U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Guidelines for Design Approval of Aircraft Data Link Communication Systems Supporting Air Traffic Services (ATS)

Date: 9/28/16 **AC No:** 20-140C

Initiated By: AIR-130

This advisory circular (AC) provides guidance on compliance with the airworthiness standards for aircraft that incorporate a data communication system supporting ATS communications. This guidance is applicable to requests for a new, amended, or supplemental type certificate for Title 14 of the Code of Federal Regulations (14 CFR) part 23, 25, 27 and 29 aircraft.

If you have suggestions for improving this AC, you may use the Advisory Circular Feedback form at the end of this AC.



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1 WHAT IS THE PURPOSE OF THIS ADVISORY CIRCULAR (AC)?

1.1 This AC provides guidance material for applicants seeking an airworthiness approval for aircraft with an installed data link system intended to support air traffic services (ATS) data communication. It identifies specific configurations of aircraft data link systems for applicants seeking approval for type certificates (TC) and supplemental type certificates (STC) in order to facilitate operational approvals. Appendix A of this AC provides a list of related documents. Appendix B of this AC contains a list of applicable acronyms.

1.2 This AC describes an acceptable means, but not the only means, for you to gain airworthiness approval for aircraft data link system equipment. However, if you use the means described in this AC, you must follow it in all important respects.

1.3 The term "must" is used in this AC to indicate a mandatory requirement driven by regulation that is to be followed when using the guidance in this AC. The term "should" is used in this AC to indicate a recommendation and not a requirement when using the guidance in this AC. Since this AC represents an accepted means of compliance, an applicant seeking an alternative to any requirement or recommendation within this AC will need to be discussed with the Aircraft Certification Office (ACO) in order to achieve a common performance level with the AC.

2 WHO DOES THIS AC AFFECT?

This AC provides guidelines for applicants seeking design approval of aircraft data link systems used for communication supporting ATS. ATS data communications included in this AC are Controller Pilot Data link Communications (CPDLC), Automatic Dependent Surveillance-Contract (ADS-C) and some Aircraft Communications Addressing and Reporting System (ACARS) (i.e., Departure Clearance [DCL], Oceanic Clearance [OCL] and Terminal Weather Information for Pilots [TWIP]) messages. ATS communication includes Flight Information Service (FIS) messages. This AC addresses only Data Link- Automatic Terminal Information Service (D-ATIS) for Flight Information Service (FIS) communications. Flight Information Service – Broadcast (FIS-B) installation guidelines are available in AC 20-149B, *Installation Guidance for Domestic Flight Information Service - Broadcast* (or latest revision).

3 DOES THIS AC CANCEL ANY PRIOR AC?

This AC supersedes and cancels AC 20-140B, dated September 27, 2012.

4 WHAT ARE THE IMPORTANT CHANGES TO THIS AC?

4.1 This AC adds airworthiness approval guidance for a Baseline 2 (B2) data communications system. Operators will need to equip their aircraft with B2, as defined in this AC, to conduct future NextGen operations in the U.S. National Airspace System (NAS) including Interval Management (IM) and Dynamic Required Navigation Performance (DRNP).

4.2 This AC recognizes Inmarsat-Swift Broadband (SBB) satellite communications as a viable sub-network for certain ATS data communication systems.

4.3 This AC provides references to current FAA cybersecurity policy and guidance to help you evaluate the need to incorporate cybersecurity provisions into your data communication installation.

4.4 This AC updates cross-referenced policy and guidance to the latest applicable revisions.

5 DEFINITIONS FOR DIFFERENT TYPES OF DATA LINK SYSTEMS.

5.1 Overview.

5.1.1 This AC defines interoperability designators for data link capability in terms of the data link applications. It identifies all Interop, Sub-network, and Performance designators with "**bold red text**". Associated with the data link capability, this AC defines interoperability, safety, and performance criteria for the aircraft data link system. For domestic, oceanic and remote airspace, when data link is required for operations, this AC defines designators to identify the criteria for the design approval. This AC covers only the aircraft allocations of these criteria and the aircraft's ability to interoperate and perform with a representative ground system. The FAA will also consider the communication service provider (CSP), air navigation service provider (ANSP) and operator when evaluating requests for operational authorization according to AC 120-70C, *Operational Authorization Process for use of Data Link Communication System* (or latest revision). ANSPs typically refer to the type of data link system through the use of these designators to prescribe data link capability and performance in specified airspace.

5.1.2 International Civil Aviation Organization's (ICAO's) *Global Operational Data Link (GOLD) Manual*, Doc 10037 and *Performance-Based Communication and Surveillance (PBCS) Manual*, Doc 9869 facilitate global harmonization of existing data link operations and resolve regional and/or State differences impacting seamless operations. PBCS includes required communication performance (RCP) specifications, required surveillance performance (RSP) specifications, and guidelines on post-implementation monitoring and corrective action. The RCP/RSP specifications are based on RTCA DO-350A/EUROCAE ED-228A, *Safety and Performance Standard for Baseline 2 ATS*

Data Communications (Baseline 2 SPR Standard). The guidance in this AC is compatible with GOLD and PBCS.

5.1.2.1 GOLD Doc 10037 edition 1 and PBCS Doc 9869 edition 2 include provisions for existing operations (i.e., operational capabilities supported by Future Air Navigation System FANS 1/A+ and Aeronautical Telecommunication Network – Baseline 1 ATN B1).

5.1.2.2 Future amendments to these manuals are planned to include operational capabilities supported by B2.

5.2 **Data link Systems – Interoperability Designators**.

5.2.1 "Data link" is a generic term that encompasses different types of data link systems and sub-networks.

