



NAS Data Communications Guide



Version 4.0
December 20, 2017

Data Communications Implementation Team (DCIT):
(CPDLC) NAS Data Communications Guide

Change History

Version	Date	Description of Change
1.0	April 30, 2015	Initial issue of the Data Communications Implementation Team (DCIT) Tower Data Link Services (TDLS) Departure Clearance Service (DCL) Flight Deck User Guide
2.0	March 31, 2016	TDLS System update – Push DCL, cockpit flow diagram and description of logon procedure with PUSH DCL services, General document update to include Airbus aircraft pictures for integrated CPDLC interface and DCDU (requires an update from AIRBUS to reformat pictures to align with initial deployment of DCL service)
3.0	February 28, 2017	TDLS update – Flight crew awareness phrase add for loadable routes, change of revised DCL functionality, graphics update supporting TDLS 12.2 software update, general content update to support TDLS 12.2 software update, KUSA logon information fy17, 2 nd qtr. name change of document to “NAS Data Communications Guide”
4.0	December 20, 2017	Reordering of the document. New Sections added for S1P2 En-Route CPDLC Initial services, added new material into the appendix sections, review and general update

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Executive Summary

As part of the FAA NextGen introduction of advanced communications services in the National Airspace System (NAS), Controller Pilot Data Link Communication (CPDLC) has been introduced at local Tower Data Link Service (TDLS) equipped facilities to provide the delivery of departure clearances and revised departure clearances through advanced automation. Future En Route ATC CPDLC services providing both transfer of communication, lateral and vertical navigation related ATC clearance services are expected to be deployed in the fall of 2018. The *NAS Data Communications Guide* introduces flight crews to the concept of CPDLC in the NAS and outlines the roles of the Airline Operations Center (AOC), clearance delivery and En Route controllers, and flight crews. The document describes the general procedures for logging on/off, loading the flight plan, receiving clearances, responding to CPDLC clearances, and flight crew initiated ATC requests. Examples of different types of CPDLC clearances are provided with guidance for reviewing, processing and responding to the clearances.

Purpose

The following guidance material will support operators in the FAA's CPDLC Data Communications program at participating TDLS airports and En Route Air Traffic Control Centers. Operators should extract information from the NAS Data Communications Guide and DCIT CPDLC End2End documents that will support their participation in the CPDLC Operations within the National Airspace System (NAS). Recommended CPDLC procedures or guidance is supplemental to the procedures recommended in the *Data Link Communication Advisory Circular (AC 90-117, currently in draft form)*. Where appropriate, this guidance should be included in flight crew standard operational procedures.

Participation in CPDLC is at the discretion of the flight crew and/or operator. For CPDLC – DCL, if the flight crew chooses not to participate, they will contact Clearance Delivery via voice for their ATC clearance or, if TDLS CPDLC-DCL is inoperative, request a PDC using Standard Operating Procedures (SOP) per the ATC flight plan filing instruction and operator's guidance concerning departure clearance retrieval. When En Route CPDLC services are available (fall 2018), flight crews' participation is at their discretion.

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Chapter 1. Introduction

Voice communication frequencies used by flight crews and air traffic control (ATC) are becoming increasingly congested and will not be able to accommodate the projected increase in air traffic demand. Use of data communications (Data Comm) to supplement some routine voice communications will increase efficiency, capacity, and safety. The FAA Data Communications Program (DCP) initiatives will be incrementally implemented to provide advanced communication capabilities. This transition from analog voice to digital communications results in a viable mode of communication that may predominate clearance delivery and the En Route phase of flight. The following information provides a description of FAA CPDLC services both on the ground and future En Route with additional aircraft related descriptions. Recognizing that many type of aircraft fly within the NAS, this document only shows a representation of flight deck CPDLC messages to some aircraft designs. Operators should consult with their aircraft OEM for actual CPDLC functionality and cockpit design and display capability.

Chapter 2. CPDLC Communication on the Flight Deck

2.1 Controls and Indicators supporting CPDLC

On some Boeing implementations, the Engine Indicating and Crew Alert System (EICAS) advisory message “• ATC” (as shown in Figure 1) or Airbus aircraft “ATC MSG” pushbutton on the glare shield (as shown in Figure 3) along with an audible tone (in some aircraft) in the cockpit indicates that a message from ATC is available for viewing. To view the message, on Boeing implementations, select the Multifunction Control Display Unit (MCDU) ATC or ATC COMM Function key (as shown in Figure 2). Figure 3 and Figure 4 show Airbus implementations to view ATC messages.



Figure 1. Indication of ATC message (Boeing)

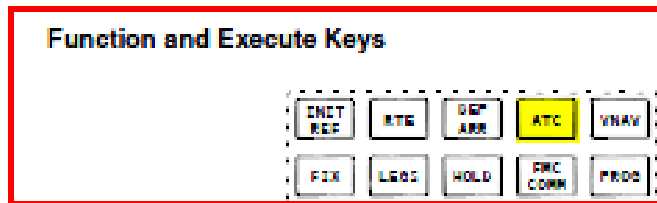


Figure 2. Function Execute Keys (Boeing)

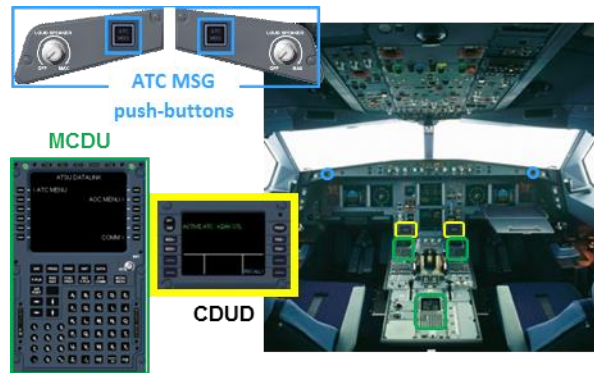


Figure 3. A320 & A330/A340 Controls and indications for FANS (Airbus)

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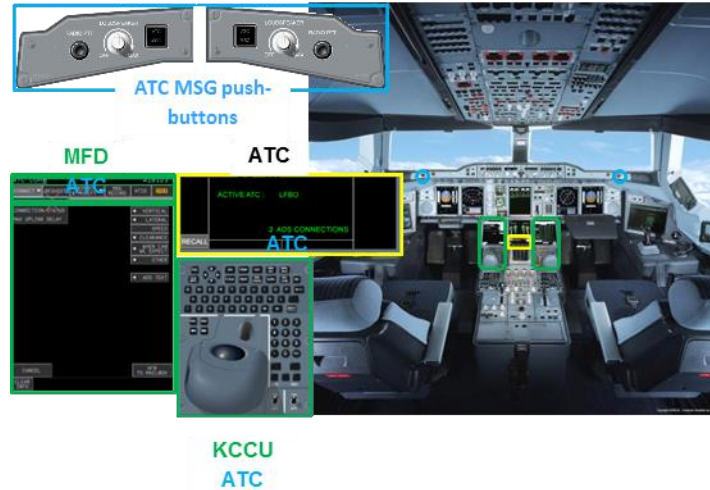


Figure 4. A380 / A350 Controls and Indications for FANS (Airbus)

Available responses to CPDLC Clearances are ACCEPT, REJECT, and STANDBY on Boeing implementations, or are WILCO, UNABLE and STANDBY on Airbus implementations (as shown in Figure 5).

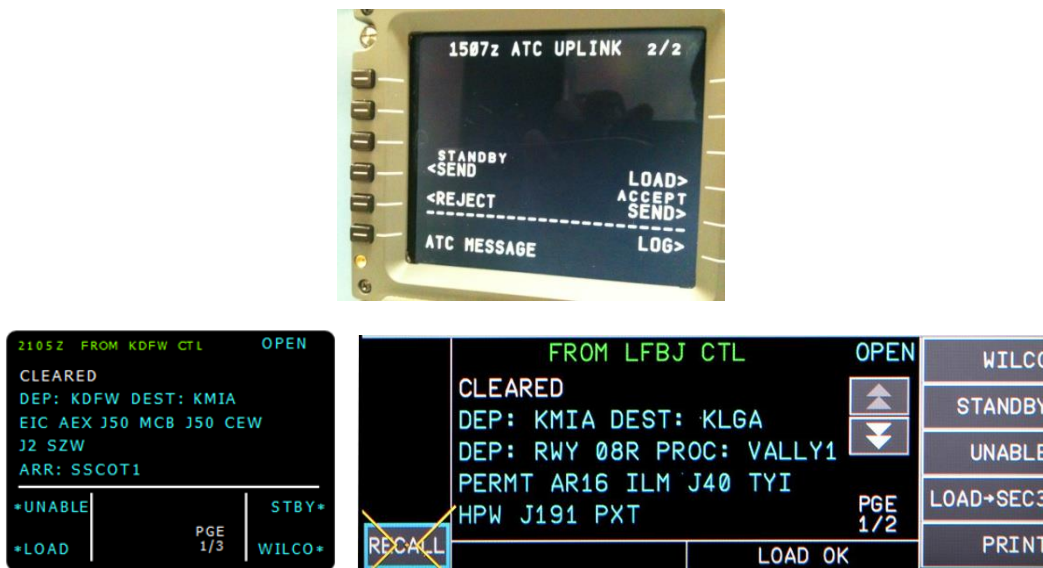


Figure 5. Examples of Clearance Responses and Page Locations

2.2 The Flight Crew should ACCEPT/WILCO the CPDLC clearance when:

- After the flight crew reviews the uplinked CPDLC message per company SOP. The flight crew should take appropriate action to comply with the CPDLC clearance; and
- If loadable route information is included with the CPDLC message, after selecting the load prompt and the FMS indicates the clearance has been successfully loaded, and the loaded route is acceptable to the flight crew per SOP's. For CPDLC – DCL clearances this will may include a manual entry of the Departure Procedure (DP), transition and runway if necessary. As per SOP, flight crews must confirm no FMS discontinuities exist as they review the entire updated clearance.

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Note: On Boeing aircraft the flight crew should select ACCEPT whereas on Airbus, WILCO (WILL Comply) is used to accept the clearance. Both of these responses are displayed as a "WILCO" response to the controller

2.3 The Flight Crew should REJECT/UNABLE the CPDLC clearance when:

- The uplinked CPDLC clearance is not acceptable; or
- For uplinked CPDLC routes loaded into the FMS, the FMS indicates that it cannot load the clearance (e.g. the clearance was unable to be loaded or only part of the clearance loaded and the flight crew was unable to resolve the clearance); or
- For uplinked CPDLC routes loaded into the FMS and the FMS indicates inconsistencies or discontinuities with the route modification that are not addressed by AIPs or local procedures and the flight crew was unable to resolve the clearance; or
- When company policies require the flight crew to obtain a new clearance.
- The flight crew should use voice to clarify a clearance due to any loading failures, route discontinuities, or inconsistencies. If equipped, the ATC Review page (Boeing), or the FMS-ATC REJ INFO page (Airbus), or a displayed full route clearance may be used to resolve the clearance instead of voice.

Note: On Boeing aircraft the flight crew should select REJECT whereas on Airbus, UNABLE is used; both are displayed to the controller as UNABLE.

2.4 The Flight Crew should select STANDBY when:

The Flight Crew should select STANDBY when: A timely response is not practical. For example, a STANDBY response is appropriate when company procedures require an operational assessment of the reroute by the flight crew, dispatch or the AOC.

2.5 Transferring Route Clearance Information to the FMS

The "LOAD" option is available when ATC route information is included in the CPDLC uplink. Selecting "LOAD" will transfer route information into the FMS Active Route (RTE) page or into the Secondary Flight Plan page allowing the flight crew to review and accept the clearance per company procedures. The FMS checks the loadable portion of the clearance to ensure it is correctly formatted and compatible with the FMS navigation database.

NOTE: The departure procedure and departure transition is not included in the loadable route uplink and must be manually entered by the crew into the FMS when provided in the CPDLC-DCL.

2.6 CPDLC ATC Log or MSG RECORD

The "ATC LOG" or "MSG RECORD" function allows previous messages to be viewed by the flight crew when necessary.

Chapter 3. Departure Clearance Service (CPDLC-DCL)

The Controller Pilot Data Link Communication-Departure Clearance (CPDLC-DCL) provides automated assistance for delivering initial and revised departure clearances. CPDLC-DCL provides the following: flight plan route, initial and requested altitude, beacon code assignment and departure frequency. CPDLC-DCL messages are established message sets in Future Air Navigation System (FANS) equipped aircraft. The CPDLC-DCL service is designed for use in surface operations and replaces the existing Pre-Departure Clearance (PDC) at Tower Data Link Services (TDLS) sites for participating aircraft. A summary of the roles of the Airlines Operations Center (AOC) or company dispatch, clearance delivery controller, and flight crew are described below:

- AOC / System Dispatch Just as in current operations, the aircraft operator will file an ATC flight plan with the Air Route Traffic Control Center (ARTCC) associated with the departure airport with appropriate data communication codes via a ground-to-ground communication system. Dispatch will receive dispatch copies of Departure Clearances sent to the aircraft.
- Clearance Delivery Controller ATC automation creates a proposed departure clearance and presents it to the controller for review. The controller may modify the departure clearance with local data, such as a Departure Procedure, and approves or revises the departure clearance. Upon delivery of the CPDLC-DCL to the aircraft, the automation system forwards a copy of the departure clearance to the AOC (or company dispatch).
- Flight Crew The flight crew activates the CPDLC system during preflight by logging on KUSA. ATC can accept valid logon data before the controller reviews the departure clearance for approval. Once the controller (ATC) reviews and approves the departure clearance, ATC correlates the logon with a filed flight plan and initiates a CPDLC connection between the aircraft and ATC. ATC transmits a controller approved CPDLC-DCL to the aircraft. If the clearance needs to be amended (e.g., runway change, due to weather) the controller will send a message to the flight crew revising the CPDLC-DCL.

