AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL

Working Group 2

Alexandria, Virginia, USA

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Review of Transport APRL

(WG 2 Action 9/1)

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SUMMARY

This paper compiles a number of defects which have been identified when reviewing the Transport APRL (Chapter 5.5) of Version 6.0 of the Draft Internet Communications Service SARPs. A change proposal and replacement text is provided for each identified problem.

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1. BACKGROUND

At the Editorial Review Meeting of the ATN Internet Communications Service Draft SARPs held in Toulouse, 3-7 June 1996, the need to review all references to ISO standards in the APRLs of Chapter 5.5 was identified and reported to the WG2 meeting in Munich, 24-28 June 1996. At this meeting, WG2 accepted the recommendation of the Editorial Review Group and defined action 9/1: "Check ISO Standard References in the ATN Internet Communications Service Draft SARPs Transport APRLs". DFS agreed to complete this action until the next WG2 meeting.

2. SCOPE

A review of the APRLs contained in Chapter 5.5 (Transport Service and Protocol Specification) of the ATN Internet Communications Service Draft SARPs (Version 6.0) has been performed with respect to the correctness and completeness of the references to the relevant ISO base standards.

The relevant ISO base standards which have been used in this review were:

❐ ISO/IEC 8073, Third Edition, 15 Dec 1992
❐ ISO/IEC 8602, Second Edition, 1 April 1995.

During the review a number of editorial defects in the APRLs were identified for which appropriate replacement/amendment text is offered in the following section.

3. RESULTS

3.1 REVIEW OF ATN CONNECTION MODE TRANSPORT APRL

Four wrong references to ISO/IEC 8073 subclauses have been identified in Chapter 5.5. These are listed in the following table.

Subvolume 5 Section No	APRL Index	APRL Text	Current ISO/IEC 8073 Reference	Correct ISO/IEC 8073 Reference
5.5.2.7.1.4.1.3	T4F31	Retention and acknowledgement of TPDUs Use of selective acknowledgement	6.13.4.3	6.13.4.4
5.5.2.7.1.4.1.3	T4F32	Retention and acknowledgement of TPDUs Use of request acknowledgement	6.13.4.2	6.13.4.3
5.5.2.7.1.11.1	PE4L	Class 4 over CLNS	6.22.2	6.22.2.3
5.5.2.7.1.11.2	RR6	On receipt of the class option...	13.3.3 h)	13.3.3

Table 3.1-1: Compilation of existing and correct reference to ISO/IEC 8073 subclauses

Several deviations in the entries for the subclause reference column in ISO/IEC 8073 and the ISO/IEC 8073 Reference column in the ATN Internet Communications Service Draft SARPs have been identified. It has been verified that all identified deviations are due to errors in the ISO/IEC 8073 PICS proforma, i.e. the ISO/IEC 8073 Reference column in the ATN Internet Communications Service Draft SARPs references the correct text section of ISO/IEC 8073 in all these cases.

Several editorial defects and inconsistencies have been identified in the Transport APRLs of the ATN Internet Communications Service Draft SARPs. An updated Connection Mode Transport APRL which corrects these defects and inconsistencies and also includes the corrected references to ISO/IEC 8073 subclauses (as listed in the above table) has been prepared using revision marks to clearly highlight any modifications. This updated APRL is reproduced in the following and is offered as replacement for the existing Connection Mode Transport APRLs in Version 6.0 of the ATN Internet Communications Service Draft SARPs.

Protocol Implementation

Classes Implemented

Index	Class	ISO/IEC 8073 References	ISO Status	ATN Support
C0	Class 0	14.2	O.1	O
C1	Class 1	14.4	C0:O	O
C2	Class 2	14.2	O.1	O
C3	Class 3	14.3	C2:O	O
C4	Class 4 operation over CONS	14.3	C2:O	O
C4L	Class 4 operation over CLNS	14.3	C2:O	M

Specific ATN Requirements

Index	Feature	SARPs Reference	ATN Support
ATN1	Support of Congestion Avoidance Procedures?	5.5.2.5	M
ATN2	Transport to Network Priority Mapping?	5.5.2.6.1.4.2	M
ATN3	Support of ATN Security Label?	5.5.2.6.1.4.3	M
ATN4	Timer Settings on a per Transport Connection basis?	5.5.2.2.12	O
ATN5	Enhanced encoding of Acknowledgment Time Parameter?	5.5.2.4.2	M