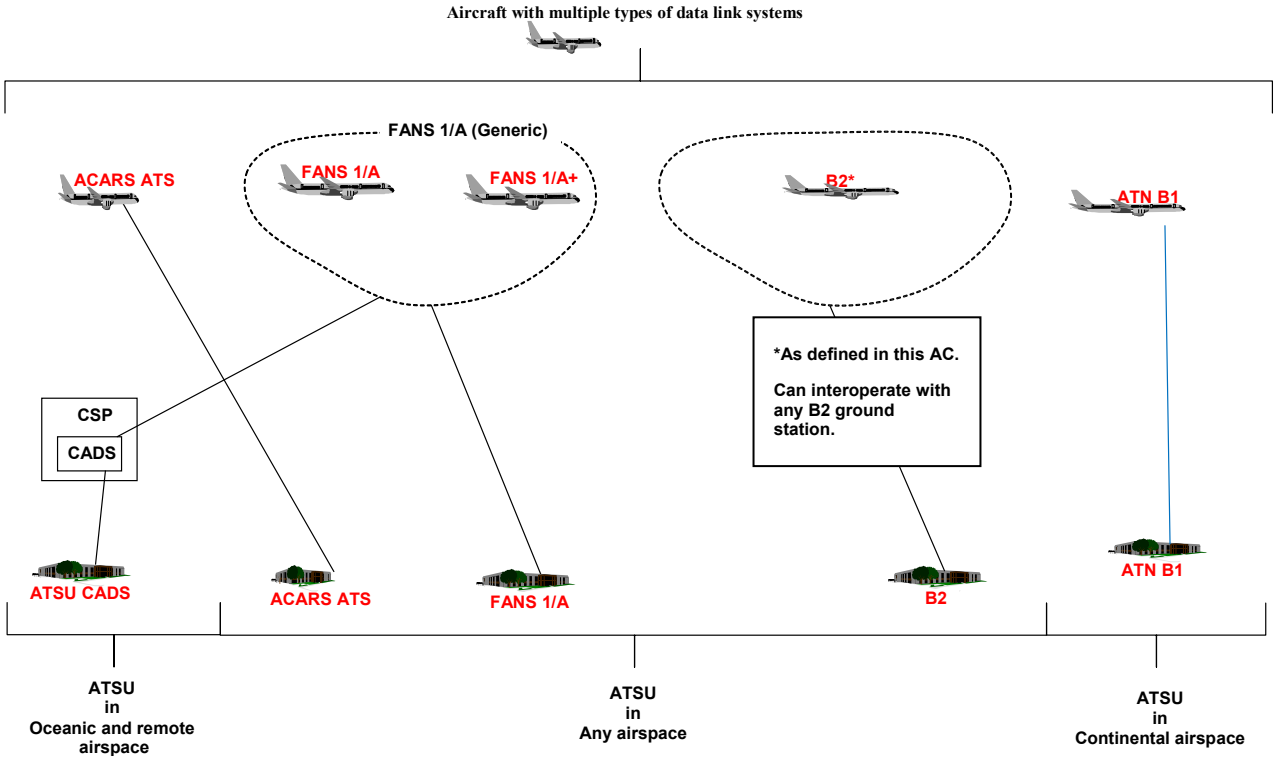
5.2.2 Figure 1 shows different air traffic service unit (ATSU) ground systems and aircraft systems that are interoperable. Each type of ATSU and aircraft data link system has a designator to indicate acceptable interoperable configurations for the data link applications. Future air navigation system (FANS 1/A) designators are shown for operational purposes and are not appropriate for new installation approvals (new FANS 1/A+ installations are acceptable).

Note 1: Figure 1 is comprised of a graphical portion and a table with text providing more detail information. Notes in the table of Figure 1 elaborates when an aircraft and ATSU is able to perform data communications when accommodation interoperability requirements are included in the aircraft/ATSU implementation.

Note 2: Figure 1 does not indicate when data communications may occur when an aircraft and/or ATSU is configured with multiple capability (i.e., multiple stack implementation).

Note 3: Table 4 identifies interoperability requirements of the different data communication systems that the FAA considers acceptable for an applicant seeking a new, amended, or supplemental type certification for an aircraft that supports ATS communication.

Figure 1. Different ATSU/Aircraft Data Link Application Interoperability Designators



Interop Designator	Description
ACARS ATS	ATS applications, departure clearance (DCL), oceanic clearance (OCL), terminal weather information for pilots (TWIP) and data link – automatic terminal information service (D-ATIS) supported by aircraft communications addressing and reporting system (ACARS).
ATSU CADS	Communication service provider's (CSP) centralized ADS-C system (CADS) enables an ATSU without FANS 1/A capability to receive ADS-C reports from any FANS 1/A, FANS 1/A+ or FANS 1/A ADS-C aircraft.
FANS 1/A	Initial FANS 1/A supported with ATS applications, ATS facilities notifications (AFN), Controller Pilot Data link Communications (CPDLC) and automatic dependent surveillance –Contract (ADS C) supported by FANS 1/A. This AC does not provide an acceptable means of compliance for type design approval for FANS 1/A designated aircraft, but you may use FANS 1/A+ for new design approvals (see below). **Note:** FANS 1/A typically involves communication (CPDLC), navigation (area navigation/required navigation performance, RNAV/RNP) and surveillance (ADS-C). This document refers to the FANS 1/A for the data link system, which includes the CPDLC and ADS C applications. Refer to ICAO Doc 9613 for guidance material on navigation (RNAV/RNP) qualification and use.

Figure 1. Different ATSU/Aircraft Data Link Application Interoperability Designators (continued)

Interop Designator	Description
FANS 1/A+	Same as FANS 1/A, except with additional features, such as the message latency timer function, described in DO-258A/ED-100A, paragraph 4.6.6.9. Note 1: FANS 1/A+ aircraft are interoperable with FANS 1/A and FANS 1/A+ ground stations. However, message latency capability is only available when FANS 1/A+ ground stations interoperates with FANS 1/A+ aircraft. Note 2: Seamless transition of ATS data link service occurs between ATN B1 and FANS 1/A+ ground stations when: • Aircraft equipped with ATN B1 and FANS 1/A+ data link system also incorporates interoperability requirement IR-207, IR-209, IR-210, IR-211, IR-212, IR-214 and IR-215 of DO-305A/ED-154A. • ATN B1 ground station incorporates interoperability requirement IRec-1 and IR-213 of DO-305A/ED-154A. • FANS 1/A+ ground station incorporates interoperability requirement IR-208 of DO-305A/ED-154A. Otherwise, the flight crew will lose their data link service requiring the flight crew to manually perform a logon to reestablish ATS data link service. Note 3: Seamless transition of ATS data link service occurs between B2 and FANS 1/A+ ground stations when: • Aircraft equipped with B2 and FANS 1/A+ data link system also incorporates interoperability requirement NIR-153, NIR-155, NIR-156, NIR-157, NIR-158, NIR-160 and NIR-161 of DO-352A/ED-230A. • B2 ground station incorporates interoperability requirement NIRec-3 and NIR-159 of DO-352A/ED-230A. • FANS 1/A+ ground station incorporates interoperability requirement NIR-154 of DO-352A/ED-230A. Otherwise, the flight crew will lose their data link service requiring the flight crew to manually perform a logon to reestablish ATS data link service. Note 4: To allow a FANS 1/A+ data communication system on an aircraft to communicate with a ATN B1 data communication system at an ATSU, the ATSU ground system needs to accommodate the FANS 1/A+ aircraft by incorporating the interoperability requirements of DO-305A/ED-154A. Note 5: To allow a FANS 1/A+ data communication system on an aircraft to communicate with a B2 data communication system at an ATSU, the ATSU ground system needs to accommodate the FANS 1/A+ aircraft by incorporating the interoperability requirements of DO-352A/ED-230A.
ATN B1	ATS applications CM and CPDLC supported by Aeronautical Telecommunication Network – Baseline 1 (ATN B1): a) Context management (CM) is a data link application providing data link initiation capability (DLIC); b) CPDLC (Version 1) for ATC communications management (ACM), ATC clearance (ACL), and ATC microphone check (AMC) Note 1: Interoperability for departure clearance (DCL), downstream clearance (DSC), data link – automatic terminal information service (D-ATIS), and flight plan consistency (FLIPCY) data link services, which are defined in DO-280B/ED-110B are not supported. Note 2: Seamless transition of ATS data link service between ATN B1 and FANS 1/A+ ground stations when: • Aircraft equipped with ATN B1 and FANS 1/A+ data link system also incorporates interoperability requirement IR-207, IR-209, IR-210, IR-211, IR-212, IR-214 and IR-215 of DO-305A/ED-154A. • ATN B1 ground station incorporates interoperability requirement IRec-1 and IR-213 of DO-305A/ED-154A. • FANS 1/A+ ground station incorporates interoperability requirement IR-208 of DO-305A/ED-154A. Otherwise, the flight crew will lose their service requiring the flight crew to manually perform a logon to reestablish ATS data link service. Note 3: To allow a FANS 1/A+ data communication system on an aircraft to communicate with a ATN B1 data communication system at an ATSU, the ATSU ground system needs to accommodate the FANS 1/A+ aircraft by incorporating the interoperability requirements of DO-305A/ED-154A. Note 4: To allow an ATN B1 data communication system on an aircraft to communicate with a B2 data communication system at an ATSU, the ATSU ground system needs to accommodate the ATN B1 aircraft by incorporating the interoperability requirements of DO-353A/ED-231A. Note 5: To allow a B2 data communication system on an aircraft to communicate with an ATN B1 data communication system at an ATSU, the B2 data communication system on the aircraft needs to accommodate the ATN B1 ground system by incorporating the interoperability requirements of DO-353A/ED-231A.

