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: 4/7/10 **AC No:** 20-140A
Initiated by: AIR-130

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

a. The guidance in this advisory circular (AC) provides one acceptable means of compliance, but not the only means, for type design approval of aircraft that have a data link system installed.

b. Use the guidance in this AC to gain approval for type certificates (TC) and supplemental type certificates (STC) involving aircraft data link systems intended to support air traffic services. This AC will standardize these approvals among the aircraft certification offices (ACOs) in their assessment of aircraft data link systems for design approval.

c. This AC was developed in consideration of the International Civil Aviation Organization (ICAO) Annexes and guidance material, RTCA Inc. documents (RTCA DO) and European Organization for Civil Aviation Equipment documents (EUROCAE ED). It is based on published safety and performance (SPR) standards and interoperability (INTEROP) standards for data link systems in different types of operating environments.

d. This AC is not mandatory and does not constitute a regulation. It is issued to provide guidelines and to outline a means of showing that an aircraft data link system complies with airworthiness requirements.

e. This AC provides airworthiness requirements for the type design approval of aircraft with a data link system installed. It identifies specific configurations of aircraft data link systems intended for air traffic services in order to facilitate operational approvals for aircraft that comply with this AC. AC 120-70A, Operational Authorization Process for Use of Data Link Communication System, or latest revision provides guidelines for the operational authorization needed to use the data link capability. Appendix A of this AC provides a list of related documents. Appendix B of this AC contains a list of applicable acronyms.

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).

3. What Does this AC Cancel? This AC supersedes and therefore cancels AC 20-140.

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 must also be considered when approving operations as part of the operational authorization in AC 120-70A 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.

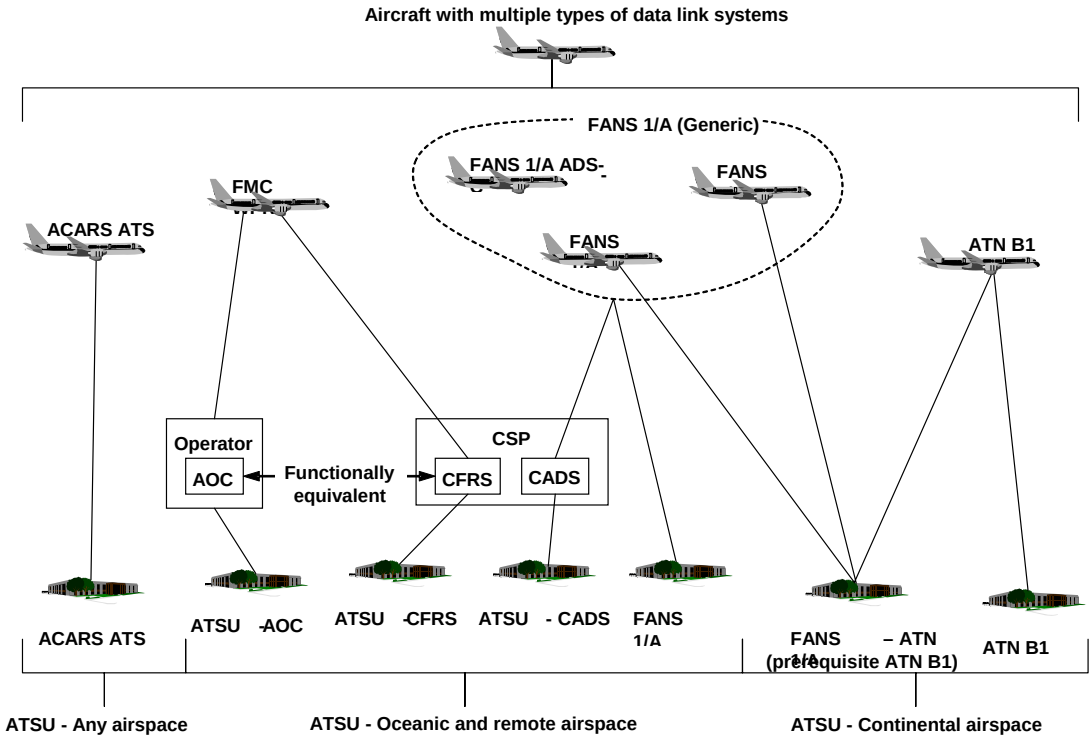
(2) ICAO is developing a Global Data Link Document (GOLD), expected to be published in July 2010, to facilitate global harmonization of existing data link operations and resolve regional and/or State differences impacting seamless operations. It includes required communication performance (RCP), surveillance specifications and guidelines on post-implementation monitoring and corrective action. The RCP and surveillance specifications are based on RTCA DO-306/EUROCAE ED-122.

