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| ../../../Program%20Files/Default%20Company%20Name/ICAOMainMenuSetup/Icons/icaologo.jpg | International Civil Aviation Organization  **WORKING PAPER** | |  | | --- | | ACP WGM/19-WP13  1/06/12 | |  | |

**AERONAUTICAL COMMUNICATIONS PANEL (ACP)**

**WORKING GROUP M (MAINTENANCE)**

**19th MEETING**

**Bucharest, 30 May to 1June 2012**

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| **Agenda Item** | **3c:** | **ATN/OSI Document 9880 Update Status on PM-FIS and PM-ADS-C** |
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UPDATE FOR PUBLICATION OF TECHNICAL SPECIFICATIONS FOR FIS AND ADS-C APPLICATIONS AND

NORMALIZATION OF DOC 9880 WITH SC-214/WG-78 STANDARDS

(Presented by Boeing)

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| **SUMMARY** |
| This paper presents the status of the technical specifications for ADS-C and FIS Applications and explores the options for the publication of this material. |

1. INTRODUCTION
   1. This working paper presents the status of the material developed by several standardization bodies on the FIS and ADS-C ATN Applications since the release of the First Edition of ICAO Doc 9880 in 2010. It also explores different solutions concerning the conditions of publication of this material in both RTCA/EUROCAE and ICAO.
2. BACKGROUND and status
   1. Since 2006, the material contained in Document 9705 Edition 3 has been progressively moved into Doc 9880 "Manual on Detailed Technical Specifications for the ATN based on ISO/OSI standards and protocols".
   2. This transfer from Doc 9705 to 9880 has initially been performed for the Context Management (CM) application and the Controller-Pilot Data Link Communications (CPDLC) application, then followed by the inclusion of the AMHS, AIDC, ULCS and ICS specifications.
   3. As the technical provisions of both “protected-mode” ADS-C and FIS Applications were not fully validated at that time and new operational requirements were expected to be developed by operational working groups, it was decided to postpone the integration of the ADS-C and FIS specification in Doc 9880 at the later time. Instead, a placeholder section was added in Doc 9880 Part I for future inclusion.
   4. The First Edition of ICAO Doc 9880 was published with these placeholder sections intact, i.e. there is no ADS-C nor FIS technical specifications contained in the First Edition of Doc 9880.
   5. CM
      1. As previously mentioned, the CM application has been transferred to Doc 9880. However, the version that was transferred was from Doc 9705 Edition 3, which defined CM version 2. There are a number of features of CM version 2 (e.g. Server Facility Query, Server Facility Update, security exchange) that were added; however, CM version 2 was never implemented. As such, and since there has been no operational need defined for the CM version 2 services, the CM application should be reverted to the implemented version, which is CM Edition 2 plus some PDRs. This is the same version that was implemented for LINK2000+.
      2. Additionally, some of the CM user requirements (Doc 9880 Part I, 2.7) are now covered by the RTCA SC-214/EUROCAE WG-78 SPRs at the operational level. These duplicate requirements will need to be removed from Doc 9880.
      3. RTCA SC-214/EUROCAE WG-78 is still investigating operational requirements for the DLIC service. Currently there are no new features identified that would necessitate a change from CM version 1, but there is additional planned validation work in this area that should be completed and analyzed prior to making the proper edits in Doc 9880. These validation activities are mainly expected to be completed by early 2013, with some activities planned to continue on as late as 2015.
      4. This means that the final output for the CM specification will be sometime in early 2013, and Doc 9880 will need to be updated accordingly at that time. It is assumed that this updated CM section will form the CM component of Doc 9880 Second Edition, and will be a complete and matching technical specification for the RTCA SC-214/EUROCAE WG-78 document.
   6. CPDLC
      1. Also as previously mentioned, the CPDLC application has been transferred to Doc 9880 and updated to include the integrity check functionality necessary to provide protected mode operation. However, some of the CPDLC user requirements (Doc 9880, Part I, 3.7.1, 3.7.4 and 3.7.6) are now covered by the RTCA SC-214/EUROCAE WG-78 SPRs at the operational level. These duplicate and/or changed requirements will need to be removed from Doc 9880. There are also aspects of the CPDLC version 2 application (e.g. the Security parameter) that were never implemented so should also be removed.
      2. Additionally, the CPDLC message ASN.1 has also been removed to the RTCA SC-214/EUROCAE WG-78 Interoperability Requirements documents. This will also need to be removed from Doc 9880. There are still a number of validation projects involving the CPDLC message set, and the message set itself is also under review by the ICAO OPLINK panel. The OPLINK review and the various validation activities are mainly expected to be completed by early 2013, with some activities planned to continue on as late as 2015.
      3. This means that the final output for the CPDLC specification will be sometime in early 2013, and Doc 9880 will need to be updated accordingly at that time. It is assumed that this updated CPDLC section will form the CPDLC component of Doc 9880 Second Edition, and will be a complete and matching technical specification for the RTCA SC-214/EUROCAE WG-78 document.
   7. ADS-C
      1. In the 2006-2007 timeframe, the ATN ACP WG-N (Internetworking) developed the protected mode version of ADS-C (Version 0.4), using the same approach than the one used for CPDLC (i.e. encoding of the operational data outside the ATN application and appending to each message of an Application Message Integrity Checksum (AMIC) for message modification or mis-direction detection by the receiver). The operational ADS-C data were aligned with the Manual of ATS Data Link Applications (Doc 9694 Edition 1) developed by OPLINKP. The technical provisions for the communication part have been verified through validation activities (analysis and prototyping) led by Eurocontrol.
      2. Starting in 2008, the ATN Accommodation Group (ADG) of the Data Link Steering Group (DLSG) produced new ADS-C related operational requirements mainly defined to support the FAA NextGen and the European SESAR programs. The group activity resulted in an updated Doc 9694 (“draft 11”).
      3. The ADG updated as well the PM-ADS specification (version 0.5) to align the technical provisions with the proposed updated Doc9694. The main changes were the following:

