June 15, 2012

ASIA PACIFIC
OPERATIONAL AUTHORIZATION INFORMATION PACKAGE

DATA LINK COMMUNICATIONS
CONTROLLER/PILOT DATA LINK COMMUNICATION (CPDLC)
AUTOMATIC DEPENDENT SURVEILLANCE CONTRACT (ADS-C)

1. INTRODUCTION

1.1 The FAA Headquarters Flight Technologies and Procedures Division (AFS-400) developed this information package at the instigation of the FANS Interoperability Teams (FIT). The FITs have been tasked by various Pacific Air Traffic Service (ATS) Provider States through the Informal South Pacific ATS Coordinating Group (ISPACG) and the Informal Pacific ATC Coordinating Group (IPACG), with identifying, tracking, and resolving problems related to the operational use of Controller/Pilot Data Link Communication (CPDLC) and Automatic Dependent Surveillance Contract systems in Pacific oceanic airspace. AFS-400 coordinated this package with Pacific ATS providers, aircraft manufacturers, certain operators currently using CPDLC and ADS-C, the Central Reporting Agency of the FITs and the International Air Transportation Association. In implementing data link services, the industry has worked to ensure that operational procedures are as close to standard from region to region as is possible. This information package, therefore, has global application for the use of ATS data link.

1.2 EXPANSION OF CPDLC SERVICE IN PACIFIC FIR'S. CPDLC has been used as the primary communications medium in oceanic airspace since 1995 in most of the South Pacific Flight Information Regions (FIR's). CPDLC in the Oakland FIR was only operational in the Oakland Oceanic sectors that served flights operating between the U.S., Sydney and Auckland until the year 2000 when it became operational in all Oakland Oceanic sectors. Anchorage FIR also has CPDLC capability. CPDLC was also declared operational in the Tokyo FIR in November 1998. Additional FIR's such as Singapore are now operational. As a result of this expansion, most of the major Asia/Pacific Oceanic FIR's now offer CPDLC services.

1.3 EXPANSION OF ADS-C SERVICE IN PACIFIC FIR'S. ADS-C has been used in the Nadi, Tahiti, Auckland, Brisbane and Melbourne FIR's since 2000. ADS-C is part of the FAA's Advanced Technologies and Oceanic Procedures (ATOP) operational capability and its use was implemented by trial in Oakland's OC-3 oceanic airspace in December 2005 and in Anchorage's oceanic airspace in April 2006.

1.4 NECESSITY FOR STANDARD PROCEDURES AND KNOWLEDGE. CPDLC provides an efficient means of communication between the pilot and controller; however it also invokes major changes from long standing voice communication practices to newly developed data communication practices. These changes include the use of satellite communication systems; new or modified flight deck systems; new pilot, dispatcher and controller procedures and knowledge; and new aircraft maintenance practices and procedures. One of the most significant lessons learned in more than ten years of Pacific CPDLC operations is the absolute necessity for standardized pilot, controller, and maintenance procedures/practices applied by both operators and ATS providers. The failure to follow standard procedures has led to incidents of missed and/or miss-communication between the aircraft and ATS, and in some cases, failure of the aircraft to comply with its ATC clearance. Most of these incidents could have been avoided had standard procedures been followed properly.

2. OBJECTIVE OF THIS INFORMATION PACKAGE.

2.1 The objective of this information package is to provide operators with information and contacts that will help them prepare pilot and dispatcher procedures, training programs, and aircraft engineering programs necessary for obtaining operational approval to use CPDLC and ADS-C.

2.2 To meet the provisions of ICAO Annex 6 (Operation of Aircraft) for pilot, dispatcher, and maintenance training, prior to using CPDLC or ADS-C in FAA-controlled oceanic FIR's (Oakland, Anchorage and New York), operators must develop and/or revise affected programs to conform to standard CPDLC and/or ADS-C practices and procedures required for data link operations. Once the related programs are completed, operators should obtain operational approval to use CPDLC and/or ADS-C from the appropriate State authority. While, at present, ATC data link is not required equipage for normal oceanic route operations, it is required for special Pacific procedures such as Dynamic Airborne Route Planning, and it is important for authorities to ensure that operating procedures be specified, crews be properly trained and aircraft equipped and maintained appropriately in order to prevent disruption of the end-to-end data link system. It should be noted that other State regulatory authorities have equivalent Operational Authorization requirements and operators should obtain guidance on associated requirements from the States directly. Note also that data link operations are beginning in some domestic airspace (e.g. Australia, Europe and the U.S)., procedures may differ from those used in oceanic airspace. These differences, if any, will be addressed in the ICAO Global Operational Data Link Document (GOLD).

2.3 TABLE OF CONTENTS. The following major subject areas are covered in this paper. Items annotated with an asterisk (*) denote areas in which operators should revise or develop material:

2.4 PRE-FLIGHT PROCEDURES.

2.4.1 ICAO FLIGHT PLAN ANNOTATION. To indicate to ATS Providers that the aircraft is equipped with operational data link and the pilots are trained to use it, operators should annotate the COMM/NAV field of block 10 (Equipment) of the ICAO flight plan with the letter "J". To indicate to ATS Providers that the aircraft is equipped with operational ADS-C and the pilots are trained to use it, operators should annotate the surveillance field of block 10 (Equipment) of the ICAO flight plan with the letter "D". Appendix 2 of ICAO Doc 4444 (PANS/ATM) states that, in annotating block 10 with one of the designated letters, the pilot is indicating that the equipment is "available and serviceable". Operators should not annotate block 10 with letter "J" until they receive operational authorization to use data link applications.

