International Civil Aviation Organization (ICAO)

Aeronautical Telecommunication Network Panel (ATNP)

Report of the Third Joint Working Group Meeting (JWG/3)

1.   Introduction

1.1   The third joint meeting of ATNP Working Groups A (Applications and Implementation) and B (Communication Services) was held in Phuket, Thailand from 19 to 20 March 2002. The meeting was jointly chaired by Messrs Brian Cardwell and Jean-Yves Piram, rapporteurs of the working groups. The agenda, as approved by the meeting, is reflected in this report and a list of participants is shown in Appendix A.

2.   Organizational issues

2.1   Organizational issues relating to schedule, facilities and review of draft reports were discussed and agreed upon by the meeting.

2.2   The meeting was sad to be informed of the demise of Messrs Thomas Calow and Stephen Pearce who had actively participated in the work of the panel in the past. The meeting also noted the departure of Messrs Michael Bigelow and Paul Hennig from the panel and expressed its appreciation to them for their great contributions to the work of the panel and wished them success in their future endeavours.

3.   Update from Panel Secretary

3.1   The meeting noted the information provided by the Panel Secretary with respect to the following matters:

a) coordination with the AMCP on "Mapping of ATN network priority to mobile subnetwork priority;

b) coordination with other panels/study groups on "Stability of ATN provisions";

c) status of Doc 9705 – *Manual of Technical Provisions for the ATN*; and

d) extract from Assembly Resolution A33-14 dealing with the formulation of SARPs.

It was noted that a) would be discussed under a separate agenda item. With regards to b), the meeting was informed that pre-coordination could be expected from other technical bodies but

relevant work of operational bodies would only be communicated to the panel once they are approved by the Air Navigation Commission (ANC). Concerning c) it was noted that most identified errors had been corrected in the latest version of the document shown on the ATNP website and that the subject would be revisited under a separate agenda item. Finally, the meeting noted the part of A33-14 which calls for SARPs to consist mainly of broad, mature and stable provisions specifying system-level, functional and performance requirements. It was however noted that the status of detailed technical specifications and their importance for ensuring global interoperability would continue to be debated.

4.   Status of the Third Edition of Doc 9705

4.1   It was noted that a thorough review of the latest draft version of the Third Edition of Doc 9705 had just been undertaken and apart from a few errors in "Formal definition of messages" in Sub-volume VI (Systems Management), no other major problem had been detected. It was agreed that the errors should be corrected before publication of the document. The intention of the Secretariat to publish the document in the form of CD-ROM (in PDF format) only was also welcome by the meeting.

4.2   It was also agreed that as proposed defect reports (PDRs) should be posted on the ATNP website as they get resolved. It was noted that under the current arrangements, amendments to the document could be published, if necessary, once a year.

5.   Report of the Configuration Control Board (CCB)

5.1   The meeting was provided with a list of PDRs being processed by the CCB. It was noted that none of the PDRs warrant any further delay in the publication of the Third Edition of Doc 9705.

5.2   The outstanding PDR dealing with the mapping of priorities between ATN network layer to mobile subnetworks was reviewed and the following action item was agreed upon:

Action item 1: The Panel Secretary to forward the revised Table 3.3 of core ATN SARPs (corresponding to an identical table in Sub-volume I of Doc 9705) as shown in Appendix B to the AMCP for final coordination/joint agreement with the aim of its incorporation in Amendment 78 to Annex 10 (for applicability in November 2003).

6.   Status of the draft Second Edition of Doc 9739 – *Comprehensive ATN Manual*

6.1   It was reported to the meeting that guidance material relating to PICS/OICS and AMHS addressing scheme was yet to be fully developed for inclusion in the document. It was however agreed that all the material developed so far be considered as final and should therefore be posted on the ATNP website as soon as possible with the understanding that the remaining material, once developed and agreed at the next round of working group meetings, would be forwarded to the Panel Secretary so that the process of publication could start.

6.2   The meeting reviewed and finalized the Table of Contents and the Introduction parts of the new Part V of the draft Second Edition of the document dealing with ATN systems management, directory and security services.

7.   ATN security issues

7.1   The meeting was presented with the first draft of a "Strawman ICAO Policy on Mandate of Security Services" as shown in Appendix C. It was agreed that the draft strawman should be used as a starting point for further discussion and that the draft policy would be further evolved and forwarded to the next meeting of the panel and subsequently to the Air Navigation Commission in due course. It was understood that although a global SUNSET date (for the use of ATN services without security) could be set by ICAO (through a recommendation from the Panel), the mechanism existed for ICAO regions to mandate such dates in their respective areas.