Technical Changes

1. De-coupling of the application and network functions, leading to an application design made of a generic ADS-C ATS application and a set of interface modules customized for each communication technology (e.g. ATN);
2. replacement of the emergency contract by specific procedures to set up and cancel emergency within the demand, event and periodic contracts;
3. identification of the ADS-C contract by a contract number;

Operational Changes

1. removal of the short term intent data block;
2. enhancement of the extended protected profile to include speed, type of way point, level constraint, RTA and speed constraints, current and predicted gross mass and speed schedule.
3. Definition of new contract events (vertical deviation change and aircraft out of boundaries change).
   * 1. It must be noted that with the support of the protected mode, the operational changes have no impact on the ADS-C Application specification. Indeed, the operational data are now passed to the ADS-C Application as an unstructured bit string (encoded in PER). Changes to structure and/or contents are fully transparent to the ADS-C protocol. Modification of the data contents in the ADS-C requests and responses will be reflected in the INTEROP document where the ASN.1 definition now stands.
     2. In 2009, the OPLINKP planned to reconvene and take over the development of new operational requirements for emerging data link services and technologies. In parallel, RTCA SC-214 / EUROCAE WG-78 was also in the process of developing operational requirements for new data link services (e.g. 4DTRAD) for the 2011-2015 timeframe. It is believed that all these ORs will only require update of the operational data definition with no impact on the ADS application protocol.

