



Advisory Circular

Subject: Operational Authorization
Process for use of Data Link
Communication System

Date: 12/29/05
Initiated by: AFS-430

AC No: 120-70A

This advisory circular (AC) presents various methods for operators of differing data link systems to meet international standards set by the International Civil Aviation Organization (ICAO) and the Regional Airspace Authorities. The FAA notes that there is presently no requirement in Title 14 of the Code of Federal Regulations to have data link communications when operating in the National Airspace System (NAS). Instead, the regulations in Title 14 govern radio communication systems, and nothing in this AC absolves an operator from the requirement to have and use a voice communication system when operating in the NAS. However, operators that choose to use a data link system (in addition to the required voice communication system) must obtain FAA design approval and a revision to their Operating Specifications. Thus, the FAA is issuing this AC is to present the consensus of the aviation community regarding acceptable methods, procedures, and training for users of data link systems.

ORIGINAL SIGNED BY
Carol Giles for

James J. Ballough
Director, Flight Standards Service

CONTENTS

	Page
1. Purpose.....	1
2. Cancellation	1
3. Applicability	1
4. Related Material.....	2
5. How To Order	3
6. Background And Definitions	3
7. Authorization To Use Data link Communications In Flight Operations	8
8. Flightcrew Qualification For Use Of Data link Communications	10
9. Other Operational Issues.....	16
10. Maintenance.....	17
11. Data link Communications Operational Use	18
12. Data Link Event Reporting	20
13. Foreign Air Carriers.....	21
 APPENDIX 1 SAMPLE DATA LINK EVENT REPORTING INFORMATION (1 page)	 1
APPENDIX 2. DATA LINK COMMUNICATIONS MINIMUM REQUIREMENT LIST (MEL) AND MASTER MINIMUM EQUIPMENT LIST (MMEL) PROVISIONS (2 pages)	 1
APPENDIX 3. PART 129 PROVISIONS FOR USE OF DATA LINK IN U.S. AIRSPACE (1 page).....	 1
APPENDIX 4. ACRONYMS AND ABBREVIATIONS (2 pages)	1

1. PURPOSE. This advisory circular (AC) presents various methods for operators of differing data link systems to meet international standards set by the International Civil Aviation Organization (ICAO) and the Regional Airspace Authorities. The FAA notes that there is presently no requirement in Title 14 of the Code of Federal Regulations to have data link communications when operating in the National Airspace System (NAS). Instead, the regulations in Title 14 govern radio communication systems, and nothing in this AC absolves an operator from the requirement to have and use a voice communication system when operating in the NAS. However, operators that choose to use a data link system (in addition to the required voice communication system) must obtain FAA design approval and a revision to their Operating Specifications. Thus, the FAA is issuing this AC is to present the consensus of the aviation community regarding acceptable methods, procedures, and training for users of data link systems.

The original advisory circular, AC 120-70, was applicable to Aeronautical Telecommunication Network (ATN) VHF Data Link (VDL) Mode 2 communication systems. The Future Air Navigation System (FANS 1/A) system used in Oceanic and Remote airspace is an analog system which communicates over Aircraft Communications Addressing and Reporting System (ACARS). Guidance is needed for the operation of both systems and therefore the requirement for this revision.

2. CANCELLATION. AC 120-70 dated February 17, 2000, Initial Air Carrier Operational Approval for Use of Digital Communication System, is cancelled.

3. APPLICABILITY. This AC applies to aircraft and air carriers operating under parts 121, and 135, other organizations conducting training approved in accordance with part 121 (e.g., training centers or aircraft manufacturers), operators under part 125, and foreign air carriers conducting operations in United States airspace under part 129. This AC describes the process for obtaining operational authorization for data link communication systems, acceptable methods for training and maintenance, and operational policies for use. In addition, it describes appropriate actions in the event of an exceptional air traffic control (ATC) data link communications event, and criteria for foreign operator use of data link communications in U.S. airspace. This AC may be applied to operators conducting operations under 14 CFR part 91. This AC does not address the use of data link communications for specific ATS applications such as ATIS, PDC, and DDTC, which are information services not directly related to aircraft separation.

The Data Link System should comply with International Standards and Recommended Practices and Procedures for Air Navigation Services, Annex 10 to the Convention on International Civil Aviation, Aeronautical Telecommunications, Volume II, Communications Procedures including those with PANS status, Chapter 8, Aeronautical Mobile Service – Data Link Communications, Sixth Edition October 2001. This AC is consistent with-Volume III, Part I, Digital Communication Systems, Chapter 3, Aeronautical Telecommunication Network (ATN).

4. RELATED MATERIAL.

a. Title 14 Code of Federal Regulations (14 CFR). The following 14 CFR parts are applicable to the communications systems and applications covered in this document: parts 21, 23, 25, 27, 29, 43, 91, 121, 125, 129 and 135.

b. Advisory Circulars. The following AC provides additional information that may assist in the operational authorization of data link communications systems:

- AC 20-140, Guidelines for Design Approval of Aircraft Data Communications Systems

c. International Civil Aviation Organization (ICAO) documents:

(1) Annex 10 to the ICAO Convention (Standards and Recommended Practices – SARP's), Volume III, Part 1, Data link Data Communications Systems.

(2) Document 4444 (PANS/ATM), Procedures for Air Navigation Services - Rules of the Air and Air Traffic Services.

(3) Annex 6 to the ICAO Convention Operations of Aircraft.

(4) Annex 11 to the ICAO Convention Air Traffic Services.

(5) Document 7030, Regional Supplementary Procedures.

d. FAN's Interoperability Team and FAN's Interoperability Group Global Document:

- **FAN's Operations Manual**

e. The following RTCA documents are available from RTCA Inc., 1140 Connecticut Avenue, NW. Suite 1020, Washington, DC 20036:

(1) DO-210C, Minimum Operational Performance Standards for Aeronautical Mobile Satellite Service (AMSS avionics).

(2) DO-212, Minimum Operational Performance Standards for Airborne Automatic Dependent Surveillance (ADS) Equipment.

(3) DO-215A, Guidance on Aeronautical Mobile Satellite Service (AMSS) End-to-End System Performance.

(4) DO-219, Minimum Operational Performance Standards for ATC Two-Way Data Link Communications (Applications).