7.2   The meeting discussed the need for the existence of a suitable mechanism for secure installation and update of the aircraft private keys and in this regard, agreed on the following:

Action item 2: The Panel Secretary to forward the communique' shown in Appendix D (which could be edited as deemed necessary by ICAO) to the Airlines Electronic Engineering Committee (AEEC) through the ICAO Secretariat; and

Action item 3: Panel members and their advisors to investigate the possibility and appropriateness of further communications with RTCA and EUROCAE on the matter.

7.3   The meeting was provided with a summary table of enhancements to existing provisions resulting from the foreseen new "confidentiality" feature being developed as part of ATN security service. The information provided was noted and considered for further work on the subject. Specifically, the impacts of new provisions on air-ground applications would be further investigated by Working Group A.

7.4   The meeting was also provided with a comprehensive list of issues/questions relating to the use of security provisions in the AMHS which had been identified by the work on the SPACE (Study and Planning of AMHS Communications in Europe) Project in Europe. It was agreed that the issues/questions raised deserve further consideration and resolution by Working Group B in close coordination with Working Group A.

8.   Issues relating to Internet Protocol Suite (IPS)

8.1   The meeting was informed about the establishment of the Internet Protocol for Aeronautical eXchange Task Force (iPAX) in August 2001 by EUROCONTROL with the aim to provide an alternative to current X.25-based network services using Transmission Control Protocol/Internet Protocol (TCP/IP).

8.2   The meeting was also presented with a list of questions relating to the possible use of commercial off the shelf (COTS) TCP/IP protocol suite (in lieu of OSI-based protocols) for in the implementation of ground-ground communications.

8.3   It was pointed out to the meeting that plans had already been developed in the ASIA/PAC Region of ICAO to implement ATN SARPs-compliant AMHS systems. It was discussed that while customized solutions could always be found to interface dissimilar implementations, the general notion of having different and non-interoperable AMHS implementations in various regions was a point of concern.

8.4   It was discussed that while it was rather early to have thorough technical discussions on the subject, the Panel would benefit from formulating a statement of position guiding its further work.

8.5   Consequently, the meeting noted the material shown in Appendix E as the draft position statement of Working Group B on the use of IP subnetworks in the context of the ATN.

9.   Current work programme of working groups

9.1   The meeting noted and agreed to the following salient work items of working groups:

Working Group A

i)   Development of guidance material on AMHS addressing; and

ii)   Preparation for accommodating potential revised operational requirements for air-ground and AIDC applications in Doc 9705.

Working Group B

i)   Development of SNDCF for IP subnetwork; and

ii)   Development of confidentiality provisions.

9.2   The meeting also discussed a wide range of topics pertaining to the development and implementation of the ATN. The apparent slow pace of implementation, unclear cost/benefit relationship (especially with regards to air-ground applications), the possibility of non-interoperable implementations, the rapid pace of change in communication technology and the limited/shrinking pool of ATN expertise were among the topics discussed. It was concluded that although it was not within the charter of the Panel to address all such issues, efforts should be made to better assist all relevant training, development and implementation activities.

10.   Schedule of future meetings

10.1   It was agreed that the current pattern of holding two round of meetings per year should be maintained and in that regard, the invitation by the French Air Navigation Directorate (DNA) to host

the next round of meetings in STNA premises in Toulouse, France in September/October 2002 was accepted with appreciation.

10.2   It was noted that the next major deliverable of the Panel would be technical specifications (for inclusion in Doc 9705) relating to confidentiality and a new SNDCF (for IP) and that such material could be forwarded to ICAO Secretariat through a meeting of the Working Group of the Whole which should be tentatively planned for the third quarter of 2003.

10.3   It was further noted that once the "Strawman ICAO Policy on Mandate of Security Services" reaches maturity, the Panel would want to make a recommendation to ICAO pertaining to the SUNSET date (for ATN without security). It was however felt that it was too early to predict a date when making such a firm recommendation should be made and therefore, no target date for the next panel meeting was identified.

11.   Any other business

11.1   The meeting was provided with information on the European Air Traffic Management Programme (EATMP) Communications Gateway (ECG) as well as an overview of the content of the data link CD-ROM which had been produced by EUROCONTROL and distributed to the participants. The information was noted with interest.

11.2   Panel members and their advisors were invited by the meeting to forward nominations for a new chairperson of Sub-group A1 (Institutional issues) to the Panel Secretary and the rapporteur of Working Group A.

11.3   Before closing, the meeting again expressed its appreciation to AEROTHAI for the excellent meeting and support facilities provided as well as the kind hospitality extended to all participants.