Chapter 4. CPDLC - DCL Flight Crew Procedures and Guidance

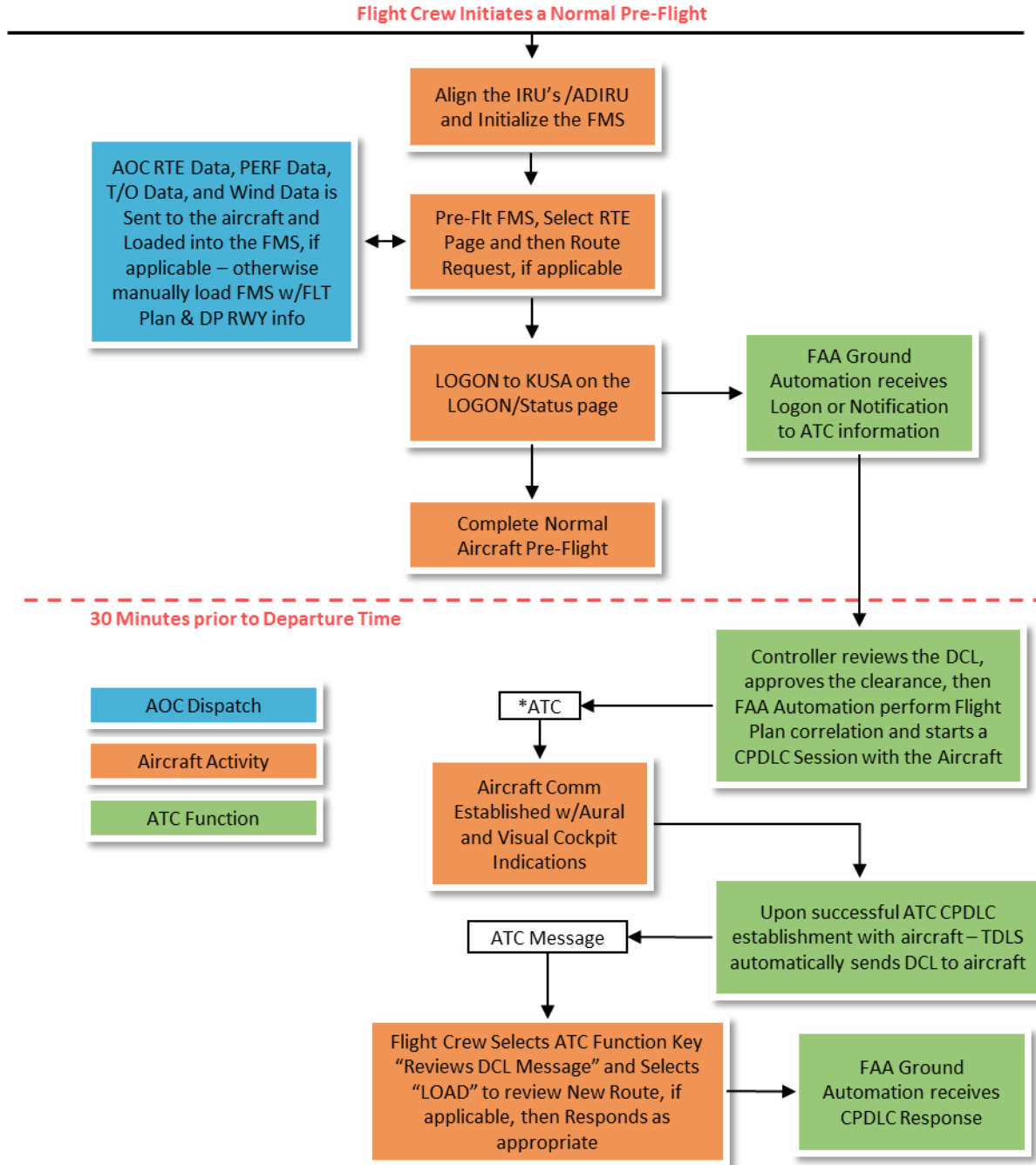


Figure 6. Overview of Flight Crew Departure Clearance (CPDLC – DCL) Activities

4.1 CPDLC-DCL - Loading the Original Filed Flight Plan

Flight crews will have a flight plan (paper or electronic) on board to initially load the FMS with the filed route of flight. Crews should load the flight plan that was filed with ATC into the FMS via either:

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- Company FMS uplink with route, wind, performance and takeoff information, or
- Manually-entered full route, wind, performance and takeoff information from the onboard flight plan per company procedures.

4.2 CPDLC-DCL - LOGON or Notification

The flight crew activates the data link system as they prepare the aircraft for the flight by logging on to KUSA. KUSA is the common National Single Data Authority (NSDA) logon address for all NAS CPDLC connections within the Continental United States.

Logon or Notification to ATC may be completed anytime during pre-flight operations. Within 30 minutes of the proposed departure time (P-30), an "ATC Connection Established" message will be received by the aircraft if the following conditions are met:

- Company dispatch has indicated to the FAA the aircraft is CPDLC-DCL capable via the flight plan or subscriber data base information
- The logon information was correctly formatted
- ATC filed flight plan on file

If the initial attempt to logon/notification fails, flight crews should ensure that a flight plan is on file, verify the logon information is correct, then one additional logon attempt should be made. If the second logon attempt fails, the crew should revert to voice and contact clearance delivery for the departure clearance or revert to PDC if your company has indicated preferences for data communication in the FAA subscriber data base or Field 18 of the filed flight plan. Flight Crews should verify their current logon/notification status before attempting any additional logon/notification request. Momentary No Comm messages displayed in the cockpit may not indicate that you have lost your CPDLC connection and if any questions arise concerning your CPDLC connection contact Clearance Delivery to verify connection status.

- Reverting to PDC is only available if entire CPDLC-DCL service is unavailable at the TDLS parent facility e.g., KMKE is the departure airport and Chicago ARTCC is not able to support CPDLC, then if requested via the flight plan PDC would be available as the second Departure Clearance option if part of the ATC flight plan filing.

4.3 CPDLC-DCL - Departure Clearance Delivery:

Once a successful ATC connection has been established and your departure clearance has been approved by the controller, the CPDLC-DCL will be automatically sent to the aircraft.

After the first received uplink departure clearance, if appropriate, the aircrew may request a subsequent departure clearance using the REQUEST CLEARANCE (DM25). This will result in either a CLEARED (route clearance) (UM80) or CLEARED TO (position) VIA (route clearance) (UM79) uplink message being delivered to the aircraft.

Note: When making a departure clearance request, DO NOT add any "free text" to the downlink page. If any free text information is added, the ground system will reject the message and send an auto reply message indicating: "ATSU CANNOT PROCESS DATA APPENDED TO CLEARANCE REQUEST".

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Boeing Aircraft: To request the CPDLC-DCL on the ATC page, select “CLEARANCE”, followed by request “SEND”. See Figure 7 and Figure 8 for MCDU examples.

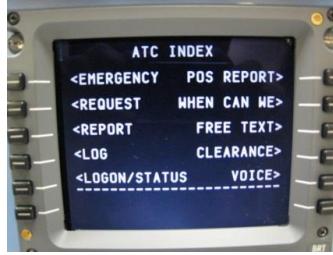


Figure 7. Boeing ATC Index Page w/Clearance



Figure 8. Verification/Send

Airbus Aircraft: On A320/330/A340 aircraft, request the CPDLC-DCL on the ATC OTHER REQ page, select “CLEARANCE”. Then, select “ATC REQ DISPL” to generate the downlink on Datalink Control and Display Unit (DCDU) (as shown in Figure 9).



Figure 9. ATC OTHER REQ Page on A320/330/A340

Airbus Aircraft: On A350/380 aircraft, request the CPDLC-DCL on the REQUEST page, select “GENERIC” in the “CLEARANCE” sub-menu. Then, select “XFR TO MAILBOX” to generate the downlink on Mailbox (as shown in Figure 10).



Figure 10. REQUEST Page on A350 / A380

4.4 Flight Crew Processing of uplinked CPDLC-DCL

Flight crews should treat any CPDLC-DCL sent to the aircraft just like they would any voice or PDC per company approved CPDLC standard operating procedures when reviewing and accepting route clearances. One additional feature of the CPDLC-DCL is the ability to send revisions to a previously cleared flight plan. Revisions can be received at any time until the aircraft is ready for takeoff. Amendments can be a simple altitude change or a more complex full re-route clearance. When notified of a revised clearance, flight crews should use good judgment and follow company procedures, especially when the clearance is received just prior to takeoff.

At any time, flight crews should contact clearance delivery by voice:

- To clarify the delivered clearance
- To request an amendment
- When requested by ground control
- Whenever safety dictates
- Anytime when confusion exists or clarification is needed

Caution: Flight crews should review uplink and downlink messages using approved flight deck displays. Unless otherwise authorized, the flight crew should not use printer-based information to verify CPDLC messages as printers are not usually intended for this specific purpose.

Note: For aircraft that have CPDLC message printing capabilities, there are constraints associated with the use of the flight deck printer and crews should review their aircraft flight manual (AFM) for any limitations. Printers may not produce an exact copy of the displayed clearance with the required reliability, and should not be used as the primary display for CPDLC. However, in some cases, printed copies may assist the flight crew with clearances and other information that are displayed on more than one page, conditional clearances and crew handover briefings. As always, the flight deck display of CPDLC clearances should be used to verify the accuracy of any printed CPDLC message.

4.4.1 CPDLC-DCL - At the Gate

When an initial/revised CPDLC-DCL is received, flight crews should, in accordance with company policy or best operational judgment, review the initial or revised clearance and respond with ACCEPT-WILCO / REJECT-UNABLE / STANDBY, as appropriate.

4.4.2 CPDLC-DCL - Off the Gate

Flight crews should, in accordance with company policy or best operational judgment, review the revised clearance and respond with ACCEPT-WILCO / REJECT-UNABLE/ STANDBY, as appropriate.

A revised clearance may contain simple changes (e.g., a revised transponder code) or complex changes (e.g., a full re-route). Complex revisions may require substantial 'heads-down' time for FMS route loading and verification. Whether or not these activities will be able to be conducted without requesting additional time from ATC will depend on a variety of factors and is at the discretion of the flight crew. In some cases, it may not be prudent to conduct these activities when the aircraft is in motion (such as approaching a runway). It is advisable to notify the appropriate ATC controller (ground or tower control) and pull out of the ground traffic flow when:

- Required by company procedures
- In areas of high traffic density or high-tempo operations
- In low-visibility or nighttime operations
- When safety dictates

4.5 CPDLC-DCL Logoff Current Data Authority (CDA) and Logon to Next Data Authority (NDA)

For aircraft participating in CPDLC-DCL ground operations only, flight crews can expect an automated ATC initiated disconnect 5-10 minutes after takeoff.

Flight crews are reminded to logoff the CDA (i.e. KUSA) and logon to other Air Traffic Service provider or oceanic remote environments as required. In the NAS, automatic handoff from the CDA to the NDA will occur in fall 2018 with the implementation of En Route CPDLC services.

Flight crews should wait at least 10 minutes after landing before initiating a CPDLC-DCL logon to ensure En Route Automation Modernization (ERAM) and TDLS have enough time to clear previous flight information.

4.5.1 Flight Crew/ATC initiated CPDLC connection Termination while on the ground

If the flight crew elects to disconnect their ATC CPDLC connection or the CPDLC session is terminated by the controller while on the ground, all subsequent departure clearance services will be handled via voice. Accepted CPDLC clearances will remain in effect for that flight unless amended by clearance delivery via voice.

Chapter 5. Types of Departure Clearances (CPDLC-DCL)

5.1 CPDLC–DCL “THEN AS FILED”

When no changes have been made to the filed flight plan, ATC will send a “THEN AS FILED” departure clearance that does not contain a loadable route clearance:

- Flight crews will obtain the FMS route information from the onboard flight plan or from company dispatch and **manually insert the DP, transition and runway (if applicable)** obtained from the CPDLC-DCL, ATIS, or other ATC source into the FMS.

5.2 CPDLC–DCL “Initial Clearance” - Change from Filed Flight Plan

If ATC has modified the filed flight plan, a FMS loadable route clearance will be sent to the aircraft stating either a “CLEARED ROUTE CLEARANCE” or “CLEARED TO [position] VIA ROUTE CLEARANCE” message.

Caution: After loading the uplinked CPDLC-DCL clearance, it is important to use the individual FMS pages to request AOC/company wind, performance, and/or takeoff data, or manually enter the data per company procedures. Do not use the (Boeing) AOC/Company FMS RTE page “ROUTE REQUEST” and the (Airbus) FMS INIT/CPNY F-PLN request functions for these requests. **Using the (Boeing) AOC/Company FMS “ROUTE REQUEST” or (Airbus) FMS INIT/CPNY F-PLN request function will delete the cleared ATC assigned route from the FMS.**

Note: On Airbus aircraft, after loading a FMS loadable route from a CPDLC clearance the flight crew should reinsert Alternate Airport/Fuel or the minimum fuel at destination as required. Also, cross checking critical flight parameters should be accomplished after all data is re-entered by the flight crew.

5.3 Types of Revised CPDLC-DCLs with Loadable Route Information

A route modification will have one of two types of FMS loadable clearances (as shown in Figures 11-12). **Reminder: DPs, transitions and the departure runway are always manually entered by the flight crew.**

- **Partial Reroute:** This is displayed in the DCL as a “CLEARED TO (position) VIA ROUTE CLEARANCE” and is sent when the beginning of the DCL connects downstream to the previously cleared or filed ATC route. In the example shown in Figure 11 below, the clearance from TORNN to MCB is the modified route and may be loaded into the FMS via the LOAD prompt. The DP DARTZ3.TORNN must be manually entered into the FMS along with the runway (if required).

This type of clearance may be issued as a “revised initial clearance” as your first received CPDLC-DCL or as a subsequent clearance.

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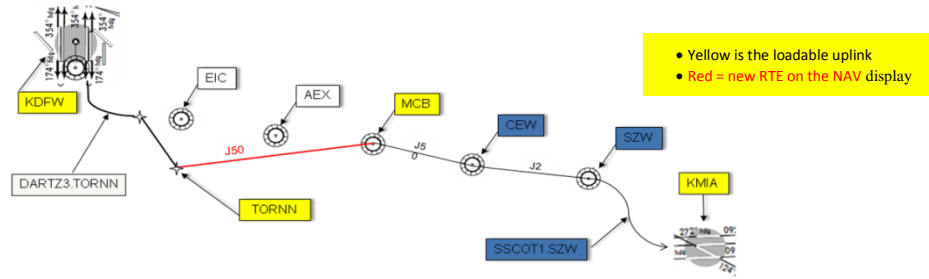


Figure 11. Depiction of a Revision to the Initial Portion of the CPDLC-DCL

OR

- **Full Reroute:** This is displayed as “CLEARED ROUTE CLEARANCE” and revises the routing all the way to destination. A complete route modification that does not connect to the previously cleared flight plan (as shown in Figure 12) may be loaded into the FMS via the LOAD prompt. The DP ARDIA3.CLL must be manually entered into the FMS along with the runway (if required).

This type of clearance may be issued as a “revised initial clearance” as your first received CPDLC-DCL or as a subsequent clearance.