Figure 1. Different ATSU/Aircraft Data Link Application Interoperability Designators (continued)

Interop Designator	Description
B2	Version of the Baseline 2 Data Communication system described in this section. The United States plans to use B2, as defined in this AC, as part of FAA's NextGen initiative. An aircraft equipped with B2, as defined in this AC, is fully interoperable with any B2 ground station. Aircraft equipped with a version of B2 other than that defined by this AC are not eligible for the B2 interop designator. B2 is comprised of the following data link applications and data link services. a) Context management (CM) is a data link application supporting the following data link service: Data link initiation capability (DLIC). b) CPDLC (Version 3) is a data link application supporting the following data link services: ATC Communications Management (ACM), Clearance Request and Delivery (CRD), ATC Microphone Check (AMC), Departure Clearance (DCL), Data Link Taxi (D-TAXI), Oceanic Clearance Delivery (OCL), 4-Dimensional Trajectory Data Link (4DTRAD), Information Exchange and Reporting (IER), In-Trail Procedure (ITP), Interval Management (IM), and Dynamic Required Navigation Performance (DRNP). c) ADS-C (Version 2) is a data link application supporting the following data link services: 4-Dimensional Trajectory Data Link (4DTRAD), Information Exchange and Reporting (IER), Position Reporting (PR), Interval Management (IM) and Dynamic Required Navigation Performance (DRNP). Note 1: To allow a FANS 1/A+ data communication system on an aircraft to communicate with a B2 data communication system at an ATSU, the ATSU ground system needs to accommodate the FANS 1/A+ aircraft by incorporating the interoperability requirements of DO-352A/ED-230A. Note 2: To allow an ATN B1 data communication system on an aircraft to communicate with a B2 data communication system at an ATSU, the ATSU ground system needs to accommodate the ATN B1 aircraft by incorporating the interoperability requirements of DO-353A/ED-231A. Note 3: To allow a B2 data communication system on an aircraft to communicate with an ATN B1 data communication system at an ATSU, the B2 data communication system on the aircraft needs to accommodate the ATN B1 ground system by incorporating the interoperability requirements of DO-353A/ED-231A.

5.2.3 Table 1 below provides the designators for each type of sub-network:

Table 1. Sub-network Designators

Sub-network Designator	Description of designator
VDL M0/A	Very high frequency data link – mode 0/A
VDL M2	Very high frequency data link – mode 2
HFDL	High frequency data link
SATCOM (Classic Aero)	Inmarsat or MT-SAT – Classic Aero satellite communications
SATCOM (SBB)	Inmarsat – Swift Broadband satellite communications
SATCOM (SBD)	Iridium – short burst data satellite communications

5.2.4 The applicable interoperability standards for each type of data link system and each type of sub-network allocate criteria to the operator, the aircraft data link system, and the air traffic service provider to ensure that the aircraft system, the ground system, and sub-networks are compatible.

5.3 **Data link Services – Safety and Performance Criteria.**

RTCA DO-350A/EUROCAE ED-228A (Any Airspace SPR), provides operational, safety and performance criteria for data link services that are applicable in continental, oceanic and remote airspace for normal ATC communication and surveillance for a variety of operational capabilities. DO-350A/ED-228A defines communication and surveillance performance designators as shown in Table 2 and Table 3, which include the applicable safety criteria. The RCP/RSP specifications shown in Table 2 and Table 3 may be prescribed by an ANSP when required for air traffic services (ATS) provision in a particular airspace or applied for operational approval and aircraft system design approval. Section 5 of this AC only provides an overview of the PBCS framework, whereas, the applicable criteria for aircraft system design approval is specified in Section 6 of this AC.

Table 2. Communication performance specifications (apply to CPDLC)

RCP Specification	Transaction time (sec)	Continuity	Availability	Integrity
RCP 130	130	0.999	0.989	Malfunction = 10^{-5} per flight hour
RCP 240	240	0.999	0.989	Malfunction = 10^{-5} per flight hour
RCP 400	400	0.999	0.989	Malfunction = 10^{-5} per flight hour

Table 3. Surveillance performance specification (apply to ADS-C)

RSP Specification	Surveillance overdue delivery time (sec)	Continuity	Availability	Integrity	
RSP 160	160	0.999	0.989	Navigation FOM	*See Note below*
				Time at position accuracy	+/- 1 sec (UTC)
				Data Integrity	Malfunction = 10^{-5} per flight hour
RSP 180	180	0.999	0.989	Navigation FOM	*See Note below*
				Time at position accuracy	+/- 1 sec (UTC)
				Data Integrity	Malfunction = 10^{-5} per flight hour
RSP 400	400	0.999	0.989	Navigation FOM	*See Note below*
				Time at position accuracy	+/- 1 sec (UTC)
				Data Integrity	Malfunction = 10^{-5} per flight hour

Note: The navigation figure of merit (FOM) is specified based on the navigation criteria associated with this spec. For example, if RNP 4 is prescribed, then for ADS-C surveillance service, the FOM level would need to be 4 or better. In all cases, when the navigation capability no longer meets the criteria specified for the operation, the flight crew is responsible for reporting the non-compliance to ATC in accordance with ICAO procedures.