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| Version | Date | Description of evolution | Modification |
| V01 / V02 | September 2006 | Initial Version (Word Perfect) |  |
| V03 | December 2006 | Translation into MS Word  State tables not updated.  Version sent to SGN2 | All sections |
| V04 | January 2007 | SGN2 review  Version sent to WGN |  |
| V05 | January 2008 | ADG/6 Operational Requirements  Aligned with Doc 9694 Draft 11 | All |
| V06 | October 2009 | Aligned with RTCA SC-214/EUROCAE WG78 SPR, redlined Doc 9694 Draft 11 |  |
| V07 – Version H | February 2010 | redlined Doc 9694 Draft 13  Aligned acknowledgements, including adding a positive ack for cancel; added reject reasons; corrected ASN.1; updated state tables; additional user requirements removed; changed timer value t-PC-2 | 3, 4, 5 |
| V08 – DraftVersion I | November 2011 | PDRs 180, 206, 208, 209, 246 |  |
| V09 – Version I | February 2012 | No change |  |

Table 1: PM-ADS Document Versions

* + 1. As a consequence, the ADS-C specification output from RTCA SC-214 / EUROCAE WG-78 can be used for publication after a validation period, which is currently underway within various external agencies (e.g. SESAR and NextGen). These validation activities are mainly expected to be completed by early 2013, with some activities planned to continue on as late as 2015.
    2. The original publication target of the RTCA SC-214/EUROCAE WG-78 document has been delayed; it is now anticipated that the document will be published in mid-2013, after most of the validation activities have been completed and final updates to the specifications provided. This means that the final output for the ADS-C specification will be sometime in early 2013, and Doc 9880 will need to be updated accordingly at that time. It is assumed that this updated ADS-C section will form the ADS-C component of Doc 9880 Second Edition, and will be a complete and matching technical specification for the RTCA SC-214/EUROCAE WG-78 document.
  1. FIS
     1. In the 2006-2007 timeframe, ATN ACP developed the protected mode version of FIS (Version 0.4), using the same approach than used for PM-CPDLC (i.e. encoding of the operational data outside the ATN application and appending to each message of an Application Message Integrity Checksum (AMIC) used by the receiver to detect message modification). The operational FIS data were aligned with the Manual of ATS Data Link Applications (Doc 9694 Edition 1) developed by the OPLINKP for D-ATIS and METAR. The technical provisions for the communication part have been verified through validation activities (analysis and prototyping) led by Eurocontrol.
     2. In 2008/2009, RTCA SC-214 / EUROCAE WG-78 developed an SPR an associated INTEROP documents for the D-OTIS Application (providing D-ATIS, NOTAM, VOLMET and AIB services). The INTEROP sub-group developed an update of the FIS specification (version 1.4) to address the following technical changes:

1. De-coupling of the application and network functions, leading to an application design made of a generic FIS ATS Application and a set of interface modules customized for each communication technology (e.g. ATN);
2. Update of the technical specifications to ensure full independence between the communication functions (ASE) and operated FIS sub-services (D-OTIS, METAR), in order to guarantee stability of the specification when introducing new sub-services (e.g. HIWAS).
   * 1. For the same reasons identified above for per ADS-C, it must be noted that operational changes have no impact on the FIS Application specification. The support of new data types for D-OTIS, NOTAM and VOLMET is transparent to the FIS specification.

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| Version | Date | Description of evolution | Modification |
| V0.1 | 27/10/2005 | Initial draft for distribution on SGN2 mailing list |  |
| V0.2 | 12/12/2005 | Input SGN2/5 Meeting (December 2005, Toulouse – France) |  |
| Prop V0.3 | 07/03/2005 | Input SGN2/6 Meeting (March 2006, Atlantic City – USA) |  |
| V0.3 | 10/03/2006 | Output SGN2/6 Meeting (March 2006, Atlantic City – USA) |  |
| Prop V0.4 | 28/06/2006 | Input SGN2/7 Meeting (June 2006, Brussels – Belgium) |  |
| V0.4 | 03/07/2006 | Output SGN2/7 Meeting (June 2006, Brussels – Belgium)  Input WGN/6 Meeting (July 2006, Brussels – Belgium) |  |
| V05 | 09/03/2008 | Word Version |  |
| V06 | 6/02/2008 | Initial alignment, SC-214 first produced version |  |
| V1 | 11/7/2008 | Update, input to SG3 meeting Nov 08 |  |
| V1.1 | 11/11/08 | Diagram alignment, updated input to SG3 meeting Nov08 |  |
| V1.2 | 12/06/08 | FIS reject reasons for demand, update changed |  |
| V1.3 | 2/12/09 | Minor ASN.1 updates, minor editorials including diagram updates and pagination |  |
| V1.4 | 4/30/09 | References updated, TOCs added, paragraph formatting cleanup  FAA Evaluation Release |  |
| V1.5 Version H | 2/3/10 | No change  Version Input for Validation |  |
| V1.6 Draft Version I | 18/11/11 |  |  |
| V1.7 Version I | 01/02/12 |  |  |