NOTE: Block 18 of the flight plan should also be annotated with "DAT/" followed by the letters: S if satellite data-link equipped; H if HF data-link (HFDL) equipped (and the HFDL will be used for ATS purposes); and V if VHF data-link equipped. All media that apply should be entered. If an MEL item precludes the use of any data link media, these media should be excluded from this field.

2.4.2 NOTIFICATION OF OUTAGES: PRE-FLIGHT AND ENROUTE. Oceanic Centers will issue NOTAMS for planned or predicted system outages. Pilots should inform the active Oceanic Center if system outages are noted enroute (requiring reversion to back-up voice communication). Data link service providers will inform affected ATS units if a system outage is noted or planned for the network. Oceanic Centers will inform all affected aircraft and their Aeronautical Operations Control Centers of an unplanned outage and its expected duration.

2.4.3 REQUIRED OPERATOR CONTACTS FOR PROBLEM REPORTING. To facilitate resolution of problem reporting, all operators should provide the FIT/DLMA with contacts for the receipt of problem information. These operator contacts should be available on a 24 hour-a-day basis. Contact numbers and e-mails should be sent to the FIT/DLMA Central Reporting Agency using either of the following contacts:

Brad Cornell….	(425)-280-5603	e-mail bradley.d.cornell@boeing.com
Suzie Ness…….	(425) 342-5538	e-mail suzi.ness@boeing.com
Gordon Sandell..	(425) 342-6330	e-mail Gordon. R.Sandell@boeing.com

The FIT/DLMA will forward contact information to all data link service providers.

2.5 FLIGHT PROCEDURES.

2.5.1 CPDLC/ADS-C OPTIONAL FOR COMMUNICATIONS AND SURVEILLANCE. Until further notice, use of CPDLC or ADS-C in FAA-controlled oceanic airspace is optional. CPDLC and ADS-C are NOT currently required for operation in any region with the exception of route L-888 in Western China over the Tibetan Plateau. Enhanced communication and surveillance capabilities are beginning to show economic and safety benefits. Despite the lack of a general requirement for FANS functionality, FANS is required if the aircraft is to participate in certain beneficial procedures such as the 30NM separation standard or Dynamic Airborne Route Planning (DARP). In the future, the ability to achieve reduced separation and hence increase airspace capacity will be contingent on the use of data link functions.

2.5.2 HF COMMUNICATIONS. High Frequency radio (HF) is required in all FAA-controlled oceanic FIR's, whether or not CPDLC or ADS-C is in use. This means that HF must be operative for departure to remote and oceanic areas per the MMEL (see para 2.9). It is imperative that crews comply with the transfer-of-control uplink by establishing HF contact or HF monitoring with each general purpose (GP) radio facility providing communications services with ATS in each of the FIR's through which the flight operates. In the data link environment, this requirement is met by calling the GP radio facility serving the FIR that the flight is entering, determining the primary and secondary HF frequency assignments, and

obtaining a SELCAL check. If this is not accomplished, the GP radio facility has no way of knowing of the flight's existence and required communications may be compromised.

2.5.3 SOURCE FOR CPDLC OPERATING PROCEDURES. For standardization purposes, operating procedures have been adopted in all oceanic airspace. These procedures are detailed in the ICAO Global Operational Data Link Document (GOLD).

2.5.4 DATA-LINK LOGON. Successful logon is required for CPDLC. Logon should be initiated between 15 and 45 minutes before entering an area in which CPDLC is being used from an area CPDLC is not in use. The flight identification used for the logon must be exactly the same as that filed in the ATS flight plan. If a logon attempt is not successful, wait at least 5 minutes before making a second attempt. FAA ground systems use the CPDLC logon as a source of aircraft address for initiation of ADS-C services in the oceanic environment.

2.5.5 CPDLC USE FOR WEATHER DEVIATION MESSAGES. As expected, given the more direct and reliable nature of CPDLC compared with HF third person voice messaging, improvements in weather deviation request responses have been noted in airspace where CPDLC is used. Priority will be given to aircraft appending "DUE TO WEATHER" to requests or which use the message REQUEST WEATHER DEVIATION. Basic procedures are published in the Pacific Chart Supplement and in individual state-published Aeronautical Information Publications (AIPs). As noted in the Supplement, aircraft with Satellite Communications (SATCOM) voice capability may utilize published General Purpose Radio telephone numbers to expedite weather deviation clearances if CPDLC response is not timely.

2.5.6 WAYPOINT SEQUENCING WHEN NOT OPERATING IN LNAV AND AIRCRAFT DISPLACED 21 NM OR MORE. Pilots should be aware that if the aircraft is displaced from track by more than a given distance (distances are 21 nm or 7 nm depending on aircraft model) and is being flown in a lateral mode other than LNAV, the FMC position report page will not automatically sequence to the next waypoint when the aircraft passes abeam the current waypoint. Operators should ensure that pilots are trained on procedures to follow when this situation is encountered.

2.6 AIRCRAFT CPDLC/ADS-C SYSTEM CONFIGURATION. Based on experience gained in CPDLC and ADS-C operations, aircraft manufacturers develop lists of avionics configuration combinations that have been shown to produce acceptable performance. Operators should provide the aircraft manufacturer representatives listed in Annex F with details (vendor, software load designations, part numbers as appropriate) of the aircraft's flight management computer, ACARS Management Unit/Communications Management Unit and SATCOM data unit. Aircraft manufacturers will then advise as to the suitability of the combination, and possibly recommend additional options.