6 MEANS OF COMPLIANCE FOR THE AIRCRAFT DATA LINK SYSTEM.

This section includes the interoperability, safety and performance criteria for the aircraft data link system. Alternate means of compliance must substantiate interoperability. You must identify any operational limitations and/or restrictions. This includes, but is not limited to partial compliance to the criteria provided for any of the designators selected in Table 4 as applicable.

6.1 Interoperability Criteria.

6.1.1 Table 4 provides interoperability criteria for aircraft that incorporate ATN B1, B2, FANS 1/A+, or ACARS ATS interop designator(s), or any combination of those interop designators. An aircraft data link system may support any combination of the interop designators in Table 4 as applicable.

> **Note 1:** Aircraft incorporating Baseline 2 data communication capability, as defined in this AC, will receive a B2 interop designator (meeting criteria of Table 4). The B2 interop designator indicates that the installed data communications system supports future NextGen operations planned for use in the US NAS, including IM and DRNP.
>
> **Note 2:** Since only the version of B2 defined in this AC will fully support future NextGen operations in the US NAS (particularly IM and DRNP), aircraft must be equipped with the version of Baseline 2 defined in this AC to be eligible for operational approval to use the B2 interop designator for operations in the US NAS.

6.1.2 The interoperability criteria in each row of Table 4 are applicable in their entirety to the aircraft data link system for the row (capabilities and the sub-networks selected). To meet 14 CFR 23/27/29.1301(a) or 25.1301(a)(1), as applicable, aircraft data link system installations must comply with all the referenced criteria in a row in order to receive the associated interoperability designator. The interoperability criteria define the CPDLC message sets for each data link system (e.g., ATN B1, FANS 1/A+, or B2). Therefore, aircraft with multiple data link systems installed must incorporate CPDLC message sets for each supported data link system.

> **Note 1:** "CPDLC" is a data link application that includes a CPDLC message set, which comprises message elements that are used to construct messages to support the operational intent of the message elements defined in the "Message element intended use" column of the tables contained in Appendix 5 of ICAO Document 4444, *Procedures for Air Navigation Services/Air Traffic Management (PANS ATM)*.
>
> **Note 2:** Appendix A of ICAO GOLD Document 10037, *Global Operational Data Link (GOLD) Manual*, First Edition, identifies the CPDLC message elements defined in PANS ATM (see Note 2) and associates those message elements amongst the message elements defined

for ATN B1 and FANS 1/A+ (i.e., different air-ground data link technologies). ICAO is planning to incorporate message elements defined for Baseline 2 into a later version of the GOLD Manual, with plans to amend Doc 4444 after 2020.

6.1.3 Aircraft system developers and data suppliers intending to use a database (within the data link communication system); such as a database containing addressing information of Air Traffic Control Centers (ACCs) to allow the flight crew to perform a LOGON, should provide database assurance.

6.1.3.1 The certification plan should define the design assurance method for the database (i.e., DO-178C or DO-200B, or approved alternative means) with the hazard effect. The safety assessment in Appendix B of DO-350A/ ED-228A may be a useful tool to identify the hazard and the effect contributing from the database. For instance, this safety assessment indicates the inability to complete a LOGON is a minor safety effect; hence a database used to perform a LOGON should provide design assurance commensurate to a minor hazard. We recommend you seek concurrence from the certification authority early in the program.

6.1.3.2 AC 20-153B, *Acceptance of Aeronautical Data Processes and Associated Databases*, provides guidance related to FAA acceptance for all safety-related aeronautical databases. For this type of database, a database Letter of Acceptance (LOA) is the preferred means to gain FAA acceptance of the design assurance method. This method of approval allows database updates without going through the type design approval change management process.

6.1.4 Seamless CPDLC connection at FIR boundaries may not occur in some situations, requiring the flight crew to perform a manual logon. Flight crew procedures are needed to ensure transfer of CPDLC connections between ATSUs with different data link systems.

Table 4. Interoperability Criteria for the Aircraft Data Link System

Interop Designator	Applicable Standards	Criteria applicable to aircraft means of compliance
Single Capability - Aircraft Configuration:		
ACARS ATS	Varies	The applicant identifies any of the following data link services and meets the associated standards: a) DCL: ED-85A, Chapter 7 (section 7.1) and Appendix A. b) D-ATIS: ED-89A, Chapter 7 (section 7.1) and Appendix A. c) OCL: ED-106A, Chapter 7 (section 7.1) and Appendix A. d) DCL, D-ATIS, TWIP and/or OCL: ARINC 623-3.
	Sub-network Designator(s)	• See sub-networks of FANS 1/A+ of this table for applicability.

Table 4. Interoperability Criteria for the Aircraft Data Link System (continued

Interop Designator	Applicable Standards	Criteria applicable to aircraft means of compliance
Single Capability - Aircraft Configuration:		
ATN B1	DO-280B/ ED-110B, as modified by Eurocontrol Specification on Data Link Services (EUROCONTROL SPEC 0116)	• Annex B, para. B.2.1 of DO-280B/ED-110B, Airborne System CM P/OICS, at least all items identified as "M" (i.e., Mandatory) for column titled "Profile Status". • Annex B, para. B.4.1 of DO-280B/ED-110B, Airborne System CPDLC P/OICS, at least all items identified as "M" (i.e., Mandatory) for column titled "Profile Status".
	Sub-network Designator	Viable sub-network associated with ATN B1: **VDL M2** a) TSO-C160a for (Class X) or (Class Z and Y). b) ARINC 631-6.
B2	DO-351A/ED-229A	• Interoperability requirements (Denoted by "Aircraft System") applicable to CPDLC Version 3 and ADS-C Version 2.
	Sub-network Designator(s)	Viable sub-networks associated with B2 **VDL M2** a) TSO-C160a for (Class X) or (Class Z and Y). b) ARINC 631-6.

Table 4. Interoperability Criteria for the Aircraft Data Link System (continued)

Interop Designator	Applicable Standards	Criteria applicable to aircraft means of compliance
Single Capability - Aircraft Configuration:		
FANS 1/A+	DO-258A/ED-100A	• Section 6, Allocation of interoperability requirements (Denoted by "Air").
	Functional Integration Requirements	• The aircraft must provide the flight crew with automation for FMS Flight Plan modification based on data received in UM79, UM80 and UM83. 1) If the [position] in UM79 matches a fix in the active flight plan, the aircraft replaces all fixes before that fix with the specified [route clearance]. 2) If the [position] in UM79 does not match a fix in the active flight plan the aircraft inserts the [position] and [routeclearance] before the existing route, followed by a discontinuity and the existing route. 3) UM80 replaces the entire active flight plan, beginning at the departure airport (when on the ground) and present position (when in the air). 4) If the [position] in UM83 matches a fix in the active flight plan, the aircraft replaces all fixes subsequent to that fix with the specified [route clearance]. Flight crew action is still required to accept or load the clearance (i.e., "Wilco" the clearance via the data comm system and activate the route modification via the FMS). Compliance to 14 CFR parts 2X.771(a) and 2X.1523 must be demonstrated on aircraft without automation. • Aircraft must provide the flight crew with automation to generate DM24, DM40 and DM59 containing the [routeclearance] variable from the route in the FMS. Compliance to 14 CFR parts 2X.771(a) and 2X.1523 must be demonstrated on aircraft without automation.

