routing capabilities in a backwards compatible manner |

## 2.4    Validation Objectives

The ATN Validation Objectives (AVOs) agreed by WG2 are reproduced in Attachment A. The AVOs were developed under 4 major validation criteria, namely:

- Criteria 1: has the requirement been implemented ?

- Criteria 2: do ATN systems interoperate ?

- Criteria 3: does the ATN satisfy User Requirements ?

- Criteria 4: does the ATN perform well ?

Detailed definitions of each of the above criteria are provided in Attachment A. The coverage of the AVOs contributed to by Validation Exercises is given in Attachment C.

## 2.5    Validation Exercises

The validation exercises have been specified by various States/Organisations under their own validation initiatives. This consolidated report relies on these States/Organisations for producing Validation Exercise Specifications, Tool Specifications, Detailed Reports as appropriate. All documentation listed under each Validation Initiative Summary is accessible via the responsible State/Organisations.

## 2.6    Validation Initiatives

All Validation Initiatives have been summarised in Attachments E through *tbd*. The purpose of the summary is to give some insight about the work achieved, and the confidence gained under the corresponding exercises.

The summary reports are written in such a way that, in case further details are needed, the reader is provided with all the necessary references and contact points.

# 3.    Consolidated Validation Results

## 3.1    Doc 9705 Sub-Volume V Third edition text consistency

The draft third edition of the Doc 9705 Sub-Volume V has been developed under the control of the ATNP WG2. The procedures enforced by the WG2 ensure that any proposed change is firstly motivated, then consistent with current draft technical provisions and finally correctly drafted before incorporation in new version. All text changes resulting from this process are traceable.

Besides this Quality Assurance process, additional verifications have been performed throughout the draft third edition of the Doc 9705 Sub-Volume V development to ensure overall consistency and correctness both internally and in reference to other Doc 9705 Sub-Volumes and base standards (e.g., ISO Documents):

- An ATNP WG2 ICS Drafting Group held in November 1999 did a complete editorial review of the draft third edition of the Doc 9705 Sub-Volume V ensuring the necessary

editorial quality of the draft text. This meeting reviewed the correctness of outlines, title texts, presentation, figures and tables and internal consistency of cross-references.

- a final detailed review of the draft third edition of the Doc 9705 Sub-Volume V was made at a meeting of ATNP Working Group of the Whole held in Japan in December 1999.

From the above it can be concluded that there is sufficient confidence that the draft Internet SARPs (i.e., Doc 9705 Subg-Volume V, Second Edition) are specified in an unambiguous and consistent manner.

## 3.2    Coverage by Implementations

The requirements contained in the draft third edition of the Doc 9705 Sub-Volume V may be divided in two categories: those pertaining to ATN systems (i.e. how systems are built), and those pertaining to the Network deployment (i.e. how ATN systems are used, how the network is managed).

Confidence has been gained in the draft third edition of the Doc 9705 Sub-Volume V pertaining to ATN systems by implementing many of these third edition enhancements in real life systems, either prototype or pre-operational systems. A coverage analysis of the requirements associated with the third edition enhancements is provided in Attachment D to this document.  The focus of the validation coverage was on the enhancements proposed in the third edition of Doc 9705 Sub-Volume V as compared to the baseline second edition of the same sub-volume.

Confidence has been gained in the draft third edition of the Doc 9705 Sub-Volume V pertaining to ATN deployment by either implementing limited scale networks or by simulating them in larger configurations. A coverage analysis of the requirements associated with the third edition enhancements is provided in Attachment D to this document.

Based on the coverage analysis provided in Attachment D it can be concluded that the majority of the requirements associated with the third edition enhancements defined in Doc 9705 Sub-Volume V have been implemented by various initiatives in the various validation tools that they have employed to provide a sufficient level of confidence that the requirements are implementable. There is, however, a number of requirements that remain to be validated/implemented and have been identified as requiring validation up to the proposed ATNP WGW meeting in May 2000.

## 3.3    Interoperability of ATN Systems

Based upon the results of the Validation Initiatives reported in the Attachments E through *tbd* relating to prototype, experimental and demonstration third edition of the Doc 9705 Sub-Volume V compliant systems sufficient confidence has been gained that compliant implementations will result in interoperable systems.

The various draft third edition of the Doc 9705 Sub-Volume V compliant airborne and ground based systems employed in these Validation Initiatives have, in general, been independently developed which has provided further confidence in the maturity and stability of the technical provisions.

## 3.4     Deployment of the ATN and large scale issues

Following the success of and the confidence achieved in the draft third edition of the Doc 9705 Sub-Volume V validation work, it is anticipated that initiatives to develop pre-operational and Reference ATN systems will initiated.

