



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: 9/27/12

AC No: 20-140B

Initiated by: AIR-130

1. What is the Purpose of this Advisory Circular (AC)?

a. This AC provides airworthiness requirements for aircraft with an installed data link system intended to support air traffic services. 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.

b. This AC describes an acceptable means, but not the only means, to gain airworthiness approval for your aircraft data link system equipment. However, if you use the means described in this AC, you should follow it in its entirety.

2. Who Does this AC Affect? This AC provides guidelines for applicants seeking design approval of aircraft data link systems used for communication supporting air traffic services (ATS). 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 20-149 or latest approved revision.

3. Cancellation. This AC supersedes and therefore cancels AC 20-140A.

4. Definitions for Different Types of Data Link Systems.

a. Overview.

(1) This AC defines interoperability designators for data link capability in terms of the data link applications. Associated with the data link capability, this AC defines interoperability, safety and performance criteria for the aircraft data link system. For oceanic and remote airspace, when data link is required for operations, performance designators have been defined to identify the criteria for the design approval. This AC covers only the aircraft allocations of these criteria. The communication service provider (CSP), air traffic service provider (ATSP), and

operator should also be considered when approving operations as part of the operational authorization in AC 120-70B or latest revision. The air traffic service provider may use these designators to prescribe data link capability and performance in specified airspace and require the aircraft and the operator to be approved by the State of Registry or State of the Operator.

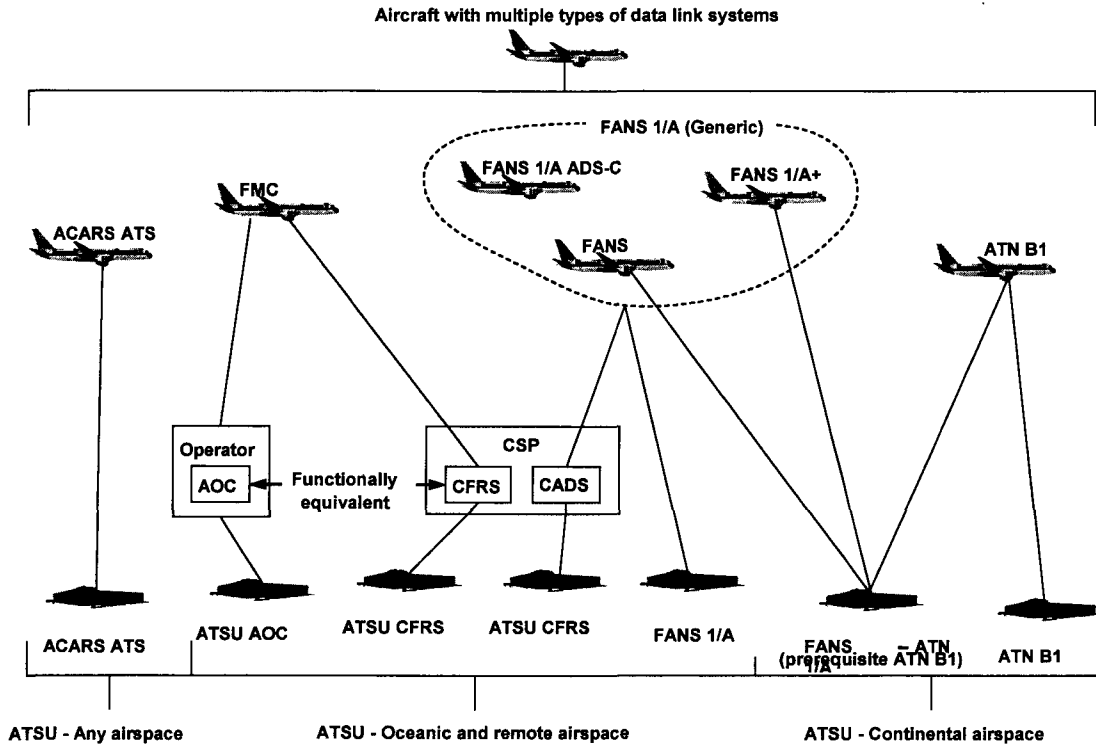
(2) International Civil Aviation Organization's (ICAO's) Global Data Link Document (GOLD), published on June 14, 2010, facilitates global harmonization of existing data link operations and resolves regional and/or State differences impacting seamless operations. GOLD includes required communication performance (RCP), surveillance specifications and guidelines on post-implementation monitoring and corrective action. The RCP and surveillance specifications are based on RTCA DO-306 Change 1/EUROCAE ED-122 Change 1. The guidance in this AC is compatible with the GOLD.

b. Data link Systems – Interoperability Designators.