(5) DO-224, Signal-in-Space Minimum Aviation System Performance Standards for Advanced VHF Data link Communications.

(6) DO-231, Design Guidelines and Recommended Standards for the Internet working, Implementation and Use of AMS(R)S.

(7) DO-239, Minimum Operational Performance Standards for Traffic Information Services (TIS) Data Link Communications.

(8) DO-240, Minimum Operating Performance Standards for Aeronautical Telecommunication Network (ATN) Avionics.

(9) DO-242, Minimum Aviation System Performance Standards for Automatic Dependent Surveillance Broadcast (ADS-B).

(10) DO-243, Guidance for Initial Implementation of Cockpit Display of Traffic Information.

(11) DO 264, Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications.

f. The following SAE documents are available from SAE International, Customer Sales, 400 Commonwealth Avenue, Warrendale, PA, 15096:

(1) ARP 4754, Certification Considerations for Highly-Integrated or Complex Aircraft Systems.

(2) ARP 4761, Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment.

5. HOW TO ORDER.

a. A copy of this AC and other ACs mentioned herein may be obtained from:

**U.S. Department of Transportation
Subsequent Distribution Office, SVC-121.23
Ardmore East Business Center
3341 Q 75th Ave
Landover, MD 20785**

b. Identify this publication in your order as Federal Aviation Administration (FAA) Advisory Circular (AC 120-70A), Operational Authorization Process For Use Of Data link Communication Systems.

6. BACKGROUND AND DEFINITIONS.

a. **Data Link Implementation.** Data link applications are being implemented in flight operations and other operations on a widespread basis (e.g., PDC, D-ATIS, FANS-1 CPDLC, FIS/TIS, and ADS). Data link applications operate without any specific knowledge by the user as to whether a satellite, VHF, or HF air/ground data link medium network service is in use. However, these applications may be limited by the level of end-to-end data link service

implementation in use. (e.g., ACARS, FANS-1 ACARS/ARINC 622, CNS/ATM-1). This AC provides information for U.S. operators, aircraft and data link manufacturers, various inspectors, foreign air carriers operating in U.S. airspace, and other aviation organizations regarding a means acceptable to the FAA for the use of data link systems in ATS communications. This information is intended to facilitate the operational authorization of data link systems, promote timely and comprehensive program implementation, encourage development of standard practices for the application of data link techniques, and provide an appropriate response to exceptional data link events.

b. Definitions. Certain definitions in this AC are taken from other FAA materials. Other definitions are unique to this AC, and their application is limited to use with data link systems.

(1) Aircraft Certification Office (ACO). FAA offices responsible for the determination of aircraft airworthiness and other issues related to parts 21, 23, 25, 33, and other airworthiness rules. ACOs issue Type Certificates (TC), and Supplemental Type Certificates (STC), and are responsible for the technical assessment of service difficulties and Airworthiness Directives (AD).

(2) Aircraft Evaluation Group (AEG). FAA offices responsible for operational aspects of newly certificated, modified, or "in-service" aircraft. AEGs establish FAA criteria for pilot qualification as it relates to Flight Standardization Board (FSB) and initial aircraft certification, AEGs are also responsible for minimum equipment lists (MEL), initial airworthiness, and other operationally related regulation, including 14 CFR parts 43, 61, 91, 121, 135.

(3) Certificate-Holding District Office (CHDO). A Flight Standards office responsible for the administration of part 119 certificate authority for operations conducted under parts 121 or 135 for a particular certificate holder.

(4) Air Traffic Data Link Service. A data communication capability comprising air/ground and ground/ground data network services, specified data link message sets and protocols, aircraft equipment, ATS Facility equipment, and operational procedures intended to provide primary or supplemental ATS communications without reversion to voice procedures under most circumstances.

(5) Data Link Event. For the purpose of this AC, a Data Link Event is one or more of the following occurrences or situations related to data link:

- In-flight traffic conflicts or potential conflicts as determined by a flightcrew member in which use of a data link service is suspected to be contributing cause.
- Near mid-air collisions (NMAC) in which the use of a data link service is suspected to be a contributing cause.
- Data link system performance below that of normal operation.
- ATC operational error involving a data link-equipped aircraft.

- Other occurrences or situations in which use of a data link service is suspected to compromise continued operational safety. Loss of standard ATC separation resulting from a procedure or maneuver where a data link transaction, failure, or unmonitored error is suspected to be a factor.
- Use of the data link service that caused excessive crew workload.
- A data link service that provides reasonable information but is subsequently verified to be erroneous.
- An excursion of more than 500 feet from an assigned flight level/altitude, or a lateral/longitudinal deviation exceeding ATS minimum separation criteria in which use of a data link service is suspected to be a contributing cause.

(6) Data Link Service Academic Training (as applied within this AC). Training that exclusively addresses *knowledge* requirements (rather than skills), and is usually related to achieving satisfactory knowledge of data link service concepts, systems, limitations, or procedures. The academic training on data link services is generally accomplished using a combination of classroom methods (stand up instruction, slide/tapes, computer-based instruction (CBI), tutorial, etc.), flight manual information, bulletins, or self-study. See paragraph 8b for an expanded explanation of the recommended curriculum.

(7) Data Link Service Use Training. This is training that addresses all of the skills related to the operational use of data link services including the knowledge and skills needed to receive information provided by data link services, and appropriately accept, reject, cancel, or defer a response to that information. In addition, this training includes the knowledge and skills needed to load, store, formulate, and request information from the data link service.

(8) Data Link System. A general term referring to data link digital or analog based systems. At the present time the digital operation is known as VDL–Mode 2 system. The analog operation is known as the FANS system. The FANS (1/A) system uses both digital and analog components. The data link applications are digital and binary encoded, and then processed by the ACARS convergence function (ACF) for transmission over a character-oriented network.

(9) Flight Standards District Office (FSDO). An FAA field office serving an assigned geographical area and staffed with Flight Standards personnel who serve the aviation industry and the general public on matters relating to the licensing of aviation personnel, certification of aircraft and operational authorization of air carriers, commuter and general aviation operations.

(10) Flight Standards Board (FSB). The FAA board responsible for establishing or revising crew qualification requirements (e.g., training, checking, currency, and type rating(s)) for specific aircraft). FSBs are established for each large turbojet and turboprop aircraft type used in air transportation, as well as other part 25 aircraft, transport category multi-engine helicopters, and large multi-engine piston aircraft.

