# COMMUNICATIONS PANEL (CP)

# TWENTY-EIGHTH MEETING OF WORKING GROUP I (WG-I)
## (Internetworking)

**Montreal, QC Canada  22-24 May 2019**

**Agenda Item 7.12: Consideration of Transition Aspects from Existing/Legacy Systems**

### Proposed Changes to ICAO Doc. 9896 to support Adaptation of ACARS-based Applications using the Internet Protocol Suite Dialog Service (IPSDS)

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| SUMMARY |
|---|
| This working paper proposes changes to ICAO Doc. 9896 technical provisions to support adaptation of existing ACARS-based applications, e.g., FANS1/A application set, using the IPS Dialog Service. |
| **ACTION** |
| The WG-I is invited to consider and discuss the proposal as a precursor to preparation of an amendment proposal for incorporating the proposed changes into the next edition of ICAO Doc. 9896. |

1.      **INTRODUCTION**

1.1          During the transition to the Aeronautical Telecommunication Network (ATN) over the Internet Protocol Suite (IPS), a means to accommodate aircraft and ground systems using the FANS-1/A application set is needed.  During WG-I/26, the WG-I participants agreed that Job Card CP-DCIWG.006,

*Provisions on the exchange of information using the Aeronautical Telecommunication Network over the Internet Protocol Suite*, was sufficiently broad to cover FANS accommodation.

1.2        This working paper proposes changes to ICAO Doc. 9896 technical provisions to support adaptation of existing ACARS-based applications, including the FANS1/A application set, using the IPS Dialog Service.

2.        **DISCUSSION**

2.1        ICAO Doc. 9896 specifies an IPS Dialog Service that allows existing ATN applications to make use of the ATN/IPS with minimal impact on the applications themselves.  The technical provisions specify an encapsulation format (called ATNPKT) that permits application parameters and service primitives to be carried in the data part of the transport protocol.

2.2        The ATNPKT format includes an application technology type parameter that identifies the type of application information that is encapsulated.  ICAO Doc. 9896 currently specifies a value of b011 to indicate "FANS/IPS DS."

2.3        Attachment 1 in this paper presents relevant excerpts (shown as black text) from ICAO Doc. 9896 and proposed modifications (shown as ~~deletion/replacement~~ and insertion) that add:

- Provisions for IPS accommodation of ACARS-based applications, including but not limited to the FANS1/A application set;

- References to ARINC Specification 858 (in development by SAE/ITC AEEC), which will specify technical provisions for an ACARS to IPS DS Convergence Function (ACF) that maps the contents of ACARS messages to the ATNPKT format.

- Transport layer port numbers to support ACARS-based applications.

  o Note: Specification of additional port numbers may be necessary to support other IPS applications; however, the scope of this working paper focuses on proposed changes for accommodation of ACARS-based applications.

2.4        To provide additional context for the proposed changes, Attachment 2 in this paper provides a brief overview of the ACARS to IPS DS Convergence Function (ACF) that will be specified in ARINC Specification 858.

3.        **ACTION BY THE MEETING**

3.1        The CP WG-I is invited to:

3.2        Consider and discuss the proposed changes in Attachment 1 as a precursor to preparation of an amendment proposal for incorporating the proposed changes into the next edition of ICAO Doc. 9896.

**ATTACHMENT 1**
**PROPOSED CHANGES TO ICAO DOC. 9896 TO ACCOMMODATE**
**ACARS-BASED AIR-GROUND APPLICATIONS**

**PART II – Internet Protocol Suite (IPS) Applications**

**1.3    AIR-GROUND DATA APPLICATIONS**

**Dialogue Service**

1.3.1        The dialogue service (DS), as documented in Doc 9880, Part III, edition 2010 serves as an interface between the ATN applications and the ATN/OSI upper layer protocols via the control function. In order to minimize the impact on the ATN applications, a new dialogue service was developed to support application implementation over the ATN/IPS. This section specifies a replacement for the ATN/OSI DS interface to the upper layers, and is named the IPS DS.

*Note.— The IPS DS also supports adaptation of existing air-ground ACARS-based applications to the IPS infrastructure, examples of which include: FANS1/A AFN, CPDLC, and ADS-C as documented in ARINC Specification 622, EUROCAE ED-100A, and RTCA DO-258A; character-oriented ATS as documented in ARINC Specification 623; and Aeronautical Operational Control (AOC) as documented in ARINC Specification 620 and other applicable standards that employ the ACARS format.*

1.3.4        The aeronautical telecommunication network packet (ATNPKT) header format defined in 1.3.11 to 1.3.15 describes a dedicated format designed to accommodate the passing of ATN application data over the ATN/IPS. Either TCP or UDP may be used with the ATNPKT header format.