## 3.5     Evaluation of ATN characteristics and performances

As a result of reviewing the performance achieved from the trials and prototype implementations, which to an extent are dependent upon the performance of the underlying hardware, no inherent limitations have been identified that would preclude the use of an ATN based communications infrastructure in an operational Air Traffic Management requirement meeting the performance requirements expected from the User. Indeed, with the exception of the air/ground subnetwork technology currently envisaged for incorporation into the ATN architecture (which can be viewed as the "bottle-neck"), the performance required of the network in terms of throughput of ground/ground links, router processing capacity, security and network redundancy requirements is very much a network design/capacity planning issue. It should be noted that no hard threshold has been evaluated with respect to performance that may be achieved with an ATN based system and that the validation work has concentrated on identifying whether what is considered to be an "acceptable level of performance" is achievable.

It can be concluded that an ATN compliant system has no inherent limitations that will limit its use in the support of an operational Air Traffic Management System. The performance of the system will be a function of the technology (hardware/software) on which the ATN requirements are implemented as well as the appropriate dimensioning/capacity planning of the supporting network.

# 4.     Future work

Validation activities will continue until the proposed ATNP WGW tentatively scheduled in May 2000.  During this period, additional results will be collected and reported on.

The future validation work will in particular contribute to the validation of the following AVOs:

| AVO-3_*tbd* | *tbd* |
|---|---|
| AVO-3_*tbd* | *tbd* |
| AVO-3_*tbd* | *tbd* |

# 5.     Conclusion

In order to comply with the "ATN System Level Requirements" (i.e. SLRs), as defined in Ref. 2, the definition of the enhancements to the ICS incorporated in the draft third edition of the Doc 9705 Sub-Volume V has necessitated the definition of a detailed set of complex requirements.  For practical reasons it is not possible to conduct an exhaustive validation of all requirements. Validation is an on-going process that commenced with analysis, simulations, experimental & prototype system development and will continue as the implementation of operational ATN systems proceeds. What has been practical, however, is to conduct a broad range of independent validation initiatives the collective and consolidated results of which have provided a sufficient level of confidence that the ICS

enhancements incorporated in the draft third edition of the Doc 9705 Sub-Volume V may be declared validated.

Based upon the above and the results of the set of validation initiatives reported in this document and its Attachments sufficient confidence has been gained to conclude that the draft third edition of the Doc 9705 Sub-Volume V are a mature basis for the development of systems to be used in operational Air Traffic Management environment complying with stated User Requirements. It is therefore recommended that the ATN Panel endorse the recommendation in ATNP/3-WP/*tbd* that the draft Internet Communications Service provisions of the ATN SARPs and the third edition of Document 9705 be adopted subject to minor revisions resulting for additional validation activities reported to an ATNP WGW in May 2000.

# ATTACHMENT A — Validation Objectives

## A.1    Approach

The validation objectives in this Attachment are classified according to the criteria which are identified for ATN validation. Criteria define why a given validation objective/exercise increases the validation level of a (set of) ATN requirements. Four criteria have been defined in this document:

- Criteria 1: has the requirement been implemented?

- Criteria 2: do ATN systems interoperate?

- Criteria 3: does the ATN satisfy User Requirements?

- Criteria 4: does the ATN perform *well*?

### A.1.1    Criteria 1: has the requirement been implemented?

The Sub-Volume V Third edition technical provisions must be **implementable** in ATN systems and procedures. Evidence of this will be given by the various developments under way. Exercises are necessary to ensure that all ATN requirements have been implemented in at least two distinct implementations. The contribution of these exercises to the overall ATN Validation is: "the following ATN requirements have been implemented in development *X* by *Y*".

Candidate validation exercises to assess this criteria include:

- Analysis: review of acceptance reports, qualification reports, etc. available for the systems where requirements have been implemented.

- Experiments: limited experiments targeted at demonstrating the implementation of the requirement(s).

This Attachment does not recommend the development of experiments dedicated to the validation of this criteria. In case no evidence is found that a given (set of) requirement(s) has been implemented, its presence in Doc 9705 Sub-Volume V must be justified.

### A.1.2    Criteria 2: do ATN systems interoperate?

The Sub-Volume V Third edition technical provisions must lead to **interoperable** profiles. This has been assessed up to a certain point by analysis during SARPs editing. Exercises are necessary to ensure that ATN requirements lead to implementations that interoperate. This is particularly important for parts of the Doc 9705 Sub-Volume V which have been designed especially for the ATN.

Another issue to be considered under this criteria is the impact of choosing different sets of recommendations or options in a given interworking setup.

Candidate validation exercises to assess this criteria include:

- Analysis: review of PICS

- Experiments: verification that a set of requirements lead to interoperable systems. Breakdown of this set into individual experiments depends on available platforms.

- Simulations: detailed models may be used in some specific cases to assess interoperability.

This Attachment recommends that simulation is used only for cases that cannot be demonstrated in experiments using real implementations.

### A.1.3   Criteria 3: does the ATN satisfy User Requirements?

A number of System Level Requirements have been defined in the ATN SARPs and Doc 9705 Sub-Volume I.   Exercises are necessary to ensure that these system level requirements are satisfied.