(1) "Data link" is a generic term that encompasses different types of data link systems and subnetworks.

(2) Figure 1 shows different air traffic service unit (ATSU) ground systems and aircraft systems that are interoperable. A designator is associated with each type of ATSU and aircraft data link system to indicate acceptable interoperable configurations for the data link applications. Flight management computer waypoint position reporting (FMC WPR), future air navigation system (FANS 1/A), and future air navigation system automatic dependent surveillance- contract (FANS 1/A ADS-C) designators are shown for historical purposes and are not appropriate for new installation approvals.

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



Application 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).
FMC WPR	Flight management computer waypoint position reporting (FMC WPR) ATS application generates and sends waypoint position reports supported by flight management system and ACARS.
ATSU CFRS	Communication service provider’s (CSP) centralized flight management computer waypoint reporting system (CFRS) enables ATSU to receive waypoint position reports in ICAO format from any FMC WPR aircraft.
ATSU AOC	Operator’s aeronautical operational control (AOC) facility enables ATSU to receive waypoint position reports in ICAO format from the operator’s FMC WPR aircraft.
ATSU CADS	CSP’s 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 future air navigation system (FANS 1/A) ATS applications, ATS facilities notifications (AFN), Controller Pilot Data link Communications (CPDLC) and automatic dependent surveillance –Contract (ADS-C) supported by FANS 1/A over ACARS. This AC does not provide an acceptable means of compliance for type design approval for FANS 1/A designated aircraft. <i>Note:</i> FANS 1/A typically involve communication (CPDLC), navigation (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.
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. <i>Note 1:</i> FANS 1/A+ aircraft is 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. <i>Note 2:</i> Seamless transition of ATS data link service occurs between ATN B1 and FANS 1/A+ ground stations when: <ul style="list-style-type: none"> • 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.
- FANS 1/A ADS-C** ATS applications AFN and ADS-C supported by FANS 1/A over ACARS. FANS 1/A ADS-C complies with AFN and ADS-C applications, but does not include CPDLC application.
- ATN B1** ATS applications CM and CPDLC supported by aeronautical telecommunication network – baseline 1 (ATN B1) over ATN network:
 - a) Context management (CM) application for data link initiation capability (DLIC);
 - b) CPDLC 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.
- FANS 1/A - ATN** ATN B1 Ground stations incorporating interoperability requirements to provide data link service to ATN B1 or FANS 1/A equipped aircraft.

(3) The designators associated with each type of subnetwork is provided in the following table:

Table 4-1. Subnetwork Designators

Subnetwork 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 (Inmarsat)	Inmarsat or MT-SAT – aero classic satellite communications
SATCOM (Iridium)	Iridium short burst data satellite communications

(4) The applicable interoperability standards for each type of data link system and each type of subnetwork 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 subnetworks are compatible.

c. Data link Services – Safety and Performance Criteria.

(1) RTCA DO-306 Change 1/EUROCAE ED-122 Change 1 (Oceanic SPR), provides operational, safety and performance criteria for data link services that are applicable in oceanic and remote airspace for normal ATC communication and surveillance for a variety of operational capabilities. DO-306 Change 1/ED-122 Change 1 defines communication and surveillance performance designators as shown in Tables 4-2 and 4-3, which include the applicable safety criteria.

(2) RTCA DO-290/EUROCAE ED-120, Change 1 and Change 2 (Continental SPR) provides operational, safety and performance criteria for data link services that are applicable in airspace where radar services are provided and is referred to as “Initial Continental Performance”.