2.7 PILOT & DISPATCHER TRAINING

2.7.1 PILOT & DISPATCHER TRAINING PROGRAMS. Data Link operations have shown that end-to-end system performance is extremely sensitive to the use of correct procedures. It is essential, therefore, that crews be properly trained prior to their using the CPDLC and/or ADS-C applications.. Deterioration in end-to-end system performance as a result of improper use of procedures can lead to delay in realization of expected benefits of the functionality.

2.7.2 GENERAL PROVISIONS OF ANNEX 6 FOR TRAINING. Operators are reminded of basic provisions contained in ICAO Annex 6:

2.7.3 PILOT TRAINING: Paragraph 9.3.1. An operator shall establish and maintain ground and flight training programs, approved by the State of the Operator, which ensures that all flight crewmembers, are adequately trained to perform their assigned duties. Required for FAR Part 121, 125,135 and 91K. FAR Part 91 requires training but it does not have to be an FAA approved program. The operator must show that they have done due diligence in attending some training facility or developing satisfactory in-house training.

2.7.4 DISPATCHER TRAINING: Paragraph 10.2. A flight operations officer/flight dispatcher should not be assigned to duty unless the officer/dispatcher has demonstrated to the operator a knowledge of the radio equipment used in the airplanes.

2.7.5 DEVELOPMENT OF OPERATOR TRAINING PROGRAMS. Operators have the option of using basic source documents to develop their own training programs or they may purchase commercially available CPDLC and ADS-C training programs.

2.7.6 BASIC SOURCE DOCUMENTS. If operators choose to develop their own training programs, they must use the following basic source documents:

a) **AIRCRAFT SPECIFIC PROCEDURES**. For aircraft specific systems and procedures, the operator should contact the aircraft manufacturer representatives listed in Annex F to obtain current bulletins, manuals, etc. that are available from both aircraft and avionics manufacturers.

b) **ICAO GOLD DOCUMENT.** Contains policy and procedures that have been agreed upon by ATS Providers, operators and aircraft manufacturers. Operators must incorporate the appropriate sections of the relevant guidance material into training and manuals.

c) **NOTAMS AND AERONAUTICAL INFORMATION PUBLICATIONS (AIP).** Individual ATS Providers have published CPDLC and ADS-C information in NOTAMS, AIP Supplements and Aeronautical Information Circulars. Operators must ensure that they have current information from each FIR in which they intend to conduct data link operations.

2.7.7 COMMERCIALLY AVAILABLE PROGRAMS. Air New Zealand, United Airlines, Qantas, Continental, Air Services Australia, and SITA have made their State approved data link training programs available commercially. Contacts are listed at Annex F. Operators may also wish to contact IATA to determine if other airline programs are available.

2.7.8 SPECIAL EMPHASIS AREAS FOR PILOT AND DISPATCHER TRAINING. The following list of areas that should receive special emphasis in pilot and dispatcher training has been developed based on experience in data link operations.

a) AREAS FOR SPECIAL EMPHASIS:	
➢ Uplinks can be displayed over two pages.	
➢ Arming of uplink report messages.	
➢ Use of Free Text.	
➢ FMC/ACARS initialization	• Automatic/ Manual • Crew Check
➢ Display of active center	
➢ FIR Transfer of control Including failed transfer	• Auto
	• Manual • Identification
	• Procedures
➢ Offset Request	• Loadable
	• Due Weather

➢ Dual Request	• "Request" followed by "When Can We" Review of VERIFY pages
➢ Open Message	• Monitoring ATC Log
➢ RNP Requirements	• Definition
	• FMC Entry
	• Procedures
	• Authorizations
➢ Emergency ADS-C selection	• Possibility of inadvertent selection • How to acknowledge and cancel
➢ End of Flight Procedures	
➢ Abnormals	
➢ MMEL	See FAA Policy Letter 106
➢ Differences in use of data link in oceanic and domestic airspace	TBD

b) CONTENT OF INITIAL TRAINING. Initial Training courses should include:

- Briefings on CNS/ATM architecture, including:

  Terminology
  Data Link Communications Media VHF/SATCOM/HFDL
  GPS
  RNP/RCP/RSP
  CPDLC
  ADS-C
  AIDC

- Training on aircraft systems related to CPDLC and ADS-C.
- Performanced Based Communications (PBC)
- Computer based training, either interactive or simulated.

c) CURRENCY OF OPERATING EXPERIENCE. As FANS-1/A is a different way of doing business for both pilots and air traffic controllers and is not available in all areas of operations, current pilot CPDLC/ADS-C operating experience is an important factor. It is recommended that a pilot use CPDLC and ADS-C operationally within 30 days of initial training. In addition, the pilot should receive an annual training review of CPDLC and ADS-C. Should pilots not maintain currency, they may require retraining by Audio-Visual Training, Computer-Based Training, simulator or flight training.

2.8 OPERATOR MAINTENANCE PROGRAMS RELATED TO DATA LINK.

2.8.1 MAINTENANCE TRAINING. Operators are reminded of basic provisions contained in ICAO Annex 6, Paragraph 8.3: An operator shall ensure that all maintenance personnel are instructed regarding the maintenance methods to be employed, in particular when new or unfamiliar equipment is introduced into service.

2.8.2 MAINTENANCE PROGRAM REQUIREMENTS. Operators unsure of required maintenance procedures for data link-related equipment should contact their aircraft manufacturer field service representatives.