WG A+B Meeting Attendance

19th March 2002, Phuket, Thailand

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APPENDIX B

ATNP Communiqué to AMCP WG M
regarding the ATN CLNP Priority Mapping Table

ATNP JWG Meeting, March 2002
Phuket, Thailand

1   Background

1.1   ATNP received a communiqué from AMCP in March 2001 regarding the ATN CLNP Priority Mapping Table. This communiqué provides a response to that input.

2   Comments on Changes Requested by AMCP

2.1   The first AMCP observation (a) related to the ATNP use of the term AMSS-1. ATNP note the existence of single AMSS service and thus the inaccuracy of the reference to AMSS-1 reference. The AMSS column heading has been corrected, reference to Note 4 removed, Note 4 itself has been deleted and the subsequent notes renumbered.

2.2   The second AMCP observation (b) relates to the ATNP use of the term "restricted".
ATNP have replaced the term "restricted" with "not allowed", removed the Note that explained that term and renumbered the subsequent notes.

2.3   The third AMCP observation (c) is rather confusing but is understood to comment on the selection of 15 priority levels (0-14) in the CLNP priority table.
The ATNP does not see the need for any changes to the definition of ATN priority levels. These priority levels have previously been the subject of extensive coordination with AMCP and are already included in Annex 10.
Further, it must be understood that the defined ATN priority levels are for the ATN Internetwork, which must serve both the mobile and fixed service communications. Thus the ATN priority levels are generally a superset of the ITU defined priority levels for mobile c ommunications. It is up to the mobile subnetwork SARPs to comply with the ITU radio regulations for the use of the RF channel (i.e. to define a compliant link layer priority scheme). The ATN Internetwork (CLNP) priorities then map onto those (fewer) mobi le priorities. The ATN internetwork priority levels, as currently defined in Annex 10, are sufficient to allow use of mobile subnetworks that provide a link layer priority scheme compliant with the ITU radio regulations.

2.4   The fourth AMCP observation (d) relates to the Note associated with the VDL M4 subnetwork. The ATNP has re-written note 7 to read: VDL Mode 4 provides mobile subnetwork support for surveillance applications (e.g. ADS).

2.5   The fifth AMCP comment (e) did not request a response and so none is given.

3   Recommendation

An updated CLNP priority-mapping table is attached for information. It is red-lined against the version currently in Annex 10 and Doc 9705.

ATNP request that AMCP WG M review this table and to agree it as submitted.

Table 3-3. (In Annex 10 Volume III Chapter 3) Mapping of ATN network priority to mobile subnetwork priority

...ies	ATN network layer priority	Corresponding mobile subnetwork priority (see Note ~~5~~4)					
		AMSS ~~1~~ (~~see Note 4~~)	VDL Mode 2	VDL Mode 3	VDL Mode 4 (see Note 5)	SSR Mode S	HFDL
...s	14	14	see Note 1	3	high	high	14
...nications	13	14	see Note 1	2	high	high	14
...cations	12	14	see Note 1	2	high	high	14
...ght safety	11	11	see Note 1	2	high	high	11
...flight safety	10	11	see Note 1	2	high	high	11
	9	8	see Note 1	1	medium	low	8
	8	7	see Note 1	1	medium	low	7
...ormation	7	6	see Note 1	0	medium	low	6
...s	6	5	see Note 1	0	medium	low	5
...inistrative	5	5	~~restricted~~not allowed see Note 1	not allowed	not allowed	not allowed	~~4~~ ~~restricted~~not allowed
	4	~~not~~ ~~un~~assigned	~~not~~ ~~un~~assigned see Note 1	unassigned	unassigned	not allowed unassigned	~~not assigned~~ unassigned
...dministrative	3	3	~~restricted~~not allowed see Note 1	not allowed	not allowed	not allowed	~~3~~ ~~restricted~~not allowed
...ninistrative ...ment	2	2	~~restricted~~not allowed see Note 1	not allowed	not allowed	not allowed	~~2~~ ~~restricted~~not allowed
	1	1	restrictednot allowed see Note 1	not allowed	not allowed	not allowed	1 restrictednot allowed
...ninistrative ...and ...senger	0	0	~~restricted~~not allowed see Note 1	not allowed	not allowed	not allowed	~~0~~ ~~restricted~~not allowed

Note 1.— VDL Mode 2 has no specific subnetwork priority mechanisms.

Note 2.—. The AMSS SARPs specify mapping of message categories to subnetwork priority without explicitly referencing A... layer priority.

Note 3.— The term "not allowed" means that only communications related to safety and regularity of flight are authorized to pas... subnetwork as defined in the subnetwork SARPs.