Table 4-2. Oceanic RCP Specifications (apply to CPDLC)

RCP Specification	Transaction time (sec)	Continuity	Availability	Integrity
RCP 240	240	0.999	0.999	Malfunction = 10 ⁻⁵ per flight hour
RCP 400	400	0.999	0.999	Malfunction = 10 ⁻⁵ per flight hour

Table 4-3. Surveillance performance specification (apply to ADS-C)

Type	Surveillance overdue delivery time (sec)	Continuity	Availability	Integrity	
RSP 180	180	0.999	0.999	Navigation FOM	<i>See Note below</i>
				Time at position accuracy	+/- 1 sec (UTC)
				Data Integrity	Malfunction = 10 ⁻⁵ per flight hour
RSP 400	400	0.999	0.999	Navigation FOM	<i>See Note below</i>
				Time at position accuracy	+/- 1 sec (UTC)
				Data Integrity	Malfunction = 10 ⁻⁵ per flight hour

Note: The navigation figure of merit (FOM) is specified on the navigation criteria associated with this specification.

5. Means of Compliance for the Aircraft Data Link System.

a. This section includes the interoperability, safety and performance criteria for the aircraft data link system. Alternate means of compliance should substantiate interoperability. You should 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 5-1 and Table 5-2.

b. Interoperability.

(1) Table 5-1 provides interoperability criteria for design approval for aircraft data link systems. New installations should comply with criteria of ATN B1, FANS 1/A+, and/or ACARS ATS.

(2) The interoperability criteria provided in each row of Table 5-1 are applicable in their entirety to the aircraft data link system for the row (capabilities and the sub-networks selected). Aircraft installations of data link system should comply with all the referenced criteria in a row in order to be identified with the associated interoperability designator.

Note: Data Base Architecture Design Considerations. Recognizing that as new operational capabilities are introduced, CPDLC message elements or pre-formatted messages may need to be added or changed. Such additions and/or changes may impose a burden on the aircraft system design approval process. In order to facilitate design approval of changes to the CPDLC message set, the applicant may consider an implementation that partitions (e.g., via a database architecture) the CPDLC message set or parts of it. This partition could include pre-formatted free text messages and message elements. It's conceivable that in the future such a design may allow updates to the CPDLC message set via an operational authorization process similar to the navigational data base and/or user modifiable software independent of the aircraft system design approval process. However, until these means are in place, changes to the CPDLC message set will be considered as part of the aircraft design approval process.

(3) An aircraft data link system may support any combination of interop designators in Table 5-1. However, for aircraft that are capable of using both FANS 1/A+ and ATN B1 applications on the same flight, the aircraft should comply with RTCA/DO-305A/ED-154A, interoperability requirements IR-207, IR-209, IR-210, IR-211, IR-212, IR-214, and IR-215 to ensure seamless transition between two adjacent ATSU's, one using FANS 1/A+ and the other using ATN B1. Also, the aircraft should ensure common flight deck display and process based on operational utilization of messages.

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 ATSU's with different data link systems.

Table 5-1. Interoperability Criteria for the Aircraft Data Link System

Application Interop Designator	Applicable Standards	Criteria applicable to aircraft means of compliance
ATN B1	DO-280B/ED-110B, as modified by Eurocontrol Specification on Data Link Services (EUROCONTROL SPEC 0116)	<ul style="list-style-type: none"> 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".
	DO-305A/ED-154A	Aircraft equipped with ATN B1 and FANS 1/A+ data link system should incorporate interoperability requirement IR-207, IR-209, IR-210, IR-211, IR-212, IR-214 and IR-215.
	Sub-network Designator.	Viable sub-network associated with ATN B1: <ol style="list-style-type: none"> 1) VDL M2. <ol style="list-style-type: none"> a) TSO-C160 or TSO-C160a for (Class X) or (Class Z and Y). b) ARINC 631-6.
FANS 1/A+	DO-258A/ED-100A	Section 6, Allocation of interoperability requirements (Denoted by "Air").
	DO-305A/ED-154A	Aircraft equipped with ATN B1 and FANS 1/A+ data link system should incorporate interoperability requirement IR-207, IR-209, IR-210, IR-211, IR-212, IR-214 and IR-215.
	Functional Integration Requirements	<ul style="list-style-type: none"> The aircraft should provide the flight crew with automation for FMS Flight Plan modification based on data received in UM79, UM80 and UM83. Compliance to 14 CFR parts 2X.771(a) and 2X.1523 should be demonstrated on aircraft without automation. Aircraft should 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 should be demonstrated on aircraft without automation.