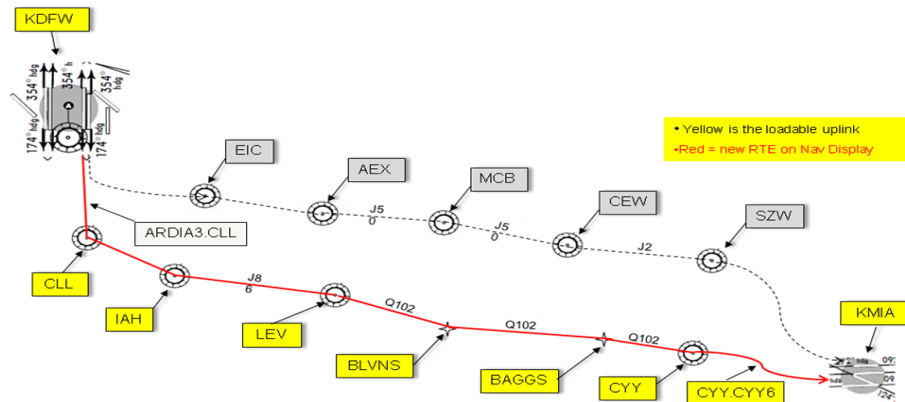


Figure 12. Depiction of a Complete Route Modification

Chapter 6. CPDLC-DCL Examples

6.1 CPDLC-DCL - Depiction of “THEN AS FILED”

The flight crew manually inserts the flight plan into the FMS or obtains an AOC flight plan FMS uplink prior to logging on CPDLC-DCL. The Cleared as Filed (CAF) CPDLC-DCL may include a DP/transition fix that will be included as free text and, if applicable, requires a manual entry into the FMS route.

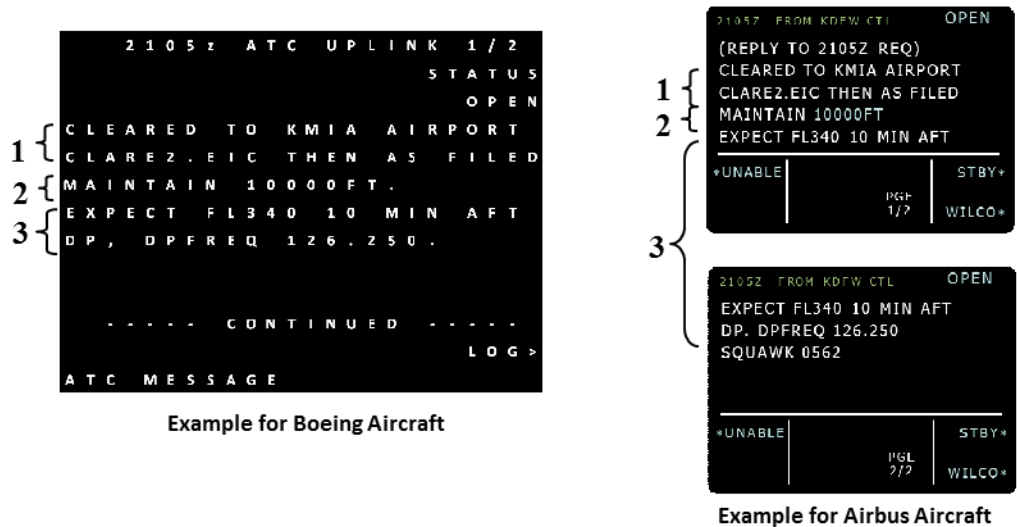


Figure 13. Depiction of CPDLC-DCL Including “THEN AS FILED”

1. In the example shown in Figure 13 above, no changes have been made to the AOC Dispatch “Filed” ATC flight plan:
 - a) “CLEARED TO KMIA AIRPORT” indicates the clearance to the destination airport. This is followed by;
 - b) “CLARE2.EIC”, DP (manually entered by the flight crew) that includes a transition fix which will connect to the ATC filed route of flight, followed by:
 - c) “THEN AS FILED”, will be appended after the DP/transition fix. Crew should use their flight plan to ensure the filed ATC route is inserted/loaded into the FMS and then verify the cleared route per company procedures.
2. “MAINTAIN 10000FT.”
 - a) This will be the “Initial” cleared altitude if included, otherwise crews can expect “CLIMB VIA SID” or “CLIMB VIA SID EXCEPT MAINT 8000 FT”.

If a “CLIMB VIA SID” is included in the clearance, then there is a vertical profile associated with the DP. Altitude and/or speed restrictions remain in force unless ATC amends the departure profile.

3. “EXPECT FL340 10 MIN AFT DP DPFREQ 126.250”

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- a) EXPECT altitudes are provided and should be verified against the filed flight plan. No revision notice will be provided if it is different from the filed flight plan.
 - 1) If different from filed, use standard company procedures to determine if acceptable.
 - 2) EXPECT Altitudes can be provided in the following formats: minutes, miles, or free text, representing a Fix on the cleared route.
- b) Departure frequency may be provided and should be verified against the departure page, if available.

6.2 CPDLC-DCL – Full Route Clearance – FMS Loadable

When the filed flight plan does not exactly match the ATC provided clearance, the controller will provide the flight crew with a FMS loadable full route clearance.

Full Route Clearance is also used when a revised departure clearance is not able to join with the originally cleared route of flight. In this case, the uplinked message format in Figure 14 below, would be used for re-routes. Prior to executing the revised routing, flight crews should:

- Review the CPDLC-DCL
- Load the amended clearance into the FMS
- Review the modified route with the new DP, transition and RWY before performing a FMS execute function
- Based on company procedures, either Accept/WILCO or Reject/UNABLE the revised clearance

```

1 1505z ATC UPLINK 1/2
   STATUS
   OPEN
CLEARED ROUTE CLEARANCE
+LOAD NEW RTE TO KMIA+
CLARE2.EIC, CLIMB VIA
SID
EXPECT FL 370 10 MIN AFT
DP, DPFREQ 118.550.

- - - - CONTINUED - - - -
ATC MESSAGE LOG>

3 1505z ATC UPLINK 2/2
   STATUS
   OPEN
SQUAWK 0562.

STANDBY
<SEND> LOAD> 2
<REJECT> ACCEPT
- - - - SEND>
ATC MESSAGE
    
```

Example for Boeing aircraft

```

1 2105Z FROM KDFW CTL OPEN
   CLEARED
   DEP: KDFW DEST: KMIA
   EIC AEX J50 MCB J50 CEW
   J2 SZW
   ARR: SSCOT1
+UNABLE STBY+
+LOAD PGE 1/3 WILCO+

2 2105Z FROM KDFW CTL OPEN
   ARR: SSCOT1
+LOAD NEW RTE TO KMIA+
CLARE2.EIC, CLIMB VIA
SID
EXP FL370 10 MIN AFT DP,
+UNABLE STBY+
+LOAD PGE 2/3 WILCO+

3 2105Z FROM KDFW CTL OPEN
   EXP FL370 10 MIN AFT DP,
   DPFREQ 118.555
   SQUAWK 0562
+UNABLE STBY+
+LOAD PGE 3/3 WILCO+
    
```

Example for A320/A330/A340 aircraft

Figure 14. Depiction of CPDLC-DCL Including a Full Route Clearance

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1. “CLEARED ROUTE CLEARANCE” or “CLEARED”, as shown in Figure 14, indicates that there has been an amendment to the filed flight plan or a “THEN AS FILED” clearance from the controller is not available and a fully loadable FMS clearance is available for review.

Note: “+LOAD NEW RTE TO KMIA+” is a reminder to the flight crew to load the route via the load PROMPT and manually insert the DP, transition and runway if necessary before executing the amendment.

Note: “Then As Filed” is not included in this departure clearance and the onboard flight plan does not exactly match the FMS loaded clearance. Use company procedures to verify new route when changes to the filed flight plan occur.

2. Load prompt allows the flight crew to load the ATC clearance into the FMS. Flight crews must load the ATC provided cleared route and manually insert the DP/transition into the FMS using standard operating procedures and review the clearance prior to accepting it.
3. “Squawk” should be selected in the transponder panel.

6.3 CPDLC–DCL Change in Departure Procedure – Partial Reroute - Connect Downstream Clearance – FMS Loadable

A revised clearance that contains a change to only the initial portion of the flight plan and is intended to connect to a position or point on the loaded active FMS route is depicted as “CLEARED TO position VIA ROUTE CLEARANCE”, with a loadable clearance, and followed by “REST OF ROUTE IS UNCHANGED OR THEN AS FILED”. Prior to executing the revised routing, flight crews should:

- Review the CPDLC-DCL.
- Load the amended clearance into the FMS.
- Review the modified route with the new DP, transition and RWY before performing a FMS execute function.
- Based on company procedures, either Accept/WILCO or Reject/UNABLE the revised clearance.

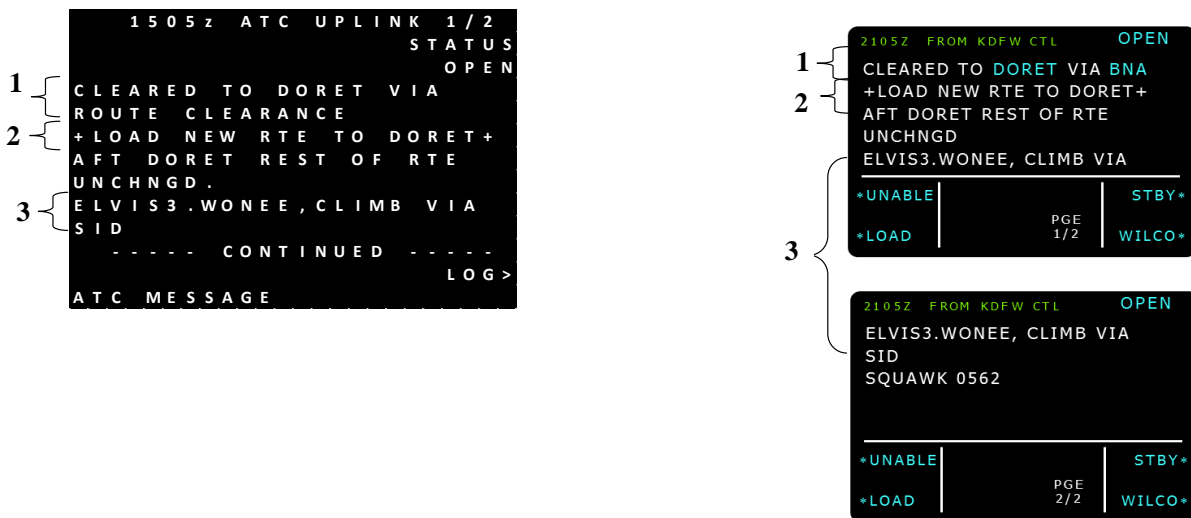


Figure 15. Depiction of Revised CPDLC-DCL Including “REST OF ROUTE UNCHANGED”

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- CLEARED TO DORET VIA ROUTE CLEARANCE or CLEARED TO DORET VIA BNA
 - In this example, the flight crew has received an amendment to the previously cleared ATC clearance which connects to the downstream waypoint DORET. “VIA ROUTE CLEARANCE” or VIA BNA is the loadable portion of the clearance.
- +LOAD NEW RTE TO DORET+
 - In this example, a flight crew awareness phrase is included to highlight that the uplinked CPDLC-DCL contains FMS loadable information that must be inserted into the FMS via the load prompt by the flight crew. No revised header tag will be shown for uplinks that have the flight crew awareness phrase. See revised information section for information related concerning CPDLC-DCL revisions.
- ELVIS3.WONEE, AFTER DORET REST OF ROUTE UNCHANGED
 - ELVIS3.WONEE is a departure procedure that must be manually inserted in to the FMS.
 - AFTER DORET “REST OF ROUTE UNCHANGED” indicates to the flight crew that they are cleared via their original/previously cleared departure clearance after DORET to destination.

6.4 CPDLC-DCL - Free Text Route Information for Departure Clearances with Loadable Route Information

For uplinks with FMS loadable routes, a FAA produced route string representing the CLEARED ROUTE is added at the end of the CPDLC-DCL message. This supplemental information assists flight crews in route and leg verification procedures. The route string will be preceded by 5 dashes and a single space and is limited to 256 characters (e.g., ----- KSLC LEETZ2.OCS KURSE Q122 ONL J94 FOD KG75M DAFLU J70 LVZ LENDY6 KJFK). In the event the FAA produced route string exceeds 256 characters, then the free text route will be truncated with a “./.” with the destination airport as the last piece of information e.g., J70 LVZ ./ . KJFK.

Note: When a DP and/or arrival transition has a period between the procedure name and the fix it is considered a named transition e.g., KSLC LEETZ2.OCS.

The following information should be considered when reviewing the free text route information:

- The loaded CPDLC-DCL clearance in the FMS is your ATC clearance and the free text at the end of your CPDLC-DCL is a means to cross-check the FMS loaded clearance. The Free Text route information is not loadable and may result in lengthy displayed messages (multiple pages to scroll through to reach the end of the uplink message).
- If the free text route information is different from the FMS loaded CPDLC-DCL message, then the flight crew should contact ATC clearance delivery via voice to discuss any discrepancies.

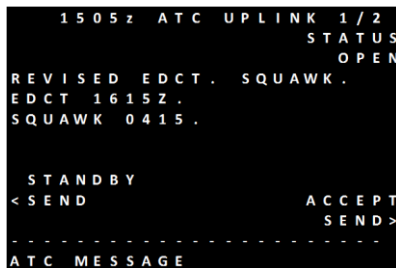


Figure 16. Supplementary Route Information for Loadable Departure Clearances

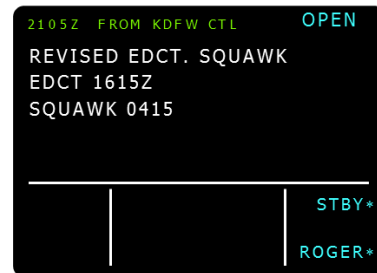
6.5 REVISED Departure Clearance – Non-Loadable Route Information

When an uplinked revised clearance is received with non-route information, it is shown to the flight crew as “Free Text”. As needed by ATC, a revised header tag is populated with updated information for the flight crew. Only revised information is included in this header.

Possible revised header tags that may be attached to a revised departure clearance include: DP, ALT, EXP ALT, DEP FREQ, EDCT, or SQUAWK.