(11) Follow-on STC (as related to data link communications). A data link communications STC other than as described in item (13) below for an "Initial TC/STC." The following examples are considered to be "follow-on" STCs:

- A previously approved data link communications installation, installed in a subsequent type or model aircraft.
- Changes of display configuration (FMS/data link display), supporting system (EICAS/ECAM) or other aircraft interface (DFDR, etc.).

(12) Initial TC/STC (as related to data link communications). The first FAA data link communications airworthiness approval (in accordance with a TC or STC) of any one or combination of the following components: a data link processor and/or management unit, data link communications avionics.

NOTE: Previously approved data link communications systems, may require an initial TC/STC, if the part number of any of the above components changes due to a significant modification that changes, the system.

(13) **Maintenance Review Board (MRB).** An FAA board responsible for establishing maintenance requirements for a specific aircraft type. MRB requirements are usually formulated in conjunction with information provided by the manufacturer and prospective operators through industry working groups. FAA CHDOs apply MRB requirements in reviewing and approving each carrier's proposed maintenance program.

(14) **Master Minimum Equipment List (MMEL).** An FAA document listing stipulations in accordance with 14 CFR §§ 121.628 and 135.179 that provides authorization for the continuation of flight beyond a terminal point with certain equipment inoperative. AEGs develop MMELs in conjunction with a Flight Operation Evaluation Board (FOEB) established for each aircraft type. The MMEL, which is associated with a particular type of aircraft, serves as the basis for MELs, which are associated with an air carrier's operation of that aircraft type.

(15) **National Airspace System (NAS).** Information on the NAS related to operations and use of air traffic data link services can be found in Aeronautical Information Publication, Airmen's Information Manual, Notice to Airmen, Jeppesen Charts, or similar resources. The common network of U.S. airspace is comprised of the following:

- Air navigation facilities
- Equipment and services
- Airports
- Aeronautical charts
- Rules

- Regulations
- Procedures
- Technical information
- Manpower
- Materials
- System components shared jointly with the military

(16) National Simulator Evaluation Team (NSET). Team of FAA operations specialists responsible for evaluating flight simulators to aid Principal Operations Inspectors (POI) in approving those simulators in accordance with regulatory requirements (e.g., NSET evaluations support POI approval of a particular simulator for use in a specific part 121 program).

(17) Principal Inspector (PI). Refers to one of three FAA principal inspectors: principal avionics inspector (PAI), principal operations inspector (POI), or principal maintenance inspector (PMI).

- Principal Avionics Inspector (PAI). The FAA inspector assigned responsibility for overseeing all avionics issues relative to a specific operator, including input to training programs, Operations Specifications, MEL requests, etc.
- Principal Operations Inspector (POI). The FAA inspector assigned responsibility for overseeing all operational issues relative to a specific operator, including approval of training programs, Operations Specifications approval, maintenance programs, MEL change requests, etc.
- Principal Maintenance Inspector (PMI). The FAA inspector assigned responsibility for overseeing all maintenance issues relative to a specific operator, including input to training programs approved maintenance programs, Operations Specifications, MEL requests, etc.

(18) Supplemental Type Certificate (STC). An FAA certificate certifying that modifications to the respective aircraft, engines, or other components meet airworthiness requirements of the regulations.

(19) Type Certificate (TC). An FAA certificate certifying that the respective aircraft, engines, or other components meet airworthiness requirements of the regulations.

7. AUTHORIZATION TO USE DATA LINK COMMUNICATIONS IN FLIGHT OPERATIONS.

a. General.

(1) Installation of a data link communication system requires FAA design approval of changes to the aircraft's type design by amending the TC or issuing an STC. However, approval to install a TC'd or STC'd data link communications system does not constitute approval to use the system. Prior to using the system, the operator must request a revision to their Operations Specifications to ensure that the system is used in accordance with international standards and requirements and in a manner that is acceptable to the FAA. A revision to the Operations Specifications includes specific authorizations, training and maintenance programs, manuals, operational procedures, MELs, and other such areas necessary for safe and effective use of data link communications. In addition, the service must be capable of meeting international standards for a specific route.

(2) Responsibilities of various FAA offices regarding data link communications. FAA ACOs approve changes to a type design or issuance of STCs. FAA AEGs formulate operational criteria for specific aircraft types related to training, checking, maintenance, MMELs or other operational issues, as necessary. FAA uses information developed by AEGs to review a particular operator's programs. CHDOs approve particular Operations Specifications, letters of authorizations, operator's training, maintenance programs, operational procedures, and MELs, if they are consistent with criteria specified in this Advisory Circular, Aeronautical Information Manual (AIM), MMELs, FSB reports, MRB reports, and policy guidance from Flight Standards Service AFS-200, AFS-300, AFS-400 and AFS-800.

b. Design Approval of Aircraft Data Communications Systems. Guidelines of design approval of aircraft data communication and SATCOM voice systems and applications primarily used for ATS are provided in FAA AC 20-140 or equivalent.

c. Operational Authorization. Criteria for data link operational authorization are determined by the communication requirements specified for the intended operation.

(1) **Data link Communications Authorization Criteria.** Operational authorizations are based on criteria in this AC, and may also include criteria outlined in, training, maintenance, MMEL, or other operationally related criteria formulated by AEGs. If criteria for training or checking are other than as specified in this AC, the criteria may be found in FSB reports applicable to a particular aircraft type. Provisions for dispatch with inoperative equipment are specified by the MMEL for each aircraft type. Maintenance requirements are identified by this AC, unless otherwise described by a MRB report for a specific aircraft type, or in FAA-approved maintenance instructions identified in conjunction with an STC or manufacturer's Service Bulletin.

(2) **Data Link Communications Authorization Methods.** FAA Flight Standards provides operational approval of data link communications training programs, checklists, operations manuals, training manuals, maintenance programs, MELs, and other pertinent documents or document revisions applicable to the particular air carrier. Operators' data link communications programs are usually approved for each specific aircraft type. However,

programs common to one or more types may be approved if data link communications program elements are common to different aircraft types.

(3) Data Link Communications Authorization Procedures.