2.8.3 CONFIGURATION CONTROL. Operators should maintain their aircraft in an avionics configuration, which has been shown to provide acceptable data link performance. The Operational Requirements Table on the aircraft must be set in the proper sequence. The correct Data Link sequence is (1) VHF, (2) Satellite, (3) HFDL. Data link service providers will provide operators with information on poor performance by individual aircraft. Operators are requested to provide the Fans Interoperability Team (FITs) with information on their current aircraft avionics configurations and provide updates when the configuration changes.

2.9 MINIMUM EQUIPMENT LIST PROVISIONS.

2.9.1 HF RADIO: TWO (2) REQUIRED. The Master Minimum Equipment List (MMEL) requirement for long-range communications was changed on 01/18/2001 to allow dispatch into the oceanic environment with at least one (1) operational HF radio. This provision only applies to aircraft logged on with a serviceable CPDLC and the airspace is approved for CPDLC operations.

2.9.2 MMEL PROVISIONS FOR SYSTEMS RELATED TO CPDLC/ADS-C OPERATIONS. For flights that intend to use CPDLC or ADS-C, operators should adopt provisions for certain specific systems to be operational at dispatch. Minimum Equipment List/Dispatch Deviation Guide should be amended to highlight the effect that loss of each associated system/subsystem has on CPDLC or ADS-C operational capability. Additional equipment required in current FANS-1/A-capable models is as follows:

- ACARS MU/CMU
- FMC
- PRINTER (if company procedures require its use)

2.10 DOCUMENTS RELATED TO OPERATIONAL AUTHORIZATIONS OF DATA LINK FOR USE BY OPERATORS.

http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/oceanic/data_link/

2.10.2 FAA ADVISORY CIRCULAR. The FAA published an Advisory Circular (AC 120-70B) on 8/24/10, entitled "**Operational Authorization Process For Use Of Data Link Communication Systems**". This document is available from the Superintendent of Documents, U.S. Government printing office, Washington D.C. 20402.

2.10.3 PACIFIC SUPPLEMENT. Procedures and notes on operations in the Oakland Oceanic area are published in the Pacific Supplement.

2.10.4 ICAO ANNEX 6 (Operation of Aircraft).

2.10.5 ICAO Doc 4444 (PANS/ATM): Appendix 2. Flight Plans.

2.10.6 System Performance Documents. The Air Traffic Services Systems Requirements and Objectives, (ATS SR&O), documents the installed functionality of the equipment on the airplane. In addition this equipment is certified based on specific requirements that the systems have satisfied. These documents are available by aircraft type or model from the manufacturer.

2.11 CPDLC AND/OR ADS-C SERVICE AVAILABILITY IN PACIFIC OCEANIC AIRSPACE.

2.11.1 PACIFIC FIRS WHERE CPDLC and ADS-C ARE AVAILABLE. See ICAO Gold Document

- Anchorage VHF, and CPDLC (Primary), and HF (Secondary)
- Auckland Oceanic
- Bangkok
- Brisbane
- Hong Kong
- Madadan
- Nadi Oakland Oceanic
- Oakland Oceanic
- Singapore
- Tahiti
- Fukuoka

2.11.2 INFORMATION ON EXPANDED OPERATIONS. A sample pilot bulletin addressing CPDLC operations in Oakland and Tokyo Oceanic airspace is attached in Annex D. It shows the type of information that operators have provided to pilots. If operators choose to use the sample, they should first review current source documents and update the sample bulletin, as required, before issuing it to pilots.

3.0 FANS INTEROPERABILITY TEAM (FIT) AND LESSONS LEARNED.

3.1 FANS operating experience has shown that there is considerable benefit to be derived from close monitoring of end-to-end system performance. In the South Pacific, this function has been performed by the FIT, an informal group reporting to ISPACG, made up of representatives from operators, ATS Providers, data link service providers, regulatory authorities and aircraft manufacturers. A similar team has been formed to serve north and central pacific airspace with the monitoring functions split between the FAA and Japan Civil Aviation Bureau.

3.2 LESSONS LEARNED. In investigating performance deficiencies and other reported problems, the FITs have learned a number of important lessons that can be applied in other ATS data link environments. Many of these issues are already addressed in the Operations Manuals and guidance materials. Operators should review this list.

3.2.1 PILOT LESSONS LEARNED.

3.2.1.1 Pilots should avoid sending multiple elements in downlink request messages unless one element is dependent on another.

3.2.1.2 Lack of standardization in free text messages causes significant problems. Pilots should not use free text unless it is absolutely essential. Use of free text often results from lack of operator knowledge of the existence of or method of access to pre-formatted messages; this highlights the need for thorough training.

3.2.1.3 Altitude clearances that include a deferral of the clearance until a certain position is reached or until a certain time have caused a number of problems. These have become known as “conditional clearances”. ATC procedures have been established to precede the clearance with “MAINTAIN ALTITUDE”, to draw the pilot’s attention to the condition. However, pilots should continue to be vigilant and utilize procedures that ensure that all clearances are followed correctly. Operators should ensure that suitable procedures and training are in place.

3.2.1.4 While CPDLC will be usable as the primary medium for ATC communication in oceanic areas, pilots must continue to monitor the appropriate HF primary and secondary frequencies through SELCAL. Procedures for the establishment of this secondary function vary from area to area and crews must understand the requirements for their specific routes of flight.

3.2.1.5 The correct application of FIR boundary crossing procedures has been problematical. The CPDLC system allows automatic transfer from FIR to FIR with no action by the pilot. Pilots may monitor the transfer through the flight deck interface. Here again, clear procedures and thorough training are essential.