Application Interop Designator	Applicable Standards	Criteria applicable to aircraft means of compliance
	Sub-network Designator(s)	Viable sub-networks associated with FANS 1/A+: <ol style="list-style-type: none"> 1) VDL M0/A <ol style="list-style-type: none"> a) ARINC 618-6, Section 4. b) ARINC 750-6. c) ARINC 758-3. 2) VDL M2 <ol style="list-style-type: none"> a) TSO-C160 or TSO-C160a, for (Class V) or (Class W and Y) non-International Standards Organization (ISO) 8208 compliant installations. Applicants should submit the performance standards that are used to qualify the sub-network access protocol (SNACp) sub-layer. b) ARINC 631-6. c) ARINC 618-6, Section 11. 3) HFDL (i.e., HFDL-DLS). <ol style="list-style-type: none"> a) TSO-C158. b) ARINC 618-6, Section 8. c) ARINC 635-4. 4) Inmarsat's SATCOM (i.e., Inmarsat Data 2). <ol style="list-style-type: none"> a) TSO-C132. b) ARINC 618-6, Section 7. c) ARINC 741P2-10, Sections 3.2, 3.6, 4.2 and Attachment 2F-44. 5) Iridium's SATCOM (i.e., Short Burst Data, SBD). <ol style="list-style-type: none"> a) TSO-C159a.
ACARS ATS	Varies	The applicant identifies any of the following data link services and meets the associated standards: <ol style="list-style-type: none"> 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 subnetworks of FANS 1/A+ of this table for applicability.

c. Functional Integration Requirements for FANS 1/A+. Aircraft should provide the flight crew with automation for FMS Flight Plan modification based on data received by the data link system. 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).

(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 [route clearance] 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].

(5) If the [position] in UM83 does not match a fix in the active flight plan, the aircraft inserts the [route clearance] and the [position] before the existing route, followed by a discontinuity and the existing route.

d. Safety and Performance Criteria.

(1) Table 5-2 provides safety and performance criteria for design approval for aircraft data link systems.

(2) Aircraft supporting multiple performance specifications, depending on the configuration, need to 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 surveillance specifications.

Table 5-2. Safety and Performance Criteria for the Aircraft Data Link System

Performance Designator	Applicable Standards	Reference to criteria applicable to aircraft means of compliance
RCP 240	DO-306 Change 1/ED-122 Change 1	Annex B, Table B-2, Allocation of CNS/ATM system requirements <ul style="list-style-type: none"> • Denoted by "Aircraft System". • Requirements applicable to RCP 240 (refer to paragraph 5.2.6).
RCP 400	DO-306 Change 1/ED-122 Change 1	Annex B, Table B-2, Allocation of CNS/ATM system requirements <ul style="list-style-type: none"> • Denoted by "Aircraft System". • Requirements applicable to RCP 400 (refer to paragraph 5.2.6).
RSP 180	DO-306 Change 1/ED-122 Change 1	Annex B, Table B-2, Allocation of CNS/ATM system requirements <ul style="list-style-type: none"> • Denoted by "Aircraft System". • Requirements applicable to Surveillance Operations (refer to paragraph 5.2.3.4).
RSP 400	DO-306 Change 1/ED-122 Change 1	Annex B, Table B-2, Allocation of CNS/ATM system requirements <ul style="list-style-type: none"> • Denoted by "Aircraft System". • Requirements applicable to Surveillance Operations (refer to paragraph 5.2.4.2).

Performance Designator	Applicable Standards	Reference to criteria applicable to aircraft means of compliance
<i>Initial Continental Performance</i>	DO-290/ED-120	Annex A, Table A-3, Allocation of requirements <ul style="list-style-type: none"> • Denoted by “Aircraft System”. • Performance requirements applicable to DLIC, ACM, ACL, and AMC. <i>Note:</i> There is no performance designator (i.e., RCP or surveillance specifications) for data link services in continental airspace. Demonstration of compliance to these criteria in this AC will be denoted in the flight manual by referring to this “Initial Continental Performance” label.

6. Design Considerations for Aircraft Data Link Systems. The following design considerations apply to all aircraft data link systems intended for air traffic services.

a. System Design. The aircraft data link system and placement of such should meet the following criteria:

(1) Make the human-machine interface consistent with the crew interface and flight deck design philosophy of the particular aircraft in which the aircraft data link system is installed.

(2) When the data link functionality is part of an integrated system, ensure that a lower priority function (e.g., AOC data link) does not interfere with the ATS data link functionality. Also, ensure that the ATS data link functionality does not interfere with a higher priority function (e.g., navigation).