(a) Operational authorization to use data link communications is provided by an FAA POI. Operators should make early contact with their respective PI's to permit timely FAA response. Usually such contact is initiated at the time preparations are being made for data link communications system selection or purchase.

NOTE: Each operator is assigned three FAA PI's; A POI, a PMI, and a PAI, that are typically located in the CHDO.

(b) Installations, training, maintenance programs, MELs, and other data link communications program elements are reviewed and approved by the FAA.

(c) Prior to issuance of Operations Specifications, or the addition of an area, route or procedure to an existing Operations Specification, the operator should demonstrate that the aircraft data link system is compatible with that of the systems being used by the ATC facility when communicating with the chosen service provider(s). The results of prior interoperability demonstrations performed, as part of a design approval may suffice. Under international standards, the service provider(s) and air/ground data link communications sub-networks used in the performance demonstrations for design approval must be operationally equivalent to those in the proposed operating approval. Operational equivalence is determined by an assessment of the SPR and INTEROP standards, which may be demonstrated in an operational flight check.

(d) Following, determination of aircraft eligibility to use data link services, the operator should conduct an interoperability test to demonstrate that the specific combination of data link communication systems elements perform as intended (e.g., FMS ACARS interface, printers, CSP and air traffic facilities along the intended routes of flight). The PAI will review the test results for conformance with international standards and FAA policy and procedures.

8. PART 121 FLIGHTCREW QUALIFICATION FOR USE OF DATA LINK COMMUNICATIONS.

a. General.

(1) Data link Communications Qualification Issues and Objectives. Separate qualification issues and training should be addressed depending on the system being used by the

air carrier, (digital or analog data link). Air carriers should address the following issues and objectives to ensure appropriate flightcrew data link communications qualification:

(a) Provide necessary flightcrew knowledge of data link communications concepts, systems, and procedures (Data link Communications Academic Training).

(b) Develop necessary flightcrew knowledge and skills to properly respond to data link communications clearances or advisories (Data link Communications Procedure Training).

(c) Assess each pilot's ability to properly use data link communications (Data link Communications Initial Evaluation).

(d) Identify Human Factors issues specific to flightcrew operation and interaction with the communication software, hardware, and operating environment (e.g., head-down time, situational awareness, and loss of party-line information).

(e) Maintain appropriate data link communications knowledge and skills which may include Data link Communications Recurrent Training.

(2) Data Link Communications Training. Flightcrew member training for first time use of data link services should be included in initial, transition, upgrade, recurrent, differences, or stand-alone qualification programs. Data link communications training could be included in specific aircraft qualification programs during transition, upgrade, or differences training (e.g., during DC-10 to B747-400 transition) or operators could conduct data link communications training in conjunction with general training (e.g., during initial “new hire” indoctrination, recurrent proficiency checks or proficiency tests, or line-oriented flight training. Data link communication training programs may also be developed as separate training programs (e.g., by completion of a standardized curriculum covering the general use of data link services at an operator’s training center or at designated crew bases).

(3) Credit for Use of Other Programs. Operators may receive credit for existing data link communications training programs that are already approved in a different application. For example, an operator may receive credit for programs based on previous use of data link services, such as on different routes or for a different type of operation, or training programs conducted by another operator, training center, or manufacturer. The POI will determine whether and how much credit an operator should receive, considering whether the training program is used in another FAA approved application and whether the operator has demonstrated that the training program is relevant to the new application. AFS-400, NSET, or the assigned AEG may assist the POI in determining the suitability of a proposed data link training program for a particular operator’s procedures and aircraft capability.

b. Data Link Communications Academic Training. The following subjects should be addressed in an approved program of data link communications academic training during the initial introduction of a crewmember to data link communication systems. For subsequent programs, only the new, revised, or emphasized items need be addressed.

(1) General Concepts of Data Link Communications Operation. Academic training should cover, in general terms, data link communications systems theory to the extent appropriate to ensure proper operational use. Flightcrews should understand basic concepts of operations involving data link services, nominal and unacceptable performance, normal and non-normal use, and limitations.

(2) Level of Capability Provided by Data link Communications and Expected Flightcrew Response. Academic training should explain the normal, expected pilot response to data link messages including acknowledgment, acceptance, rejection, or cancellation of a data link message.

(3) Data Link Communications Language, Terms and System Information. Flightcrews should be familiar with data link message sets, abbreviations and conventions used, contractions, terms, message addressing, facility and capability depiction on charts or in manuals, and terminology associated with applications (e.g., CPDLC, FIS, TWDL, ADS, ADS reporting contracts).

(4) ATS Communication, Coordination and Credits for Use of Data Link Communications. Crews should be advised of proper flight plan classifications to use and any ATS separation criteria, procedures, or MEL credits that are based on data link communications use. Training should include procedures for transitioning to voice communication and other contingency procedures related to the operation in the event of abnormal behavior of the data link services. This would include any necessary coordination with ATC related to or following a data link exceptional event and ensuring an acceptable transition to a new type of operation, such as procedures related to the transition to a different separation standard when data link services fail.

(5) Data link Communications Equipment Components, Controls, Displays, Audio Alerts, and Annunciations. Procedural training should include discussion of terminology, symbology, operation, and optional controls and display features, including any items particular to an air carrier's implementation or the uniqueness of its aircraft capability and/or procedures. Applicable message sets, expected transmission times, failure annunciations, constraints, and limitations should be addressed.

(6) Interfaces and Compatibility with other Aircraft Systems. Training should include the management of any applicable data link air/ground communications systems and applications, including; VHF data link, SATCOM data link, HF data link, and Mode S. This training should also address voice integration with other cockpit systems, FMS inputs to data link, and electronic flight instrument system interfaces, including any items particular to an air carrier's implementation or uniqueness of its system.

(7) Aircraft Flight Manual (AFM) Information. AFM provisions should be addressed including information on data link communications modes of operation, normal and non-normal flightcrew operating procedures, response to failure annunciations, and any AFM limitations.

(8) MEL Operating Provisions. Flightcrews, dispatch, and maintenance personnel should be familiar with the MEL requirements.

(9) Flightcrew Response. Appropriate pilot response to data link, SATCOM voice and other such issues.

(10) Data Link Event Reports. The air carrier's data link non-normal event reporting policies for flightcrews.