*Note.— The ATNPKT header format also specifies the means to accommodate ACARS-based applications.  Detailed specification of the ACARS to IPS DS Convergence Function, which maps the contents of ACARS messages to the ATNPKT header format fields, is documented in ARINC Specification 858.*

*DS primitive*

*Note.— The DS primitive field is set by the DS-provider to indicate the type of DS primitive in the packet.*

1.3.18        The DS primitive field shall take one of the values specified below and have a format of 4 bits / internal / mandatory:

| Value | Assigned DS primitive |
|-------|----------------------|
| 1 | D-START |
| 2 | D-START cnf |
| 3 | D-END |
| 4 | D-END cnf |
| 5 | D-DATA |
| 6 | D-ABORT |
| 7 | D-UNIT-DATA |
| 8 | D-ACK |
| 9 | D-KEEPALIVE |

*Note 1.— Reserving 4 bits will give provision for up to 16 protocol elements, allowing up to 7 additional primitives to be defined.*

*Note 2.— The D-P-ABORT is not listed, as it is not sent end-to-end. Upon receipt of an abnormal event or expiration of an inactivity timer, a D-P-ABORT will be indicated to the DS-user.*

*Note 3.— For ACARS-based applications, the subset of DS primitive values utilized is per the ACARS*

*to IPS DS Convergence Function documented in ARINC Specification 858.*
*Application technology type*

> *Note.— The application technology type identifies the type of application information that is being carried. Other applications may also take advantage of the IPS infrastructure, e.g. ACARS ATS (FANS-1/A, ARINC 623), ACARS AOC, etc.*

1.3.19          The application technology type shall be set to a value of b000 to indicate "ATN/IPS DS" and have a format of 3 bits / internal / mandatory.

1.3.20          The application technology type shall be set to a value of b011 to indicate "~~FANS~~ACARS ATS/IPS DS" and have a format of 3 bits / internal / mandatory.

1.3.20A          The application technology type shall be set to a value of b101 to indicate "ACARS AOC/IPS DS" and have a format of 3 bits / internal / mandatory.

> *Note.— The use or definition of other values is outside the scope of this manual.*

*Called peer ID*

> *Note.— The called peer ID identifies the intended peer DS-user.*

1.3.32          The called peer ID shall be either a 24-bit ICAO aircraft identifier or a 3–8 character ICAO facility designation and have the format 24 to 64 bits / external / optional.

> *Note.— For ACARS-based applications, the content of the called peer ID is per the ACARS to IPS DS Convergence Function documented in ARINC Specification 858.*

*Calling peer ID*

> *Note.— The calling peer ID identifies the initiating peer DS-user.*

1.3.33          The calling peer ID shall be either a 24-bit ICAO aircraft identifier or a 3–8 character ICAO facility designation and have the format 24 to 64 bits / external / optional.

> *Note.— For ACARS-based applications, the content of the calling peer ID is per the ACARS to IPS DS Convergence Function documented in ARINC Specification 858.*

*Content version*

> *Note.— The content version field is used to indicate the application's version number. This field is not used for ACARS-based applications.*

1.3.34          The content version shall be the version of the ASN.1 syntax used for the user data field and have the format 8 bits / external / optional.

**IPS DS parameter mapping**

1.3.41          The inclusion of optional ATNPKT parameters for each DS protocol message shall comply with Table II-1-6.

> *Note.— For ACARS-based applications, the inclusion of optional ATNPKT parameters for each DS protocol message is per the ACARS to IPS DS Convergence Function documented in ARINC Specification 858.*

## 1.4  TRANSPORT LAYER

**Port numbers**

1.4.4          The following TCP and UDP port numbers shall be used when supporting legacy ATN and ACARS-based applications over the ATN/IPS:

5908 IPS Management Application                    ← *To be registered with IANA*

5910 (ATN) Context management

5911 (ATN) Controller-pilot data link communications

5912 ~~Flight information services~~ Reserved

5913 (ATN) Automatic dependent surveillance

5914 (ACARS) Airline operational control applications          ← *To be registered with IANA*

5915 (FANS1/A) ATS Facilities Notification          ← *To be registered with IANA*

5916 (FANS1/A) Automatic dependent surveillance          ← *To be registered with IANA*

5917 (FANS1/A) Controller-pilot data link communications          ← *To be registered with IANA*

5919 (ACARS) Character-oriented Air Traffic Services          ← *To be registered with IANA*

5920 AIS/MET services          ← *To be registered with IANA*

*Note.— These port numbers are registered by the Internet Assigned Numbers Authority (IANA) at: http://www.iana.org/assignments/port-numbers.*

**ATTACHMENT 2**

**OVERVIEW OF THE ACARS TO IPS DIALOGUE SERVICE CONVERGENCE FUNCTION
TO BE SPECIFIED IN ARINC 858, IPS FOR SAFETY SERVICES**

This attachment introduces the ACARS to IPS Dialogue Service Convergence Function (ACF) that will be specified in ARINC Specification 858, *IPS for Safety Services*. The ACF adapts ACARS applications to the IPS Dialogue Service (IPS DS), which provides the mechanism for exchanging application messages over the IPS communications infrastructure.

The figure below illustrates the ACARS message flow over the IPS dialogue service via the ACF, as well as the placement of the ACF within the upper layers between the ACARS application or peripheral and the UDP transport layer. As shown in the figure legend:

- Green-shaded boxes are specified in other non-IPS standards, such as existing ACARS standards;

- Light blue-shaded boxes and their contents are specified in other IPS-related standards, such as ICAO Doc. 9896 and Doc. 10094; and

- Dark blue-shaded and dark blue-highlighted boxes are specified in ARINC 858.

  *Note – The diagram shows the use of DTLS per the decision taken during the ICAO WG-I SSG-12 meeting on 21 May 2019.*