



# **CIVIL AVIATION PUBLICATION**

**CAP 10**

**CPDLC**

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## CAP 10

## CPDLC

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## 1. INTRODUCTION

### 1.1 General

This Civil Advisory Publication (CAP) provides guidance material for the operation of San Marino registered aircraft utilising Future Air Navigation Systems (FANS) technology providing direct data link communication between the pilot and the Air Traffic Controller. The system is referred to as Controller/Pilot Data Link Communications (CPDLC) and includes air traffic control clearances, pilot requests and position reporting as well as a company data link facility.

### 1.2 Applicability

This guidance material applies to all San Marino registered aircraft operators when operating in designated airspace or routes promulgated in the particular State's AIP, where the use of CPDLC is permitted.

### 1.3 Terminology

**FANS** is Future Air Navigation Systems

Whenever FANS 1, FANS A or FANS 1/A is documented, it refers to manufacturer's programme (FANS 1 = Boeing and FANS A = Airbus) Second generation technology will become FANS 2/A.

**CPDLC** is Controller/Pilot Data Link Communication:

CPDLC is the data link software algorithm within the FMS that enables two-way communication between the cockpit and ATC. It contains the set of predefined text messages for clearances, requests and routine message traffic. The current CPDLC is designed to use the ACARS network so that the CPDLC is routed from the cockpit to ATC based on handling instructions within the aircraft communications systems.

CPDLC overcomes a number of the shortcomings of voice communication, such as voice channel congestion, misunderstanding due to bad voice quality and/or misinterpretation, and corruption of the signal due to simultaneous transmissions. The benefits are generally;

- Preferred/more direct oceanic routing;
- Fewer delays on the ground while awaiting clearance;
- Fully automated position reporting;
- Digital data link communication with ATC;
- Request/receive clearances on (M)CDU;
- Auto acceptance of clearances into flight plan;
- HF radio used only as backup; and



- Noisy communication issues avoided.

**ADS-A** – Automatic Dependant Surveillance-Addressed

**ADS-B Out** - Automatic Dependant Surveillance-Broadcast

**ADS-C** – Automatic Dependant Surveillance-Contract:

ADS-A/C contains the software algorithms to transmit the position of the aircraft (either via SATCOM or VHF) every one to five minutes to an ATC listening station (typically within the FIR). ADS contracts are established by the ground station following a logon from an aircraft. Although ADS and CPDLC are separate applications, they both use the same logon from the aircraft for their own purposes. ADS-A will also maintain surveillance continuity through automatic handover across FIR boundaries.

## 1.4 References

The references for the CPDLC operational approval are:

- (a) FAA Advisory Circular AC 120-70 (as amended) - Operational Authorisation Process for Use of Data Link Communication System
- (b) ICAO Doc, 7030 Regional Supplementary Procedures;
- (c) ICAO Doc. 9758-AN/966 - Human Factor Considerations In The Data Link Environment;
- (d) FANS - 1/A FANS Operations Manual. Available from (<http://www.crasa.cra-japan.org> or <http://www.faa.gov/ats/ato/130.htm>).
- (e) Global Operational Data Link Document. Available from: <http://www.ispacg-cra.com> or [http://www.faa.gov/about/office\\_org/headquarters\\_offices/ato/service\\_units/enroute/oceanic/data\\_link/](http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/oceanic/data_link/)

## 2. APPLICATION

### 2.1 Process

Only operators with proven operational competency, training and documentation in RNP 5 (such as B-RNAV) and RVSM airspace can be considered by the CAA for the use of CPDLC. The application must reference a particular aircraft registration number, unless all of the operator's aircraft are of the same type and have exactly the same equipment and software version.

The application, which is available on the CAA website, must address all of the following sections on equipment and communications systems requirements, operational requirements, including documentation and training.

All applicants shall provide documentary evidence of that the aircraft is CPDLC compliant. In addition an operator may need to hold an approval from the CAA for RNP 4 airspace but this depends on the airspace requirements.



A General Aviation operator does not need to provide further supporting documentation but shall sign the Applicant's Declaration on the application form indicating all operational requirements, documentation and training (as ticked) meet the requirements of this CAP.

As part of the application, AOC holders must submit documentary evidence of;

- (a) documentary evidence of required instruments and equipment;
- (b) Operations Manual (OMA), checklists and SOPs (OMB);
- (c) Adequacy of maintenance;
- (d) Pilot training (OMD);
- (e) Provision of information regarding data base, NOTAMs etc.;

and sign the Applicant's Declaration.

## **2.2 Airworthiness Requirements**

### **2.2.1 General**

The components of a CPDLC capable aircraft are usually installed at manufacture of a new generation aircraft and the manufacturer includes statements as to CPDLC capability.