3.2.1.6 Where CPDLC reporting is required in lieu of, or in addition to, ADS-C reporting, pilots should consult enroute charts to confirm that only compulsory positions reports are being forwarded via the CPDLC to ATC. It is important however that non-compulsory positions are not deleted from the FMC flight plan because the FMC-defined great circle route may differ from the route defined by the non-compulsory waypoints resulting in significant navigational error. When a Flex track or User Preferred Route is being flown, all waypoints are compulsory, except where the Flex track actually incorporates segments of a published ATS route. In that case, only the compulsory points along the fixed route segment are required.

3.2.2 CONTROLLER LESSONS LEARNED.

3.2.2.1 Under normal operating conditions, priority should be given to messages containing the term "DUE TO WEATHER" and "REQUEST WEATHER DEVIATION…".

3.2.2.2 When an aircraft leaves a data link FIR for a non-data link FIR or leaves the CPDLC service area within the FIR, keep the aircraft in the active list until the CPDLC connection is terminated by the pilot or uplink END SERVICE message after the aircraft has entered the new FIR or departed the CPDLC service area.

3.2.2.3 Controllers should, wherever possible, avoid sending multiple elements in an uplink clearance message unless one element is a constraint on another (e.g. a route clearance is conditional on reaching an altitude).

3.2.2.4 When a single-word downlink response message (e.g., WILCO, ROGER, UNABLE, NEGATIVE or AFFIRMATIVE) is received from an aircraft, the controller should review the associated uplinked message if they have any questions pertaining to the single-word downlink.

3.2.2.5 Procedures should be established for error referral messages. These procedures should detail controller/supervisor responsibility for monitoring and distribution.

3.2.3 SYSTEM PERFORMANCE LESSONS LEARNED. South Pacific operations have demonstrated that poor end-to-end system performance rapidly leads to loss of confidence in the system among both pilots and controllers. Performance requirements have been made more stringent. This move resulted from the realization that operators were dissatisfied with system performance despite its meeting earlier requirements. Current performance requirements are as follows:

- Message delay---one-way delay time should be <60 seconds 95% of the time.
- Integrity---undetected bit errors 10^{-6} per hour.
- CPDLC System Availability---99.9%
- Reliability---message delivery success rate of 99%.

APPENDIX A

Data Link Operations
Dated 15 February 2012

OPERATOR GUIDE TO USING THE ICAO – GOLD DOCUMENT

Historical background

The *Global Operational Data Link Document* (GOLD) is the result of the progressive evolution of the *FANS 1/A Operations Manual*, prepared initially by the Informal South Pacific Air Traffic Services Coordinating Group (ISPACG), and the *Guidance Material for ATS Data Link Services in North Atlantic Airspace*, produced by the North Atlantic FANS Implementation Group (NAT FIG), on behalf of the North Atlantic Systems Planning Group (NAT SPG).

Each of the two founding documents provided guidance on a regional basis. However, in recognition of the need to provide globally harmonized guidance on data link operations, the GOLD became effective on 14 June 2010.

Scope and purpose

The GOLD provides guidance and information concerning data link aspects of aeronautical activity and is intended to facilitate the uniform application of Standards and Recommended Practices contained in Annex 2 — *Rules of the Air* and in Annex 11 — *Air Traffic Services*, the provisions in the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) and, when necessary, the *Regional Supplementary Procedures* (Doc 7030).

This guidance material is intended to maximize operational benefits in data link operations by promoting seamless and interoperable data link operations throughout the world. This edition limits itself to those data link operations that apply to the use of FANS 1/A and its applications: automatic dependent surveillance — contract (ADS-C), controller-pilot data link communications (CPDLC) and the flight management computer waypoint position reporting (FMC WPR). It also addresses the performance of the data link applications taking into consideration the transmission media used by those applications. Future editions are expected to incorporate guidance that applies to the planned expansion of ATN CPDLC in core Europe as well as the use of FANS 1/A in continental Europe.

While directed primarily at air traffic services personnel and flight crews, the following personnel should be familiar with various aspects of its contents: regulators, airspace planners, aircraft operators, dispatchers, communication service providers and radio operators, training organizations, central monitoring and reporting agencies, automation specialists at centers and radio facilities, and aircraft manufacturers and equipment suppliers.

The guidance will support the following activities:

a) the States' roles and responsibilities in relation to the following:

1) safety regulatory oversight of air navigation services;

2) operational authorizations, flight crew training and qualification;

3) design approval of aircraft data link systems

b) the development of agreements and/or contractual arrangements between air traffic service providers and aircraft operators and their respective communication service providers;

c) development of operational procedures; and

d) operational monitoring, analysis, and exchange of operational data among regions, States, and communication service providers.

The Global Operational Data Link Document (GOLD) can found and downloaded from the Air Traffic Organization Web Site:

http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/oceanic/data_link/

APPENDIX B

Data Link Operations
Dated 15 February 2012

RECOMMENDATIONS FROM CURRENT PACIFIC DATA LINK OPERATORS

ON CPDLC PROCEDURES AND PROBLEMS

CPDLC PROCEDURES: To avoid ambiguous or incomplete communications, crews should comply with the following recommendations:

- Communications initiated with ATS by voice (through GP radio) should be completed by voice. Communications initiated with ATS using CPDLC should be completed, whenever possible, using CPDLC. The down-link response "WILCO" indicates "Will comply" meaning that the pilot understands and accepts fully the terms and conditions of the entire up-link message, including any ATC clearance or instruction. Neither the downlink response "AFFIRM" (meaning, 'Yes') nor "ROGER" (meaning, 'I understand') is acceptable as an acknowledgment or reply to any ATC clearance or instruction. In general, the pilot's interface with the CPDLC function will only present the appropriate available responses for each up-link message. Crews should not circumvent this protection by utilizing free text to respond and no clearances or instructions should be issued using free text.