~~Note 4. The term AMSS1 refers to the first generation aeronautical mobile satellite service.~~

Note ~~4~~5.— Only those mobile subnetworks are listed for which subnetwork SARPs exist and for which explicit support is prov... ATN boundary intermediate system (BIS) technical provisions.

~~Note 6. The term "restricted" means for this message category the use of this subnetwork may not be allowed in certain States and...~~
~~based on ITU radio frequency spectrum allocation.~~

Note 5.— The VDL Mode 4 subnetwork provides support for surveillance applications (e.g. ADS).

9

Appendix C

* * * Draft * * *

Strawman ICAO policy on mandate of Security Services

With due regard to the fact that voluntary equipage of aircraft with ATN Security Services is not expected to result in a sufficiently high ratio of equipped aircraft for real benefits to accrue at an early stage and mindful of the essential role ATN Security Services will play in the overall ATM, this ICAO Policy considers that:

- Aircraft ATN Security Services may be mandated in well defined areas/airspace volumes selected on the basis of an identified need for additional ATM capacity, covering designated aircraft operations in that airspace, on condition that:

- An appropriate independent risk analysis has been performed, showing a positive benefit for the whole ATM system; and

- The minimum airborne & ground security services are specified and agreed amongst all stakeholders prior to publication of the mandate; and

- The capability is based on ATN and functionality defined in ICAO ATN SARPS or subset(s) thereof; and

- ATN ground and airborne systems within the jurisdiction of the mandate are globally inter-operable; and

- ATS systems serving the areas/airspace volumes where aircraft ATN security services is to be mandated are enabled for use progressively, commencing not later than the publication of the mandate and achieving full capability and coverage not later than the date of the mandate; and

- A set of incentives for early aircraft ATN Security Services equipage (e.g. in the form of Service Level Agreements between aircraft operators and air traffic service providers, resulting in lower user charges for equipped aircraft) are implemented effective not later than the date of publication of the mandate; and

- The time-scale from publication to the effective date of the mandate and associated certification material is not less than 5 years; and

- Appropriate arrangements are made for those aircraft, which cannot be economically equipped, ensuring however, that such arrangements do not adversely affect equipped aircraft (e.g. unequipped aircraft may be accommodated outside of the airspace volumes defined in the mandate).

Furthermore:

- The date shall be chosen to coincide with the earliest time ATN Security Services may be considered as essential, but with due regard to the time needed by airspace users to meet the mandate in an orderly fashion.

- The mandate shall be published after having been processed via the normal route of generating new requirements, including those for certification, (e.g. ENPRM in the future in Europe) in a clear and unambiguous manner via an AIS instrument appropriate to the State(s) party to the mandate, and which carries the force of law. While an AIC may be published as the instrument of pre-notification, it is not considered as appropriate for publishing compulsory requirements.

Appendix D

Invitation to AEEC to develop specification for key management in avionics

Introduction
Over the last several years the working groups of the ATN Panel have worked on the task of development of security services for the ATN. The accomplishment of this task has been production of a set of additions (specifically a new Sub-Volume VIII and updates to several existing Sub-Volumes) as well as Guidance Material in an update. The purpose of this Communiqué is notify the AEEC of the existence of the specification and to draw attention to the need engendered by this specification for work within the AEEC.

Background on ATN SARPs
For those not familiar with the ATN SARPs, the structure is a high level entry in Annex 10 Volume III, Part I, Chapter 3 (referred to as Core) and a supporting manual (Doc 9705 – Manual of Technical Provisions for the Aeronautical Telecommunication Network). The first and second editions of 9705 contained five sub-volumes:

Sub-Volume I – Introduction and Systems Level Requirements
Sub-Volume II – Air-Ground Applications
Sub-Volume III – Ground-Ground Applications
Sub-Volume IV – Upper Layer Communications Service (ULCS)
Sub-Volume V – Internet Communications Service (ICS)

The third Edition adds four more:
Sub-Volume VI – Systems Management
Sub-Volume VII – Directory Service
Sub-Volume VIII – Security Services
Sub-Volume IX – Identifier Registration

The provisions of Sub-Volumes II through IX were developed in accordance with the systems requirements specified in Sub-Volume I.

Background on Security Services
Sub-Volume VIII contains the technical specifications for the establishment of security in the ATN. The requirements and recommendations contained in this Sub-Volume are standards based and optimized for the specific environment of the ATN. The higher level requirements (i.e. Core and SV-1) establish the need for security and set the overall ATN security policy. Sub-Volume VIII defines the means and methods of meeting the policy.