Candidate validation exercises to assess this criteria include:

- Experiments

- Simulations

- Analysis

### A.1.4   Criteria 4: does the ATN perform *well*?

There is only minimal written criteria about the performance expectations for the ATN ICS. Yet, the properties of ATN protocols and of ATN network topologies will be an important element in the ATN evaluation.

Many performance figures that can be measured in ATN networks are relative to system performance or to data link capacity. In principle, these figures can be scaled to meet any performance target by appropriate system/network design.

Some performance figures are ATN intrinsic, e.g. average protocol overhead, and can be evaluated on experimental systems or through simulation.

Expected results is this area are not of a pass/fail nature. They provide indications on which ATN validation will be assessed.

Candidate validation exercises to assess this criteria include:

- Experiments

- Simulations

- Analysis

Experimental and simulation results should be consistent. Simulation results can be confirmed by equivalent experiments in small configurations. This is a way to assess the validity of the simulation results obtained for larger configurations.

## A.2   Coverage

The set of validation objectives defined in this Attachment is meant to be complete in terms of the Sub-Volume V Third edition enhanced technical provisions coverage. Although new additional criteria and objectives could be defined, the current set is considered to provide the acceptable level of coverage. In other words, the Sub-Volume V enhancement incorporated in the third edition will be considered validated after successful verifications and executions of exercises derived from those objectives.

The details and depth of the verifications required are subject to external assessment as described below.

## A.2.1   Conventions

Objectives are stated, as much as possible, in the form of sentences beginning with verbs like "verify", "show", "evaluate", etc. Being high level statements they are not meant to describe in detail the technical steps involved. In principle, one objective is expected to be refined into one or several validation exercises.

A unique reference of the form "AVO-3_nnn" is assigned to each objective. It is intended for use in exercise specifications.

AVO reference numbers do not necessarily appear as increasing consecutive numbers.

Validation objectives are presented in table format as follows:

| Reference | Objective Description |
|-----------|----------------------|
| AVO-3_nnn | Verify that ... |

Where the term 'AVO-' identifies this as an ATN validation object for the Third edition of Doc 9705 and the 'nnn' is the number assigned to the specific validation objective. When the term compliant is used in the AVO objective description without a reference to a specific version of Doc 9705 (i.e., baseline or third edition) this is to be understood to be referring to the Doc 9705 Sub-Volume V, Third edition.

## A.2.2   Assessment

Normally, objectives state what is to be verified in order to derive a pass/fail verdict. However, it is not practical, nor even possible, to detail in this Attachment the exact degree and depth of verification that is required in order to declare an objective met. Similarly, this Attachment does not specify the number and type of topologies/configurations that should be tested (for an objective related to ATN routing topologies for example).

These issues are considered to be part of an assessment process, which needs to be set up in parallel with the development and execution of validation exercises. The assessment process is responsible for:

- deciding which ATN requirements can be considered as validated without any specific exercises and provide justification for it.

- deciding for each objective what is the minimum number/type of exercises that are required in order to consider the objective validated. For example: need for two distinct implementations, the significant ATN profiles to be experimented, the combination of options to be tested, the configurations for which simulation is sufficient.

- deciding what are the ATN topologies/configurations to be investigated.

- specifying target values for ATN properties and performances.

- relating actual validation exercises/results derived from these objectives to ATN database entries.

# A.3    Validation Objectives

## A.3.1    Implementation of ATN systems and procedures (criteria 1)

All the following exercises are meant to be conducted through analysis of existing documentation and reports: PICS, acceptance test reports.

The expected outcome is an indication of the ATN requirements that have been successfully implemented. As a result, some coverage analysis can be derived from these exercises.

In these exercises, the term 'ATN requirements' is used to refer to mandatory requirements and to recommendations. The ATN options, as derived from PRLs, can be considered as out of the scope of these exercises. However, ATN options may be the subject of additional validation exercises to verify that they are neither needed nor "dangerous" to the ATN service when implemented.

The term 'implemented' in this context is not restricted to 'implemented in operational/avionics systems'. Prototypes and pre-operational are also capable of validating the 'implementability' of Doc 9705 Sub-Volume V technical provisions. The degree of confidence required, hence the type of implementation, is an issue for the assessment procedure to establish (see 2.4).