- Include only a single request in each CPDLC clearance request message.

- Use pre-formatted message elements for CPDLC messages to the maximum extent. Free text should be used only to supplement a formatted message when no pre-formatted message element is adequate.

- Send a CPDLC position report after successful logon and after each CPDLC transfer of control to the next ATS facility. Pilots should not expect a controller response to a position report.

- Any uncertainty concerning a CPDLC clearance or instruction or any apparent conflict between a voice message and a CPDLC message must be resolved using voice communications. Be particularly cautious before acting on a CPDLC conditional clearance. e.g., "AT xxx (fix or time), CLIMB TO xxx (altitude or flight level)."

- Pilot read-back of an ATC clearance or instruction issued via CPDLC is not required.

- Using CPDLC to relay messages because an ATSU and an aircraft cannot communicate, and an intermediary data link aircraft is used for relaying messages, the following shall apply:

    - Only a free text message shall be used;

    - The first word in the message shall be "RELAY".

NOTE: The use of pre-formatted messages is prohibited because the intermediary aircraft's FMS could be unintentionally armed.

CPDLC PROBLEMS:

- **Unable to Logon.** If unable to establish a data link connection, inform ATS by HF or VHF voice using the following terminology:

  "UNABLE C-P-D-L-C LOGON."
  ATC will respond, "ROGER. CONTINUE ON VOICE."

- **Problems after Logon.** If problems are experienced with the CPDLC connection, report through GP radio HF or VHF, "CPDLC terminated due to … (State the reason.) Continuing on voice."

- **CPDLC Terminated.** If CPDLC was terminated unexpectedly, report through GP radio on HF or VHF, "CPDLC connection failure". If termination occurs at an FIR boundary where CPDLC to CPDLC transfer was expected, log on to the next Oceanic Center.

- **Service Not Terminated.** If the CPDLC "ATC COMM TERMINATED" scratchpad message (747-400 and other Boeing airplanes except 777) or "ATC DATALINK LOST" advisory message (777) is not received after leaving airspace in which CPDLC has been used and entering airspace in which the service is unavailable.

APPENDIX C

Data Link Operations
Dated 15 February 2012

RECOMMENDATIONS FROM CURRENT PACIFIC DATA-LINK OPERATORS ON ADS-C PROCEDURES AND PROBLEMS

ADS-C CRUISE PROCEDURES: These procedures currently apply in the Auckland, Brisbane, Melbourne, Tahiti, Fiji, Fukuoka, Anchorage and Oakland FIR's only.

GENERAL. The Auckland, Brisbane, Melbourne, and the Oakland Trial, ATSU's routinely used ADS-C to monitor suitably equipped flight's progress. ADS-C reports, some including meteorological data, are sent from the aircraft automatically at the following times:

- At a time interval specified by the ground system or controller.
- After crossing each waypoint or when the pilot changes a waypoint in the active flight plan
- If lateral route modifications are made e.g. offset, direct to
- If vertical or lateral deviation exceeds specified values
- Vertical change to new cruising level.

POSITION REPORTS: Unless notified otherwise by NOTAM, procedures description in route supplement, or ATC, CPDLC Position Reports are not required except at the FIR Boundary inbound and the Oceanic boundary outbound. Both reports should be sent after ATC COMM has been established with the appropriate Center.

REVISED ETA: Under normal circumstances, an aircraft providing position reports by ADS-C is not required to advise ATC of any revised waypoint estimates. Exceptions to this are:

- Revisions of greater than two minutes to a previous pilot advised estimate i.e. by voice or CPDLC
- Following a pilot initiated action (e.g. speed change) resulting in a changed estimate of greater than two minutes.
- If required, a pilot may advise a revised estimate in one of the following manners:
- Voice
- Down linking a CPDLC position report containing the revised estimate.

DELETION OF WAYPOINTS: Do not remove non-compulsory waypoints from the FMC flight plan. This will ensure the centerline of the cleared route is maintained in all cases. Prior to crossing any compulsory waypoint, the track(s) and distance(s) must be checked as far as the next compulsory waypoint.

PILOT CREATED WAYPOINTS: These must not be included in an active route as some ATSU ground systems cannot process them and may indicate that a flight is not conforming with the cleared route. If a reminder, in the form of a pilot created point is required, the FMC Flight Plan should be used to create a time fix, which can then be transferred to the appropriate FMC page. This must be accomplished without executing the route modification, as this will generate an ADS Report. The single exception to this is a

pilot created waypoint, which occurs in Domestic Airspace, inbound to destination. On some aircraft, such as the MD-11/10/717 and Airbus, because they do not have an "execute key", the use of the secondary flight plan capability possibly needs to be utilized.

CPDLC LEVEL REPORT: In ADS-C airspace, if ATC does not require a CPDLC Level Report, no attachment will be appended to the up-linked clearance. A free text reaching or level report is not required; this function will be fulfilled by ADS-C.

ADS-C PROBLEMS

EMERGENCY ACTIVATION: One of the main problems that has been experienced during the last ten years of ADS-C operations has to do with inadvertent activation of the ADS-C Emergency signal. This has been identified most of the time as a human factors incident. The FMC box on the right side of the aircraft cockpit is located in such a position as to allow the pilot's foot to accidentally push the activate button for ADS-C emergency. This only happens on the 747-400. The fix should be the installation of a guard on the panel side. Procedures for confirmation of emergency activation are located in the FOM, Part 7, section 1.2, (Confirmation of Emergency Activation).