(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.

(4) The display should be placed such that each required flight crew member can read CPDLC messages without leaving their seats. Forward normal field of view is preferred, as described in AC 25-11A, Electronic Flight Deck Displays, Appendix 3, Figure A3-1.

b. Flight Deck Annunciation. The aircraft data link system should have the following annunciation capabilities integrated into the aircraft’s crew alerting systems (refer to Title 14 of the Code of Federal Regulations (14 CFR) 2X.1322 to distinguish between warning, caution, or advisory alert indications):

(1) The data link system should provide indication to the flight crew of the presence of a new ATS message. Unless otherwise substantiated by the safety assessment, an aural and visual indication should exist for each uplink ATS message intended to be displayed to the flight crew. Such indications should include messages that are not being displayed immediately because of lack of crew acknowledgement to an earlier ATS message. Visual alerts alone can be used for uplink of non-ATS messages.

(2) Indications for the receipt of a new uplink ATS message should be incorporated into the entire suite of alerts and indications on the flight deck.

(3) Indication to the flight crew of aircraft data link system failure, including connection failures, in the pilot's normal field of view.

(4) 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.

(5) Aural annunciations indicating the receipt of a data communications message during critical flight phases (e.g., takeoff and landing) should be inhibited until after the critical flight phase. The criteria defining critical flight phases should be consistent with the particular flight deck philosophy.

(6) Indication of the active center which the aircraft has a CPDLC connection.

(7) Indication of active sub-networks.

(8) Indication of centers with established ADS contracts with the aircraft.

(9) Indication when multiple pages are used to display messages to the flight crew. Use a format the flight crew can comprehend in an intuitive manner.

(10) Indication that pending open messages are waiting for a response from the flight crew.

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

(12) Indication of the status of each message, if acknowledged or not, and the time it was sent by the originator or received by the aircraft, together with the message.

c. Flight Deck Controls. Aircraft data link systems should meet the following control capability criteria:

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

(2) Provide a way for the flight crew to acknowledge receipt of CPDLC messages to the sender, when required.

(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.

(4) Provide a way for the flight crew to clear CPDLC messages from the display.

(5) Provide a way for the flight crew to create, store, retrieve, edit, delete, and send messages.

(6) If a direct interface exists between the flight deck aircraft data link system and other computer functions (such as autoload clearances into the flight planning and navigation functions

or upload of the next ATSU frequency in the radio tuning panel standby window), provide a way for the flight crew to preview any changes prior to activation or execution.

d. Message Presentation.

(1) Present CPDLC messages, using message element formats defined in the standards identified in Table 5-1 without them being truncated. If the aircraft includes both FANS 1/A+ and ATN B1 data link systems, then messages with the same intent from the two different systems should be displayed in the same way.

(2) Present messages until acknowledged unless the flight crew selects another message; or in the case of a multi-function display, another display format or function is selected.

(3) Present the most recent messages received and sent by the flight crew. Messages should be distinguishable from each other.

(4) When the aircraft data link system is sharing a display with other aircraft functions, ensure appropriate priority for the information to be presented.

e. Flight Deck Printer. Printers can be used for retaining data communications messages sent or received during a flight. Flight deck printers used in accordance with GOLD, section 5, may be developed commensurate to a minor hazard classification.

f. Data Communication Recording. Data communication recording requirements are defined by the operating rules provided in 14 CFR parts 91, 121, 125, 135, and 129. For those aircraft required to record data link messages in crash survivable memory, AC 20-160, *Onboard Recording of Controller-Pilot Data Link Communication in Crash Survivable Memory* (or latest revision), describes acceptable means of compliance for recording.

7. Ground and Flight Test Evaluation. Test your aircraft data link system and application by end-to-end ground testing verifying 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 5-1 and Table 5-2.

8. Airplane/Rotorcraft Flight Manual (A/RFM) and A/RFM Supplement Wording.

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

a. Operating Limitations.

(1) Operating limitations are not necessary, provided the aircraft data link system has been shown to operate in accordance with all of the criteria provided in Table 5-1 for a given Application Interop Designator.

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

b. Operating Procedures.

(1) Assure the operating procedures in the A/RFM or A/RFM supplement are consistent with the criteria used to demonstrate the system.