Initiator/Responder Capability for Protocol Classes 0-4

Index		ISO/IEC 8073 References	ISO Status	ATN Support
IR1	Initiating CR TPDU	14.5 a)	O.2	M
IR2	Responding to CR TPDU	14.5 a)	O.2	M

Supported Functions

Supported Functions for Class 4 (C4 or C4L::)

Mandatory Functions for Class 4

Index	Function	ISO/IEC 8073 References	ISO Status	ATN Support
T4F1	TPDU transfer	6.2	M	M
T4F2	Segmenting	6.3	M	M
T4F3	Reassembling	6.3	M	M
T4F4	Separation	6.4	M	M
T4F5	Connection establishment	6.5	M	M
T4F6	Connection refusal	6.6	M	M
T4F7	Data TPDU numbering (normal)	6.10	M	M
T4F8	Retention and acknowledgement of TPDUs (AK)	6.13.4.1	M	M
T4F9	Explicit flow control	6.16	M	M
T4F10	Checksum	6.17	M	M
T4F11	Frozen references	6.18	M	M
T4F12	Retransmission on time-out	6.19	M	M
T4F13	Resequencing	6.20	M	M
T4F14	Inactivity control	6.21	M	M

Mandatory Functions for Operation over Connectionless Network Service

Index	Function	ISO/IEC 8073 References	ISO Status	ATN Support
T4F23	Transmission over CLNS	6.1.2	M	M
T4F24	Normal release when operating over CLNS (explicit)	6.7.2	M	M
T4F25	Association of TPDUs with transport connections when operating over CLNS	6.9.2	M	M
T4F26	Expedited data transfer when operating over CLNS (Network normal)	6.11.2	M	M
T4F27	Treatment of protocol errors when operating over CLNS	6.22.2	M	M

ISO/IEC 8073 Optional Functions

Index	Feature	ISO/IEC 8073 References	ISO Status	ATN Support
T4F28	Data TPDU numbering (extended)	6.10	O	O
T4F29	Non-use of checksum	6.17	O	M
T4F30	Concatenation	6.4	O	O
T4F31	Retention and acknowledgement of TPDUs Use of selective acknowledgement	6.13.4.34	O	O
T4F32	Retention and acknowledgement of TPDUs Use of request acknowledgement	6.13.4.23	O	O

Supported TPDUs

Index	TPDUs		ISO/IEC 8073 References	ISO Status	ATN Support
ST1	CR	supported on transmission	13.1	IR1:M	M
ST2	CR	supported on receipt	13.1	IR2:M	M
ST3	CC	supported on transmission	13.1	IR2:M	M
ST4	CC	supported on receipt	13.1	IR1:M	M
ST5	DR	supported on transmission	13.1	IR2:M	M
ST6	DR	supported on receipt	13.1	IR1:M	M
ST7	DC	supported on transmission	13.1	C4L:M	M
ST8	DC	supported on receipt	13.1	C4L:M	M
ST9	DT	supported on transmission	13.1	M	M
ST10	DT	supported on receipt	13.1	M	M
ST11	ED	supported on transmission	13.1	C4L:M	MO
ST12	ED	supported on receipt	13.1	C4L:M	MO
ST13	AK	supported on transmission	13.1	C4L:M	M
ST14	AK	supported on receipt	13.1	C4L:M	M

ST15	EA	supported on transmission	13.1	C4L:M	MO
ST16	EA	supported on receipt	13.1	C4L:M	MO
ST19	ER	supported on receipt	13.1	M	M

Note.— The following table states for which classes, if any, ER TPDU is supported on transmission:

Index	Class	ISO/IEC 8073 References	ISO Status	ATN Support
SER4L	ER support on transmission of Class 4 over CLNS	6.22.2	O	O

Supported Parameters of Issued TPDUs

Parameter Values for CR TPDU (C4L::)

Index	feature	ISO/IEC 8073 Reference	ISO Status	ATN Support
ICR1	Bits 8 ~~to~~ and 7 in the additional options selection parameter of a CR TPDU set to zero?	13.3.4 g)	M	M

If the preferred class in the CR is 2,3 or 4:

Index	feature	ISO/IEC 8073 Reference	ISO Status	ATN Support
ICR2	Is class 0 always offered as an alternative class?	14.4	O	X

Supported parameters for Class 4 TPDUs (C4L::)

Optional Parameters for a Connection Request TPDU

Index	Supported parameters	ISO/IEC 8073 References	ISO Status	ATN Support
I4CR7	Called Transport-Selector	13.3.4 a)	O	M
I4CR8	Calling Transport-Selector	13.3.4 a)	O	M
I4CR9	TPDU size	13.3.4 b)	O	O
I4CR10	Version Number	13.3.4 d)	O	O
I4CR11	Protection parameters	13.3.4 e)	O	O
I4CR12	Additional option selection	13.3.4 g)	O	M
I4CR13	Throughput	13.3.4 k)	O	O
I4CR14	Residual error rate	13.3.4 m)	O	O
I4CR15	Priority	13.3.4 n)	O	M
I4CR16	Transit delay	13.3.4 p)	O	O
I4CR17	Acknowledgement time	13.3.4 j)	O	M
I4CR18	Preferred maximum TPDU size	13.3.4 c)	O	O
I4CR19	Inactivity timer	13.3.4 r)	O	M

Optional Parameters for a Connection Confirm TPDU

Note. — According to ISO, the following parameters are optional if a CC TPDU is issued in class 4:

Index	Supported parameters	ISO/IEC 8073 References	ISO Status	ATN Support
I4CC6	Called Transport-Selector	13.4.4	O	M
I4CC7	Calling Transport-Selector	13.4.4	O	M
I4CC8	TPDU size	13.4.4	O	O
I4CC9	Protection parameters	13.4.4	O	O
I4CC10	Additional option selection	13.4.4	O	M
I4CC11	Acknowledgement time	13.4.4	O	M
I4CC12	Throughput	13.4.4	O	O

I4CC13	Residual error rate	13.4.4	O	O
I4CC14	Priority	13.4.4	O	M
I4CC15	Transit delay	13.4.4	O	O
I4CC16	Preferred maximum TPDU size	13.4.4	I4CR18:O	O
I4CC17	Inactivity timer	13.4.4	O	M

Note.— The support of T4F26 implies that the Additional Options Selection parameter is mandatory.

Optional Parameter for a Disconnect Request TPDU

Index	Supported parameter	ISO/IEC 8073 References	ISO Status	ATN Support
I4DR4	Additional information	13.5.4 a)	O	O

Mandatory Parameter for a Data TPDU

Note.— According to ISO, the following parameter is mandatory in a DT TPDU if request of acknowledgement has been selected.

Index	Supported parameter	ISO/IEC 8073 References	ISO Status	ATN Support
I4DT4	~~ROA~~Request of acknowledgement	13.7.3 b)	T4F32:M	T4F32:M

Optional Parameter for an Acknowledgement TPDU

Note.— According to ISO, an AK TPDU containing flow control information will be transmitted if an AK TPDU is received under the conditions specified in ISO/IEC 8073 12.2.3.9. The following parameter is mandatory for ATN compliant systems if an AK TPDU is issued in Class 4.

Index	Supported parameter	ISO/IEC 8073 References	ISO Status	ATN Support
I4AK4	Flow control confirmation	13.9.4 c)	O	M

Use of the Subsequence Number Parameter in the Acknowledgement TPDU

Note.— According to ISO, if an implementation can reduce credit and does so in the manner outlined in ISO/IEC 8073 12.2.3.8.2 then the subsequence number in AK TPDU is mandatory.

Index	Supported parameters	ISO/IEC 8073 References	ISO Status	ATN Support
I4AK5	Subsequence number	13.9.4. b)	O	M

Use of the Selective Acknowledgement Parameter in the Acknowledgement TPDU

Note.— According to ISO, the following parameter is optional in an AK TPDU if selective acknowledgement has been negotiated.

Index	Supported parameter	ISO/IEC 8073 References	ISO Status	ATN Support

I4AK6	Selective acknowledgement parameters	13.9.4. d)	T4F31:O	T4F31:O

Optional Parameters for an Error TPDU

Index	Supported parameter	ISO/IEC 8073 References	ISO Status	ATN Support
I4ER3	Invalid TPDU	13.12.4 a)	O	O

Supported parameters for received TPDUs

Note.— ISO/IEC 8073 requires implementations to be capable of receiving and processing all possible parameters for all possible TPDUs, depending upon the class and optional functions implemented.