APPENDIX D

Data Link Operations
Dated 15 February 2012

PURPOSE OF SAMPLE BULLETIN. This sample bulletin provides an example of information that has been provided to pilots. It does not necessarily reflect current information. IF AN OPERATOR CHOOSES TO USE IT AS A GUIDE IN DEVELOPING THEIR OWN BULLETINS, THE BASIC SOURCE DOCUMENTS LISTED IN PARA 2.7.6 (NOTAMS, AIP'S, ETC.) MUST FIRST BE CONSULTED AND THE DOCUMENT UPDATED, AS REQUIRED, BEFORE IT IS ISSUED TO PILOTS.

SAMPLE PILOT BULLETIN ON DATA LINK OPERATIONS IN

OAKLAND, FUKUOKA AND OTHER PACIFIC OCEANIC AIRSPACES

1. DATA LINK OPERATIONS IN THE OAKLAND FIR:

HF USE. HF is required in the Oakland OCA/FIR.

AREAS OF OPERATION. CPDLC service is available in all sectors of the Oakland and Anchorage Oceanic system.

LOGON WITH OAKLAND CENTER. The logon address for Oakland Oceanic is: "KZAK". When departing a U.S. west coast airport, logon should be accomplished above 10,000 feet after departure. Inform San Francisco Arinc on VHF or HF that the flight is a CPDLC flight.

ALTERNATE COMMUNICATIONS WITH OAKLAND OCEANIC CONTROLLER Oakland Oceanic will accept SATCOM voice or HF phone patch communications for messages requiring immediate handling, such as a request for weather deviation. In order to retain the availability of these services, neither SATCOM voice or HF phone patch is to be used for routine communications. For priority handling, if requesting clearance to deviate around weather, include the words "Weather deviation required" with the request. The controller also has the option of calling the flight.

2. DATA LINK OPERATIONS IN THE FUKUOKA OCA.

Within the area of the Fukuoka FIR specified below, CPDLC with the Tokyo Area Control Center (ACC) controller and ADS-C are available to FANS-1/A equipped aircraft. Neither HF phone patch or SATCOM voice is available.

AREA OF OPERATION. CPDLC is available to aircraft operating in the Fukuoka OCA of the Fukuoka FIR, except on airways G 581 (Enroute Chart FE(H/L)4, between Miyakejima (MJE) and SABAN) and G 339 (Enroute Charts FE(H/L)4 and P(H/L)2, between Tanegashima (TJE) and PAKDO). ADS-C also is available in the Fukuoka OCA if Tokyo ACC wishes to establish an ADS-C contract with the flight. ADS-C requires no additional procedure or awareness on the part of the flight crew.

HF USE. HF is required in the Fukuoka OCA/FIR.

Until further notice, the following messages should be sent only by voice (HF or VHF):

- Route requests (other than weather deviation requests). Tokyo ACC cannot uplink route clearances.
- Non-routine aircraft observations (severe turbulence, volcanic activity etc.)
- Emergency messages

LOGON WITH FUKUOKA. The logon address for FUKUOKA is "RJJJ". An attempt to logon while on the ground in Japan before departure will not be accepted. Inform Tokyo Control on VHF or through Tokyo Radio (VHF or HF) of the completion of the CPDLC connection using the following phraseology:

"C-P-D-L-C CONNECTION COMPLETED."

TRANSFER FROM VOICE COMMUNICATIONS TO CPDLC.

- **From Japan Domestic Airspace.** After logging on successfully with Tokyo ACC, when leaving the Tokyo radar service area and entering oceanic airspace where data link services are provided, the flight will be instructed to transfer to CPDLC and to contact Tokyo Radio using the following voice phraseology:

  "CONTACT TOKYO [frequency] AND TRANSFER TO FUKUOKA ON DATA LINK."
  (TOKYO and TOKYO CONTROL means Tokyo Radio and Tokyo ACC, respectively.)

  Inform Tokyo Radio of a successful CPDLC logon. Following this notification, send a CPDLC position report.

- **From an Adjacent FIR.** When operating from an adjacent FIR into the Fukuoka OCA and having established a successful data link connection with Fukuoka, inform Tokyo Radio on HF that a CPDLC connection has been established.

NOTE: Automated CPDLC to CPDLC transfer procedures between Oakland, Anchorage and Fukuoka are now active.

CPDLC MESSAGES. CPDLC may be used to send the following messages:

- Position reports
- Altitude requests
- Requests for weather deviation

Tokyo ACC cannot uplink route changes. Make requests for route changes, other than weather deviation, on HF.

TERMINATION OF DATA LINK SERVICES.

- **Leaving the Fukuoka FIR.** When leaving the Fukuoka FIR, the flight will be informed that data link services are terminated with the following CPDLC uplink message:

"CONTACT TOKYO CENTER [frequency]. DATA LINK SERVICE TERMINATED." (In this instance, TOKYO CENTER means Tokyo Radio. This phraseology is used because of limitations in the pre-formatted message set.)

Acknowledge this message by sending, "WILCO". After receiving the WILCO message, an "END SERVICE" message will be uplinked to terminate the CPDLC connection. Inform Tokyo Radio that data link services are terminated. The flight then will be informed of the HF frequencies for the receiving facility.