(11) Data Link Malfunction or Irregularity Reports. Data link malfunction or system irregularity reporting procedures as used by aircrews, if not otherwise addressed by routine maintenance procedures of that operator.

(12) Human Factors. Flightcrew Human Factors are issues specific to the operating environment and operation of the installed communication system.

C. Data Link Communications Operational Use Training. In addition to the academic training described in paragraph 8b, appropriate operational use training (e.g., to ensure use of proper procedures and response to data link advisories) should also be given. Data link use training should expose the pilot to the typical messages expected.

(1) Use training should include the following:

- Receiving and interpreting messages
- Accepting, rejecting or canceling messages
- Storing and retrieving messages
- Loading messages into appropriate controls/displays for use (e.g., FMS, FGCS)
Formulating and sending messages
- Loading message requests from the FMS (e.g., Flight plan WP's into data link for transmission if applicable)
- Managing the communications systems
- Establishing and terminating system operation
- Switching use of RF media (if this is a crew-controllable feature)
- Re-establishing system operation after loss of network log-on

(2) In addition, training programs should cover the proper use of data link communication controls, procedures, and limitations. Correct assessment of displays, aural advisories, annunciations, timely and correct responses to data link communication failures and

appropriate interaction with ATC following data link messages that are not acceptable. Recognition of data link communications system failures and data link issues unique to that air carrier should be taught. Such training may be conducted using data link communication-equipped flight training devices or simulators, or by using suitable CBI. Criteria for programs intending to address proper data link communications use through the use of simulators or training devices are listed in paragraph 8c(1). Criteria for programs intending to address proper data link communications use through CBI, and not using approved simulators or training devices, are listed in paragraph 8c(2). Operators may apply provisions of either paragraph 8c(1) or 8c(2), or combinations of these provisions to address necessary initial and recurrent data link communications use training, as approved by the FAA for that operator's specific data link communication systems, training devices, and simulators.

(3) Programs Addressing Data link Communications that use approved simulators or training device programs based on use of FAA-approved training devices or simulators should realistically depict relevant aspects of data link communication procedures, clearances, and pilot responses. This may be accomplished using one or more of a combination of training methods described in paragraph 8a. Any simulator or training device used should have the characteristics described in paragraph 8m.

(4) Programs Addressing Data link Communications Procedures Through Use of Computer-Based Instruction (CBI). Data link communications programs may be approved which do not require using approved simulators or training devices if the proposed program meets certain criteria as described below. These programs are based on CBI adequately depicting data link communications procedures, clearances, desired pilot responses, and resulting crew interactions with aircraft flight management systems. Such programs should include the issues identified in 8c(1), and be consistent with the following criteria:

- Accepted FAA and industry guidelines
- There should be no significant adverse training experience related to the particular data link communications system(s)
- Differences from or compatibility with other data link communications systems (digital versus analog), that use different presentation methods, language, abbreviations etc., should be considered in the design to ensure minimum adverse human factor difficulties
- The program should realistically depict data link communications scenarios
- The training subject should be made aware of the normal delivery delays to be expected
- Scenarios should demonstrate correct indications for messages, display annunciations, aural alerts, and require proper pilot responses

d. Training Center Approval. Training centers may conduct data link communication training for an operator if approved by the POI. The POI will consider the following factors:

(1) Provisions of paragraphs 8b and 8c are shown to be met, or

(2) Equivalence to a previously approved program can be established. In this instance, circumstances, assumptions, and conditions for the program's use should also be equivalent to those applicable to the previously approved program.

e. Initial Evaluation of Data Link Communications Knowledge and Procedures.

Individual crewmember data link communications knowledge and procedures should be evaluated prior to data link communications use. Acceptable means of initial assessment include:

(1) Evaluation by an authorized instructor or check airman using a simulator or training device capable of depicting data link communication exchanges.

(2) Evaluation by an authorized instructor or check airman during line operations, training flights, PC/PT events, operating experience (OE), route checks or line checks.

(3) Computer-based testing in which data link communication scenarios and advisories are depicted and records acceptable pilot performance.

(4) Other alternate methods acceptable to the Administrator. Alternate methods should demonstrate the equivalent effectiveness of methods (1) through (3).

NOTE: Instructors should evaluate initial data link crewmember communications for certificate holders that are authorized to use data link systems in their operations.

f. Data Link Communications Recurrent Training. Data link communications training should be integrated as other established training programs and conducted on a recurrent basis. Recurrent training for data link communications should incorporate the recommendations of paragraph 8c and address any significant issues identified by line operating experience, system changes, procedural changes, or unique characteristics.

g. Data Link Communications Recurrent Evaluation. Recurrent data link communications checking should be incorporated as necessary, as an element of routine proficiency training or proficiency check programs.

h. Data Link Communications Currency (Recency of Experience). Unless otherwise required in an operational specification, once crews have completed initial data link communications training and as long as recurrent training is accomplished in accordance with paragraph 8f the certificate holder will not be obligated to develop additional currency requirements.

i. Line Checks and Route Checks. When data link communications-equipped aircraft are used during line or route checks, check airmen should routinely incorporate proper data link communications use as a discussion item.

j. Line-Oriented Flight Training (LOFT). LOFT programs using simulators equipped with data link communications should be enhanced by interaction with data link communications. In addition, LOFT programs should consider proper crew use of data link along with other communication methods (SATCOM voice, VHF voice, HF voice, etc.).

k. Crew Resource Management (CRM). CRM programs should address effective teamwork in responding to data link exchanges.

l. Data link communications Academic Training Methods. Appropriate methods may be suited to each air carrier's program. No special methods related to academic training for data link communications are identified. Typically, a combination of ground instruction, manual information, flightcrew bulletins, and other such means as appropriate to address academic topics specified by paragraph 8b, Data link communications Academic Training.

m. Characteristics of Simulated Data Link Communications Systems for Training (e.g., data link communications in simulators or training devices). Reference paragraph 8c.