Example on Boeing aircraft



Example on A320/A330/A340

Figure 17. Depiction of a Revised Departure Clearance – Non-Loadable Route Information

Chapter 7. En Route Airspace CPDLC Communications and Session Management

7.1 Takeoff with a CPDLC Session Established from a TDLS Airport

After Departure from an airport with CPDLC DCL services and the aircraft had a CPDLC session while on the ground, the CPDLC session will be maintained by the FAA ground system while climbing through TRACON airspace until the aircraft enters En Route airspace. Once the aircraft has entered En Route ATC airspace and the controller has CPDLC turned on at their workstation the ground system will assign CPDLC eligibility with the appropriate controller and CPDLC services may then be used. The first indication of CPDLC services availability would be an uplinked CPDLC clearance from ATC controller.

7.2 CPDLC Session Establishment – En Route Operations

7.2.1 Takeoff without a CPDLC session or Logging On to KUSA while Airborne

If a flight crew is located at a non-CPDLC equipped airport, and CPDLC network coverage is available, a log on can be performed while the aircraft is on the ground. The flight crew may also log on while airborne within U.S. domestic airspace, or prior to entering U.S. domestic airspace. Assuming the logon is accepted, the connection request will be handled and established via the triggers in the next session.

7.2.2 Automatic CPDLC Session Initiation

In general, when departing a U.S. airport without a session and entering En Route airspace, the earliest a CPDLC session initiation should normally occur is when the TRACON initiates the track handoff (transfer initiate message) to En Route provided the flight crew has already logged on.

If the flight crew has not already logged on, then session initiation would immediately follow logon acceptance/correlation, provided ERAM is the controlling facility for this aircraft or has received a transfer initiate message.

Normally the En Route automation system will automatically initiate a session with an airborne IFR aircraft that does not already have a session using the following triggers and conditions:

- a) Triggers for automatic CPDLC session initiation:
 - i) receipt of correlated logon data e.g., Filed flight plan and CPDLC AFN information match
 - ii) establishment or re-establishment of a Paired track
 - iii) establishment or re-establishment of surveillance track data
 - iv) change of an aircraft trajectory predicted altitude from below a locally adapted session establishment altitude to above
 - v) receipt of a transfer initiate message

- b) Conditions (all of which must be met) for automatic CPDLC session Initiation are:
 - i) the aircraft has a correlated logon, and
 - ii) the aircraft is paired, and
 - iii) the aircraft has surveillance track data, and

- iv) the aircraft trajectory predicted altitude is above a locally adapted session establishment altitude, and
- v) the ERAM is the controlling facility for this aircraft or has received a transfer initiate message

Note: The ground system will provide the capability to adapt altitudes below which automatic CPDLC session initiation is prohibited for active flight plans. This addresses flight deck concerns, expressed by the flight crew community, regarding aural CPDLC alerts at “low” altitudes.

7.3 After CPDLC Connection is established

After successful initiation of a CPDLC session by the En Route automation system, the En Route system will uplink a Current Data Authority (CDA) confirmation message to confirm that the connection is recognized by the aircraft as a CDA connection. A UM169 free text message containing adapted text (e.g. THIS IS AN AUTOMATED MESSAGE TO CONFIRM CPDLC CONTACT WITH KUSA) is used for this uplink.



Figure 18. Automated CPDLC Confirmation to KUSA message

The flight crew’s ROGER downlink response will confirm that the ground system is indeed the CDA. If a ROGER response is not received or no response is received, the UM169 by ground automation will be retried.

If the aircraft responds with DM63 NOT CURRENT DATA AUTHORITY, the session is designated an NDA session. In this case the ground will retry the CDA confirmation uplink after a preset amount of time (e.g. 2 min). The process is repeated as long as the aircraft continues to respond with NOT CURRENT DATA AUTHORITY, or the session is terminated, or the preset maximum number of retries is reached. Once the flight crew responds to the uplink with a ROGER, the ground system will designate the connection a CDA session.

Alternatively, if there is no response received for the uplink, then the process is repeated until either a response is received or the maximum number of no responses is reached (e.g. 1 retry).

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Example: After the first free text uplink is sent, if no response is received (e.g. timeout), the uplink is retried 1 more time. If a NOT CURRENT DATA AUTHORITY is received instead, the uplink is retried every 2 min for up to 20 times.

NOTE: CDA confirmation messages will not be uplinked to aircraft that departs with a session from a TDLS DCL facility. For these aircraft, the ground system simply coordinates transfer of CPDLC eligibility from the TDLS facility to the ARTCC/sector with track control for that aircraft. When the CPDLC session is established by an En Route facility, eligibility will be assigned to the sector with track control. As the aircraft moves from ARTCC to ARTCC, eligibility will be managed by the system, and typically is transferred in conjunction with a TOC associated with the transfer of track control, which is covered later in this document. The sector with eligibility will show a CPDLC eligibility symbol. All other sectors will display a CPDLC session symbol.

Note: There will be times when no sector has CPDLC eligibility for an aircraft (e.g. during the time the aircraft is transitioning through TRACON airspace or when a facility does not have CPDLC enabled). During these times, the system will hold eligibility at the national level and automatically respond to flight crew-initiated downlinks with CPDLC NOT IN USE UNTIL FURTHER NOTIFICATION.

7.4 En Route Transfer of Communications (TOC) using CPDLC

7.4.1 CONTACT vs MONITOR

The ground system will provide the capability for the receiving controller to specify the TOC Message Type (MONITOR or CONTACT) to be used by the system for uplink of TOCs from each transferring sector into that receiving controller's sector.

TOC messages into another facility (e.g. New ARTCC/TRACON) will always use the Contact message.

When the Initial Contact (IC) service (Confirm Assigned Altitude) is set to Off for the ARTCC facility, all TOC uplinks to sectors within that facility will use the CONTACT message.

7.4.2 Nominal Case

To send any CPDLC message, including a TOC, to an aircraft, a controller must have eligibility for that aircraft, and the aircraft must be marked on-frequency at that sector. CPDLC eligibility and on-frequency information is indicated near the aircraft call sign on the controller's display.

Upon each ATC transfer of track control, a TOC will be built and available for uplink at the sector with CPDLC eligibility. When the controller is ready to uplink a TOC message, that controller will select one of the available TOCs, and may modify the frequency pre-selected for that TOC before uplink. Again, the Contact or Monitor CPDLC message choice is based on the sector TOC message settings at the receiving sector.

7.4.3 Non-Nominal Cases

The ground system will prohibit uplink of a TOC under certain conditions (e.g. when an open controller initiated uplink exists, or emergency downlink has not yet been acknowledged by the controller). In these

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cases, the controller may either first resolve the condition and then proceed to uplink the TOC, or direct the frequency transfer via voice.

1. Open Downlinks Exist

- a. TOC message can be uplinked with an open flight crew-initiated downlink. The open downlink will be handled in one of two ways:
 - i) If the open downlink has not been transferred from one controller to another once already and the transfer is intra-facility, the open downlink will be transferred to the new controller.
 - ii) If that downlink had already been transferred once or if the transfer is to another facility, the system will automatically close the downlink for that aircraft by automatically uplinking an UNABLE response concatenated with UM169 Free Text message element containing explanatory text (e.g., REQUEST AGAIN WITH NEXT ATC UNIT).

2. TRACON Transfers

- a. When an ARTCC into which an aircraft is being transferred does not have CPDLC On, the CPDLC Session will be released to and held at the national level until the aircraft enters a facility with CPDLC On, or meets other conditions for terminating the connection (e.g. Flight Object deletion in the ground system).
- b. When an aircraft is handed off to a TRACON within a given ARTCC, if that TRACON is the landing TRACON or the aircraft will be passing through that TRACON into the landing TRACON in that ARTCC, and no TOC is uplinked, session termination will occur as follows:
 - i) If the aircraft is above an adapted altitude, the session for that aircraft will be terminated when the controller releases CPDLC eligibility
 - ii) If the aircraft is not above an adapted altitude (designed to avoid nuisance alerts on the flight deck during critical phases of flight), the connection will not be terminated until after ground system Flight Object removal for that flight (e.g. after landing).
- c. Within a given ARTCC, if that TRACON is not the landing TRACON but the aircraft is not re-entering that ARTCC's airspace, and a TOC is not uplinked session termination will occur as follows:
 - i) If the aircraft is above an adapted altitude, and within an adapted distance of its destination, the session for that aircraft will be terminated when the controller releases CPDLC eligibility.
 - ii) If the aircraft is either not above an adapted altitude or not close enough to its destination, the connection will not be terminated until after ground system Flight Object removal for that flight (e.g. after landing).
 - iii) Lastly, if an aircraft will be re-entering the ARTCC's airspace from the TRACON to which it was handed off, and a TOC is not uplinked, the session will remain. CPDLC eligibility will be re-assigned to an ARTCC sector upon re-entry into the ARTCC.

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Operational Rationale: Scenario: If the controller hands off an aircraft but does not uplink a TOC, and transfers the aircraft on voice, this allows the controller to drop display of the data block. CPDLC eligibility would be released and the system would automatically attempt to assign eligibility to an En Route sector if one had track control. In the case of a handoff to TRACON, the national CPDLC service would hold eligibility until other system conditions trigger automatic session termination.

7.4.4 CPDLC TOC Contact Message Flow

1. When the ATC controller sends a Transfer of Communications message via CPDLC using the contact message flight crews can expect the following message type - UM117 CONTACT [unitname] [frequency]. Example (Figure 19 below): CONTACT INDY CENTER 134.750 MHZ



Figure 19. TOC Contact Message Example

2. When the aircraft receives a CPDLC TOC Contact message, it will alert the crew via an Aural (some airplanes) and Visual means to indicate the aircraft has received a CPDLC message that is to be acted upon.
3. The flight crew will select the message, review the Contact message independently, confer between them the message content, input/load the new ATC frequency into the radio tuning panel and ensure it is active, respond to the CPDLC message appropriately, and then call the receiving Controller via voice with their call sign and altitude confirmation.
4. Upon receipt of the Wilco Response to the CONTACT message, CPDLC eligibility is transferred to the receiving sector and the on-frequency indication is automatically removed from the transferring sector. When the flight crew checks in via voice, the receiving controller will confirm the assigned altitude and mark the aircraft on-frequency. For inter-facility transfers, the receiving controller will also verify the Mode C of the aircraft.

7.4.5 CPDLC TOC Monitor Message Flow

1. When the ATC controller sends a Transfer of Communications message via CPDLC flight crews can expect the following message type - UM120 [unitname] [frequency], concatenated with UM135 CONFIRM ASSIGNED ALTITUDE. Example: MONITOR KANSAS CITY CENTER ON 125.350 MHZ, CONFIRM ASSIGNED ALTITUDE



Figure 20. CPDLC Monitor Message with Confirm Assigned Altitude

2. When the aircraft receives the CPDLC TOC Monitor message, it will alert the crew via an Aural (some airplanes) and Visual means to indicate the aircraft has received a CPDLC message that is to be acted upon.
3. The flight crew will select the message, review the Monitor message independently, confer between them the message content, input/load the new ATC frequency into the radio tuning panel and ensure it is active, and respond to the CPDLC message appropriately, then
4. The flight crew will create a response to the Confirm Assigned Altitude (UM135) by selecting the downlink Assigned Altitude Report (DM38), ensure the Assigned Altitude is properly displayed in the altitude report, verify with the flight crew member the accuracy of the altitude in the report, and then select send.

Note: The ground system may receive one downlink response or two separate downlink responses from the flight crew to a Monitor TOC with a Confirm Assigned Altitude (CAA) instruction. Upon receipt of the Wilco response to the Monitor message, CPDLC eligibility will be transferred to the receiving sector, the on-frequency indication is automatically removed from the transferring sector, and the on-frequency indication is automatically marked on at the receiving sector. Until the Assigned Altitude downlink message is received from the aircraft, the IC-in-Progress indication is displayed at the receiving sector. Upon receipt of the Assigned Altitude downlink, ground automation will compare that altitude against the ATC assigned altitude and provide an alert to the controller if a mismatch is detected.

7.5 Voice Contact Request

In the event the flight crew is unable to contact the ATC controller via voice the flight crew may select the CPDLC REQUEST VOICE CONTACT (DM20) message and send it to the assigned ATC controller. The controller will review the flight crew initiated downlink request and either attempt to contact the flight crew via the currently assigned ATC frequency with voice communications or respond to the downlink request with a CPDLC Contact ATC uplink message with an assigned ATC frequency message and send it to the aircraft. Upon receipt of the Contact ATC message the flight crew should review the uplink message, select the ATC frequency as appropriate, and then respond with an ACCEPT/WILCO response to the message to close out the CPDLC message followed by a voice contact to the controller.

7.6 Next Data Authority

Within the FAA NAS there may be multiple examples of flight projections where aircraft are entering and exiting US airspace into foreign ANSPs such as NAVCANADA, Mexico, Cuba, Dominican Republic and Port Au Prince. Normally, the transfer of communications via CPDLC will be handled similar to voice communications. Aircraft may transition between facilities or may cut corners in and out of sectors in a multitude of ways due to weather, traffic or normal flows. Flight crews can expect ATC communication handoff procedures via CPDLC to remain the same.

The rules of establishing and terminating CPDLC communications data authority are well established throughout FAA documents and guidance material contained in the Global Operational Data Link (GOLD) Manual using Current Data Authority (CDA) and Next Data Authority (NDA) and is briefly described here.

An active CPDLC connection allows the ATC ground system and the aircraft to exchange CPDLC messages. Within US National airspace, KUSA will be the active CPDLC connection and is referred to as the Current Data Authority (CDA). An inactive CPDLC connection can be established upon completion of address forwarding procedure if an active CPDLC connection exists with the aircraft. The inactive CPDLC connection is referred to as the Next Data Authority (NDA). Under normal circumstances the FAA ground system will initiate a CPDLC transfer to an adjacent CPDLC enabled external facility (e.g., CZEG - Edmonton Center, Canada) automatically and without flight crew action. The following ground systems initiated steps are listed describing a CPDLC transfer to the next enabled CPDLC facility:

1. FAA ground system sends a NDA (CZEG) message to notify the aircraft of the identity of the next ATSU permitted to establish a CPDLC connection; and
2. Initiates address forwarding with the next facility (CZEG); and
3. Sends a CPDLC termination request message when the aircraft is in the vicinity of the boundary with the next ATSU or in this case CZEG.

Note: The aircraft system will only accept a CPDLC connection request from the ATSU specified in the NDA message e.g., CZEG.