(2) You should also document the application interoperability, sub-networks and performance designators identified in Table 5-1 and Table 5-2. For the following table, the data link type would be associated with the aircraft-allocated performance using the sub-network(s) in the far right column. The following examples illustrate common capabilities:

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

Data Link Type	Aircraft-allocated Performance	Sub-networks
ATN B1	CPDLC at Initial Continental Performance using →	VDL M2
FANS 1/A+	CPDLC at RCP 240 using → ADS-C at RSP 180 using →	VDL M0/A/2, SATCOM (Inmarsat), SATCOM (Iridium)
FANS 1/A+	CPDLC at RCP 400 using → ADS-C at RSP 180 using →	HFDL
ACARS ATS	None, using →	VDL M0/A/2, HFDL, SATCOM (Inmarsat), SATCOM (Iridium)

This design approval does not constitute operational authorization.”

(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 should also include additional information that describes the operational impact. This may be accomplished by reference to other approved documents.



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Appendix A. Related Documents

1. International Civil Aviation Organization (ICAO) document. Global Operational Data Link Document (GOLD), First Edition, published 14 June 2010.

2. RTCA, Inc. Documents (RTCA DO) and European Organization for Civil Aviation Equipment (EUROCAE) documents (ED).

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

b. RTCA DO-262A, *Minimum operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)*, Normative Appendix, section 2.

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

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

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

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

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

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

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

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

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

3. ARINC documents.

a. ARINC 618-6, *Air/Ground Character-Oriented Protocol Specification.*

- b. ARINC 623-3, *Character-Oriented Air Traffic Service (ATS) Applications*.
- c. ARINC 631-6, *VHF Digital Link (VDL) Mode 2 Implementation Provisions*.
- d. ARINC 635-4, *HF Data Link Protocols*.
- e. ARINC 702A-3, *Advanced Flight Management Computer System*.
- f. ARINC 741P2-10, *Aviation Satellite Communication System, Part 2, System Design and Equipment Functional Description*.
- g. ARINC 761-2, *Second Generation Aviation Satellite Communication System, Aircraft Installation Provisions*.

4. FAA documents.

- a. AC 20-149, *Safety and Interoperability Requirements for Initial Domestic Flight Information Service-Broadcast*.
- b. AC 20-160, *Onboard Recording of Controller-Pilot Data Link Communication in Crash Survivable Memory*.
- c. AC 25-11A, *Electronic Flight Deck Displays*.
- d. AC 120-70B, *Operational Authorization Process for use of Data Link Communication System*.
- e. TSO-C132, *Geosynchronous Orbit Aeronautical Mobile Satellite Services Aircraft Earth Station Equipment*.
- f. TSO-C158, *Aeronautical Mobile High Frequency Data Link (HF DL) Equipment*.
- g. TSO-C159a, *Next Generation Satellite systems (NGSS) Equipment*
- h. TSO-C160a, *VDL Mode 2 Communications Equipment*.

5. How to Get Related Documents.

- a. You can get copies of the 14 CFR parts referenced in this AC online at the GPO electronic CFR Internet website at www.gpoaccess.gov/cfr/.
- b. 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 www.rtca.org.
- c. 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 www.icao.int/.

- d.** Order copies of Advisory Circulars (AC) from our websites at http://www.faa.gov/regulations_policies/advisory_circulars/ and www.airweb.faa.gov/rgl.
- e.** You can find a current list of TSO on the FAA Internet website Regulatory and Guidance Library at www.airweb.faa.gov/rgl. You will also find the TSO Index of Articles at the same site.
- f.** Order copies of ARINC documents from ARINC Incorporated, 2551 Riva Rd., Annapolis, MD. 21401. Telephone +1 800-633-6882, fax +1 410-956-5465. You can also get copies from their website at www.arinc.com.
- g.** Order copies of EUROCAE documents from EUROCAE Offices, 102, rue Etienne Dolet, 92240 Malakoff, France. Telephone +33-1-40-92-79-30, fax +33-1-46-55-62-65. You can get copies from their website at www.eurocae.net.

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
ATSP	Air traffic service provider
ATSU	Air traffic service unit
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
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
INTEROP	Interoperability
OCL	Oceanic clearance
P/OICS	Protocol/operational implementation conformance statement
RCP	Required communication performance
RTCA DO	RTCA, Inc. document
SATCOM	Satellite communications
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