The solution defined in Sub-Volume VIII includes mechanisms to provide security for application and routing related communications within the ATN. The mechanisms employed use public-key cryptography and their operation requires the support of a Public Key Infrastructure (PKI) to distribute the public keys of ATN entities.

Sub-Volume VIII contains the requirements for the establishment and operation of the ATN Public Key Infrastructure including certificate policy and certificate practice statements, Certificate Authority support system capabilities, format and content for ATN certificates and Certificate Revocation Lists (by way of an ASN.1 module for certificates and CRLs). Another, and critical component of the Sub-Volume, is the specification of the ATN cryptographic infrastructure including the ATN cryptographic setting, the ATN key agreement scheme, and the ATN signature schemes. Finally the Sub-Volume specifies the operation of the mechanisms by the ATN applications and communications services to accomplish security within the ATN.

Additional information on the specifics of the ATN Security Services can be had from Sub-Volume VIII of 9705 or from the accompanying guidance material to Doc 9739 – Comprehensive ATN Manual.

Issue

The ATN SARPs are of necessity requirements oriented documents. They are directed toward what must be done and specifically restrained from addressing how it is to be implemented. As a result the specification of security services based on a Public Key Infrastructure sets the requirement for generation and installation of public-private key pairs. Since one of the entities that participates in the exchanges secured by these keys is the aircraft, some method for secure installation (and update) of the aircraft private key as well as the public keys of certain other entities in the avionics must be provided.

Specification of this sort is outside the purview of the ATN Panel but is within the charter of the AEEC.

Request

Accordingly, AEEC is invited to consider adding a work item to an existing subcommittee or if deemed necessary forming a new subcommittee to develop the form, fit, and function specification(s) for key management in avionics.

Draft Position Statement of ATNP WG B on the use of IP Subnetworks as part of the ATN

Considerations

1. The ATN was designed to embrace all air-ground and ground-ground communications technologies. IP subnetworks can and should be available for use by the ATN.

2. Non-ICAO Air-Ground networks are being developed that use IP for non-safety airborne applications. Where the Quality of Service provided is acceptable for ATC Applications, such networks could be useable as part of the ATN.

3. The ICAO specification for the ATN uses OSI protocols, specifically CLNP and TP4, to support internetworking and reliable end-to-end connection mode communications. ICAO Applications and Upper Layers Communications Services including Security Services depend upon the availability of TP4. There has been considerable industry investment, of both resources and time, in these protocols, including the development and validation of the ICAO specification and the development and certification of ATN compliant products to ensure that they meet the safety, mobility and QoS requirements of the ATN applications.

4. TCP/IP communications protocols although functionally similar cannot replace the OSI protocols specified by ICAO without a similar level of investment in time and effort to produce certified products. Off the shelf implementations are not acceptable as they neither include additional features deemed necessary for ATC use nor have they been developed using the lifecycles and methodologies appropriate for certifiable software.

5. The ATN Mobile Routing strategy permits mobile platforms to :

- act as a subnetwork and receive incoming connections on well known and statically assigned network addresses, and to make outgoing connections to ground systems;
- seamlessly move between different mobile networks without disrupting end-to-end communications;
- simultaneously use more than one mobile network; and
- support Policy Based Routing Decisions in order to choose between alternative routes to the same destination.

    Mobile IP strategies are directed to the support of single systems and support only the first two of the above functionalities. Mobile IP also introduces a special point into the network (the Home Agent) and has issues associated with a potential single point of failure, inefficient routing due to the necessity of routing through a Home Agent, and security due to apparent "spoofing" by a mobile system.

Conclusions:

It is appropriate, on both economic and technical grounds, to continue the use of CLNP and TP4 as the ATN core protocols whilst developing specifications to enable the use of IP subnetworks as ATN subnetworks for both ground-ground and air-ground use, where there is industry demand.

1. ATNP WGB SG1 will develop SARPs to permit the use of ground-ground IP subnetworks as ATN subnetworks for both BIS to BIS and within local domains.

2. Should demand ever develop, ATNP WGB SG1 could develop SARPs to enable the use of Air-Ground IP subnetworks for Airborne Router to Air-Ground Router interconnections.

In order to achieve the above, ATNP WGB SG-1 will develop SARPs and Guidance Material for an IP SNDCF to support the encapsulation of CLNP packets for their transit across an IP subnetwork. An IP subnetwork will have to meet the existing performance requirements that the ATN Technical Provisions already define. There is no intention that the public "Internet" should be used as an ATN subnetwork; the SARPs will apply to private IP subnetworks only.

- end -