However, where an aircraft has been modified for CPDLC capability, the operator must provide the CAA with all the aircraft navigation, communication and data equipment details for each aircraft registration and include the applicable software versions. The majority of this information should be contained in the Aircraft Flight Manual, AFM supplements or STCs. Unless the approved MEL and Maintenance Programme already addresses all CPDLC equipment, an amendment must be submitted. It is a requirement for all operators to provide documentary evidence as to CPDLC capability.

### **2.2.2 Equipment**

The following equipment must be installed:

- (a) Compatible radios VHF, SATCOM, HF/DL
- (b) Compatible ACARS, MU/CMU
- (c) Fully integrated dual GPS with appropriate software version.
- (d) FMC with appropriate features and software version.
- (e) Printer to support the FMC interface (if applicable).
- (f) Flight Data Recorder. The CVR must record digital communications with ATS unless recorded by the FDR.



*Note 1: The operator must provide documentary evidence that the above is fitted for a modified aircraft only. The CAA will accept documents from the manufacturer of new aircraft indicating that the aircraft equipment is CPDLC compliant.*

*Note 2: An operator of an aircraft previously approved for CPDLC by a credible foreign State should submit that approval to speed up the application process.*

### **2.2.3 Maintenance Organisation Determination**

Operators, or contracted maintenance organisations, must be capable of providing maintenance support of CPDLC equipment and software. That support must be provided by trained maintenance personnel capable of implementing digital communications related maintenance programmes. The support includes, but is not limited to;

- (a) addressing installation,
- (b) modification,
- (c) correction of reported system discrepancies,
- (d) use of test equipment,
- (e) procedures,
- (f) MEL relief, and
- (g) return to service Authorisations.

*Note: An operator shall determine that the required maintenance support and engineer training provided by the applicable maintenance organisation is adequate. Supporting documentation is required for AOC holders.*

### **2.2.4 Software Updates**

Operators should assure that appropriate digital communications software updates are incorporated when necessary and that both air and ground systems are able to identify and properly respond to the installed level of digital communication capability. There must be a documented mechanism for software update procedures.

## **3. OPERATIONAL REQUIREMENTS**

### **3.1 General**

To be eligible for a CPDLC Approval from the CAA, the following operational issues need to be addressed by the operator:

- (a) Operating procedures (SOPs including Contingency Procedures)
- (b) FCOM & Quick Reference Handbook changes (if applicable).





- (c) Minimum Equipment List (MEL) if required
- (d) Training programmes
- (e) Data base and the provision of flight planning information for CPDLC area (e.g. NOTAMs, AIP etc.).

## 3.2 Operations Manual

### 3.2.1 Policy

Operators must assess operational requirements, establish their operational policy and procedures and incorporate them in appropriate section of the Operations Manual. The following list indicates an example of Operations Manual policy which should be incorporated:

- (a) Operational Issues
  - (i) The differences between voice and data link environments.
  - (ii) The concept of “data authority”, “next data authority” and transfer of data authority (or address forwarding).
  - (iii) Flight crew handling rules for ATC uplink messages, including normal and urgent instructions.
  - (iv) ADS emergency triggering.
  - (v) Reporting and requirements.
  - (vi) Sequence of actions to be taken in case of re-route operations.
  - (vii) Loading and viewing amended route clearances.
  - (viii) Executing amended route clearances.
  - (ix) Resolving duplicate waypoint issues.
  - (x) “armable” downlinks.
  - (xi) The types of ADS contracts.
  - (xii) The type of information that is included in ADS reports and the pilot actions, which can trigger an ADS report.
- (b) Communications
  - (i) Phraseology
  - (ii) Pre-formatted messages with new interpretations such as “Standby”, “Request Deferred”;



- (iii) The differences between free text and preformatted messages.
  - (iv) The limitations of free text messages and of preformatted messages
  - (v) The need to close the loop between uplink and downlink messages.
  - (vi) Requesting amended route clearances.
  - (vii) The importance of ensuring that the correct downlink message for a given uplink scenario.
  - (viii) Out of sequence messages.
- (c) Human Factors.
- (i) the increased “head down time” for flight crew.
  - (ii) Flight deck Human – Machine Interface limitations and issues.
  - (iii) the time required for reading and interpreting uplink messages.
  - (iv) the time required for selecting, composing and sending downlink messages.
  - (v) the need for maintaining a shared crew awareness of the progress of ATC data link communications.
  - (vi) situational awareness and the inability of pilots to monitor other data link transmissions in the area of operations.