(1) Acceptable Characteristics. Training devices and simulators should have certain characteristics to be effective. This is due to the interactive nature of data link communications, the variety of exchange scenarios possible, the immediate and standardized pilot response required, and the correct display interpretation that is necessary. Thus, simulators or training devices used for data link communications training should have the following characteristics:

- The ability to functionally represent data link communication displays, controls, indications, and annunciations.
- Ability to depict selected message traffic exchange scenarios including data link communications displays and audio advisories.
- Ability to show proper data link communications reaction to depicted scenarios and advisories, crew or ATC response errors, etc.
- Ability to interactively respond to pilot inputs regarding data link communication advisories, including responses to failures or abnormal situations.

(2) Simulator and Data Link Communications System Fidelity. For a particular data link communication system, training may be accomplished in simulators or training devices that represent the specific aircraft, or an aircraft with similar characteristics. For the purposes of data link communications training, simulators or training devices may use simplified algorithms or abbreviated message set capability. Data link communication displays do not have to be identical, but should be functionally equivalent to the air carrier operator's specific aircraft in use.

(3) Training Device or Simulator Approval. Training devices or simulators meeting FAA criteria are qualified by the NSET and approved for use by the POI. Any one or combination of the following devices or simulators that meet characteristics of paragraph 8m (1) above, Acceptable Characteristics, may be used:

- Level A through D simulators,
- Level 4 through 7 flight training devices, or
- Dedicated data link communications training devices acceptable to the FAA (including those devices described in FAA Order 8400.10, Air Transportation Operations Inspector's Handbook, volume 3, paragraph 443, "Aircraft Systems Integration Training" which are shown to be suitable for data link communications training).

NOTE: Training device and simulator levels are defined by AC 120-40B, Airplane Simulator Qualification; AC 120-54 Advanced Qualification Program; and FAA Order 8400.10.

9. OTHER OPERATIONAL ISSUES.

a. Manuals and Other Publications. Airplane flight, operating, maintenance, general policy, or other manuals, publications, or written materials (e.g., operating bulletins) that may relate to data link communications use must be appropriately amended to describe data link communications equipment, procedures, and operational policies according to the appropriate guidance material in this AC.

b. MMEL/MEL. Operators formulate necessary data link communications revisions to their MEL(s) for each particular fleet (e.g., B727, DC10). The Federal Aviation Regulations require MEL revisions to be consistent with the FAA's MMEL established for each aircraft type. A summary of the process for addressing the necessary changes to MEL items as well as examples of MMEL and acceptable MEL provisions for data link communications are provided in Appendix 2.

c. Aircraft with Data Link Communications System Differences. Operators having aircraft with data link communication systems differences in displays, controls, or procedures, or operators involved with interchange operations, must account for those data link communications systems differences. This is accomplished as part of an approved differences training program in accordance with part 121, or as otherwise specified in applicable FAA FSB reports concerning crew qualification pertaining to a particular airplane type.

d. Issues Unique to a Particular Operator. Operators should address any data link communications issues that may be unique to their particular route environment, aircraft, procedures, or data link communication displays and control features. Examples include the following:

(1) Examples of "Route Environment" Issues. Operators should describe any peculiarities associated with a particular route that may involve either end-user application issues or communications performance issues, for example:

- On North Atlantic routes, it is necessary for data link oceanic clearance message verification to include the track message serial number in the response.
- A particular route may be subject to propagation disturbances (e.g., with HF radio or HF Data Link at particular locations, time of day, season, or sunspot cycles).

(2) Example of a "Procedural" Issue. Operators should describe any data link precautions that may be appropriate when operating in states where data link communications policies are uncertain. As an example, certain modes of direct controller-pilot data link communication may not be supported in certain states. In those cases, carriers should conform to the laws and regulations that govern the airspace being used and use only authorized communications equipment and methods. This guidance should be reflected in company flight operations manuals.

(3) Example of a "Unique Data Link Communications System" Issue. Operators should describe any differences in particular data link communications systems, or their versions, that may have operational impact. For example, Boeing FMS "Load 11" software requires a workaround solution for incorporating the aircraft tail number in data link messages, whereas "Load 12" does not.

10. MAINTENANCE.

a. General. Maintenance procedures for data link communications are approved or accepted as part of an operator's initial maintenance manual approval or as a revision to that manual. To obtain FAA authorization, an operator must demonstrate that their data link communications maintenance procedures are consistent with the data link communications systems manufacturer's maintenance procedures and/or aircraft manufacturer's maintenance procedures for data link communications.

b. Maintenance Training. Operators should provide adequate data link communication maintenance training to ensure that their maintenance personnel or contract maintenance personnel at facilities not staffed by the operator, are able to properly implement data link communications-related maintenance programs. This includes, but is not limited to, installation, modification, correction of reported system discrepancies, use of test equipment, procedures, MEL relief, and "return-to-service" authorizations. The training procedures should address testing data link communications on the ground in such a way that correctly evaluates data link communications functions while not introducing hazards with respect to simulated message traffic with an air traffic facility.

c. Data Link Communications System Software Updates. Operators should assure that appropriate data link communication software updates are incorporated when necessary and that

both air and ground system are able to identify and properly respond to the installed level of data link communication capability.

d. Data Link Communications "Return to Service" Policies. Data link communications "return to service" policies should be established to ensure proper data link communications functions when an aircraft is returned to service after a datalink communication failure or maintenance action.

11. DATA LINK COMMUNICATIONS OPERATIONAL USE.

a. General. Operationally, those skills addressed and the guidance provided in the data link communications training paragraph 8 should be followed and implemented by each operator electing to use data link communications.

b. Pilot Responsibilities. Data link communications are intended to serve as either a primary or supplementary communications means as designated for the operations being conducted. For data link communications to work as designed, prompt and correct initiation response to data link advisories is important. Flightcrews using data link communications should respond in accordance with the following guidelines:

- (1) Prompt initiation of messages where needed.
- (2) Prompt response to messages where appropriate.
- (3) Appropriate crew coordination so that each crewmember receives pertinent information needed.
- (4) Appropriate retention of messages (archive) requiring later action (printer copies of oceanic clearances etc.).
- (5) Appropriate resolution of message uncertainty.
- (6) Appropriate use of data link and voice, respectively, where circumstances or operations dictate (e.g., voice for backup or clarification of non-normal situations).
- (7) If an ATC data link clearance contradicts a voice clearance, comply with the voice clearance.

c. Data Link Communications Good Operating Practices. The following data link communications "good operating practices" have been identified:

- (1) To preclude unnecessary communication and possible interference with ground facilities, data link communications should be used only in conjunction with facilities specified for the route or procedure to be flown. An example would be as follows: data link communications with other than designated ground facilities should be accomplished only as necessary to support flight plan or flight operations requirements.