An active CPDLC session is terminated either by controller initiated manual termination or with a CPDLC transfer of communications contact message with a corresponding end service message to start the successful CPDLC transfer. Upon termination of the active session, the CPDLC communication transfer is dependent upon the receiving CPDLC enable facility to complete a successful establishment of a CPDLC connection. Once the new connection is established then the new active CPDLC session will become the Current Data Authority (CDA) and CPDLC messaging can be continued per SOP.

If the aircraft enters adjacent Non-US airspace (e.g., Mexico) where data link services are not provided flight crews can expect a termination of CPDLC services upon handoff via voice or via a Contact CPDLC message. Any future CPDLC connection must be initiated by the flight crew if desired e.g., planned entry into Oceanic Airspace.

Chapter 8. Vertical Navigation - Altitude and Crossing Restrictions

Vertical navigation using CPDLC message capability within the NAS consist of flight crew initiated altitude requests and controller initiated altitude uplinks, and crossing restrictions. Controllers and flight crews should use normal CPDLC responses to close uplinks/downlinks when using CPDLC.

Flight crew initiated altitude requests may be accomplished anytime when the flight crew has a CPDLC session in En Route airspace. Flight crew altitude requests to ATC are limited to a single/block altitude request and if desired with preformatted "Due To Weather" and/or "Due To Performance" message information. Any added free text will result in a "Message Not Supported" response from the FAA ground system.

Controllers may append any of the following to an altitude clearance or response to a flight crew request when appropriate for clearance clarity:

- UM166 DUE TO TRAFFIC
- UM167 DUE TO AIRSPACE RESTRICTION
- UM169 DUE TO WEATHER

8.1 Flight Crew Altitude Requests

The following Flight crew initiated downlink altitude requests are available in En Route CPDLC services:

- DM6 REQUEST [altitude]
- DM9 REQUEST CLIMB TO [altitude]
- DM10 REQUEST DESCENT TO [altitude]

Note: Not all aircraft have the ability to select the "Request Climb/Descend TO" messages via the CPDLC ATC menu prompts. When applicable, flight crews should select REQUEST ALTITUDE from the CPDLC altitude request page and allow CPDLC ATC application automation to format the message per your aircraft design and SOP.

Controllers, upon receipt of the flight crew initiated altitude request, will provide a response using normal ATC CPDLC controller processes. Controllers may respond with a Standby, Unable, or with an Altitude CPDLC message.

There are three types of altitude responses (MAINTAIN, CLIMB, OR DESCEND) that a controller may send in response to a flight crew request:

MAINTAIN messages available for uplink in response to a flight crew request:

- UM19 MAINTAIN [altitude]
- UM30 MAINTAIN BLOCK [altitude] TO [altitude]

CLIMB messages available for uplink in response to a flight crew request:

- UM20 CLIMB AND MAINTAIN [altitude]
- UM36 EXPEDITE CLIMB TO [altitude]
- UM38 IMMEDIATELY CLIMB TO [altitude]

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DESCEND messages available for uplink in response to a flight crew request:

- UM23 DESCEND TO AND MAINTAIN [altitude]
- UM37 EXPEDITE DESCENT TO [altitude]
- UM39 IMMEDIATELY DESCEND TO [altitude]

Flight crews, upon receipt of a response to the altitude request, should review the uplinked CPDLC message using normal CPDLC procedures, and either respond with a WILCO, UNABLE, or STANDBY as appropriate. If Standby is selected, flight crews will still have to respond to the CPDLC message with either a WILCO or UNABLE as appropriate to complete the ATC CPDLC message process. Any ambiguities or question pertaining to the CPDLC clearance should be resolved with voice communication with the controller.

8.2 Controller Altitude Uplinks

Controller initiated altitude amendments may be sent to the aircraft when operationally required to modify the assigned altitude/level of the aircraft. Controllers also have the capability to uplink a CPDLC instruction to cross a position at an assigned altitude and if required with a speed restriction e.g., CROSS UKW AT AND MAINTAIN 11,000 FT. AT 250 KTS.

Controller initiated CPDLC ATC altitude instructions are selected from the following CPDLC messages and are available for uplink to the flight crew:

- UM19 MAINTAIN [altitude]
- UM20 CLIMB TO AND MAINTAIN [altitude]
- UM23 DESCEND TO AND MAINTAIN [altitude]
- UM36 EXPEDITE CLIMB TO [altitude]
- UM37 EXPEDITE DESCENT TO [altitude]
- UM38 IMMEDIATELY CLIMB TO [altitude]
- UM39 IMMEDIATELY DESCEND TO [altitude]

Controller initiated CPDLC ATC crossing restrictions may be sent to the aircraft when operationally necessary to provide separation or other control guidance as part of the normal controller work flow and processes. The following altitude crossing restrictions messages are available for uplink to the flight crew:

- UM49 CROSS [position] AT AND MAINTAIN [altitude]
- UM61 CROSS [position] AT AND MAINTAIN [altitude] AT [speed]

Upon receipt of an Altitude or Crossing restriction the flight crew should use normal CPDLC operational procedures to review, confirm and respond to close out any pending ATC CPDLC messages. In the event a STANDBY response is initially selected for operational reasons; flight crews are reminded to return to the original CPDLC Altitude or Crossing Restriction message and respond with either a WILCO or UNABLE as appropriate to close out the ATC CPDLC clearance. Any ambiguities or question pertaining to the CPDLC clearance should be resolved by voice communication with the controller.

8.3 Altimeter Setting Messages

When an altimeter setting is required to be provided with an altitude clearance the FAA ground system will obtain the appropriate altimeter setting and concatenate the Altitude uplink message with a named altimeter station and altimeter setting. If the altimeter settings is greater than one (1) hour old the following concatenation will be included with the altimeter setting message "ALTIMETER MORE THAN ONE HOUR OLD". An aircraft may be provided an altimeter setting as a stand-alone message when transiting airspace that requires its use or as part of the flight crews' initial contact using CPDLC services. The En Route CPDLC provided Altimeter setting is not to be used for final approach. Use normal Altimeter setting procedures when conducting approach maneuvers within TRACON or Tower airspace.



Figure 21. Altimeter Setting Message

Chapter 9. Re-route and Lateral Navigation

CPDLC, within the NAS, allows re-routes to be accomplished with both flight crew initiated request and controller initiated uplinks. Flight crew initiated route request are limited to “Direct-To-Fix” requests on the active flight plan while controllers have a range of uplinks that will be described below.

CPDLC allows aircraft systems to be capable of loading route clearance information from CPDLC messages directly into the FMS. The flight crew should use this capability to minimize the potential for data entry errors when executing clearances involving loadable route information.

NOTE: Not all aircraft have the capability to load information from CPDLC message into the FMS e.g., PROCEED DIRECT TO MEM may not be loadable on one airframe where it is loadable on others. See aircraft AFM for additional information.

If a clearance is received that can be automatically loaded via a LOAD prompt into the FMS, the flight crew should load the clearance via the LOAD prompt into the FMS and review the clearance in the MCDU/NAV display before responding to the clearance with either a WILCO or UNABLE.

NOTE: The same recommendations apply concerning when to UNABLE/REJECT a clearance as in section 3.3 or when the flight crew selects STANDBY in section 3.4 of this document. Review this section as applicable.

After review of the clearance and the flight crew finds the loaded ATC clearance is acceptable, the flight crew should return to the uplinked ATC clearance and respond with a WILCO to close out the CPDLC transaction.

9.1 Flight Crew Initiated Route Requests

Flight crew initiated Direct-To-Fix requests may be accomplished anytime when the flight crew has a CPDLC session in En Route airspace. Flight crew Direct-To-Fix requests to ATC are limited to a single fix on the active route downstream from its current aircraft position and if desired with preformatted “Due To Weather” and/or “Due To Performance” message information. Any other free text will result in a “Message Not Supported” response from the FAA ground system.

The following CPDLC message is used for making a Direct-To-Fix request:

- DM22 REQUEST DIRECT TO [position]

Controllers, upon receipt of the route request, will review and provide a response using normal ATC CPDLC controller processes. Controllers may respond with a Standby, Unable, or with a proceed to the requested fix CPDLC message.

The response to a Direct -To-Fix request uses the following uplink when a controller has approved the reroute is as follows:

- UM74 PROCEED DIRECT TO [position]
- UM169 REST OF ROUTE UNCHANGED

Once a CPDLC Proceed Direct-To-Fix message has been received, the flight crew responds to the clearance with a WILCO, immediately loads the clearance into the FMS and proceeds to navigate directly to the

cleared fix per the uplinked CPDLC ATC clearance. If a controller is unable to approve a clearance request, a “Due To” response may be appended to the clearance for flight crew awareness.

9.2 Controller Initiated Route Uplinks

Controller initiated route clearances may be initiated anytime the need arises to change the trajectory of the aircraft. This includes a pending Airborne Re-Route (ABRR) modification from the ARTCC Traffic Management Unit (TMU) that is passed to the controller from the FAA Command Center for route modification and the controller has approved the route amendment.

The controller with track control and CPDLC connection may uplink the following controller initiated route messages to the aircraft:

- UM74 PROCEED DIRECT TO [position]
- UM79 CLEARED TO [position] VIA [routeclearance]
- UM80 CLEARED [routeclearance]
- UM83 AT [position] CLEARED [routeclearance] (currently adapted off/ unavailable)

The controller may append to the uplinked route clearance any of the following Free Text messages to controller initiated route clearance:

- UM166 DUE TO TRAFFIC
- UM167 DUE TO AIRSPACE RESTRICTION
- UM169 [freetext] DUE TO WEATHER

The ground system will automatically append a UM169 [freetext] REST OF ROUTE UNCHANGED to any route clearance that does not include the destination airport.

In addition to the route free text concatenations described above, a UM169 [freetext] TRAFFIC FLOW MANAGEMENT REROUTE message may be prepended to uplinked route clearances that have been passed to the controller from the ARTCC Traffic Management Unit (TMU).

9.3 Direct-To-Fix CPDLC Uplink

When required to amend a flights trajectory a controller may use the Direct-To-Fix [position] uplink (UM74) if the Fix position is on the currently cleared route. When the [position] is any fix other than the destination the system will automatically append UM169 REST OF ROUTE UNCHANGED.

The following example is an ATC initiated re-route - Direct-To-Fix. The aircraft is cleared direct to a fix that is located downstream in the current cleared route:

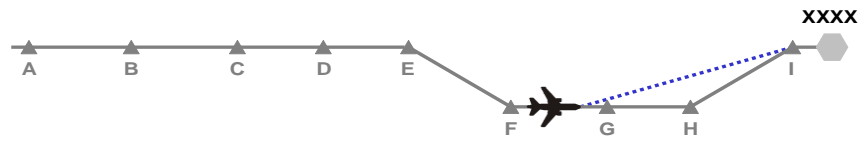


Figure 22. Direct to Fix Diagram

- ATC uplinks the clearance UM74 PROCEED DIRECT TO [fix I] to the aircraft.
- The flight crew responds to the clearance with DMO WILCO, immediately loads the clearance into the FMC and proceeds direct to the cleared direct-to fix I.

9.4 Complex Route Uplink

For more complex route amendments, the controller may uplink to the aircraft a CPDLC ATC Clearance message with FMS loadable and free text route information. To view this route modification the flight crew will be required to insert into the FMS the modified route from the CPDLC message using the FMS Load prompt or in some cases by using a two-step process using the load prompt and manually entering free text arrival information. Flight crews should use procedures described in Section 2 of this document to view, review and wilco/unable/standby the uplink using Standard Operating Procedures. ATC route amendments using UM79, UM80 and UM83 (when used) message elements are subject to the General Pilot Response Timeout parameter (e.g. 3 min).

Note: As previously discussed in the document when entering new route information into the FMS (via the load prompt or manually) flight crews should crosscheck/reenter FMS data as appropriate. This may include wind information, performance, airport/alternate information and predicted fuel parameters depending on your aircraft type. Flight crews should use their company approved Standard Operating Procedures to reenter FMS required data as appropriate.

The re-route examples below are scenarios from GOLD Second Edition – 26 APR 2013 document and cover ATC re-routes with amendments on the current route and off route modifications.

The following diagram with associated steps represent a combination of possible ATC initiated re-routes – first waypoint in the new route is on the current route and there is no route discontinuity.

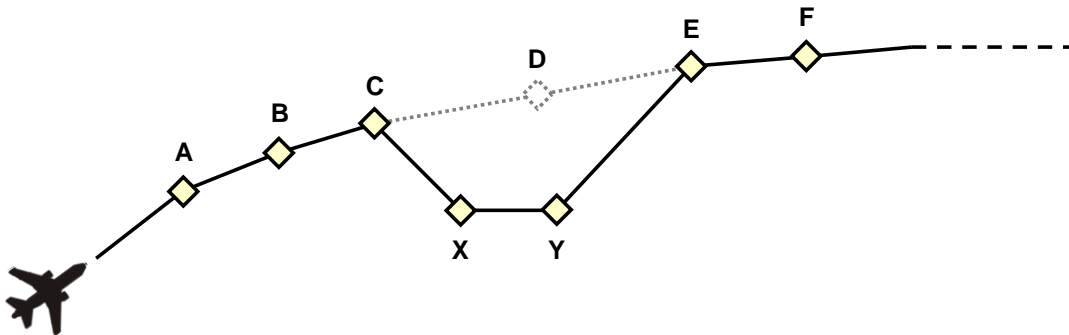


Figure 23. Complex Clearance Diagram

- ATC uplinks the clearance CLEARED TO [E] VIA [A B C X Y] to the aircraft using UM79 CLEARED TO [position] VIA [route clearance]. There is no discontinuity because the uplink fix (E) is in the existing cleared flight plan; or

Note: Forecast weather data in the FMS may be lost for waypoints A, B, C, D, waypoints X, Y do not contain any forecast weather data, forecast weather data for waypoints E, F, remains intact.

- ATC uplinks the clearance CLEARED [A B C X Y E F ...Dest] to the aircraft using UM80 CLEARED [route clearance]. There is no discontinuity because the entire route has been replaced. The route must be specified to destination; or

Notes for UM80 Route Clearances:

- For En Route CPDLC, an option is made available for operators whose aircraft have known issues loading a route clearance with a STAR Arrival and Transition. To support these aircraft an additional DAT filing code has been created (1FANSER2PDC or FANSER) that places the Arrival/Transition in an appended free text message enabling those impacted aircraft to receive a CPDLC route clearance. Flight crew will have a two-step process to select the load prompt to load ATC clearance information into the FMS and then manually insert the Arrival and Transition which will be in free text in the uplinked ATC clearance.