### 3.2.2 Operations Manual Procedures

The following list indicates a typical range of procedures, which should be addressed in the Operations Manual where applicable:

- (a) Cockpit preparation;
- (b) AFN logon;
- (c) CPDLC procedures - general;
- (d) ATC/crew/dispatch initiated re-route;
- (e) Required time of arrival;
- (f) Company operational control (FMC route and wind/temp data uplink);
- (g) Complimentary voice communications;
- (h) Navigation: GNSS (GPS if applicable and rules and procedures for RNP operations);



- (i) Surveillance (ADS);
- (j) Dynamic airborne reroute procedure (DARP) operation;
- (k) Weather deviation;
- (l) Non normal procedures of CPDLC, DARP, RNP;
- (m) Contingency procedures;
- (n) RNP airspace/large navigation errors;
- (o) Minimum Equipment List.

### 3.2.3 Training - Pilots

The Training Manual (OMD) for a commercial operator or the training section of a General Aviation operator's manual should reflect the training given, the qualification on equipment, procedures and operational requirements. In particular, consideration must be given to the training syllabus, training devices, training material and training staff.

Whilst the provision of CPDLC and FMS MCDU (or similar equipment) in an aircraft simulator or training device is desirable, it is not a pre-requisite for the operator to have this capability. However, data link training must be representative of the equipment in the particular aircraft type.

Pilots involved in both Commercial or General Aviation operations must receive formal training from qualified training organisations or the manufacturer. The following list of training topics indicates the range of training that a pilot should receive and to be able to demonstrate:

- (a) a satisfactory knowledge of:
  - (i) CNS/ATM concepts, terminology and architecture;
  - (ii) CNS/ATM components – GNSS, CPDLC, ADS, operational control data link, ATN, RNP, ATM;
  - (iii) CNS/ATM procedures appropriate to approach and departure phases of flight;
  - (iv) CPDLC procedures – means of communications, pre-flight phase, AFN logon, exchange of CPDLC messages, transfer of connection, disconnection, abnormal cases, use of complementary voice communication;
  - (v) Human factor considerations in the data link environment (refer to ICAO Doc. 9758-AN/966);
  - (vi) Aircraft equipment requirements;



- (vii) Contingency weather deviation procedures – sequence of actions when no ATC clearance is available;
  - (viii) RNP contingency procedures – one RNP capable LRNS, inability to navigate to the specified RNP, loss of all LRNS;
- (b) the ability to satisfactorily perform the following operational tasks:
- (i) Flight plan preparation for a flight using CNS/ATM operational procedures, including any special requirements for communications, navigation, surveillance or crew;
  - (ii) Pre-flight check for CNS/ATM operation;
  - (iii) Use of FMS MCDU (or similar equipment) – CNS/ATM function;
  - (iv) AFN logon;
  - (v) Operation of ADS;
  - (vi) CPDLC – exchange of CPDLC messages, FIR boundary procedure, disconnection;
  - (vii) Operation of operational control data link;
  - (viii) Operation of SATCOM;
  - (ix) Operation of GPS;
  - (x) Perform contingency procedures associated with degradation of RNP;
  - (xi) Identification of deterioration of navigation performance, cross checking procedure to identify navigation errors;
  - (xii) Dynamic airborne reroute procedure (DARP) operations;
  - (xiii) Use of CPDLC under emergency or abnormal situations;
  - (xiv) Non-normal procedures – CPDLC connection and disconnection;
  - (xv) Appropriate interaction between two pilots in a data link environment;

## **4. AUTHORISATION**

### **4.1 CAA Authorisation**

The CPDLC Authorisation will be part of the Operation Specifications issued to an AOC holder or as a Specific Approval certificate for a General Aviation operator.



## 4.2 Foreign Authorisation

Once authorised by the CAA, the operator may be required to obtain a separate authorisation from some FIR controlling States responsible for the use of digital communications in their airspace. This authorisation may be in the form of a letter or the amendment of the Operations Specifications issued to that operator by the foreign State (e.g. USA, Australia). The operator is responsible for obtaining those authorities.

## 5. CONTINUING SURVEILLANCE

### 5.1 Operator Responsibility

As part of their Safety Management System, all operators should conduct their own continuing surveillance on the following areas,

- (a) Checking the Occurrence Reports for abnormalities.
- (b) Checking Voyage Reports for CPDLC anomalies.
- (c) Use of CPDLC and ADS equipment.
- (d) Continuation training evaluation.
- (e) Expansion of data link applications (load sheet, V speeds, mass & balance etc.)
- (f) Cross-checking to ensure that operations are in accordance with the appropriate ICAO Regional Supplementary Procedures and/or Aeronautical Information Publication for that airspace.

### 5.2 Reporting Action

Unsafe conditions or performance related to data link operations such as a data link event, which potentially could affect continued safe operations, must be reported to the ATS of FIR controlling State and to the CAA within 24 hours.

It is incumbent upon each operator to take immediate action to rectify the conditions that cause an operational error. In addition to reporting data link events to the ATS above, the operator should also report the event to the CAA within 72 hours, by submission of a CAA Occurrence Report with initial analysis of causal factors and measures taken to prevent further events.



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