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 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.

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



Application Designator	Description
ACARS ATS	ATS applications, departure clearance (DCL), oceanic clearance (OCL) 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's) 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, AFN, CPDLC and ADS-C, supported by FANS 1/A over ACARS. *Note: 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.
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, and without CPDLC application.
ATN B1	ATS applications, CM and CPDLC, supported by aeronautical telecommunication network – baseline 1 (ATN B1): a) Context management (CM) application for data link initiation capability (DLIC); b) CPDLC for ATS communications management (ACM), ATS clearance (ACL), and ATC microphone check (AMC), except that: 1) UM 135 CONFIRM ASSIGNED LEVEL and UM 233 USE OF LOGICAL ACKNOWLEDGEMENT PROHIBITED will not be used by the ATSU; and 2) DM 38 ASSIGNED LEVEL (level) is not required by the aircraft. *Note: Interoperability for departure clearance (DCL), downstream clearance (DSC), data link – automatic*

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

Table 4-1. Subnetwork Interoperability 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/EUROCAE ED-122 (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/ED-122 defines communication and surveillance performance designators as shown in Tables 4-2 and 4-3, which include the applicable safety criteria.

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

RCP type	Transaction time (sec)	Continuity	Availability	Integrity
RCP 240	240	0.999	0.999 0.9999 (efficiency)	Malfunction = 10^{-5} per flight hour
RCP 400	400	0.999	0.999	Malfunction = 10^{-5} per flight hour

Table 4-3. Oceanic Surveillance performance types (apply to ADS-C and FMC WPR)

Type	Surveillance overdue delivery time (sec)	Continuity	Availability	Integrity	
Type 180	180	0.999	0.999 0.9999 (efficiency)	Navigation FOM	*See Note 1.*
				Time at position accuracy	+/- 1 sec (UTC)
				Data Integrity	Malfunction = 10^{-5} per flight hour
Type 400	400	0.999	0.999	Navigation FOM	*See Note 1.*
				Time at position accuracy	+/- 1 sec (UTC)
				Data Integrity	Malfunction = 10^{-5} per flight hour

Note 1: The navigation figure of merit (FOM) is specified on the navigation criteria associated with this specification.

(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, referred to as continental airspace. While no RCP types or surveillance specifications have been developed for the data link services in continental airspace, the VDL M2 subnetwork is the only subnetwork that has been prescribed for data link services in continental airspace.

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. Any change to these criteria is considered a deviation from the provisions of this AC. If you request a deviation from these criteria, you should include substantiation that the proposed deviation does not impact interoperability or global seamless operations. 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+, FMC WPR, and/or ACARS ATS. FANS 1/A and FANS 1/A ADS-C apply to previously approved equipment.

(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 must comply with all the referenced criteria in a row in order to be identified with the associated interoperability designator.

(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, standards and appropriate guidance material will need to be developed.

> ***Note**: Standards are needed to provide the protocols and requirements to manually or automatically transfer CPDLC connections between ATSUs with different data link systems. Also, guidelines are needed to ensure common flight deck display of messages with the same operational intent, resulting from different message sets between FANS 1/A(+) and ATN B1 CPDLC applications.*

c. Safety and Performance Criteria.

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

(2) Aircraft capability that supports multiple RCP type or surveillance operations needs 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 types or surveillance specifications.

> ***Note**: Data link operations that use certain subnetworks, e.g., HFDL, or take place in subnetwork transition areas, e.g., VHF fringe coverage area, may not meet the criteria for some RCP types or surveillance specifications.*