Figure 24. Clearance Uplink with Free Text Arrival – DAT Code 1FANSER2PDC or FANSER Example

- Aircraft **without** route loading issues will receive a full UM80 loadable route when applicable. To support those aircraft an operator must file a DAT code (1FANSE2PDC or FANSE) to support fully loadable route clearances.
- Forecast weather data in the FMS may be lost for the whole route.
- ATC uplinks the clearance AT [C] CLEARED [X Y E F ...Dest] to the aircraft using UM83 AT [position] CLEARED [route clearance]. There is no discontinuity because the entire route after C was specified. The route must be specified to destination.

Note: Forecast weather data in the FMS is lost for all waypoints after C.

- The flight crew responds to the clearance with DM0 WILCO or DM1 UNABLE, as appropriate using approved Standard Operating Procedures

The Following diagram with associated steps represents an ATC initiated re-route where the first waypoint in the new route is not on the current route and there is no route discontinuity.

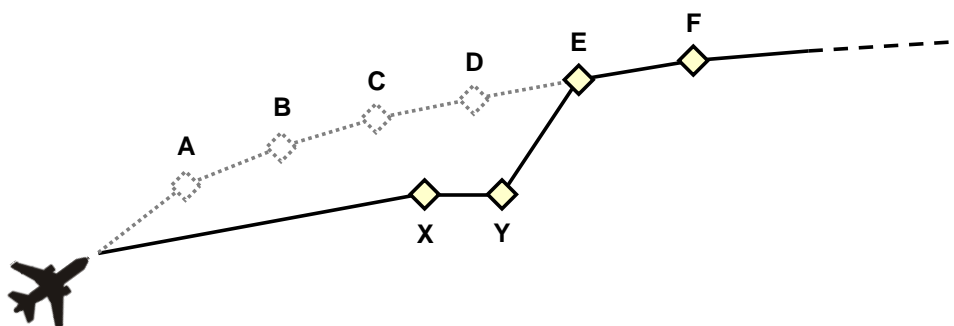


Figure 25. Complex Clearance Where First Fix is Not on Existing Route

- ATC uplinks the clearance CLEARED TO [E] VIA [X Y] to the aircraft using UM79 CLEARED TO [position] VIA [route clearance]. There is no discontinuity at E because the uplink fix (E) is in the existing cleared flight plan; or

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Note: Forecast weather data in the FMS is lost for waypoints A, B, C, and D. Waypoints X, and Y do not contain any forecast weather data. Forecast weather data for waypoints E, F, etc., remains intact.

- ATC uplinks the clearance CLEARED [X, Y, E, F ...Dest] to the aircraft using UM80 CLEARED [route clearance]. The entire route is replaced and the route must be specified to destination.

Note for UM80 Cleared Route Clearance:

- For En Route CPDLC, an option is made available for operators whose aircraft have known issues loading a route clearance with a STAR Arrival and Transition. To support these aircraft an additional DAT filing code has been created (1FANSER2PDC or FANSER) that places the Arrival/Transition in an appended free text message enabling those impacted aircraft to receive a CPDLC route clearance. Flight crew will have a two-step process to select the load prompt to load ATC clearance information into the FMS and then manually insert the Arrival and Transition which will be in free text in the DCL.



Figure 26. Clearance Uplink with Free Text Arrival – DAT Code 1FANSER2PDC or FANSER Example

- Aircraft without route loading issues will receive a full UM80 loadable route when applicable. To support those aircraft an operator must file a DAT code (1FANSE2PDC or FANSE) to support fully loadable route clearances.
- Forecast weather data in the FMS is lost for the whole route.
- The clearance above takes immediate effect and, since the first fix specified (X) is not on the existing route of flight, the new route effectively starts with “present position direct X,” although this is not explicitly stated in the uplink message.
- The flight crew responds to the clearance with DM0 WILCO or DM1 UNABLE, as appropriate using approved Standard Operating Procedures.

Chapter 10. Emergency CPDLC Messages

When a flight crew initiated emergency downlink is received by ground automation the En Route controller that has track control and CPDLC eligibility will have the ability to display and review the emergency message, but will not have the ability to acknowledge the emergency downlink via CPDLC. The only emergency downlink message that is not closed upon sending is the DM68 [free text]. The DM68 message technically requires a ROGER response from the ground, however the ground system/controller will not uplink a ROGER. Flight crews can expect voice contact from the controller, and both parties should use standard operating procedures to resolve the emergency condition that prompted the CPDLC emergency downlink.

If an aircraft is transiting airspace where CPDLC session is not at an active controller workstation, then the emergency message will be made available to a supervisor workstation at the ATC En Route facility and at the National CPDLC site where an alert will be given to the facility to notify them that an Emergency downlink has been received.

The following emergency flight crew initiated downlink CPDLC messages are supported:

- DM55 PAN PAN PAN
- DM56 MAYDAY MAYDAY MAYDAY
- DM57 [remainingfuel] OF FUEL REMAINING AND [remainingsouls] SOULS ON BOARD
- DM58 CANCEL EMERGENCY
- DM59 DIVERTING TO [position] VIA [route clearance]
- DM60 OFFSETTING [distanceoffset] [direction] OF ROUTE
- DM61 DESCENDING TO [altitude]
- DM68 [freetext]
- DM80 DEVIATING [distanceoffset] [direction] OF ROUTE

Flight crews and controllers should use standard emergency procedures to take care of the emergency condition and reestablish voice communications as applicable.

Appendix A: B777 CPDLC-DCL Procedure Examples

Table 1. Flight Crew Procedures for CPDLC-DCL – B777

Audible Chime with EICAS • ATC	Responding to an Uplinked Clearance
<p>ATC Function Key.....Select</p> <p>View the message and act appropriately on the message.</p> <p><u>Verify the Altitude and Squawk as part of the uplinked Clearance.</u></p>	<p><input type="checkbox"/> ATC MCDU Key.....Select</p> <p>Return to the ATC Communication message and after the flight crew agrees with the ATC Departure Clearance and have verified route upload to the FMC</p> <p><input type="checkbox"/> ACCEPTSelect</p> <p>Standby, Reject are also available response as needed by the flight crew</p>
Request a Departure Clearance (DCL), <i>If required</i>	Manual Entry of DP and Runway
<p><input type="checkbox"/> ATC MCDU Key.....Select</p> <p><input type="checkbox"/> Clearance 4R.....Select</p> <p><input type="checkbox"/> REQUEST CLEARANCE.....Select</p> <p><input type="checkbox"/> SEND.....Select</p>	<p><input type="checkbox"/> Dept/ARR.....Select</p> <p><input type="checkbox"/> RWY.....Select</p> <p><input type="checkbox"/> Procedure.....Select</p> <p><input type="checkbox"/> Transition.....Select</p> <p><input type="checkbox"/> RTE.....Select</p> <p>Verify the appropriate Departure Procedure, Runway and Transition are correct against the departure clearance with no Route Discontinuities</p> <p><input type="checkbox"/> Execute.....Select</p>
Loading and Verifying an FMS uplinked CPDLC-DCL	LEGS Page / Distance check for Uplinked DCL
<p><input type="checkbox"/> Load.....Select</p> <p>LOAD prompt automatically updates FMC RTE page with route clearance information.</p> <p><input type="checkbox"/> FMC RTESelect</p> <p><input type="checkbox"/> VerifyDEPT Airport</p> <p><input type="checkbox"/> VerifyDEST Airport</p> <p><input type="checkbox"/> VerifyRunway If part of the Uplinked Clearance, otherwise this is a manual entry</p> <p><input type="checkbox"/> VerifyFLT NO: For Example:CAL123</p> <p><input type="checkbox"/> Verify.....Cleared Route</p> <p>The Departure Procedure and Runway will require manual entry if provided</p> <p><input type="checkbox"/> Activate.....Select</p> <p><input type="checkbox"/> EXECSelect</p> <p>to complete the RTE page upload</p>	<p><input type="checkbox"/> LEGSSelect</p> <p><input type="checkbox"/> Map Mode.....Select</p> <p>Step through the legs page using “Step” at 6R and observe on the Navigation Display:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Waypoints and Altitude constraints agree with those on the filed flight plan and navigation charts, and <input type="checkbox"/> No discontinuities exist between waypoints <p><input type="checkbox"/> Verify that an active waypoint is depicted in 1L on LEGS page 1</p> <p><input type="checkbox"/> Verify the total route distance is proper for route of flight versus the filed flight plan</p>

Appendix B: Airbus CPDLC-DCL Procedure Examples

Table 2. Flight Crew Procedures for CPDLC-DCL – A320/A330/A340

Ring tone with ATC MSG lights flashing (Uplink message displayed on DCDU)	Responding to an Uplinked Clearance
<p><input type="checkbox"/> ATC MSG p/b Press This will turn of the lights and stop aural alert View the message and act appropriately on the message. <u>Verify the Altitude and Squawk as part of the uplinked Clearance.</u></p>	<p><u>On DCDU</u> Review the ATC message. After the flight crew agrees with the ATC Departure Clearance and have verified route upload in the FMS: <input type="checkbox"/> WILCO Select STBY or UNABLE are also available answer as needed by the flight crew <input type="checkbox"/> SEND..... Select</p>
Request a Departure Clearance, if required	Manual Entry of DP and Runway
<p><u>On MCDU</u> <input type="checkbox"/> ATC COM keySelect <input type="checkbox"/> OTHER REQ (2R).....Select <input type="checkbox"/> CLEARANCE (3L).....Select <input type="checkbox"/> ATC REQ DISPLAY (6R)Select</p> <p><u>On DCDU</u> <input type="checkbox"/> SENDSelect Depending on A/C version, it may be necessary to manually close the request selecting CLOSE (2R) after sending.</p>	<p><u>On MCDU</u> <input type="checkbox"/> Departure airport on F-PLN page Select <input type="checkbox"/> DEPARTURE (1L) Select <input type="checkbox"/> RWY Select <input type="checkbox"/> SID Select <input type="checkbox"/> TRANS..... Select <input type="checkbox"/> On the resulting temporary flight plan, verify the appropriate Departure Procedure, Runway and Transition are correct against the departure clearance and there is no Route Discontinuities. <input type="checkbox"/> INSERT (6R) or TMPY INSERT (6R) Select</p>
Loading and Verifying an FMS uplinked departure clearance	Check for Uplinked DCL
<p><u>On MCDU</u> <input type="checkbox"/> SEC F-PLN keySelect <input type="checkbox"/> Copy Active (1L).....Select</p> <p><u>On DCDU</u> <input type="checkbox"/> LOADSelect Depending on FANS version, it may be necessary to select OTHER before, to display the LOAD prompt. LOAD automatically updates the FMS SECONDARY F-PLN with route clearance information.</p> <p><u>On MCDU</u> <input type="checkbox"/> SEC F-PLN keySelect <input type="checkbox"/> SEC F-PLN (2L).....Select <input type="checkbox"/> Verify ORIGIN Airport <input type="checkbox"/> Verify DEST Airport <input type="checkbox"/> VerifyRunway If part of the Uplinked Clearance, otherwise this is a manual entry <input type="checkbox"/> VerifyCleared Route The Departure Procedure will require manual entry and Runway selection based on field conditions <input type="checkbox"/> SEC F-PLN keySelect <input type="checkbox"/> ACTIVATE SEC (4L) Select to activate the secondary flight plan as the active flight plan.</p>	<p><input type="checkbox"/> F-PLN key..... Select <input type="checkbox"/> PLAN Mode on EFIS Control Panel Select Scroll along the F-PLN and observe on the Navigation Display and F-PLN page: ○ Waypoints and Altitude constraints agree with those on the filed flight plan and navigation charts if your departure clearance is a “CLEARED AS FILED” clearance, and ○ No discontinuities exist between waypoints. <input type="checkbox"/> Verify the total route distance is proper for route of flight versus the filed flight plan. INIT A/B pages..... Check FUEL PRED pages..... Check PERF pages..... Check</p> <p>Note: In Airbus SOP, it is recommended to select STBY, then LOAD and finally WILCO or UNABLE depending on the flight crew decision to accept or reject the clearance.</p>

Appendix C: Communication Information Messages from ATC

The examples below include CPDLC error processing that include Cause, Result, and resultant error messages. The tables below include both ground and aircraft error processing. The tables are representative of known capabilities and system behavior that will be updated as new information becomes available.

Table 3. Tower DCL Ground Error Processing

Cause	Result	ERROR Message
Received CPDLC downlink response message is not expected.	Session with aircraft is aborted. This is viewed as a Protocol error	UM161 CPDLC End Service – No UM159 is sent.
Received downlink CPDLC message with an operationally unsupported message element/parameter.	Disregard the received message and send a CPDLC message containing message element UM169 "MESSAGE NOT SUPPORTED BY THIS ATS UNIT".	UM169 "MESSAGE NOT SUPPORTED BY THIS ATS UNIT".
Received downlink CPDLC message DM67 or DM68 as a single message element	Disregard the received message and send a CPDLC message containing message elements UM159 unexpectedData and UM169 "FREETEXT NOT SUPPORTED".	UM159 unexpectedData and UM169 "FREETEXT NOT SUPPORTED".
TDLS session is in Delayed Termination and receives a message that requires a response	Disregard the received message and send a CPDLC message containing message element UM162 SERVICE UNAVAILABLE	UM162 SERVICE UNAVAILABLE is sent.
DM25 received with appended data	Disregard the received message and send a CPDLC message containing message element UM159 unexpectedData and a UM169 "ATSU CANNOT PROCESS DATA APPENDED TO CLEARANCE REQUEST".	UM159 unexpectedData and a UM169 " ATSU CANNOT PROCESS DATA APPENDED TO CLEARANCE REQUEST
DM62 received with appended data that is not a DM67 Free text	Disregard the received message and send a CPDLC message containing message element UM159 unexpectedData	UM159 unexpectedData
DM1 UNABLE received with appended data other than DM65, DM66 or DM67	Disregard the received message and send a CPDLC message containing message element UM159 unexpectedData	UM159 unexpectedData

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Cause	Result	ERROR Message
DM25 received with a DM25 pending	Disregard the received message and send a CPDLC message containing message element UM169 "CLEARANCE REQUEST PENDING".	UM169 "CLEARANCE REQUEST PENDING".
DM25 received with a clearance awaiting a flight crew response	Disregard the received message and send a CPDLC message containing message element UM169 "CLEARANCE SENT PILOT RESPONSE REQUIRED"	UM169 "CLEARANCE SENT PILOT RESPONSE REQUIRED"
Received a response message with a MRN that has no match	Disregard the received message and send a CPDLC message containing message element UM159 unrecognizedMsgReference Number	UM159 unrecognizedMsgReference Number
DM0, DM2, DM3,DM63 received with appended data	Disregard the received message and send a CPDLC message containing message element UM159 unexpectedData	UM159 unexpectedData

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En Route CPDLC Ground Error Processing

The following ATC uplinks may be received for review by the flight crew.