Table 4. Interoperability Criteria for the Aircraft Data Link System (continued)

Interop Designator	Applicable Standards	Criteria applicable to aircraft means of compliance
Single Capability - Aircraft Configuration:		
	Sub-network Designator(s)	Viable sub-networks associated with FANS 1/A+: 1) **VDL M0/A** a) ARINC 618-7, Section 4. b) ARINC 750-4. c) ARINC 758-3. 2) **VDL M2** a) TSO-C160a, for (Class V) or (Class W and Y) non-International Standards Organization (ISO) 8208 compliant installations. Applicants must submit the performance standards that are used to qualify the sub-network access protocol (SNAcP) sub-layer. b) ARINC 631-6. c) ARINC 618-7, Section 11. 3) **HFDL** a) TSO-C158. b) ARINC 618-7, Section 8. c) ARINC 635-4. 4) **SATCOM (Classic Aero)** a) TSO-C132a. b) ARINC 618-7, Section 7. c) ARINC 741P2-11, Sections 3.2, 3.6, 4.2, and Attachment 2F-44. 5) **SATCOM (SBB)** a) TSO-C159c for Equipment Class in Table 1B. b) ARINC 741P2-11, Sections 3.2, 3.6, 4.2, and Attachment 2F-44. 6) **SATCOM (SBD)** a) TSO-C159c for Equipment Class in Table 1A. b) ARINC 741P2-11, Sections 3.2, 3.6, 4.2, and Attachment 2F-44.

Table 4. Interoperability Criteria for the Aircraft Data Link System (continued)

Interop Designator	Applicable Standards	Criteria applicable to aircraft means of compliance
Multiple Capability - Aircraft Configuration:		
ATN B1 and **FANS 1/A+**	Baseline	• ATN B1 criteria • FANS 1/A+ criteria
	DO-305A/ED-154A	In addition to baseline criteria, • Interoperability requirements IR-207, IR-209, IR-210, IR-211, IR-212, IR-214 and IR-215 to ensure seamless transition between two adjacent ATSUs, one using FANS 1/A+ and the other using ATN B1. *Note: Seamless CPDLC connection at FIR boundaries may not occur in some situations, requiring the flight crew to perform a manual logon. Operational standards are needed to ensure transfer of CPDLC connections between ATSUs with different data link systems.*
ATN B1 and **B2**	Baseline	• B2 criteria
	DO-353A/ED-231A	In addition to baseline criteria, • Interoperability requirement (Denoted by "Aircraft System") applicable to CPDLC Version 3.
	Aircraft implementation of dual ATN B1 and B2 capability might also be accomplished with independent application of both ATN B1 and B2 criteria.	
ATN B1 and **B2** and **FANS 1/A+**	Baseline	• B2 criteria • FANS 1/A+ criteria
	DO-353A/ED-231A	In addition to baseline criteria, • Interoperability requirement (Denoted by "Aircraft System") applicable to CPDLC Version 3.
	Aircraft implementation of dual ATN B1 and B2 capability might also be accomplished with independent application of both ATN B1 and B2 criteria.	
	DO-352A/ED-230A	• Interoperability requirements NIR-153, NIR-155, NIR-156, NIR-157, NIR-158, NIR-160 and NIR-161 to ensure seamless transition between two adjacent ATSUs, one using FANS 1/A+ and the other using B2 or ATN B1. *Note: Seamless CPDLC connection at FIR boundaries may not occur in some situations, requiring the flight crew to perform a manual logon. Operational standards are needed to ensure transfer of CPDLC connections between ATSUs with different data link systems.*
B2 and **FANS 1/A+**	Baseline	• B2 criteria • FANS 1/A+ criteria
	DO-352A/ED-230A	• Interoperability requirements NIR-153, NIR-155, NIR-156, NIR-157, NIR-158, NIR-160 and NIR-161 to ensure seamless transition between two adjacent ATSUs, one using FANS 1/A+ and the other using B2 or ATN B1. *Note: Seamless CPDLC connection at FIR boundaries may not occur in some situations, requiring the flight crew to perform a manual logon. Operational standards are needed to ensure transfer of CPDLC connections between ATSUs with different data link systems.*

6.2 **Safety and Performance Criteria.**

6.2.1 This section provides safety and performance criteria for design approval for aircraft data link systems. To meet 14 CFR 25.1523, 23.1309(a), 25.1302, 25.1301(a)(4) or 27/29.1301(d), as applicable, aircraft data link system installations must meet these criteria.

6.2.2 To meet 14 CFR 23.1309(d) or 25/29.1309(c), as applicable, aircraft supporting multiple performance specifications, depending on the configuration, must include appropriate indications and/or procedures to enable the flight crew to notify ATC when aircraft equipment failures result in the aircraft's ability to no longer meet its criteria for any of the RCP or RSP specifications. 14 CFR part 27 rotorcraft data link system installations should also meet this standard.

6.2.3 Safety Requirements for CPDLC. CPDLC installations must meet the safety requirements denoted by "Aircraft System" in RTCA/DO-350A/ED-228A Table 5-13, Safety Requirements and Supported Safety Objectives.

6.2.4 Performance Requirements for CPDLC. If seeking an RCP performance designator (**RCP 130**, **RCP 240**, or **RCP 400**), CPDLC installations must meet the following performance requirements specified in RTCA/DO-350A/EUROCAE ED-228A Table 5-14, CPDLC Performance Requirements, for the applicable RCP performance designator being sought:

6.2.4.1 $RCTP_{Aircraft}$ (Transaction Time).

6.2.4.2 $C_{Aircraft}$ (Continuity).

6.2.4.3 $I_{Aircraft}$ (Integrity).

6.2.4.4 $MA\text{-}1a_{Aircraft}$ and $MA\text{-}1b_{Aircraft}$ (RCP Monitoring and Alerting Criteria).

6.2.4.5 In lieu of the $A_{Aircraft}$ (Availability) requirement shown in Table 5-14, $A_{Aircraft}$ must be 0.999 or greater.

6.2.5 Safety Requirements for ADS-C. ADS-C installations must meet the safety requirements denoted by "Aircraft System" in RTCA/DO-350A/ED-228A Table 6-12, Safety Requirements and Supported Safety Objectives.

6.2.6 Performance Requirements for ADS-C. If seeking an RSP performance designator (**RSP 160**, **RSP 180**, or **RSP 400**), ADS-C installations must meet the following performance requirements specified in RTCA/DO-350A/EUROCAE ED-228A Table 6-13, ADS-C Performance Requirements, for the applicable RSP performance designator being sought:

6.2.6.1 $RSTP_{Aircraft}$ (Transaction Time).