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.	• Annex B, para. B.2.1, Airborne System CM P/OICS. • Annex B, para. B.4.1, Airborne System CPDLC P/OICS except that: (1) UM 135 (CONFIRM ASSIGNED LEVEL), and UM 233 (USE OF LOGICAL ACKNOWLEDGMENT PROHIBITED), will not be used by the ground systems; and (2) DM 38 (ASSIGNED LEVEL) is not required by the aircraft.
	Sub-network Interop Designator.	Viable sub-networks associated with ATN B1: 1) VDL M2. a) TSO-C160 for (Class X) or (Class Z and Y). b) ARINC 631-5.
FANS 1/A+	DO-258A/ ED-100A	Section 6, Allocation of interoperability requirements (Denoted by "Air").
	DO-305/ED-154	Paragraph 4.2.13.2, Downlink Message Elements.
	Sub-network Interop Designator(s).	Viable sub-networks associated with any application designator supported by the ACARS network: 1) VDL M2 a) TSO-C160, 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 631-5. c) ARINC 618-6, Section 11 for INFO frame data format. 2) HFDL (i.e., HFDL-DLS). a) TSO-C158. b) ARINC 618-6, Section 8. c) ARINC 635-4. 3) Inmarsat's SATCOM (Inmarsat, i.e., Data 2). a) TSO-C132. b) ARINC 618-6, Section 7. c) ARINC 741P2-10, Sections 3.2, 3.6, 4.2 and Attachment 2F-44. 4) Iridium's SATCOM (i.e., Short Burst Data, SBD). a) DO-262A, Normative Appendix, Section 2.
FANS 1/A	DO-258A/ ED-100A or previous version.	Section 6, Allocation of interoperability requirements (Denoted by "Air"). *<u>Note 1:</u> This aircraft capability supports oceanic & remote operations, but not continental (domestic), except in the Maastricht airspace.*

Application Interop Designator	Applicable Standards	Criteria applicable to aircraft means of compliance
	Sub-network Interop Designator(s).	See subnetworks of FANS 1/A+ of this table for applicability.
FANS 1/A ADS-C	DO-258A/ ED-100A or previous version.	Section 6, Allocation of interoperability requirements (Denoted by "Air") for AFN and ADS-C functionality only.
	Sub-networks.	See subnetworks of FANS 1/A+ of this table for applicability.
FMC WPR	ARINC 702A	Paragraph 4.3.6, AOC Interfaced Function, for automatic position reports. *Note 2: Provided for definition of FMC WPR and interoperability aspects of the AOC functionality. See DO-306/ED-122 for the safety assessment criteria with respect to use of this functionality.*
	Sub-network Interop Designator(s).	See subnetworks of FANS 1/A+ of this table for applicability.
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, and/or OCL: ARINC 623-3.
	Sub-network Interop Designator(s).	See subnetworks of FANS 1/A+ of this table for applicability.

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/ED-122	Annex B, Table B-2, Allocation of CNS/ATM system requirements • Denoted by "Aircraft System". • Requirements applicable to RCP 240 (refer to paragraph 5.2.6).
RCP 400	DO-306/ED-122	Annex B, Table B-2, Allocation of CNS/ATM system requirements • Denoted by "Aircraft System". • Requirements applicable to RCP 400 (refer to paragraph 5.2.6).
Type 180	DO-306/ED-122	Annex B, Table B-2, Allocation of CNS/ATM system requirements • Denoted by "Aircraft System". • Requirements applicable to Surveillance Operations (refer to paragraph 5.2.3.4).
Type 400	DO-306/ED-122	Annex B, Table B-2, Allocation of CNS/ATM system requirements • Denoted by "Aircraft System". • Requirements applicable to Surveillance Operations (refer to paragraph 5.2.4.2).
(Continental)	DO-290/ED-120	Annex A, Table A-3, Allocation of requirements • Denoted by "Aircraft System". • Requirements applicable to DLIC, ACM, ACL, AMC *Note:* *There is no performance designator (i.e., RCP type 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 "Continental" 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 meet the criteria for the intended operation.

(4) Operationally relevant system behavior should be obvious to the trained crew member.

(5) The display must be placed such that each required flight crew member can read CPDLC messages without leaving their seats.

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 CFR 2X.1322 to distinguish between warning, caution, or advisory alert indications):

(1) Unless otherwise substantiated by the safety assessment, an aural and visual indication for each uplink ATS message intended to be displayed to the flight crew. Include messages 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) Indication to the flight crew of aircraft data link system failure.

(3) Indication of status to the flight crew of the air/ground data communication sub-network, such as loss of an air/ground link.

(4) Indication when the data link system reaches its capability limits, for example, when the system exceeds it 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 suspended until after the critical flight phase. The criteria that define critical flight phases should be consistent with the particular flight deck philosophy.

(6) Indication of the ATS provider(s) connected to the aircraft; and the applications and sub-networks involved with each connection.

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

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

(9) 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.