- **Entering a Radar Service Area within the Fukuoka FIR.** When entering an area of radar coverage within the Fukuoka FIR, the flight will be informed by the following CPDLC uplink message that data link services are terminated:

"CONTACT [ICAO unit name] [frequency], DATA LINK SERVICE TERMINATED."

Acknowledge this message by sending "WILCO". After voice communications have been established, terminate the data link connection by selecting "ATC COMM, <SELECT OFF" on the ATC LOGON / STATUS page.

3. OPERATIONS IN OTHER ASIA/PACIFIC OCEAN CTA'S / FIR'S

Full CPDLC service is available in the following additional Asia/Pacific OCAs / FIRs:

- Auckland (NZZO)
- Brisbane (YBBB)
- Singapore (WSJC)
- Magadan (GDXB)
- Melbourne (YMMM)
- Nadi (NFFF)
- Tahiti (NTTT)
- Hong Kong (VHHH)
- Ulan Bator (ZMUB)
- Anchorage (PAZN)

HF is required in these OCAs.

There are no unique CPDLC procedures required in any of these OCAs.

APPENDIX E

Data Link Operations
Dated 15 February 2012

LIST OF ABBREVIATIONS AND ACRONYMS.

ACARS	Aircraft Communications Addressing and Reporting System
ACC	Area Control Center
ADS-C	Automatic Dependent Surveillance - Contract
AFS-400	FAA Headquarters Flight Technologies and Procedures Division
AIDC	ATS Inter-facility Data Communication
AIP	Aeronautical Information Publication
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ATC	Air Traffic Control
ATO-150	FAA Air Traffic Oceanic Operations & Procedures
ATS	Air Traffic Service
CERAP	Combined Center Radar Approach Control
CPDLC	Controller/pilot data link communications
DARP	Dynamic Airborne Route Planning
FAA	Federal Aviation Administration
FANS	Future Air Navigation System
FIR	Flight Information Region
FIT	FANS Interoperability Team
FOM	FANS Operations Manual
GP	General Purpose
GPS	Global Positioning System
HF	High Frequency radio
ICAO	International Civil Aviation Organization
IPACG	Informal Pacific ATC Coordinating Group
ISPACG	Informal South Pacific ATS Coordinating Group
LOA	Letter of Agreement
MCDU	Multifunction Control and Display Unit
MEL	Minimum Equipment List
MMEL	Master Minimum Equipment List
NOTAM	Notice to Airmen
OCA	Oceanic Control Area
PANS/ATM	Procedures for Air Navigation/Air Traffic Management
RNP	Required Navigation Performance
SATCOM Voice	Satellite Communications Voice
SATCOM Data	Satellite Communications Data
SELCAL	Selective calling facility
VHF	Very High Frequency radio

APPENDIX F

Data Link Operations
Dated 15 January 2012

CONTACTS AND WEBSITES

ORGANIZATION	REPRESENTATIVE	PHONE NUMBER	E-MAIL ADDRESS
United Airlines	Capt Joe Burns	1-847-700-4166	Joe.burns@ual.com
Air New Zealand	Tracy Bremer	64-9-256-3448	Tracy.bremer@airnz.co.nz
Qantas Airlines	Capt David Oliver	61-2-9691-1158	Doliver@qantas.com.au
	Capt Murray Warfield	61-2-9691-195761-	Mwarfield@qantas.com.au
	Capt David Coates	2-9691-9152	Dcoates@qantas.com.au
Airbus	Jean-Francois Bousquie	33-561-934-704	Jean-rancois.bousquie@airbus.fr
Boeing (CRA)	Brad Cornell (South Pacific, Bay of Bengal)	1-425-280-5603	Bradley.d.cornell@boeing.com
	Craig Roberts (South Pacific)	1-425-373-2685	craig.j.roberts@boeing.com
	Gordon Sandell (North & Central Pacific)	1-425-342-4765	Gordon.r.sandell@boeing.com
	Suzie Ness (South Pacific)	1-425-342-6803	Suzie.ness@boeing.com
	Dung Nguyen (North Atlantic)	1-425-342-9263	Dung.q.nguyen@boeing.com
	Glenn Torgerson (Indian Ocean)	1-425-342-8345	Glenn.a.torgerson@boeing.com
	John Brown (Indian Ocean)	1-425-294-2623	John.a.Brown@boeing.com
	Rob Mead (North Atlantic)	1-425-373-2684	Rob.Mead@boeing.com
Universal Avionics	Carey Miller	1-520-807-7426	cmiller@UASC.com
ARINC	Peter Grogan	1-410-266-2344	Pgrogan@arinc.om
SITA	Kathleen Kearns	1-703-339-8965	Kathleen.Kearns@sita.aero
FAA Flight Standards	Bob Tegeder	1-202-385-4581	Robert.m.tegeder@faa.gov
	Trent Bigler	1-202-385-4504	Trent.Bigler@faa.gov
Oakland Center	Dennis Addison	1-510-745-3258	dennis.addison@faa.gov
Anchorage Center	Gregg Howard	1-907 269 1109	gregg.howard@faa.gov
Tokyo Center	Hideo Watenabe	81-042-992-1317	Hideo-wsj@jacc.go.jp

APPENDIX F (CONT.)

WEBSITES

1. **FAA OCEANIC AIR TRAFFIC OPERATIONS AND PROCEDURES WEBSITE** for current version of South Pacific Operations Manual and this information paper:

   http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/oceanic/

2. **ATC DATA LINK NEWS: provides** background and current information on CPDLC operations.

   http://www.optusnet.com.au/~cjr

3. **CANSO WEBSITE**

   http://www.canso.org/