Table 2: FIS Document Versions

* + 1. As a consequence, the FIS ATS Application specification output from RTCA SC-214 / EUROCAE WG-78 can be used for publication a validation period, which is currently underway within various external agencies (e.g. SESAR and NextGen). These validation activities are mainly expected to be completed by early 2013, with some activities planned to continue on as late as 2015.
    2. The original publication target of the RTCA SC-214/EUROCAE WG-78 document has been delayed; it is now anticipated that the document will be published in mid-2013, after most of the validation activities have been completed and final updates to the specifications provided. This means that the final output for the FIS specification will be sometime in early 2013, and Doc 9880 will need to be updated accordingly at that time. It is assumed that this updated FIS section will form the FIS component of Doc 9880 Second Edition, and will be a complete and matching technical specification for the RTCA SC-214/EUROCAE WG-78 document.
  1. ULCS
     1. As previously mentioned, the ULCS was also initially translated into Doc 9880. Again, this was done from Doc 9705 Edition 3, which was never implemented. As such, there are a number of additions that should be removed, such as the Security ASO. This will align the ULCS with the current validation implementations. Since the ULCS is not specified directly in the RTCA SC-214/EUROCAE WG-78 documentation, there is no overlap; however the inconsistencies should be addressed.

1. approachES for THE PUBLICATION of ADS-C and FIS ATS Applications technical Specification
   1. After the validation period is completed, the FIS and ADS-C technical provisions as identified in section 2 will be ready for publication. Several approaches for publication of this material can be considered:
2. #1 Publication of FIS and ADS-C within Doc 9880 Part I, along with CM and CPDLC;
3. #2 Publication of FIS and ADS-C as RTCA DO / EUROCAE ED documents;
4. #3 Publication of all applications except CM (CPDLC, FIS and ADS-C) as RTCA DO / EUROCAE ED documents.
5. #4 Publication of part of all applications (CDPLC, FIS and ADS-C) within Doc 9880 Part I (the parts dealing with the protocol, i.e. from the dialogue service down) and part of the application as RTCA DO / EUROCAE ED documents (the parts dealing with application-level message sets and user requirements)
   1. **#1: Publication of FIS and ADS-C technical provisions in Doc 9880**
      1. The publication of ADS-C and FIS in Doc 9880 is the process initially envisaged by ICAO when creating the document. Applications are specified as ATN applications.
      2. Advantages to be considered are:
6. Consistent publication process, all technical specifications are available in a unique document.
7. Unique reference for all Application specification document.
   * 1. Drawbacks to be considered are:
8. Does not support the final objective to define unique applications independent of the communication infra-structure;
9. Not an independent publication process. Although Doc 9880 can have Parts published independently, all sections of a given part needs to follow the same publication timescale.
10. Continued maintenance of technical standards to be performed by ICAO, whereas the tendency is to delegate this kind of activity to industrial bodies like EUROCAE and RTCA.
    1. **#2: Publication of FIS and ADS-C as independent DO / ED Documents**
       1. The not-yet Doc 9880 included specification (FIS and ADS-C) are published as DO / ED documents and references to these documents are made in the associated Doc 9880 placeholders. Applications are specified as generic ATS applications with at least one adaptation module over the ATN.
       2. Advantages to #2 to be considered are:
11. Emphasize the idea that FIS and ADS-C Application are not ATN-specific;
12. Flexibility in the specification, publication and maintenance processes. Validation results requiring changes to the specification will be easier to address in the SC-214/WG-78 framework.
    * 1. Drawbacks to be considered are::