TPDUs in Class 4 (C4L::)

Note.— According to ISO, if use of checksum has been selected then it is mandatory to process a checksum parameter in the following TPDUs.

Index	TPDU	ISO/IEC 8073 References	ISO Status	ATN Support
R4CCch	CC TPDU	13.4.4	M	M
R4DRch	DR TPDU	13.5.4 b)	M	M
R4DCch	DC TPDU	13.6.4	M	M
R4DTch	DT TPDU	13.7.4	M	M
R4EDch	ED TPDU	13.8.4	M	M
R4AKch	AK TPDU	13.9.4 a)	M	M
R4EAch	EA TPDU	13.10.4	M	M
R4ERch	ER TPDU	13.12.4 b)	M	M

User Data in Issued TPDUs

Class 4 (C4 or C4L::)

Index	User Data	ISO/IEC 8073 References	ISO Status	ATN Support
D4ICR	User data of up to 32 octets in a CR with preferred class 4 ?	13.3.5	M	M
D4ICC	User data of up to 32 octets in a CC ?	13.4.5	M	M
D4IDR	User data of up to 64 octets in a DR ?	13.5.5	M	M

User Data in Received TPDUs

Index	User Data	ISO/IEC 8073 References	ISO Status	ATN Support
DRCC	32 octets of user data in a CC TPDU ?	13.4.5	IR1:M	IR1:M
DRDR	64 octets of user data in a DR TPDU ?	13.5.5	IR1:M	IR1:M
DRCR	32 octets of user data in a CR TPDU ?	13.3.5	IR2:M	IR2:M

Negotiation

Note.— If an option is not returned in the CC, it is considered to have been refused. This allows compatible negotiation between versions of the ISO/IEC 8073 transport protocol.

Class Negotiation - Initiator

Index	Feature	ISO/IEC 8073 References	ATN Supported Value
NC	The preferred class in the CR TPDU may contain any of the classes supported by the implementation	6.5.5 j)	Class 4

Note 1.— Negotiation of other protocol classes is out of scope. If this is the only profile supported then it is not possible to negotiate any other protocol class.

Note 2.— The table below specifies valid alternative classes.

Index	Preferred class	ISO/IEC 8073 References	ISO Allowed Vvalues	ATN Supported Vvalues
NAC5	Class 4 over CLNS	6.5.5 j)	None	None

Note 3.— The class cannot be negotiated since Class 4 is the only class allowed over CLNS.

Class negotiation - responder side

Index	Preferred class	ISO/IEC 8073 References	ISO Allowed Rresponses	ATN Supported Vvalues
RC4	What classes can you respond with if CR proposes only class 4?	6.5.4 j) Table 3	2,4 or connection refused depending on classes supported	Class 4

RC4a	What classes can you respond with if CR proposes class 4 as preferred class and the alternative class parameter is present?	6.5.4 j) Table 3	0,1,2,3,4 or connection refused depending on classes supported and coding of alternative class	Class 4

Note.— This table does not preclude connection refusal for other reasons.

TPDU Size Negotiation

Index	TPDU size	ISO/IEC 8073 References	ISO Status	ATN Support
TS1	If maximum TPDU size is proposed in a CR TPDU then the initiator shall support all TPDU sizes from 128 octets to the maximum proposed~~, as defined in ISO 8073~~	14.6 e)	I4CR9:M	I4CR9:M
TS2	If the preferred maximum TPDU size parameter is used in a CR TPDU then the initiator shall support all TPDU sizes, except 0, that are multiples of 128 octets up to the preferred maximum proposed	14.6 e)	I4CR18:M	I4CR18:M

Index	TPDU size	ISO/IEC 8073 References	ISO Allowed V~~v~~alues	ATN Supported V~~v~~alues
TS3	What is the largest value of the preferred maximum TPDU size parameter in a CR TPDU?	14.6 e)	any multiple of 128 octets	any multiple of 128 octets
TS4	What is the largest value of the preferred maximum TPDU size parameter in a CC TPDU?	14.6 e)	any multiple of 128 octets	any multiple of 128 octets

Note.— An implementation of the Transport Layer can support a preferred maximum TPDU size larger than 1024 octets.