(10) Indication of the status of each message, if acknowledged or not, and the time it was sent by the originator, 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 to 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 CPDLC 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 CPDLC messages received and sent by the flight crew so that messages are 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. If the flight deck printer interfaces with the data link system, it should meet integrity criteria appropriate for the intended use. Normally, printers can be used for storing data communications messages sent or received during a flight.

f. Data Communication Recording. Data communication recording requirements are defined by the operating rules provided in Title 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*, 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 that verifies 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. Submit 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 120-70A (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 the criteria provided in Table 5-1.

(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. The following examples illustrate common capabilities:

- The FAA has approved the aircraft data link system to the criteria contained in AC 20-140A for FANS-1/A+ using VDL M2, VDL M0/A, and SATCOM (Inmarsat). The data link system meets the aircraft-allocated performance requirements of RCP 240 and type 180 (all subnetworks), and the performance requirements for continental applications (VDL M2 only). This design approval does not constitute operational authorization.
- The FAA has approved the aircraft data link system to the criteria contained in AC 20-140A for FANS-1/A+ using VDL M2, VDL M0/A, and SATCOM (Inmarsat), and for ATN B1 using VDL M2. The data link system meets the aircraft-allocated performance requirements of RCP 240 and type 180 (FANS-1/A+ using all subnetworks), and the performance requirements for continental applications (FANS-1/A+ and ATN B1 using VDL M2). This design approval does not constitute operational authorization.
- The FAA has approved the aircraft data link system to the criteria contained in AC 20-140A for ACARS ATS using SATCOM (Inmarsat). The performance of the data link system has not been evaluated. This design approval does not constitute operational authorization.

(3) If the Federal Aviation Administration (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 either by reference to the applicant's already agreed upon and approved documents or as part of the A/RFM.

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Appendix A. Related Documents

1. International Civil Aviation Organization (ICAO) document:

a. Global Operational Data Link Document (GOLD), v 1.0 expected publication in July 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-305/EUROCAE ED-154, *Future Air Navigation System 1/A (FANS 1/A) – Aeronautical Telecommunications Network (ATN) Interoperability Standard*.

g. RTCA DO-306/EUROCAE ED-122, *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*.

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 631-5, *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 20-160, *Onboard Recording of Controller-Pilot Data Link Communication in Crash Survivable Memory.*

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

c. TSO-C132, *Geosynchronous Orbit Aeronautical Mobile Satellite Services Aircraft Earth Station Equipment*

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

e. TSO-C160, *VDL Mode 2 Communications Equipment*

5. How to Get Related Documents:

a. Order copies of 14 CFR parts from the Superintendent of Documents, Government Printing Office (GPO), P.O. 979050, St. Louis, MO 63197. For general information telephone (202) 512-1800 or fax (202) 512-2250. You can also get copies online at the GPO electronic CFR Internet website at www.gpoaccess.gov/cfr/.

b. Order copies of RTCA documents from RTCA Inc., 1828 L Street NW, Suite 805, 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 the U.S. Department of Transportation, Subsequent Distribution Office, M-30, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785. You can also get copies from our website at http://www.faa.gov/regulations_policies/advisory_circulars/ or www.airweb.faa.gov/rgl.

e. You can find a current list of technical standard orders 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 Regulation
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
AVLC	Aviation VHF link control
CADS	Centralized ADS-C system
CFRS	Centralized flight management computer waypoint reporting system
CM	Context management
CPDLC	Controller pilot data link communications
CSP	Communication Service Provider
D-ATIS	Digital - automated terminal information service
DCL	Departure clearance
DCPC	Direct controller-pilot communications
DLIC	Data link initiation capability
DM	Downlink message
DSC	Downstream clearance
EUROCAE ED	European Organization for Civil Aviation Equipment documents

FAA	Federal Aviation Administration
FANS	Future air navigation system
FLIPCY	Flight plan consistency
FMC	Flight management computer
FMC WPR	Flight management computer waypoint position reporting
FOM	Figure of merit
HF	High frequency
HFDL	HF data link
ICAO	International Civil Aviation Organization
IER	Information exchange and reporting
INTEROP	Interoperability
NAT FIG	North Atlantic Future Air Navigation Systems (Fans) Implementation Group
OCL	Oceanic clearance
P/OICS	Protocol/operational implementation conformance statement
PDC	Pre-departure clearance
PR	Position reporting
RCP	Required communication performance
RTCA DO	RTCA, Inc. document
SATCOM	Satellite communications
SPR	Safety and performance requirements
STC	Supplemental type certificate
TC	Type certificate
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
WPR	Waypoint position reporting