13. Inconsistent approach at the application level (CPDLC in Doc 9880, other applications in DO / ED documents). The exception made to CPDLC is only justified for historical reasons (CPDLC already included in Doc 9880).
    1. **#3: Publication of all applications (CPDLC, FIS and ADS-C) as independent DO / ED Documents**
       1. The not-yet Doc 9880 included specifications (FIS and ADS-C) are published as DO / ED documents and references to these documents are made in the associated Doc 9880 placeholders. Applications are specified as generic ATS applications with at least one adaptation module over the ATN.
       2. Additional advantages to #3 to be considered are:
14. Consistent publication process for all ATS applications
    * 1. Drawbacks to be considered are:
15. Removal of the CPDLC section in Doc 9880 and creation of a new DO / ED document
16. New DO / ED documentation required for the protocol provisions of FIS and ADS-C
17. Having all applications except CM in a different DO / ED document contributes to a more difficult publication process
    1. **#4: Publication of part of all applications (CDPLC, FIS and ADS-C) within Doc 9880 Part I (the parts dealing with the protocol, i.e. from the dialogue service down) and part of the application as RTCA DO / EUROCAE ED documents (the parts dealing with application-level message sets and user requirements)**
       1. The not-yet published Doc 9880 will be modified to include the updated FIS and ADS-C specifications in the placeholder sections. CM and CPDLC will be modified to remove any user requirements (e.g. 2.3.7 for CM, and 2.3.12.3 and 2.3.15 for CPDLC, as appropriate) and instead reference the RTCA DO / EUROCAE ED documents. The requirements that are removed from Doc 9880 will then be covered in the RTCA DO / EUROCAE ED documentation. This is already done for FIS and ADS-C, and will need to be confirmed for CM and CPDLC.
       2. Additional advantages to #4 to be considered are:
18. Consistent publication process for all ATS applications, with user-level requirements contained in RTCA DO / EUROCAE ED documentation
19. Ease of publication burden on ICAO by supporting independent publications, with changes and additions to the user-level requirements not requiring modifications to Doc 9880 (EUROCAE and RTCA manage the publication of the user-level requirements contained in DO / ED documents)
20. Supports the final objective to define unique applications independent of the communication infra-structure
21. No new DO / ED documents required; user-level splits of the applications are already contained in the draft validation versions of the documentation.
    * 1. Drawbacks to be considered are:
22. Potential for more complicated references for the applications
23. ACTION BY THE Meeting
    1. Upon further review and discussion by members of RTCA SC-214 / EUROCAE WG-78 and ICAO ACP WG-M, it seems that Option #4 above would provide the least impact to the current documentation, as well as provide a number of key advantages as detailed above.
    2. After the validation period of the RTCA / EUROCAE documentation is completed, it is proposed that the user-level requirements, where appropriate, are removed from Doc 9880 and covered in the DO / ED documentation for all applications. Likewise, the FIS and ADS-C protocol sections of the application will be included in the appropriate chapters of Doc 9880 Part I (Chapters 4 and 5, respectively).
    3. The ULCS section of the Doc 9880 will also be updated at that time to reflect the current validation versions of the ULCS, and not include unnecessary requirements that have not yet been validated, or that do not have an identified operational need.
    4. RTCA SC-214 / EUROCAE WG-78 will work with ICAO ACP WG-M to make the changes at the appropriate time, currently targeted for early- to mid-2013.
    5. The Meeting is invited to note and endorse the publication approach of FIS and ADS-C, as well as the modifications proposed to the CM, CPDLC and ULCS sections of Doc 9880.

Ref: ACP WGM/14-WP03 from Eurocontrol, 2 June 2009, ACP WGM/15-WP20 from Boeing, 19 May 2010

— END —