### A.3.1.1 Ground End System

| AVO-3_101 | Verify that all requirements associated with Doc 9705 Sub-Volume V Third edition enhancements pertaining to ground End Systems have been implemented and demonstrated to be compliant.  Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-03<br>ICS3-05<br>ICS3-10<br>ICS3-11 |
|---|---|

### A.3.1.2 Airborne End System

| AVO-3_102 | Verify that all requirements associated with Doc 9705 Sub-Volume V Third edition enhancements pertaining to airborne End Systems have been implemented and demonstrated to be compliant.  Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-03<br>ICS3-05<br>ICS3-10<br>ICS3-11 |
|---|---|

### A.3.1.3 Ground-Ground BIS

| AVO-3_103 | Verify that all requirements associated with Doc 9705 Sub-Volume V Third edition enhancements pertaining to ground-ground Boundary Intermediate Systems have been implemented and demonstrated to be compliant.  Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-05<br>ICS3-06<br>ICS3-15 |
|---|---|

### A.3.1.4 Air-Ground BIS

| AVO-3_104 | Verify that all requirements associated with Doc 9705 Sub-Volume V Third edition enhancements pertaining to air-ground Boundary Intermediate Systems have been implemented and demonstrated to be SARPs compliant. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-02 ICS3-04 ICS3-05 ICS3-06 ICS3-07 ICS3-08 ICS3-09 ICS3-12 ICS3-13 ICS3-14 ICS3-15 |
|---|---|

### A.3.1.5 Airborne BIS supporting IDRP

| AVO-3_105 | Verify that all requirements associated with Doc 9705 Sub-Volume V Third edition enhancements pertaining to airborne Boundary Intermediate Systems supporting IDRP have been implemented and demonstrated to be compliant. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-02 ICS3-04 ICS3-05 ICS3-06 ICS3-07 ICS3-08 ICS3-09 ICS3-12 ICS3-13 ICS3-14 ICS3-15 |
|---|---|

### A.3.1.6 Airborne BIS without IDRP

| AVO-3_106 | Verify that all requirements associated with Doc 9705 Sub-Volume V Third edition enhancements pertaining to airborne Boundary Intermediate Systems not supporting IDRP have been implemented and demonstrated to be compliant.  Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-02 ICS3-04 ICS3-05 ICS3-07 ICS3-09 ICS3-12 ICS3-13 ICS3-14 |
|---|---|

## A.3.1.7 ATN Subnetworks

| AVO-3_107 | Verify that the VDL Mode 3 subnetwork and the mobile SNDCF interaction has been implemented for support of ATN communications and demonstrated to be SARPs compliant. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-01<br>ICS3-12 |
|---|---|
| AVO-3_108 | Verify consistency of the Mobile SNDCF provisions versus the behaviour of VDL Mode 2, VDL Mode 3, AMSS, HFDL and Mode S subnetworks in the issuance of Join and Leave Events under conditions of rapid fading conditions on the r.f. link.  This includes verification that Doc 9705 correctly indicates which subnetworks will need to use the enhanced features of the mobile SNDCF.  Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-01<br>ICS3-02 |

## A.3.1.8 Routing architecture and policy

| AVO-3_109 | Verify that all requirements associated with Doc 9705 Sub-Volume V Third edition enhancements pertaining to routing architecture and routing policy have been implemented and demonstrated to be SARPs compliant. This includes ATN system aspects and associated procedures. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-04<br>ICS3-08<br>ICS3-15 |
|---|---|

## A.3.2    Interoperability (criteria 2)

The ATN Internet Communications Service SARPs specify the ATN Network and Transport Layers in terms of their constituent protocols and functions. They mandate certain features, recommend others and document a wide variety of options without mapping these to real world systems (e.g. Routers and Host Computers). The large number of possible combinations of standards, recommendations and options complicates the validation process.

Within each type of ATN system defined in SARPs (ES, GG-BIS, AG-BIS, A-BIS), there are a number of possible ATN compliant solutions (called hereafter ATN Compliant Profiles). A Profile is defined as a specific choice of recommendations/options allowed by the SARPs. Validation must prove that all these possible profile solutions interoperate. When this is not the case, the ATN SARPs must be in error and cannot be validated as they stand.

Experiments will contribute to the definition of a practical number of interoperable ATN components of various types (e.g. air-ground Router, ground-ground Router, ATC Host Computer etc.) by identifying ATN Compliant Profiles for them. These Profiles will be constructed from the standards, recommendations and options specified in the ATN SARPs.

Assuming that a set of interoperable ATN components has been developed, the validation process will continue by examining the operation of a number of ATN components in various topologies to demonstrate the stable operation of the ATN.

Interoperability objectives are divided into two main families:

1) peer to peer interoperability objectives concentrate on the dialogue between two systems and the service provided by those two systems.

2) multi-peer interoperability objectives concentrate on network-wide properties of the ATN which involve an arbitrary number of systems. Note that these objectives do not address multi-peer user application concepts.

The focus of the validation effort is on the enhancements introduced between the pre-existing baseline Sub-Volume V technical provisions and the third edition of Sub-Volume V. However, the validation will confirm the interoperability of the third edition Sub-Volume V enhanced features with the existing baseline configuration.

## A.3.2.1 Peer to peer interoperability

### A.3.2.1.1    Data transfer

Data transfer exercises should investigate various transport user situations. Depending on the tool used, transport users may be:

- raw data exchanges with no relationship to ATN transport users. This data exchange type only serves the purpose of demonstrating the transport provider capabilities. It should not be used to demonstrate the ATN capability to support any specific ATN user type.