Index	TPDU size	ISO/IEC 8073 References	ISO Allowed Values	ATN Supported Values
T4S1	What is the largest value of the maximum TPDU size parameter in a CR TPDU with preferred class 4?	14.6 e)	One of 128, 256, 512, 1024, 2048, 4096, 8192	One of 128, 256, 512, 1024, 2048, 4096, 8192

T4S2	What is the largest value of the maximum TPDU size parameter which may be sent in the CC TPDU when class 4 is selected?	14.6 e)	128, 256, 512, 1024, 2048, 4096, 8192	128, 256, 512, 1024, 2048, 4096, 8192

Use of Extended Format.

Index	Extended format	ISO/IEC 8073 References	ISO Allowed Values	ATN Supported Value
NEF3	What formats can you propose in the CR TPDU in class 4?	6.5.5 n)	normal, extended	normal,extended
NEF6	What formats can you select in CC when extended has been proposed in CR in class 4?	6.5.5 n)	normal, extended	normal,extended

Note.— This table does not preclude proposal of the extended format.

Expedited data Transport service

Index	Expedited data	ISO/IEC 8073 References	ISO Status	ATN Supported values
TED1	Is the expedited data indication supported in CR and CC TPDU?	6.5.5 r)	M	MO

Note.— Expedited data is proposed using the Additional Options Parameters in the CR and CC TPDUs.

Non-use of Checksum (C4L and T4F29::)

Index	Non-use of checksum	ISO/IEC 8073 References	ISO Allowed Values	ATN Supported Values
NUC1	What proposals can you make in the CR?	6.5.5 p)	non-use, use	non-use, use
NUC2	What proposals can you make in CC when non-use of checksum has been proposed in CR?	6.5.5 p)	non-use, use	non-use, use

Note 1.— A Transport Layer is able to propose either use or non-use of checksum in a CR TPDU.

Note 2.— The term "non-use" means that the Transport Layer may respond accepting non-use of checksum. A Transport Layer may also respond with use of checksum if non-use has been proposed.

Use of selective acknowledgement

Index	Selective Acknowledgement	ISO/IEC 8073 References	ISO Status	ATN Support

USA1	Is use of selective acknowledgement proposed in CR TPDUs ?	6.5.5 s)	O	O
USA2	Is use of selective acknowledgement selected in a CC when it has been proposed in a CR ?	6.5.5 s)	O	O

Use of Request Acknowledgement

Index	Request of Acknowledgement	ISO/IEC 8073 References	ISO Status	ATN Support
ROA1	Is use of request of acknowledgement proposed in CR TPDUs ?	6.5.5 t)	O	O
ROA2	Is use of request of acknowledgement selected in a CC when it has been proposed in a CR ?	6.5.5 t)	O	O

Error Handling

Note.— Using Class 4 over CLNS, a TPDU with an invalid checksum will be discarded.

Action on Detection of a Protocol Error

Index	Item	ISO/IEC 8073 References	ISO Allowed Values	ATN Supported Values
PE4L	Class 4 over CLNS	6.22.2.3	C4L: ER, DR, Discard	C4L: ER, DR, Discard

Note.— The choice of action (DR, Discard) is an implementation choice and may depend on the type of error encountered.

Actions on receipt of an invalid or undefined parameter in a CR TPDU

Index	Event	ISO/IEC 8073 References	ISO Status	ATN Support
RR1	A parameter not defined in ISO/IEC 8073 shall be ignored	13.2.3	M	M
RR2	An invalid value in the alternative protocol class parameter shall be treated as a protocol error	13.2.3	M	M
RR3	An invalid value in the class and option parameter shall be treated as a protocol error	13.2.3	M	M

RR4	On receipt of the additional option selection parameter bits 8 to 7, and bits 6 to 1 if not meaningful for the proposed class, shall be ignored	13.3.4 g)	M	M
RR6	On receipt of the class option parameter bits 4 to 1 if not meaningful for the proposed class shall be ignored	13.3.3 h)	M	M

Index	**Event**	**ISO/IEC 8073 References**	**ISO Allowed Value**	**ATN Supported Value**
RR7	What action is supported on receipt of aA parameter defined in ISO 8073 (other than those covered above) and having an invalid value ?	13.2.3	Ignore, Protocol Error	Ignore, Protocol Error

 Note.— The choice of action (Ignore, Protocol error) is an implementation choice and may depend on the type of error encountered.