6.2.6.2 $C_{Aircraft}$ (Continuity).

6.2.6.3 $I_{Aircraft}$, Navigation Figure of Merit (FOM), and Time at position accuracy (Integrity).

6.2.6.4 MA-1a$_{Aircraft}$ and MA-1b$_{Aircraft}$ (RSP Monitoring and Alerting Criteria).

6.2.6.5 In lieu of the $A_{Aircraft}$ (Availability) requirement shown in Table 6-13, $A_{Aircraft}$ must be 0.999 or greater.

7 DESIGN CONSIDERATIONS FOR AIRCRAFT DATA LINK SYSTEMS.

The following design considerations apply to all aircraft data link systems intended for air traffic services.

7.1 System Design.

To meet 14 CFR 25.1523, 25.1302, 23/27/29.1301(a) or 25.1301(a)(1), as applicable, the aircraft data link system and placement of its controls and displays must meet the following criteria:

7.1.1 Design the flight crew human-machine interface to be consistent with the flight deck design philosophy of the particular aircraft in which you are installing the aircraft data link system.

7.1.2 When the data link functionality is part of an integrated system:

7.1.2.1 Ensure that a lower priority function (e.g., AOC data link) does not interfere with the ATS data link functionality.

7.1.2.2 Ensure that the ATS data link functionality does not interfere with a higher priority function (e.g., navigation).

7.1.2.3 Ensure that there are adequate computer resources to perform the functions necessary for the intended operation in accordance with established continuity criteria (e.g., navigation functions should not interrupt or interfere with essential ATS data link functionality).

7.1.3 If the data link system includes multiple ATS data link applications and sub-networks, provide the crew with the capability to ensure that the different modes of the data link system are available to meet the criteria for the intended operation. For instance, some operations require specific data link applications and/or subnetworks.

7.1.4 Place the display so that each flight crew member can read CPDLC messages. Placement in the flight crew's primary field of view is best, as described in AC 25-11B, *Electronic Flight Displays*, Appendix C, Figure C-2.

7.1.5 The following documents provide FAA policy for when Special Conditions for cybersecurity are required and reference certain industry standards on cybersecurity for aircraft systems installations.

7.1.5.1 FAA Policy Statement PS-AIR-21.16-02, *Establishment of Special Conditions for Cyber Security*, provides FAA policy on when the FAA requires special conditions for cybersecurity. You can find this Policy Statement online at the FAA's Regulatory and Guidance Library, http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgPolicy.nsf/0/34e0a8b89f20a44686257c93006b20e5/$FILE/PS-AIR-21.16-02.pdf.

7.1.5.2 RTCA DO-326A, *Airworthiness Security Process Specification*, provides process assurance guidance and requirements for the aircraft design regarding systems information security.

7.1.5.3 RTCA DO-355, *Information Security Guidance for Continuing Airworthiness,* provides guidance for assuring continued safety of aircraft in service in regard to systems information security.

7.1.5.4 RTCA DO-356, *Airworthiness Security Methods and Considerations*, provides analysis and assessment methods for executing the process assurance specified in DO-326A.

7.2 **Flight Deck Annunciation.**

The aircraft data link system must have the following annunciation capabilities integrated into the aircraft's crew alerting systems (refer to 14 CFR 2X.1322 to distinguish between warning, caution, or advisory alert indications):

7.2.1 Indication to the flight crew upon receipt of a new ATS message.

7.2.1.1 Except as indicated in 7.2.4, unless the safety assessment substantiates otherwise, an aural and visual indication must be provided upon receipt of each uplink ATS message intended for display to the flight crew.

7.2.1.2 Such indications must be provided upon receipt of the message even when the system may not display it immediately because of a pending earlier ATS message.

7.2.1.3 The system can use visual alerts alone for uplink of non-ATS messages.

7.2.2 Indication to the flight crew of aircraft data link system failure, including connection failures (e.g., loss of comm), in the pilot's primary field of view.

7.2.3 Indication when the data link system reaches its memory capacity limits, for example:

- When the system exceeds its memory capacity such that storage or printing is not possible, or
- The system cannot process a route clearance request because it contains too many user-defined waypoints.

7.2.4 During critical flight phases (e.g., takeoff and landing), inhibit aural annunciations indicating the receipt of a data communications message until after the critical flight phase. The criteria defining critical flight phases must be consistent with the particular flight deck philosophy.

7.2.5 Indication of the active center with which the aircraft has a CPDLC connection.

7.2.6 Indication of active sub-networks.

7.2.7 Indication of established ADS contracts with the aircraft.

7.2.8 Indication when there are multiple pages of messages for the flight crew. Use a format that enables the flight crew to comprehend this fact in an intuitive manner.

7.2.9 Indication that pending open messages are waiting for a response from the flight crew.

7.2.10 Indication of the presence of a message remainder (i.e., additional message information not capable of fitting on a single page) when a message is greater than the available display area.

7.2.11 Indication of the following for each uplink message, together with the message:

- Whether the flight crew has acknowledged the message or not, and
- The time the originator sent the message.

7.3 **Flight Deck Controls.**

To meet 14 CFR 23.1309(d), 25.1302 and 25.1309(c), or 29.1309(c) (as applicable), aircraft data link systems must meet the following control capability criteria. 14 CFR 27 rotorcraft data link system installations should also meet these criteria.

7.3.1 Provide a way for the flight crew to activate or deactivate each of the flight deck data communication applications and sub-networks.

> **Note:** Flight crew may need to deactivate a sub-network that does not meet the performance specification for an intended operation. A multi-mode radio may need to be deactivated when a mode of a multi-mode radio does not meet the performance specification and it is not possible to deactivate that mode individually.

7.3.2 Provide a way for the flight crew to acknowledge receipt of a CPDLC message to the sender, when required. The flight crew should only be able to acknowledge receipt of a CPDLC message after the flight crew has viewed the complete message, such as a multiple-page message.

7.3.3 Provide a way for the flight crew to list, select, and retrieve the most recent CPDLC messages received and sent by the flight crew.

7.3.4 Provide a way for the flight crew to clear a CPDLC message from the display.

7.3.5 Provide a way for the flight crew to create, store, retrieve, edit, delete, and send a CPDLC message.

7.3.6 Provide a way for the flight crew to preview any changes prior to activation or execution of information from a CPDLC message that can be directly loaded into other avionics, such as clearance information into the flight management system or the next ATSU frequency in the radio tuning panel.

7.4 **Message Presentation.**

To meet 14 CFR 23.1309(d), 25.1302 and 25.1309(c), or 29.1309(c) (as applicable), aircraft data link systems must present messages to the flight crew with the following criteria. 14 CFR 27 rotorcraft data link system installations should also meet these criteria.

7.4.1 Present CPDLC messages, without truncating them, using message element formats defined in the standards identified in Table 4. If the aircraft includes more than one data link system capability, then display messages with the same message intent in the same way for all data link systems.