(2) Free text data link messages should use standard aeronautical terminology, accepted abbreviations, and be written in English.

(3) When appropriate, verify data link communication functions prior to departure.

d. Operator Responsibilities. Operators have the following general responsibilities regarding data link communications:

(1) Verify data link communications functionality for each environment to be used and when new or modified components or software are introduced.

(2) Assure follow-up and evaluation of exceptional data link events.

(3) Periodically assess data link communications training, checking, and maintenance programs to ensure their correctness, pertinence, timeliness, and effectiveness.

e. ATC Responsibilities. The operator can expect ATC to adhere to the following procedures.

(1) Ensure that controllers do not knowingly issue data link instructions that are contrary to voice instructions when a data link is being used.

(2) Be aware of pertinent data link communication program changes.

(3) Train ATC specialists about data link expected flightcrew responses to data link advisories, and permit familiarization flights for specialists on data link equipped aircraft to the extent possible.

(4) When requested by the flightcrew, provide clarification or confirmation of data link messages and assist in returning to the assigned clearance, if appropriate. Issue additional clearance instructions when the situation so requires.

(5) Advise pertinent FAA offices via data link communications questionnaires about airspace or airports where data link communications problems occur. This facilitates initiation of corrective actions related to data link communications enhancements, procedures, and airspace adjustments.

(6) Advise FAA if aware of other hazardous conditions, situations, or events which may be related to data link communications.

12. DATA LINK EVENT REPORTING.

a. General. Operators and manufacturers are encouraged to develop procedures to ensure effective identification, tracking, and follow up of data link-related events, as appropriate. Such procedures should focus on providing useful information to:

- (1) Properly assess the importance of data link events,
- (2) Follow up on information related to specific data link events as necessary.
- (3) Keep the industry and FAA informed on the performance of data link in the NAS and international operations.

b. Pilot Reports.

(1) **"Data Link-Specific" Reports.** Pilots should make the following reports for unusual data link events, as necessary:

(a) **Upon query from ATC, or after an inadvertent deviation from an ATC clearance, make radio communications as appropriate to report the event.** Refer to the Airman's: Information Manual, Section 4, ATC Clearances, for guidance regarding recommended phraseology, and Appendix 5 of this AC for acronyms and abbreviations.

(b) **Reports, as specified by the operator, concerning data link anomalies, procedural difficulties, or system failures typically are made by pilots through one or more of the following methods**

- Pilot/Observer Questionnaire,
- Logbook entry, ACARS, etc., or
- Other record used by that operator (e.g., "Captain's Report"). An example of a typical reporting form for data link event information is shown in Appendix 1.

(2) Other Reports Incidental to Data Link.

(a) **Near Mid-Air Collision, NMAC Reports.** Flightcrews should continue to submit NMAC reports in accordance with existing policies and procedures. (Crews should be aware that there is no requirement to submit an NMAC report solely due to a data link event).

(b) **Aviation Safety Reporting System (ASRS) Reports.** ASRS reports may be filed at the discretion of the flightcrew.

(c) **Operator/Maintenance Department Reports.** Operator maintenance department personnel should make data link-related reports as necessary. Submit reports of frequent or systematic data link problems that may relate to system performance, manufacturers, and/or data link vendors to the PAI or PMI, as appropriate.

(d) FAA ATC. Report the following:

- Data link events to FSDOs as necessary

- Any exceptional data link-related events regarding NAS performance to the Air Traffic Procedures Division

(e) Data Link Manufacturer Reports. Data link avionics manufacturers report problems found with specific data link systems in accordance with established service difficulty report (SDR) procedures. Generic problems, such as those that may relate to the definition of ARINC 622 or 745 characteristics or of documents listed in paragraph 4(c) should be reported to the Aircraft Engineering Division, AIR-200 (Production/Airworthiness).

13. FOREIGN AIR CARRIERS.

a. General. Foreign air carriers may use data link communications when operating in U.S. airspace. Foreign air carriers are not required to install and use data link communications for any aircraft or operations even though separation services may be provided by a U.S. ATC facility (e.g., in oceanic airspace), unless separation standards or a desired flight plan classification are based on its use.

b. Data Link Communications Approval for Foreign Air Carriers. FAA does not approve data link communications installations, training programs, MELs, or maintenance programs for foreign operators operating non-U.S. registered aircraft. Such authorizations are addressed as specified by the state of the operator. However, since compatibility of data link communications within U.S. airspace is essential, part 129 operations guidelines for data link communications are issued by this AC. Compliance with these data link communications provisions ensures both data link communication system and procedural compatibility. The issuance of operations specifications (OpSpecs) or an amendment to existing OpSpecs for data link communications must take place prior to a foreign air carrier operating a data link communication-equipped aircraft in Domestic U.S. airspace, or with U.S. Domestic facilities. Standard provisions for foreign air carriers for data link communications are shown in Appendix 3.

c. Application and Approval. Foreign air carriers should contact their FAA POI to obtain application information for part 129 data link communications OpSpecs in U.S. airspace. When a foreign air carrier submits the necessary information to the respective PI, showing that its aircraft comply, the PI approves those OpSpecs or an amendment. Standard OpSpec provisions regarding data link communications for foreign air carriers are shown in Appendix 3. Although not mandatory, foreign operators should comply with the provisions of this AC, or equivalent provisions specified by the state of the operator or specified by ICAO.

APPENDIX 1.
SAMPLE DATA LINK EVENT REPORTING INFORMATION

Date_____ Time_____

Operator/Flight #_____ Origination_____ Destination_____

Submitted to: ATC Inquiry_____ Other_____

Phase of Flight_____ Position_____ Altitude_____

(Optional for Aircrew:)

Name_____ Phone (W)_____ Phone (H)_____

Describe Event:

APPENDIX 2.
DATA LINK COMMUNICATIONS MINIMUM EQUIPMENT LIST (MEL)
AND MASTER MINIMUM EQUIPMENT LIST (MMEL) PROVISIONS

1. EXAMPLE OF A MINIMUM EQUIPMENT LIST (MEL). Each operator intending to have authority to dispatch an aircraft with a data link communication system or component temporarily inoperative must do so in accordance with provisions of an MEL. MEL's are approved for each operator and type aircraft, within provisions of the FAA MMEL for that type. When proposed, MEL provisions are consistent with the FAA MMEL; POI's may approve the MEL. If less restrictive MEL or different MEL provisions are requested, a proposal for consideration of an FAA MMEL change must be forwarded to the AEG assigned for that aircraft type. Enhanced features (those above and beyond the basic data link communication system) may be inoperative, provided that the inoperative features do not degrade the system; for example, data link printers.