Actions on receipt of an invalid or undefined parameter in a TPDU other than a CR TPDU

Index	**Event**	**ISO/IEC 8073 References**	**ISO Status**	**ATN Support**
U11	A parameter not defined in ISO/IEC 8073 shall be treated as a protocol error	13.2.3	M	M
U12	A parameter which has an invalid value as defined in ISO/IEC 8073 shall be treated as a protocol error	13.2.3	M	M
U13 (class 4 only)	A TPDU received with a checksum which does not satisfy the defined formula shall be discarded	6.17.3	M	M

Class 4 Timers and Protocol Parameters

Index		ISO/IEC 8073 References	ISO Status	ATN Support
TA1	T1 (Local Retransmission)	12.2.1.1.4	M	M
TA2	N (Maximum Transmission)	12.2.1	M	M
TA3	I_L (Local Inactivity Time)	12.2.1.1.7	M	M
TA4	W (Window Update)	12.2.1	M	M
TA5	L (Frozen Reference Time)	12.2.1.1.6	M	M

Index		ISO/IEC 8073 References	ISO Status	ATN Support
ATN-TA1	R (Persistence)	12.2.1.1.5	O	O
ATN-TA2	M_{LR} (NSDU Lifetime)	12.2.1.1.1	O	O
ATN-TA3	M_{RL} (NSDU Lifetime)	12.2.1.1.1	O	O
ATN-TA4	E_{LR} (Maximum Transit~~mission~~ Delay)	12.2.1.1.2	O	O
ATN-TA5	E_{RL} (Maximum Transit~~mission~~ Delay)	12.2.1.1.2	O	O
ATN-TA6	A_L (Acknowledgement Time)	12.2.1.1.3	O	M
ATN-TA7	A_R (Acknowledgement Time)	12.2.1.1.3	O	M
ATN-TA8	I_R (Remote Inactivity Time)	12.2.1.1.7	O	M

Note. — According to ISO, the following applies to an implementation under test (IUT):

Index		ISO/IEC 8073 References	ISO Status	ATN Support
OT9	Does IUT support optional timer TS2 when operating in class 4?	6.22.2.3	O	O

3.2   REVIEW OF ATN CONNECTIONLESS MODE TRANSPORT APRL

All subclause references to the ISO/IEC 8602 standard text are correctly reproduced in the ATN Internet Communications Service Draft SARPs.

One wrong entry in the ISO Support column of the ATN Internet Communications Service Draft SARPs has been identified for the item "TpTu". The current entry is "O"; the corresponding entry in ISO/IEC 8602 is "M". The current entry in the ATN Internet Communications Service Draft SARPs should be changed to "M".

The entry "UD2" in the Item column of the ATN Internet Communications Service Draft SARPs is not compliant with the corresponding entry in the ISO/IEC 8602:1995 PICS Proforma. The corresponding entry in the ISO/IEC 8602:1995 PICS Proforma is "UD2AM" and has been changed from the ISO 8602:1987/ DAM 1 PICS Proforma. It is proposed to modify the entry "UD2" to "UD2AM" in the Item column of the ATN Internet Communications Service Draft SARPs.

4.   RECOMMENDATION

WG 2 is invited to review the proposed changes and to approve the following amendments of the ATN Internet Communications Service Draft SARPs along the recommendation of the WG2 Change Control Board (CCB):

❒   modify in the Connection Mode Transport APRLs of the ATN Internet Communications Service Draft SARPs the ISO/IEC 8073 references as listed in Table 3.1-1;
❒   adopt the editorial changes of the Connection Mode Transport APRLs as proposed in section 3.1;
❒   change the ISO Status entry for the Item "TpTu" from "O" to "M" in the Connectionless Mode Transport APRLs;
❒   change the entry "UD2" to "UD2AM" in the Item column of the Connectionless Mode Transport APRLs.

Furthermore, WG2 is requested to ensure the update of the Draft Internet Communications Service SARPs to incorporate the above amendments prior to ATNP/2 through appropriate liasion with the ICAO Secretariat.