7.4.2 Present message until it is acknowledged by the flight crew, unless the flight crew selects another message; or selects another display format or function in the case of a multi-function display.

7.4.3 Present the most recent messages the flight crew has received and sent. Messages must be distinguishable from each other.

7.4.4 When the aircraft data link system is sharing a display with other aircraft functions, ensure appropriate priority for presentation of the information.

7.5 **Flight Deck Printer.**

The flight deck printer should meet integrity criteria appropriate for the intended use. Printers can be used to retain data communication messages sent or received during a flight; but cannot be used to verify CPDLC messages.

7.6 **Data Communication Recording.**

The operating rules in 14 CFR parts 91, 121, 125, 135, and 129 define data communication recording requirements. For those aircraft that must record data link messages in crash survivable memory, AC 20-160A, *Onboard Recording of Controller-Pilot Data Link Communication in Crash Survivable Memory* (or latest revision), describes acceptable means of compliance for recording in terms of the CPDLC message sets identified in 6.1 of this AC.

8 GROUND AND FLIGHT TEST EVALUATION.

Evaluate your aircraft data link system using laboratory, ground, and flight tests that consider the following:

8.1 **Interoperability.**

Verify system interoperability and performance per DO-264/ ED-78A, section 6. Test with either an appropriate ATS unit or with test equipment that is representative of an actual ATS unit. Retain evidence that the representative ATS ground test equipment demonstrates appropriate interface with the aircraft, in compliance with the interoperability and performance designators identified in Table 4.

8.2 **Function.**

Evaluate the functional operation of the data link system for consistency with flight deck philosophy and usability without excessive reliance on memory for procedures, the time and number of actions required to access the CPDLC message, meaning of icons, symbols and aural tones.

> **Note:** Aircraft equipped with Iridium and Inmarsat SATCOM systems must ensure electromagnetic compatibility (EMC) or define operational limitations in the Flight Manual defined in 9.1.1 of this AC (e.g., preclude simultaneous operations of Iridium and Inmarsat SATCOM systems).

8.3 **Performance.**

Evaluate message delivery times for uplink and downlink, long messages that require paging, receipt and acknowledgment of multiple uplink messages sent simultaneously from more than one source, and message queue capacities.

8.4 **Failures.**

Evaluate aural and visual annunciations for data link system failures for their suitability in conveying the failure mode and flight crew action.

9 AIRPLANE/ROTORCRAFT FLIGHT MANUAL (A/RFM).

Provide a description of all the aircraft data link system operational characteristics, including what actions you expect the flight crew to take in each case. You can reduce the material addressed by the A/RFM or A/RFM supplement if the information is in other related references, such as the flight crew operating manual that the operator uses as the basis for flight crew qualification. See AC 120-70C (or latest revision) for guidance.

9.1 Operating Limitations.

9.1.1 Operating limitations are not necessary, if you show that the aircraft data link system operates in accordance with all of the criteria provided in Table 4 for a given Interop Designator.

9.1.2 Use operating limitations if it provides the basis for an alternative to satisfying the criteria contained in this AC.

9.2 Operating Procedures.

9.2.1 Assure the operating procedures in the A/RFM or A/RFM supplement are consistent with the criteria you use to demonstrate the system.

9.2.2 Document the interoperability, sub-networks and performance designators identified in Table 4. Provide a statement such as the one shown in Figure 2 for your data link system, indicating all the data link types the aircraft supports, along with the aircraft-allocated RCP and/or RSP performance capabilities and associated sub-networks for each supported data link type. Because the interop designator for FANS 1/A+ does not clarify if the implementation supports automation capability defined in Table 4 (e.g., avionics ability to load routes into the flight management system in lieu of manual entry by the flight crew), FANS 1/A+ data link types must indicate either FANS 1/A+ (with automation) or FANS 1/A+ (without automation). Figure 2 shows an example A/RFM supplement for a multiple-stack data link system meeting various performance criteria to support ATS, including FANS 1/A+ (with automation).

Figure 2. Flight Manual Supplement Example

"The FAA has approved the aircraft data link system to the criteria in AC 20-140C for the following data link capabilities:

Interop Designators:	FANS 1/A+ (with automation) ATN B1 B2 ACARS ATS	
Subnetworks:	VDL M0/A/2 SATCOM (Classic Aero, SBD, SBB) HFDL	
Aircraft-Allocated Performance:	CPDLC: ADS-C:	RCP 130, RCP 240, RCP 400 RSP 160, RSP 180, RSP 400

This design approval does not constitute operational authorization."

9.2.3 If the FAA approves variations to the criteria contained in this AC and these variations impact operational use of the data link system, the A/RFM must also include additional information that describes the operational impact. You may accomplish this by reference to other approved documents.

Appendix A. Related Documents

A.1 INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) DOCUMENTS.

A.1.1 *Global Operational Data Link Document (GOLD) Manual*, Doc 10037.

A.1.2 *Performance-Based Communication and Surveillance (PBCS) Manual, Doc 9869.*

A.2 RTCA, INC. DOCUMENTS (RTCA DO) AND EUROPEAN ORGANIZATION FOR CIVIL AVIATION EQUIPMENT (EUROCAE) DOCUMENTS (ED).

A.2.1 RTCA DO-200B/EUROCAE ED-76A, *Standards for Processing Aeronautical Data*.

A.2.2 RTCA DO-258A/EUROCAE ED-100A, *Interoperability Requirements for ATS Applications Using ARINC 622 Data Communications*.

A.2.3 RTCA DO-262B (including Change 1 to Appendix D), *Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)*.

A.2.4 RTCA DO-264/EUROCAE ED-78A, *Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications*.

A.2.5 RTCA DO-280B/EUROCAE ED-110B (including Change 1), *Interoperability Requirements Standard for ATN Baseline 1 (INTEROP ATN B1)*.

A.2.6 RTCA DO-290 /EUROCAE ED-120 (including Changes 1 and 2), *Safety and Performance Requirements Standard for Air Traffic Data Link Services in Continental Airspace (Continental SPR Standard)*.

A.2.7 RTCA DO-305A/EUROCAE ED-154A, *Future Air Navigation System 1/A (FANS 1/A) – Aeronautical Telecommunications Network (ATN) Interoperability Standard*.

A.2.8 RTCA DO-306/EUROCAE ED-122 (including Change 1), *Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard)*.

A.2.9 RTCA DO-326A, *Airworthiness Security Process Specification*.

A.2.10 RTCA DO-350A/EUROCAE ED-228A, *Safety and Performance Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard)*.

A.2.11 RTCA DO-351A/EUROCAE ED-229A, *Interoperability Requirements Standard for Baseline 2 ATS Data Communications*.

A.2.12 RTCA DO-352A/EUROCAE ED-230A, *Interoperability Requirements Standard for Baseline 2 ATS Data Communications, FANS 1/A Accommodation.*

A.2.13 RTCA DO-353A/EUROCAE ED-231A, *Interoperability Requirements Standard for Baseline 2 ATS Data Communications, ATN Baseline 1 Accommodation*.