- models of ATN transport users. These data exchanges can be tailored to reflect the characteristics of real application behaviours. These models include setting of average messages length, time distribution patterns, etc.

- prototype/real applications using ATN transport service. These data exchanges can be used in demonstration of capability to support ATN user applications.

### A.3.2.1.1.1   Default end system interworking profiles

| AVO-3_201 | Verify that two compliant ATN End Systems interoperate and provide Connection-Oriented Transport Service to Transport Service users. These End Systems should be configured so as to be compliant to a default third edition of Sub-Volume V ATN profile (subsequent validation exercises will investigate different profile combinations). |
|---|---|
| | The exercise(s) based on that objective should address: connection establishment, one-way data transfers, two-way data transfers, normal disconnection, multiple simultaneous connections.  The ability to gracefully recovery from out of order TPDU delivery and changing transit delays shall be verified.  COTP profiles specific to air-ground and ground-ground will be verified.  Applicable Sub-Volume V enhancements (see 2.3) are: |
| | ICS3-03 |
| | ICS3-10 |
| | ICS3-11 |
| | Note: several other experiments may have this exercise as a prerequisite. Data transfers will be used to test various network conditions and to exercise ATN systems. |

### A.3.2.1.1.2   Varying end system protocol profiles

| AVO-3_202 | Verify that two ATN End Systems supporting different protocol profiles (i.e., support of ATN recommendations) interoperate and provide the Transport Service.  Several exercises are needed to investigate different transport and network options.<br>The exercises should verify: Existing baseline Sub-Volume V COTP profile will successfully interoperate with a profile compliant with the third edition Sub-Volume V COTP (e.g., use of selective acknowledgement and dynamic timers algorithms).  Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-03<br>ICS3-10<br>ICS3-11 |
|---|---|

## A.3.2.1.1.3   Enhancements to Mobile SNDCF

| | |
|---|---|
| AVO-3_203 | Verify that compliant airborne and air-ground BISs implementing the enhancements to the mobile SNDCF(s) to deal with changing subnetwork connectivity interoperates. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-01<br>ICS3-02 |
| AVO-3_204 | Verify that a compliant airborne BIS or air-ground BIS implementing the enhancements to the mobile SNDCF(s) to deal with changing subnetwork connectivity will interoperate with a peer BIS implementing the mobile SNDCF according to the existing baseline Sub-Volume V provision. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-01<br>ICS3-02 |
| AVO-3_205 | Verify that a compliant airborne BIS and air-ground BIS implementing the enhancements to the VDL Mode 3 Frame-Mode mobile SNDCF with interoperate with a VDL Mode 3 subnetwork and with the peer SNDCF. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-12 |

## A.3.2.1.2   Enhancements for exchange of Inter-domain routing information

| | |
|---|---|
| AVO-3_210 | Verify that ground BISs and air-ground BISs will interoperate for the secure exchange of IDRP information.  The provisions to authenticate IDRP exchanges with the peer BIS across a ground-ground path will be verified. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-06 |
| AVO-3_211 | Verify that compliant airborne and air-ground BISs support authentication of IDRP exchanges in the air-to-ground direction. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-06<br>ICS3-09 |
| AVO-3_212 | Verify that compliant airborne BISs and air-ground BISs supporting the optional mutual authentication of IDRP exchanges are each able to authenticate IDRP PDUs received from the peer BIS. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-06<br>ICS3-09 |
| AVO-3_213 | Verify that compliant airborne BISs and air-ground BISs supporting the option to request and to attach a security certificate to an IDRP OPEN-PDU. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-06<br>ICS3-09 |
| AVO-3_214 | Verify that a compliant airborne BIS, air-ground BIS and ground BIS will interoperate for the unsecured exchange of routing information with a peer BIS implemented in accordance with the current baseline Sub-Volume V provisions. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-06<br>ICS3-09 |

## A.3.2.1.3 Enhancement for suppression of re-advertisement of routes

| AVO-3_220 | Verify compliant airborne and air-ground BISs suppress the re-advertisement of routes in the case of changing mobile subnetwork connectivity. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-08 |
|---|---|
| AVO-3_221 | Verify that a compliant airborne or air-ground BIS supporting the mechanisms to suppress the re-advertisement of routes in the case of changing mobile subnetwork connectivity will interoperate with a peer BIS that has been implemented according to the baseline Doc 9705 Sub-Volume V. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-08 |

## A.3.2.1.4 Enhanced signalling for non-support for IDRP

| AVO-3_230 | Verify compliant airborne and air-ground BISs using a parameter in ISH PDU to signal non-support for IDRP interoperate. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-09 |
|---|---|
| AVO-3_231 | Verify that a compliant airborne or air-ground BIS supporting the use of a parameter in ISH PDU to signal non-support for IDRP will interoperate with a peer BIS that has been implemented according to the baseline Doc 9705 Sub-Volume V. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-09 |