Table 4. En Route CPDLC Ground Error Processing

Item #	Information Message	Condition	Flight Crew Action
1	MESSAGE NOT DELIVERED. FREE TEXT/DUE TO REASON NOT SUPPORTED. CONTACT ATC OR RESEND REQUEST.	Air Description: The Flight Crew selected a preformatted free text message or manually added free text to a request/response that is not supported by the FAA. Ground Description: Automatically appends error free text to a UMO UNABLE in response to a supported message containing DM67 free text.	The FAA only accepts “Due To Weather or Performance” as additional reasons /information, Flight crews should avoid all other additional reject reasons or additional information such as free text.
2	UNABLE RECEIVED. FREE TEXT/DUE TO REASON NOT SHOWN TO ATC.	Air Description: The Flight Crew selected a preformatted free text message or manually added free text to a request/response that is not supported by the FAA. Ground Description: Automatically uplinked upon the receipt of (DM1) UNABLE containing DM67 Free text.	The FAA only accepts “Due To Weather or Performance” as additional reasons /information, Flight crews should avoid all other additional reject reasons or additional information such as free text.
3	DOWNLINK DELAYED – USE VOICE.	Air Description: If a message is received by the ground system greater than 2 minutes old than the current ground system time, the message is Rejected/UNABLEd automatically. Ground Description: Appended to UMO) UNABLE (UM0) and automatically uplinked when a Normal (non-emergency) message is received after the adapted latency value (120 seconds).	If desired, flight crew should contact ATC via voice for their ATC request.

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Item #	Information Message	Condition	Flight Crew Action
4	REQUEST AGAIN WITH NEXT ATC UNIT	<p>Air Description: CPDLC message will be appended with an UNABLE (UM0) and automatically uplinked for open messages.</p> <p>Ground Description: Appended to (UM0) UNABLE and automatically uplinked for open messages before uplinking a TOC, when:</p> <ul style="list-style-type: none"> • An inter-facility TOC is uplinked, or • An intra-facility TOC is uplinked and the message has already been forwarded once. 	Make request with the next ATC controller.
5	MESSAGE CANCELLED BY ATC – CONTACT ATC BY VOICE	<p>Air Description: The controller has canceled an uplinked CPDLC message.</p> <p>Ground Description: Sent when (DM0) WILCO received to controller 'Canceled' (locally closed) uplink.</p> <p>Since it is expected that a controller cancelling an uplink includes voice instructions to the flight crew to reject the uplink, the expected flight crew response is UNABLE. When the UNABLE is received in this scenario, it is simply processed and discarded.</p>	The controller and flight crew should coordinate any related ATC messages closed by the ground system via voice.

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Item #	Information Message	Condition	Flight Crew Action
6	INVALID DATA – DOWNLINK REJECTED. RESEND OR CONTACT ATC BY VOICE	Air Description: none Ground Description: Appended to (UM0) UNABLE and automatically uplinked when the MIN of a message matches the MIN of an open message. If the entire contents of the message are determined to be duplicate of an open message, the duplicate message will be SAR recorded and discarded (not displayed).	Resend message with correct information or contact ATC via voice.
7	DOWNLINK REJECTED - OPEN REQUEST OF SAME TYPE EXISTS	Air Description: A flight crew request is open, and the flight crew downlinks another request of the same type. Ground Description: Appended to (UM0) UNABLE and automatically uplinked upon the receipt of a non-emergency message when an open message of the same message type exists.	Flight crew should contact ATC via voice to coordinate related ATC request.

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Item #	Information Message	Condition	Flight Crew Action
8	INVALID MESSAGE FORMAT	<p>Air Description: Message has been rejected and is appended with an Unable response.</p> <p>Ground Description: Appended to (UM0) UNABLE and automatically uplinked when invalid data or data in an invalid format exists in a non-emergency message... This should be exceedingly rare.</p> <p>Examples: A Direct To [position] request containing a Fix Radial Distance (FRD) with a distance value greater than 700NM. An Altitude request containing other than QNH Feet or Flight Level. An Altitude request containing a FT altitude type but containing an altitude above 18,000 feet. An Altitude request containing a Flight Level altitude field type but containing an altitude below FL180.</p>	Flight crews should review PID and determine if the format is correct for the CPDLC request, otherwise contact ATC if desired.
9	CONTACT ATC - RESPONSE RECEIVED FOR AN UNKNOWN MESSAGE	<p>Air Description: The ground system has received a CPDLC message, but the downlink message reference number is not included.</p> <p>Ground Description: Automatically uplinked when the ground system receives a downlink message containing valid response element (DM0-DM3, DM63), but without an MRN.</p>	Flight crew should contact ATC via voice.

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Item #	Information Message	Condition	Flight Crew Action
10	DOWNLINK MESSAGE NOT SUPPORTED	<p>Air Description: Message has been rejected and is appended with an UNABLE response. Either the message is not supported or an acceptable message type may contain unsupported information such as free text.</p> <p>Ground Description: Appended to (UM0) UNABLE and automatically uplinked in response to an unsupported message.</p>	If desired, flight crew should contact ATC via voice for their ATC request.
11	CPDLC NOT IN USE UNTIL FURTHER NOTIFICATION	<p>Air Description: Controller / flight crew CPDLC communications is currently not available. The message has been rejected and is appended with an UNABLE response</p> <p>Ground Description: Appended to (UM0) UNABLE and automatically uplinked from National.</p> <p>To reject a non-emergency message received when National is the LDA.</p> <p>To close an open message when that ARTCC disables CPDLC.</p>	If desired, flight crew should contact ATC via voice for their ATC request.

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Item #	Information Message	Condition	Flight Crew Action
12	CONTACT ATC - RESPONSE RECEIVED FOR AN UNKNOWN MESSAGE	<p>Air Description: The ground system has received a CPDLC message, but does not match any corresponding CPDLC message.</p> <p>Ground Description: Automatically uplinked when a response downlink message contains a MRN that does not match the MIN of an open uplink.</p> <p>This does not apply to the case where the ground receives a response message to an uplink that the controller or the system have canceled.</p>	Contact ATC via voice.
13	DOWNLINK RESPONSE NOT SUPPORTED – CONTACT ATC BY VOICE	<p>Air Description: The Flight Crew selected a preformatted free text message or manually added free text to a request/response that is not supported by the FAA.</p> <p>Ground Description: Free text uplink sent when the response downlink received for an uplinked message is not expected/not supported.</p>	The FAA only accepts “Due To Weather or Performance” as additional reasons /information, Flight crews should avoid all other additional reject reasons or additional information such as free text.
14	REQUEST DIRECT TO FIX IS NOT AVAILABLE UNTIL FURTHER ADVISED.	<p>Air Description: If a route request is received by the ground system, and Routes has been disabled on the ground, the request is auto UNABLEd.</p> <p>Ground Description: Appended to (UM0) UNABLE and automatically uplinked when Routes are disabled on the ground</p>	The flight crew should contact ATC for route requests

Appendix D: CPDLC Flight Plan and Route Planning Guidance

Flight Planning Guidance

ICAO FPL

CPDLC DCL requires the operator to file the relevant equipage codes in the Equipage Field 10a of the International Civil Aviation Organization (ICAO) Flight Plan (FPL). To specify a preference to receive a CPDLC DCL, the appropriate delivery preference code is filed in the DAT/ sub-field of Field 18.

Field 10a Equipage Codes

E and Z Codes

E-codes indicate the type of service that can be received over the Aircraft Communications Addressing and Reporting System (ACARS).

The Z-code is a generic code which all other equipment or capabilities which are not specified in that item and apply to that flight.

Table 5. E and Z Codes

Code	Description	Notes
E-Code		
E1	Flight Management Computer (FMC) WayPoint Reporting (WPR) ACARS	A number of airlines routinely receive ACARS position reports from their aircraft via satellite as part of their AOC flight monitoring. These position reports can be forwarded to an ATS provider and used to replace HF voice position reports. This method of delivery for aircraft position reports is known as FMC WPR.
E2	Data link (D)-Flight Information Services (FIS) ACARS.	The flight information services provided can be weather reports and operational data.
E3	Pre-Departure Clearance (PDC) ACARS.	PDC from ATC can be received in the cockpit via the ACARS.
Z-Code		
Z-Code	Indicates that other equipment or capabilities which are not specified in that Item, apply to that flight.	Additional equipment or capabilities, for the aircraft shall be specified in Item 18 preceded COM/, NAV/, DAT/.

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J Codes

J-codes are used to indicate what radio communication, navigation and approach aid equipment and capabilities are onboard the aircraft. These are filed in box 10a of the ICAO FPL.

Table 6. J Codes

J-Code	Description	Notes
J1	CPDLC ATN VDL Mode 2	
J2	CPDLC FANS 1/A HF DL	
J3	CPDLC FANS 1/A VDL Mode A	Accepted for DCL only
J4	CPDLC FANS 1/A VDL Mode 2	Preferred media for U.S. domestic CPDLC
J5	CPDLC FANS 1/A SATCOM (INMARSAT)	
J6	CPDLC FANS 1/A SATCOM (MTSAT)	
J7	CPDLC FANS 1/A SATCOM (Iridium)	

Field 18 DAT/ Codes

The DAT/ codes, which are filed in Field 18 of the ICAO FPL, are the mechanisms, which allow Federal Aviation Administration (FAA) automation to generate a DCL, PDC or voice clearance. Additionally, the codes will be used for determining an aircraft's eligibility for U.S. domestic En Route CPDLC.

For En Route CPDLC, an option is made available for operators whose aircraft have known issues loading a route clearance with a STAR. An additional filing code has been created (FANSER) that places the STAR in an appended free text message enabling those impacted aircraft to receive a CPDLC route clearance.

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Table 7. DCL DAT/ Codes

User Preference	Data Comm Capability Description	ICAO 2012 Field 10a	Data Comm Field 18 DAT/ Code	Comments •Fld 10a order is any order and world-wide •Z is required to get to DAT/ •No spaces in actual DAT/ field
DCL Only				
PDC only*	Not ACARS equipped but gets PDC via manual means	Z	1PDC	Some aircraft are non-ACARS equipped, and 10a is physical equipage. Still get PDC via other means. Optional if currently getting PDC.
PDC only*	Equipped only for ACARS PDC	E3 Z	1PDC	Optional if currently getting PDC.
PDC only*	Equipped for ACARS PDC and FANS but wants PDC only	E3J4Jx Z	1PDC	Equipped for ACARS PDC and FANS 1/A or 1/A+, and possibly other capabilities (Jx).
FANS1/A DCL only	Equipped for ACARS/PDC and FANS but wants FANS 1/A only	E3J4Jx Z	1FANS	Identifies US domestic preference for FANS 1/A DCL.
FANS 1/A+ DCL only	Equipped for ACARS/PDC and FANS but wants FANS 1/A+ only	E3J4Jx Z	1FANSP	Identifies US domestic preference for FANS 1/A+ DCL.
FANS 1/A DCL/PDC	Equipped for ACARS PDC and FANS 1/A, with primary/secondary preferences	E3J4Jx Z	1FANS2PDC	Code number shows priority preference, e.g., FANS 1/A DCL is primary preference; PDC is secondary that will be used if primary is unavailable and feasible.
FANS 1/A+ DCL/PDC	Equipped for ACARS PDC and FANS 1/A+, with primary/secondary preferences	E3J4Jx Z	1FANSP2PDC	Code number shows priority preference, e.g., FANS 1/A+ DCL is primary preference; PDC is secondary that will be used if primary is unavailable and feasible.
PDC and En Route Data Comm Clearances				
FANS 1/A & FANS 1/A+	For flights authorized for En Route Data Comm with no UM 80 load issues departing from PDC ONLY airports	E3J4J Z	1PDCFANSE	This code is to be used to obtain PDC and CPDLC DCL En Route clearances with aircraft that have no UM80 load issues from PDC ONLY airports
FANS 1/A & FANS 1/A+	For flights authorized for En Route Data Comm with UM80 load issues departing from PDC ONLY airports	E3J4J Z	1PDCFANSER	This code is to be used to obtain a PDC and CPDLC En Route clearances with aircraft that have UM80 load issues departing from PDC ONLY airports
DCL and En Route Data Comm Clearances				
FANS 1/A & FANS 1/A+	For flights authorized for En Route Data Comm with no UM 80 load issues	E3J4J Z	1FANSE2PDC	This code is to be used to obtain CPDLC DCL and En Route clearances with aircraft that have no UM80 load issues.
FANS 1/A & FANS 1/A+	For flights authorized for En Route Data Comm with UM80 load issues	E3J4J Z	1FANSER2PDC	This code is to be used to obtain CPDLC DCL and En Route clearances with aircraft that have UM80 load issues.
En Route Data Comm Clearances ONLY				
FANS 1/A & FANS 1/A+	For flights authorized for En Route Data Comm with no UM 80 load issues	J4 Z	FANSE	This code is to be used to obtain a PDC and CPDLC En Route clearances with aircraft that do not have UM80 load issues. (No Tower DCL)
FANS 1/A & FANS 1/A+	For flights authorized for En Route Data Comm with UM80 load issues	J4 Z	FANSER	This code is to be used to obtain a PDC and CPDLC En Route clearances with aircraft that have UM80 load issues. (No Tower DCL)

* No ICAO FPL change is required if the user currently gets PDC and does not want DCL. Current PDC designation will be the default.

** It makes no difference whether “FANS or FANSP” is filed in a flight plan. Either entry will result in a Data Comm clearance. The ‘P’ merely indicates if the aircraft is equipped with FANS 1/A+ (plus).

Subscriber Database (SDB)

Prior to specific flight plan filing, the user has an option to designate flights that will participate in PDC or CPDLC Departure Clearance service, using the FAA Subscriber Data Base (SDB), which is maintained by the FAA Inter Facility Communications Engineering Team (IFCET), in Oklahoma City, OK. Details for using the SDB are provided in the User’s Guide for Tower Data Link Service (TDLS) Subscriber Database (SDB) Web-based Application.

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http://dcis.harris.com/sites/default/files/SDB%20User%27s%20Guide%20v3.1_0.pdf

Users may designate DCL clearance delivery settings independently from flight plan filing, however the Field 18 DAT/ codes will always take precedence. Use of the SDB is only required for PDC operators or operators who want to receive a dispatch copy of the CPDLC DCL.