A.2.14 RTCA DO-355, *Information Security Guidance for Continuing Airworthiness*

A.2.15 RTCA DO-356, *Airworthiness Security Methods and Considerations*.

A.2.16 EUROCAE ED-85A, *Data-Link Application System Document (DLASD) for the 'Departure Clearance' Data-Link Service*.

A.2.17 EUROCAE ED-89A, *Data-Link Application System Document (DLASD) for the 'ATIS' Data-Link Service*.

A.2.18 EUROCAE ED-106A, *Data-Link Application System Document (DLASD) for the 'Oceanic Clearance' Data-Link Service*.

A.2.19 EUROCONTROL Specification on Data Link Services (EUROCONTROL SPEC 0116). Published on 28 January 2009.

A.3 **ARINC DOCUMENTS.**

A.3.1 ARINC 618-7, *Air/Ground Character-Oriented Protocol Specification*.

A.3.2 ARINC 623-3, *Character-Oriented Air Traffic Service (ATS) Applications*.

A.3.3 ARINC 631-6, *VHF Digital Link (VDL) Mode 2 Implementation Provisions*.

A.3.4 ARINC 635-4, *HF Data Link Protocols*.

A.3.5 ARINC 702A-4, *Advanced Flight Management Computer System*.

A.3.6 ARINC 741P2-11, *Aviation Satellite Communication System, Part 2, System Design and Equipment Functional Description*.

A.3.7 ARINC 750-4, *VHF Data Radio.*

A.3.8 ARINC 758-3, *Communications Management Unit (CMU) Mark 2*.

A.4 **FAA DOCUMENTS.**

A.4.1 AC 20-149B, *Installation Guidance for Domestic Flight Information Service - Broadcast*.

A.4.2 AC 20-153B, *Acceptance of Aeronautical Data Processes and Associated Databases*.

A.4.3 AC 20-160A, *Onboard Recording of Controller-Pilot Data Link Communication in Crash Survivable Memory*.

A.4.4 AC 25-11B, *Electronic Flight Displays*.

A.4.5 AC 25.1302-1, *Installed Systems and Equipment for Use by the Flightcrew*.

A.4.6 AC 120-70C, *Operational Authorization Process for use of Data Link Communication System*.

A.4.7 TSO-C132a, *Minimum Operational Performance Standards for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics*.

A.4.8 TSO-C158, *Aeronautical Mobile High Frequency Data Link (HFDL) Equipment*.

A.4.9 TSO-C159c, *Next Generation Satellite Systems (NGSS) Equipment.*

A.4.10 TSO-C160a, *Very High Frequency (VHF) Digital Link (VDL) Mode 2 Communications Equipment*.

A.4.11 FAA Policy Statement PS-AIR-21.16-02, *Establishment of Special Conditions for Cyber Security*.

A.5 HOW TO GET RELATED DOCUMENTS.

A.5.1 Order copies of ICAO documents from ICAO, Customer Services Unit, 999 University St., Montreal, Quebec, H3C 5H7, Canada. Telephone +1 514-954-8022, fax +1 514-954-6077. You can also order copies online at http://www.icao.int/.

A.5.2 You can get copies of the 14 CFR parts referenced in this AC online at the U.S. Government Publishing Office (GPO) electronic CFR Internet website at http://www.ecfr.gov/.

A.5.3 You can obtain copies of Advisory Circulars (ACs), Technical Standard Orders (TSOs), and FAA Policy Statement referenced in this AC online at FAA's Regulatory and Guidance Library (RGL) website at http://rgl.faa.gov/.

A.5.4 Order copies of RTCA documents from RTCA Inc., 1150 18th Street NW, Suite 910, Washington, D.C. 20036-4007. Telephone (202) 833-9339, fax (202) 833-9434. You can also order copies online at http://www.rtca.org/.

A.5.5 Order copies of EUROCAE documents from EUROCAE, 102 rue Étienne Dolet, 92240 Malakoff, France. You can also order copies online at http://www.eurocae.net/.

A.5.6 Order copies of ARINC documents from SAE-ITC, ARINC Industry Activities, 16701 Melford Blvd, Suite 120, Bowie, MD. 20715. Telephone +1 240-334-2575, fax +1 301-383-1231. You can also get copies from their website at http://www.aviation-ia.com/cf/store/.

Appendix B. List of Acronyms.

ACARS	Aircraft communications addressing and reporting system
14 CFR	Title 14 of the Code of Federal Regulations
A/RFM	Airplane/rotorcraft flight manual
AC	Advisory circular
ACL	ATC clearance
ACM	ATC communications management
ACO	Aircraft certification office
ADS-C	Automatic dependent surveillance – contract
AFN	ATS facility notification
AMC	ATC microphone check
AOC	Aeronautical operational control
ATC	Air traffic control
ATN	Aeronautical telecommunication network
ATN B1	ATN baseline 1 (as defined in this AC)
ATS	Air traffic service
ANSP	Air navigation service provider
ATSU	Air traffic service unit
B2	Baseline 2 (as defined in this AC)
CADS	Centralized ADS-C system
CM	Context management
CPDLC	Controller pilot data link communications
CSP	Communication service provider
D-ATIS	Data link - automated terminal information service
DCL	Departure clearance
DLIC	Data link initiation capability
DM	Downlink message
DRNP	Dynamic Required Navigation Performance
EUROCAE ED	European Organization for Civil Aviation Equipment document
FAA	Federal Aviation Administration
FANS	Future air navigation system

FIS	Flight information service
FIS-B	Flight information service - broadcast
FMS	Flight management system
FOM	Figure of merit
HF	High frequency
HFDL	HF data link
ICAO	International Civil Aviation Organization
IER	Information exchange and reporting
IM	Interval Management
INTEROP	Interoperability
LOA	Letter of Acceptance
OCL	Oceanic clearance
P/OICS	Protocol/operational implementation conformance statement
RCP	Required communication performance (used for CPDLC)
RSP	Required surveillance performance (used for ADS-C)
RTCA DO	RTCA, Inc. document
SATCOM	Satellite communications
SBB	Swift Broadband (SATCOM system operated by Inmarsat)
SBD	Short Burst Data (SATCOM system operated by Iridium)
SESAR	Single European Sky ATM Research
SPR	Safety and performance requirements
STC	Supplemental type certificate
TC	Type certificate
TWIP	Terminal weather information for pilots
UM	Uplink message
UTC	Coordinated universal time
VDL	VHF data link
VDL M0/A	VHF data link mode 0/A
VDL M2	VHF data link mode 2
VHF	Very high frequency

Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) complete the form online at https://ksn2.faa.gov/avs/dfs/Pages/Home.aspx or (2) emailing this form to 9-AWA-AVS-AIR-DMO@faa.gov

Subject: AC 20-140C Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page_____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

☐ Other comments:

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____