## A.3.2.1.5 Enhanced route selection

| AVO-3_240 | Verify compliant airborne and air-ground BISs supporting enhanced selection of routes for the AOC traffic type category will interoperate. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-04 |
|---|---|
| AVO-3_241 | Verify a compliant airborne or air-ground BISs supporting enhanced selection of routes for the AOC traffic type category will interoperate with a peer BIS that has been implemented according to the baseline Doc 9705 Sub-Volume V. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-04 |

## A.3.2.1.6    Enhanced compression mechanisms

| | |
|---|---|
| AVO-3_250 | Verify compliant airborne and air-ground BISs supporting negotiation of pre-stored Deflate dictionaries will interoperate. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-13 |
| AVO-3_251 | Verify a compliant airborne or air-ground BISs supporting negotiation of pre-stored Deflate dictionaries will interoperate with a peer BIS that has been implemented according to the baseline Doc 9705 Sub-Volume V. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-13 |
| AVO-3_252 | Verify compliant airborne and air-ground BISs supporting a mobile SNDCF option to allow maintenance of Deflate history window when changing ground stations will interoperate. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-14 |
| AVO-3_253 | Verify a compliant airborne or air-ground BISs supporting a mobile SNDCF option to allow maintenance of Deflate history window when changing ground stations will interoperate with a peer BIS that has been implemented according to the baseline Doc 9705 Sub-Volume V. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-14 |

## A.3.3    User Requirements (criteria 3)

Only a subset of the ATN User Requirements have been selected. The main selection criteria has been that the user requirement was linked to an observable property of an ATN network or ATN topology and related to an enhanced capability offered by the third edition of Sub-Volume V as compared to the existing baseline document.

### A.3.3.1 Independence from the subnetwork service interruptions

| AVO-3_300 | Verify the ability of the ATN service to ensure a rapid fall back to another mobile subnetwork in case of service interruption on the default mobile subnetwork, consistent with the declared ATSC traffic class supported by the default mobile subnetwork. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-01<br>ICS3-08<br>ICS3-10 |
|---|---|
| AVO-3_301 | Verify that a pertubated default sub-network (experiencing fading on the r.f. channel) has no impact on the ATN service except for increase in average end-to-end transit delay and/or fall back to another mobile subnetwork. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-01<br>ICS3-02<br>ICS3-03<br>ICS3-11 |

### A.3.3.3 Service delivered to users

| AVO-3_310 | Verify that the ATN is able to support the various types of user communications as defined by the security type parameter :<br><br>- ATN Administrative communications,<br><br>- ATN Operational communications,<br><br>- General communications,<br><br>- ATN Systems Management communications<br>Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-04<br>ICS3-15 |
|---|---|

### A.3.4 ATN properties and performances (criteria 4)

This section can be viewed as a list of objectives which validates the assumed or implicit User Requirements. Other than the ATN SARPS and Doc 9705 Sub-Volume I, no other formal ICAO source document is available which states the expected technical high-level properties/performances of the ATN.  Generally many of the performance characteristics of the ATN (e.g., number of mobile users to be supported) will be determined on a local or regional basis.

The assessment procedure is required to define the expected values/targets against which the ATN properties and performances will be evaluated.

Until these expected values are specified, an objective of the form "Evaluate X" should be interpreted as "Evaluate X. Verify that X is acceptable". The acceptability criteria for such a general case is:

- exercises derived from this objective do not reveal SARPs inconsistencies or gaps,

- observed performances are consistent with provision of ATN user services,

- observed performances are scaleable to future ATN configurations or ATN systems.

## A.3.4.1 Enhanced provisions for the exchange of routing information

| | |
|---|---|
| AVO-3_400 | Show the ground BISs and air-ground BISs capability to authenticate IDRP exchanges with the peer BIS across a ground-ground path will be verified. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-06 |
| AVO-3_401 | Show the compliant airborne and air-ground BISs capability for authentication of IDRP exchanges in the air-to-ground direction. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-08 ICS3-09 |
| AVO-3_402 | Show the compliant airborne BISs and air-ground BISs capability for the mutual authentication (option) for IDRP exchanges. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-08 ICS3-09 |
| AVO-3_403 | Show the compliant airborne BISs and air-ground BISs capability to request and to attach a security certificate to an IDRP OPEN-PDU. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-08 ICS3-09 |
| AVO-3_404 | Show compliant airborne and air-ground BISs' capability to suppress re-advertisement of routes in the case of changing mobile subnet connectivity. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-08 |

## A.3.4.2 Enhanced mobile SNDCFs

| | |
|---|---|
| AVO-3_410 | Show that compliant airborne and air-ground BISs implementing the enhancements to the mobile SNDCF(s) to deal with changing subnetwork connectivity minimise routing updates when the mobile subnetwork is experiencing rapid changes in connectivity. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-02 ICS3-08 |
| AVO-3_411 | Show that compliant airborne and air-ground BISs implementing support for new mobile SNDCF(s) (e.g., VDL Mode 3 - frame mode) correctly interoperate via the applicable new mobile subnetwork(s). . Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-12 |