The SDB values for CPDLC service will be superseded by the service preferences provided in the flight plan.

For further information on the SDB, please contact:

IFCET Team Line
Phone: (405) 954-9131
Monday through Friday, 6:00 AM to 6:00 PM Central Time

-or-

Harris Corporation
Email: dcit@harris.com

Route Planning Guidance

This section contains route construction rules for PDC or CPDLC clearances. If the user files a flight plan that does not adhere to these rules, the ground system will not create a PDC or CPDLC clearance for the flight - Clearances will then be handled via voice. These rules are in place to ensure that the clearance can be correctly loaded into an aircraft's flight navigation computer. The following definitions apply:

Fix - As used below, the term 'fix' means published intersections, waypoints, or nav aids. A fix may also be a fix-radial-distance (FRD), also known as Place Bearing Distance (PBD), or a latitude/longitude (L/L). For the purposes of this document an airport is not considered a 'fix'.

Route Element - Airways and fixes defining a route of flight. Departure/Arrival airports are NOT considered route elements.

General Rules

1. Use of an airway as a route element requires a published entry and exit point for the airway, (e.g. ..SJM.J108.GINGR..).
2. An implied airway/airway junction (i.e. no fix between airways) is NOT loadable, (e.g. .J4..J65.).
3. If a named fix is published at the implied junction, it may be added to make the route loadable, (e.g. .J4.ABI.J65.).
 - a. *Note: This is the preferred option.*
4. A NAVAID radial is NOT a loadable route element in a Data Comm clearance, e.g. .AIR111, or .ABQ092R.).
5. An FRD may be used in place of a NAVAID radial, or unnamed airway junction, (e.g. ..TCH..TCH094074..MTU..).
 - a. *Note: Use a named fix, if available. Some PBDs are also an issue for some aircraft and may not be loadable.*

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6. Unpublished, named (Ghost) fixes are not contained in the NAV database are not FMS loadable, (e.g. KMSY..TIKDP..).
7. ClearanceSupportAlphas' (formerly Host G-Keys) are non-standard route elements applied by ground automation, (e.g. MAXIE-STAR or RV LAIRD or RV HDG030. They may be forwarded to the AOC for PDCs, but not for CPDLC Dispatch messages. They will not be included in CPDLC uplinks to the flight crew. Use of ClearanceSupportAlphas should be avoided, if possible.

Departure Phase

(Adapted Departure Route (ADR)/Preferential Departure Route (PDR), Adapted Departure Arrival Route [ADAR]/ Preferential Arrival and Departure Route (PDAR), Center Designated Routes (CDR), Instrument Flight Rules [IFR] Preferential Route, Playbook Routes, etc.)

1. The first route element after departure must NOT be an airway, (e.g. KPHX.J65..).
2. The first route element may be a fix, or a standard instrument departure (SID)/DP followed by the last fix on the common route, or a published transition fix. Other exit fixes are NOT loadable, (e.g. KPHX..PXR.J65.).

Step Climbs

Step Climbs traditionally have been filed by dispatchers and flight planners to notify crews when to request speed and altitude changes for optimal flight performance. En Route Automation Modernization (ERAM) does not support any data associated with filed waypoints and strips any extra information, such as altitude(s) and speeds from the route of flight, leaving only the filed waypoints. This is true for both domestic and international flight plans. Therefore, it is important for dispatchers and flight planners to be aware that if waypoints do not match character-for-character in an applied ADR /ADAR, an amended route revision, UM79 or UM80 will occur. In turn, this sometimes will remove the filed step climb waypoint(s) entirely. It should also be noted that any step climb data will not be displayed for any waypoints outside of the ERAM data base on international flight plans. Once again meaning that it will show only the revised route of flight's waypoints in their entirety in the UM169 (free text) portion of the revision.

The following is an example of a filing that included speed and altitude with their associated waypoints and how the route was revised.

TUDEP/M084F350 NATV 53N040W/M084F380 NATV 54NN030W/M084F350 NATV
55N020W/M084F410 NATV NETKI/N0476F410

– This as filed (containing speed and altitudes) will get a UM169 (free text message) with the associated UM79 or UM80, and will be amended to show the following:

TUDEP NATV 53N040W NATV 54NN030W NATV 55N020W NATV NETKI

It is recommended that if step climbs are desired in the NAT then all waypoints within the defined track should be filed and if necessary include step climbs as appropriate.

Also, an issue has been identified for domestic operators when step climbs are filed with the filed ATC route. The FAA does not use this information and in fact when filed this way all DCLs will result in a UM79 or UM80 route amendment which causes additional flight crew workload. Therefore, it is recommended

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that domestic operators do not file step climbs within the filed ATC route and should indicate to flight crews route verticals profile plans / step climbs be located elsewhere in their paperwork.

Arrival Phase

(Adapted Arrival Route [AAR]/Preferential Arrival Route [PAR], ADAR/PDAR, APR, CDR, IFR Preferential Route, Playbook Routes, etc.)

1. The last route element prior to destination must NOT be an airway, (e.g. ..J78.KAMA).
2. The last route element must be a fix, or a standard terminal arrival (STAR) preceded by a published transition fix, or the first fix on the common route. Other entry fixes are NOT loadable, (e.g. ...J78.AMA..KAMA).
3. Arrival procedures, i.e., STARS, should be filed with a published arrival transition.

Dynamic Routes (International Flight Plans)

When included in the filed flight plan, NAT tracks or other dynamic routes will be handled as any other initial or revised departure clearance. The following is a summary:

- If the filed route has not changed and the flight is eligible, a 'CLEARED AS FILED' uplink will be sent as the initial CPDLC departure clearance. The portion of the route containing NAT tracks, as either latitude/longitudes or names (e.g., NATW) will be considered part of the "AS FILED" clearance.
- If the filed route does not match the En Route automation processed route and the change is inside the flight information region (FIR) boundary, then you will receive a revision. However, if the change is outside the FIR boundary, the system will not be able to create a revision and the revision will be given over voice.

Other

Additional filing guidelines are designed to minimize discontinuities (discon) in the FMS and auto-loading issues. These include the following undesirable filings:

1. Three (3) Letter Identifiers being utilized as origin and destination airports.
2. "XXX" indicating an incomplete route. This will prevent a CPDLC or PDC departure clearance from being generated.
3. Any custom non-published points inserted into the route.

Refiling a Flight Plan

If a flight plan needs to be amended or refiled for any reason, the following procedure should be followed:

1. For U.S., domestic flights if it is before P-45, then submit a new flight plan.
2. For international destinations, the old flight plan should be removed and a new flight plan filed.
3. If after P-45, then the old flight plan should first be removed from the system
4. If an Expect Departure Clearance Time (EDCT) is in effect, then it should be handled between AOC and Command Center
5. AOC may use remarks field to include original assigned EDCT

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Follow any additional guidance in the AOC Standard Operating Procedures (SOP).

For all operators, both domestic and international, it is important to remove and receive acknowledgement of the cancellation and refile a new flight plan. The reason for this is because ERAM cannot support amendments outside of the FIR.

For further information on route planning and/or reroutes please reference the Information for Operators (InFO) document, subject, "***Flight Plan Discrepancies and Amendment Filing Procedures***". The document is InFO 14012, dated December 24, 2014. It can be found on the FAA's website at the following web address:

http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info

Tail Swap Procedures to Avoid the CPDLC Blocked List

When it becomes necessary to swap aircraft, cancel the old flight plan with acknowledgment and refile a new flight plan with the new aircraft.

1. Two CPDLC flight plans on file for one registration number on the same date, time, city pair, etc. will place the aircraft registration on the blocked list.
2. Once the flight has been placed on the Blocked List, the flight crews will not be able to receive their CPDLC DCL until the conflict is resolved and the blocked aircraft registration is removed from the blocked list.

Proposed Recommendations to the Operators to Avoid the Blocked List

(Best Practice)

- Remove the original flight plan and refile.
- In the event an EDCT is in effect, can be handled between AOC and Command Center.
- AOC may use remarks field to include original assigned EDCT.
- Follow any additional guidance in the AOC SOP.

Note: To ensure continuity of service during re-filing scenarios, it is critical that the original flight plan is removed before a new flight plan with the same aircraft (AC) Registration is filed.

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Appendix E: CPDLC Message Elements Used for NAS Data Comm

The following message tables are a subset of the DO-258A message set implemented in Tower and En Route Data Comm services.

Table 8 shows all of the uplink messages planned for Tower and En Route services.

Table 8. Uplink Messages

FANS MSG ID	FANS Message Element
UM0	UNABLE
UM1	STANDBY
UM3	ROGER
UM19	MAINTAIN [altitude]
UM20	CLIMB TO AND MAINTAIN [altitude]
UM23	DESCEND TO AND MAINTAIN [altitude]
UM36	EXPEDITE CLIMB TO [altitude]
UM37	EXPEDITE DESCENT TO [altitude]
UM38	IMMEDIATELY CLIMB TO [altitude]
UM39	IMMEDIATELY DESCEND TO [altitude]
UM49	CROSS [position] AT AND MAINTAIN [altitude]
UM61	CROSS [position] AT AND MAINTAIN [altitude] AT [speed]
UM74	PROCEED DIRECT TO [position]
UM79	CLEARED TO [position] VIA [route clearance]
UM80	CLEARED [route clearance]
UM83	AT [position] CLEARED [route clearance]
UM117	CONTACT [icao unit name][frequency]
UM120	MONITOR [icao unit name][frequency]
UM135	CONFIRM ASSIGNED ALTITUDE
UM153	ALTIMETER [altimeter]
UM159	ERROR [error information]
UM160	NEXT DATA AUTHORITY [icao facility designation]
UM161	END SERVICE
UM162	SERVICE UNAVAILABLE
UM163	[icao facility designation] [tp4 table]
UM166	DUE TO TRAFFIC

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FANS MSG ID	FANS Message Element
UM167	DUE TO AIRSPACE RESTRICTION
UM169	[free text]
UM177	AT PILOTS DISCRETION

Table 9 shows all of the downlink messages planned for Tower and En Route services.

Table 9. Downlink Messages

FANS MSG ID	FANS Message Element
DM0	WILCO
DM1	UNABLE
DM2	STANDBY
DM3	ROGER
DM6	REQUEST [altitude]
DM9	REQUEST CLIMB TO [altitude]
DM10	REQUEST DESCENT TO [altitude]
DM20	REQUEST VOICE CONTACT
DM22	REQUEST DIRECT TO [position]
DM25	REQUEST CLEARANCE
DM38	ASSIGNED ALTITUDE [altitude]
DM55	PAN PAN PAN
DM56	MAYDAY MAYDAY MAYDAY
DM57	[remaining fuel] OF FUEL REMAINING AND [remaining souls] SOULS ON BOARD
DM58	CANCEL EMERGENCY
DM59	DIVERTING TO [position] VIA [route clearance]
DM60	OFFSETTING [distance offset] [direction] OF ROUTE
DM61	DESCENDING TO [altitude]
DM62	ERROR [error information]
DM63	NOT CURRENT DATA AUTHORITY
DM64	[icao facility designation]
DM65	DUE TO WEATHER
DM66	DUE TO AIRCRAFT PERFORMANCE
DM68	[free text]

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FANS MSG ID	FANS Message Element
DM73	[version number]
DM80	DEVIATING [distance offset] [direction] OF ROUTE

Appendix F: FAA CPDLC Acronym List

Table 10. Table of Acronyms

Acronym	Definition
ABRR	Airborne Re-route Execution
ACARS	Aircraft Communications Addressing and Reporting System
ACID	Aircraft Identification (Code)
ACK	Acknowledge
ACL	Access Control List
ADAR/PDAR	Adapted Departure-Arrival Route/Preferential Departure-Arrival Route
ADR/PDR	Adapted Departure Route/ Preferential Departure Route
AFM	Aircraft Flight Manual
AGL	Above Ground Level
AID	Aircraft Identification
ANSP	Air Navigation Service Provider
AOC	Airline Operations Center
ARTCC	Air Route Traffic Control Centers
ASN1	Abstract Syntax Notation One
ATC	Air Traffic Control
ATOP	Advanced Technologies and Oceanic Procedures
ATS	Air Traffic Services
ATSU	Air Traffic Services Unit
CAA	Confirm Assigned Altitude
CAF	Cleared As Filed
CC1	Connect Confirm
CDA	Current Data Authority
CDR	Coded Departure Routes
CERA	Controller-Entered Reported Altitude
CHI	Computer Human Interface
CPDLC	Controller-Pilot Data Link Communication
CSP	Communication Service Provider
DAT	Data Application information
DCIT	Data Comm Implementation Team

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Acronym	Definition
DCL	Departure Clearance
DCNS	Data Communications Network Service
DLD	Data Link Dispatch
DM	Departure Message
DP	Departure Procedure
DPP	Departure Procedure information (SID/Climb via and Climb out)
E2E	End-to-End
ERAM	En Route Automation Modernization
ERR	Error indicator
FAA	Federal Aviation Administration
FANS	Future Air Navigation System
FDB	Flight Data Block
FDR	Fixed Radial Distance
FIR	Flight Information Region
FLID	Flight Identification
FMC	Flight Management Computer
FMS	Flight Management System
FOC	Flight Operations Center
FPL/FP	Flight Plan
FRC	Full Route Clearance
GREQ	Gate Request
IATA	International Air Transport Association
IC	Initial Contact
ICAO	International Civil Aviation Organization
ID	Identification
IFR	Instrument Flight Rules
IRD	Interface Requirements Document
JMS	Java Message Service
L/L	Latitude/Longitude
LTV	Latency Time Value
NAS	National Airspace System

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Acronym	Definition
NAT	North Atlantic Tracks
NAVAID	Navigational Aid
NDA	Next Data Authority
NEMS	NAS Enterprise Management Service
NM	Nautical Mile
PBD	Place Bearing Distance
PDC	Pre-Departure Clearance
REG	Registration
SATCOM	Satellite Communication
SDB	Subscriber Database
SID	Standard Instrument Departure
STAR	Standard Terminal Arrival Route
STBY	Standby indicator
TDLS	Tower Data Link System
TFM	Traffic Flow Management
TMU	Traffic Management Unit
TOC	Transfer of Communication
TRACON	Terminal Radar Approach Control
UM	Uplink Message
VDL	VHF Data Link
VFR	Visual Flight Rules
VHF	Very High Frequency
XML	Extensible Markup Language