Equipment		Condition
Data Link system	C-0	*(M) May be inoperative provided the system is deactivated and secured.
Dual data link or data link controls or displays	C-21	*(0) May be inoperative on the flying pilot side provided that: (a) Appropriate data link elements and functions are operative on the non-flying pilot side, and (b) Display data link indications are visible to the flying pilot. (0) May be in-operative on the non-flying pilot side, provided that: (a) The required minimum voice communications are operative and that voice procedures are approved for the route or procedures to be flown, and (b) The required minimum voice command communications audio functions are operative, and voice procedures may be used for the route or procedures to be flown.
Data Link Printer	C-0	(0) May be inoperative provided all other data link display and control functions are operative. All elements of each data link transmission can be retrieved, displayed and reviewed by the flightcrew or may be inoperative if relevant operations or functions are not predicated on data link use (e.g., Print Control function not authorized if the printer is inoperative).

2. EXAMPLE OF A DATA LINK MASTER MINIMUM EQUIPMENT LIST (MMEL) PROVISION.

Boeing 747-400

23 COMMUNICATIONS						
-XX-1 Digital Data Link Communications Systems	D	-		-	Any in excess of those required by Regulation may be inoperative.	
-XX-2 Analog Data Link Communications Systems	D	-		-	Any in excess of those required by Regulation may be inoperative.	

NOTE: The provisos and repair category intervals are intended to grant the operator sufficient relief during the initial stages of the data link implementation. This is intended to promote the installation process, as well as support the use of a partial system. Both equipment reliability and operational experience will dictate, if any, revision to this MMEL relief should be considered after the installation phase is completed.

APPENDIX 3.
PART 129 PROVISIONS FOR USE OF DATA LINK IN U.S. AIRSPACE

- 1.** The issuance of operations specifications (OpSpecs) or an amendment to existing OpSpecs for data link communications must take place prior to a foreign air carrier operating a data link communication-equipped aircraft in Domestic U.S. airspace, or with U.S. Domestic facilities.
- 2.** An appropriate data link must be installed and operated on suitable frequencies specified by ATC during flight in U.S. airspace if procedures are predicated on its use. A unique and specific address, the ICAO 24-bit aircraft identification, must be assigned to the airplane and the data link must recognize this address. When properly set, the unique address, may not be altered, set to a duplicated address, or set to an address that potentially interferes with ATC or data link safety functions.
- 3.** A data link capable of coordinating with air traffic facilities using RTCA DO-219 or other equivalent standards must be installed if operations will be predicated on its use. The data link system should be operated in an appropriate data link mode during flight in U.S. airspace using data link, except as provided for by MEL provisions acceptable to the State of the operator.
- 4.** Training and procedures for use of data link as specified by ICAO, this AC, or other equivalent criteria acceptable to the FAA, should be used when operating in U.S. airspace.
- 5.** Unsafe performance or conditions related to data link operations which potentially could affect continued safe operations in U.S. Airspace, (a data link event), should be reported to the FAA within 10 days of the time that such a hazard is identified.

APPENDIX 4.
ACRONYMS AND ABBREVIATIONS

AAR	Office of Aviation Research
AC	Advisory Circular
ACARS	Aircraft Reporting and Communications System
ACO	Aircraft Certification Office
ADS	Automatic Dependent Surveillance
AEG	Aircraft Evaluation Group
AFM	Airplane Flight Manual
AFS	Flight Standards Service (FAA)
AGL	Above Ground Level
AIR	Aircraft Certification Service (FAA)
AMSS	Aeronautical Mobile Satellite Service (sometimes (AMS(R)S specifically for safety services)
AOC	Aeronautical Operational Control
ASRS	Aviation Safety Reporting System
ATC	Air Traffic Control
ATCRBS	ATC Radar Beacon System
ATIS	Automated Terminal Information Service
ATP	Air Traffic Procedures Division (FAA)
ATS	Air Traffic Service
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
CAA	Civil Aviation Authority
CBI	Computer-Based Instruction
CHDO	Certificate-Holding District Office
CNS	Communications/Navigation/Surveillance
CFR	Codified Federal Regulations
CPDLC	Controller-Pilot Data Link Communication
D-ATIS	Digital Automated Terminal Information System
DC	Data Link communications
DCPC	Direct Controller-Pilot Communication (voice or data)
DL	Data Link
EICAS	Engine Indicating and Crew Alerting System
EFIS	Electronic Flight Instrument System
FAA	Federal Aviation Administration
FANS	Future Air Navigation System
FMS	Flight Management System
FOEB	Flight Operation Evaluation Board
FSB	Flight Standards Board
FSDO	Flight Standards District Office
HF	High Frequency (radio)
ICAO	International Civil Aviation Organization
LOA	Letter of Authorization

Appendix 4

LOFT	Line-Oriented Flight Training
MASPS	Minimum Aviation System Performance Standards
MEL	Minimum Equipment List
MMEL	Master Minimum Equipment List
MRB	Maintenance Review Board
NAS	National Airspace System
NAT	North Atlantic
NMAC	Near Mid-Air Collision
NSET	National Simulator Evaluation Team
NTSB	National Transportation Safety Board
OE	Operating Experience
PAI	Principal Avionics Inspector
PC	Proficiency Check
PDC	Pre-Departure Clearance
PI	Principal Inspector
PMI	Principal Maintenance Inspector
POI	Principal Operations Inspector
PT	Proficiency Training
RCTP	Required Communication Technical Performance
SATCOM	Satellite Communications
STC	Supplemental Type Certificate
TC	Type Certificate
TSO	Technical Standard Order
VDL	VHF Data Link
VHF	Very High Frequency (radio)