## A.3.4.3 Enhancement for suppression of re-advertisement of routes

| | |
|---|---|
| AVO-3_420 | Show compliant airborne and air-ground BISs suppress the re-advertisement of routes in the case of changing mobile subnetwork connectivity. Applicable Sub-Volume V enhancements (see 2.3) are: ICS3-08 |

### A.3.4.4 Enhanced signalling for non-support for IDRP

| AVO-3_430 | Show the compliant airborne and air-ground BISs capability to use a parameter in ISH PDU to signal non-support for IDRP. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-09 |
|---|---|

### A.3.4.5 Enhanced route selection

| AVO-3_440 | Show the compliant airborne and air-ground BISs capability for enhanced selection of routes for the AOC traffic type category. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-04<br>ICS3-09 |
|---|---|

### A.3.4.6 Enhanced compression mechanisms

| AVO-3_450 | Show that compliant airborne and air-ground BISs capability for negotiation of pre-stored Deflate dictionaries will interoperate. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-13 |
|---|---|
| AVO-3_451 | Show the performance advantage provided by the use of a pre-stored Deflate dictionary compared to the dynamic construction of the dictionary, as per the standard Deflate mechanism specified by the baseline Doc 9705 Sub-Volume V. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-13 |
| AVO-3_252 | Show that compliant airborne and air-ground BISs supporting a mobile SNDCF option to allow maintenance of Deflate history window when changing ground stations will interoperate. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-14 |
| AVO-3_253 | Show the performance advantage provided by allowing the maintenance of Deflate history window when changing ground stations as compared to a Deflate algorithm that has been implemented according to the baseline Doc 9705 Sub-Volume V. Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-14 |

## A.3.4.1 Enhanced Connection Orient Transport Service mechanisms

| AVO-3_460 | Show the enhanced COTP provisions for dynamic re-transmission timers and selective acknowledgement result in an improved ability to quickly recover to changes in transit delay by the underlying internet service or a non-uniform delay in the delivery of TPDUs.  Any improvements are as compared to the capabilities of default COTP profile in the baseline Doc 9705 Sub-Volume V.  Such changes in transit delay could be the result of changing subnetwork loading or a change in the mobile subnet being used.  Applicable Sub-Volume V enhancements (see 2.3) are:<br>ICS3-03 |
|---|---|
| AVO-3_461 | Show that the revised COTP ACK timer setting results in improved recovery from the loss of TPDUs.  The loss of TPDUs resulting from changing mobile subnetwork connectivity as well as from other causes will be considered.  Results are to be compared to the use of the nominal COTP ACK timer value (i.e., 20 seconds) in the baseline Doc 9705 Sub-Volume V.<br>ICS3-11 |

# ATTACHMENT B — High Level Validation Tool Descriptions

## B.1    *TBD* Validation Tool

| Tool Identification | | |
|---|---|---|
| Name | | |
| Category | | |
| Description | | |
| Contact Point and/or Supplier | | |
| Tool Version and Date | | |
| Supporting Hardware | | |
| Supporting Operating System and/or Software | | |
| | | |
| ATN Systems | | |
| Protocols | | |
| CNS/ATM-2 Specifics | | |
| Connectivity Information | | |
| Type | Connector Type and Number | |
| | ) | |
| Notes | | |
| | | |

# ATTACHMENT C — Coverage of Validation Objectives by Validation Exercises

## C.1    List of Validation Initiatives

| Initiative Name | Title | Attachment |
|---|---|---|
| | | E |
| | | F |
| | | G |
| | | |
| | | |
| | | |
| | | |
| | | |

## C.2    Cross Reference List

| Validation Objective | Validation Initiative | Validation Exercise | Exercise Title |
|---|---|---|---|
| AVO_tbd | | | |
| | | | |
| AVO_tbd | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ATTACHMENT D — Analysis Exercises

## D.1    Initiative Reference & Title

ATNP WG2 Analysis Exercises.

## D.2    Type

Analysis of experimental data and Inspection of documents (test reports and conformance statements)

## D.3    Responsible State/Organisation

ATNP WG2/IDG

## D.4    Contact Point

| Organisation | Contact Details |
|---|---|
| ATNP WG2/IDG | *tbd* |

## D.5    Participating States/Organisations

None

## D.6    Validation Tools Involved

These experiments made use of the following ATN systems available at the various sites:

| Name | Attach.  B reference | Involvement |
|---|---|---|
|  |  |  |

In addition, the experiments made use of the following supporting tools/functions.

| Name | Annex B reference | Involvement |
|---|---|---|
|  |  |  |
|  |  |  |

## D.7    Validation Periods

The analysis exercises were performed in November 1999 using data gather during the previous months.

