



International Civil Aviation Organization

**MIDANPIRG Communication Navigation and Surveillance
Sub-Group (CNS SG)**

Sixth Meeting
(Tehran, Iran, 9 – 11 September 2014)

Agenda Item 3: Global and Regional Developments related to CNS

CONTROLLER PILOT DATA LINK COMMUNICATIONS (CPDLC)

(Presented by the Secretariat)

SUMMARY

The aim of this paper is to give an overview of Controller Pilot Data Link Communications (CPDLC). It describes the main principles, the different data link services and the basics of CPDLC operations, including related phraseology.

Action by the meeting is at paragraph 3.

REFERENCES

- Annex 10 Volume III Part 1 Chapter 3
- ICAO Doc 4444
- EUROCAE-Documents ED-110B

1. INTRODUCTION

1.1 The CPDLC application provides air-ground data communication for the ATC service. It enables a number of Data Link Services (DLS) that provide for the exchange of communication management and clearance/information/request messages which correspond to voice phraseology employed by air traffic control procedures. The controllers are provided with the capability to issue ATC clearances (level assignments, lateral deviations/vectoring, speed assignments, etc), radio frequency assignments, and various requests for information. The pilots are provided with the capability to respond to messages, to request/receive clearances and information, and to report information. A “free text” capability is also provided to exchange information not conforming to defined formats.

1.2 The CPDLC is being globally implemented and currently is in different implementation stages. The global communication procedures are detailed in the ICAO Provisions: Annex 10 Volume III Part 1 Chapter 3. The CPDLC message set is contained in ICAO Doc 4444: PANS-ATM, Annex 5.

2. DISCUSSION

2.1 The meeting may wish to recall that in the European Region The Data Link Services Implementing Rule (DLS-IR) was adopted on 16 January 2009 by the European Commission and published as Regulation 29/2009 - Data link services for the Single European Sky. The DLS-IR is legally binding and applies directly to Air Navigation Service Providers (ANSPs) and to Aircraft Operators. The list below summarises the key elements of the DLS-IR but is not exhaustive and in no way replaces the need for careful reading of the text itself (view the text published in the Official Journal of the European Union:

- a) 1 January 2011 – After this date all new aircraft operating above FL 285 shall be delivered with a compliant system;
- b) 7 February 2013 - By this date all LINK Region ANSPs shall have implemented an operational compliant system in EUR(see the yellow Region on the map);
- c) 5 February 2015 - By this date all aircraft operating above FL 285 shall have been retrofitted with a compliant system;
- d) 5 February 2015 - By this date all EU Region ANSPs shall have implemented an operational compliant system (see the pink Region on the map);
- e) 31 December 2017 - Aircraft which are at least 20 years old and which will cease operation in the concerned airspace before 31 December 2017 are exempt;
- f) 1 January 2014 - Aircraft with individual airworthiness certificate before this date that are equipped with Future Air Navigation System (FANS) are exempt for the lifetime of the aircraft. Aircraft entering into service after 1 January 2014 shall comply with the rule; and
- g) 1 January 2014 - New transport type State aircraft should comply with the rule if equipped with non-military data link.

2.2 Below is list of some of the main expected benefits of CPDLC:

- less communication on the ATC frequency;
- increased sector capacities;
- more pilot requests can be dealt with simultaneously;
- reduced probability of miscommunication (e.g. due call sign confusion); and
- safer frequency changes, hence fewer loss of communication events.

2.3 The following underlying principles are applicable to the use of CPDLC:

- Voice and Data Link shall co-exist as a means of ATS communication. Implementation of CPDLC is intended as a supplementary means of communication to the use of voice communication;
- CPDLC shall only be used in the context of non-time-critical communications. Time-criticality is mainly determined by the following factors: ATC traffic situation, end-to-end performance (systems and flight crew/controller response time) and recovery time. Users should be aware that while a voice response is generally expected in a few seconds the latency of CPDLC is usually much longer (up to several minutes);

- the decision to use either voice or CPDLC shall be at the discretion of the controller and/or pilot involved; and
- the provisions regarding the use of CPDLC shall respect the following standard as provided in ICAO Annex 11, Chapter 3, par. 3.5.1: “A controlled flight shall be under the control of only one air traffic control unit at any given time”.

2.4 CPDLC Operations:

- Flight Planning. Operators of CPDLC capable aircraft shall insert the letter J in Item 10 and COM/CPDLC in Item 18 of the ICAO flight plan form;
- Transfer of CPDLC. If an aircraft is transferred from an ATS unit where CPDLC is not available to an ATS unit where CPDLC is available, the aircraft uses DLIC to log on to the unit that is CPDLC equipped. The procedures and timings are detailed in the respective AIP;
- if both adjacent ATS units are using CPDLC the transfer of voice communications and CPDLC commences concurrently. The transferring unit being the Current data authority (CDA) designates the receiving unit as Next data authority (NDA). The purpose of this designation is to reduce the possibility of logging on to an improper data authority (which is equivalent to switching to the wrong radio frequency in voice communications); and
- if an aircraft is transferred from an ATS unit where CPDLC is available to an ATS unit where CPDLC is not available, CPDLC termination commences concurrent with the transfer of voice communications.

2.5 *Use of CPDLC.* The extent to which CPDLC can replace voice communications is largely subject to local implementation choices. Although the technology allows a wide array of complex messages the most commonly used are:

- change of SSR code;
- transfer of control and communication;
- ATC clearances (e.g. level changes, vectoring, direct routing, speed control) that are not time-critical; and
- response to aircraft CPDLC requests;

2.6 *CPDLC message composition.* The messages are composed in standard format, in plain language or in abbreviations and codes, as prescribed in Annex 10, paragraph 3.7. Plain language should be avoided when the length of the text can be reduced by using appropriate abbreviations and codes. Nonessential words and phrases, such as expressions of politeness, are not to be used. Sets of mandatory and optional uplink (ground-to-air) and downlink (air-to-ground) messages have been developed for each data link service. It is therefore possible that either the airborne or the ground system supports a larger array of messages. Proper handling of unsupported messages (e.g. responding with appropriate error messages) is an essential part of CPDLC system development and implementation.

2.7 CPDLC messages can be single element or multi-element. A maximum of 5 elements in one message is allowed according to ICAO ATN SARPs and the EUROCAE-Document ED-110B. Systems compliant to the EUROCONTROL Specification should allow downlink messages, containing maximum 2 elements.

2.8 A single element message response to a multi-element message applies to all message elements. If any part of a multi-element message cannot be complied with, the pilot shall send an “UNABLE” response for the whole message (which means that the pilot will not comply with any of the message elements). This could result in an unnecessarily prolonged communication exchange. Therefore the use of messages with multiple elements should be avoided where possible. They should be used when it is necessary to execute the set of clearances or instructions in its entirety (dependent clearances). Only one open dialogue of the same type with the same aircraft at any given time is allowed.

2.9 *Reverting from CPDLC to Voice:* Usually when a controller or pilot communicates via CPDLC, the response should be via CPDLC. When a controller or pilot communicates via voice, the response should be via voice. The following circumstances describe potential situations where the air ground communications should revert to voice:

- when it is required to clarify the meaning or the intent of any unexpected, inappropriate or ambiguous CPDLC message;
- when it is necessary to ensure the timely execution of an instruction issued by CPDLC;
- when corrective actions are required with respect to unintended messages that have been sent using CPDLC; and
- when a system generates a time-out or an error for a CPDLC message.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this information paper.

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