## D.8    Coverage of Doc 9705 Sub-Volume V Third edition enhancements by implementations

The purpose of this exercise is to assess the extent to which the Doc 9705 Sub-Volume V Third edition enhanced requirements and recommendations have been implemented in prototype ATN systems.

The analysis has been performed by using available implementation conformance statements. These statements were created using the ATN Requirements Database. This database provides an interface which allows a user to state for each applicable entry, the conformance status of its implementation (plus some support notes, if required).

The following AVOs are applicable:

AVO_tbd

AVO_tbd

## D.9    Description

### D.9.1    Coverage of ICAO Doc 9705 Sub-Volume V Third edition enhancements by implementations

Conformance statements made using the Internet Communication Service Requirements Database have been used to assess the proportion of the Doc 9705 Sub-Volume V Third edition enhancements which have been implemented in prototype and pre-operational ATN systems and networks. A set of requirements which have been implemented increase the level of confidence in the specification.

The following conformance statements have been reviewed:

| Reference | Notes |
|-----------|-------|
|           |       |
|           |       |

The review adopted the following method:

The databases were searched for requirements as indicated by their status (usually an 'M') and for which all implementations stated 'no' in the support column.

The databases were searched similarly for recommendations as indicated by their status 'REC'.

The databases were searched similarly for options defined in the mobile SNDCF APRL and in the routing initiation APRL. These options have corresponding Sub-Volume V text for which a validation statement is required.

Options in protocol base standards were not considered in this assessment. These options have no associated Sub-Volume V text to be validated. Their support or non-support is treated as information only.

## D.9.2  Inspection of Test Documents

Test Plan documents include a comprehensive list of "Features to be tested" and their associated acceptance tests. Test Plans and associated test reports have been inspected and evaluated against the ATN Validation Objectives.

## D.9.3  Experimentally Derived Data

### D.9.3.1 Analysis Exercises

### D.9.3.2 Analysis of Results

The results were analysed using a set of Excel spreadsheets. This analysis resulted in two sets of results:

1.  Summary results showing the overall compression achieved by each exercise.

2.  Convergence analysis showing the rate of convergence on the best compression ratio for each exercise.

The results could then be assessed through inspection.

# D.10  Results

## D.10.1 Coverage of ICAO Doc 9705 Sub-Volume V Third edition enhancements by implementations

The Sub-Volume V requirements, recommendations and options which have not been implemented in prototype ATN systems are summarised in the following tables. Analysis and validation assessment is also provided.

| ARL Index | Item | Description | Reference | ATN Status | Applies to |
|-----------|------|-------------|-----------|------------|------------|
|           |      |             |           |            |            |
|           |      |             |           |            |            |

Although ATN systems have been built with all the necessary functionalities to satisfy these requirements and recommendations, they have not been implemented in an actual network with ATN Islands and administrative domains.

| ARL Index | Item | Description | Reference | ATN Status | Applies to |
|---|---|---|---|---|---|
|  |  |  |  |  |  |

These recommendations apply to the future deployments of ATN systems by States and Organisations. No "implementation" is required to validate them. They are considered as validated.

| ARL Index | Item | Description | Reference | ATN Status | Applies to |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
|  |  |  |  |  |  |

These recommendations and options are under development in future releases of ATN systems.

| ARL Index | Item | Description | Reference | ATN Status | Applies to |
|---|---|---|---|---|---|
|  |  |  |  |  |  |

This feature is under development in future releases of prototype ATN systems. Future validation is planned when systems become available.

| ARL Index | Item | Description | Reference | ATN Status | Applies to |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
|  |  |  |  |  |  |

### D.10.2  Inspection of Test Documents

Inspection was carried on the following documents:

*[1]    tbd*

*[2]    tbd*

*[3]    tbd*

| AVO_*tbd* |  |
|---|---|
| AVO_tbd |  |
|  |  |
|  |  |

## D.11   Future Work

## D.12   Findings

# ATTACHMENT E — *tbd* Validation Report of ICS Enhancements Incorporated into Doc 9705 Sub-Volume V Third edition

## E.1    Initiative Reference & Title

## E.2    Type

## E.3    Responsible State/Organisation

## E.4    Contact Point

| State/Organisation | Contact Details |
|---|---|
|  |  |

## E.5    Scope and Purpose of this Report

## E.6    References

## E.7    Overview

### E.7.1    Tools

#### E.7.1.1  Prototyping

#### E.7.1.2  Simulation

### E.7.2    Documentation

## E.7.3    Results

The following is a list of the high level ATN validation objectives for the ICS enhancements incorporated in the third edition of the Doc 9705 Sub-Volume V and how they relate the *tbd* validation  efforts.  Table 1 contains a list of the AVOs, their description, and the results of the *tbd*. validation  efforts.

| AVO Number | Description | Validated By U.S. | Comments |
|---|---|---|---|
| AVO_*tbd* | | | |
| AVO_*tbd* | | | |
| AVO_*tbd* | | | |

Notes:

> *tbd*

## E.8    Conclusion