

# S1P1 CPDLC DEPARTURE CLEARANCE END2END DESCRIPTION

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An overview of the FAA Segment 1 Phase 1 (S1P1) Implementation of CPDLC Departure Clearance (DCL) processing from an end-to-end perspective

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# **DCIT End-to-End Procedures for CPDLC Departure Clearance Operational/Production System**

## **(Segment 1 Phase 1)**

### **1. Overview**

This document describes the Future Air Navigation System (FANS) 1/A(+) Controller Pilot Data Link Communication (CPDLC) Departure Clearance (DCL) for the “Production” system that is being deployed by the Federal Aviation Administration (FAA) in 2016, from an end-to-end view. This is a high-level summary designed to capture the Data Comm Implementation Team (DCIT) inputs into the operational procedures and concepts for this new CPDLC capability for departure clearances, and was developed from the comparable End-to-End Procedures for the Trials demo system and the Segment 1 Phase 1 (S1P1) Production system specifications. This is designed to be a work in progress, leveraging DCIT, industry and user community inputs, and is planned to be updated as new information becomes available.

Note that the appendices and most of the S1P1 Production system documents use the term “DCL” for the FANS CPDLC departure clearance. Within this E2E DCIT document, the term CPDLC will be used, however the term DCL may be considered synonymous.

### **2. User Preferences and Flight Plan Filing**

#### **2.1. Subscriber Data Base**

Prior to specific flight plan filing, the user has an option to designate flights that will participate in the CPDLC Departure Clearance service, using a new FAA Web-Access Subscriber Data Base (SDB). Details for using the SDB are provided in the User’s Guide For Tower Data Link Service (TDLS) Subscriber Database (SDB) Web-based Application. Using standard browser capabilities, users may designate DCL and PDC clearance delivery settings independently from flight plan filing.

The SDB values for CPDLC or PDC service will be superseded by the service preferences provided in the flight plan.

The SDB allows the user to provide a fleet default value an airport/fleet value, e.g., all airline flights at airport X get PDC, or a flight-specific value, e.g., XYZ123 gets CPDLC. For those users currently receiving PDC service, the default settings for the SDB will be the current PDC options.

##### **2.1.1. SDB Fallback Hierarchy**

If desired, users may designate a CPDLC primary/ PDC secondary hierarchy for CPDLC flights. If the CPDLC service is not available, flights that are explicitly designated as “PDC secondary” will revert to PDC if they have not yet been processed as a CPDLC flight. This user preference can be implemented in the Subscriber Data Base, the filed flight plan, both or none.

*Note: The fallback to PDC capability applies when the entire CPDLC service is unavailable at an airport, not when an individual flight ends up not being eligible for a CPDLC clearance.*

### 2.1.2. SDB Updates

Users may update the SDB up to 60 minutes prior to the filed departure time (P-time). If a user wants to change delivery preferences after that time, they should either cancel and refile or amend the flight plan accordingly (up to approximately 45 min).

## 2.2. Flight Plan Filing

### 2.2.1. Service Eligibility

- a. In order to receive CPDLC or PDC service, users should file an ICAO flight plan, nominally not later than 45 minutes prior to P-Time (P-Time defined within this document as the proposed departure time in the flight plan), via normal flight plan filing mechanisms.
- b. The flight plan must have the Flight Identification (FID) in Field 7 (e.g. FDX123), the departure airport, and registration number in field 18, per standard requirements for FANS operations (ref: GOLD 2.2.6.2.a).

### 2.2.2. User Preference in Flight Plan

For flights that will participate in the CPDLC service or the legacy PDC service, users may designate the flight as CPDLC or PDC in either the ICAO Flight Plan (FPL) and/or the FAA Web-Access SDB (see above).

- i. If using the ICAO FPL, the user includes the relevant equipage codes and "Z" in the Equipage Field 10a, and the appropriate CPDLC/PDC delivery preference code in the DAT/ sub-field of Field 18. (See Appendix D, Table D - 1 ICAO FPL Field 10a and Field 18 DAT/ Codes, for the specific proposed preference codes.
- ii. In the ground system, the ICAO FPL always takes precedence; if the clearance delivery preference codes are in the flight plan, they will override anything in the SDB.

### 2.2.3. Flight Plan Fallback Hierarchy

In addition to designating the preferred clearance delivery mechanism, users may optionally designate a “CPDLC DCL primary/PDC secondary” hierarchy in the ICAO FPL.

- a. If the user designates it as such, a flight may revert to PDC if the CPDLC service becomes unavailable. If no PDC secondary code is provided, then the ground system will revert to voice for CPDLC flights.
- b. Hierarchy codes in the flight plan supersede any hierarchy preferences in the SDB.
- c. If the user did not file a CPDLC or PDC preference code in the original flight plan, a subsequent flight plan amendment may be entered to provide it within a site adaptable time prior to P-Time, e.g., 45-60 min.

Users may also update the flight plan codes in the flight plan up to the existing site adaptable parameter that allows users to amend flight plans. After that time, any issues/requests would require voice discussion with ATC. *Note: The adaptable time is currently configured per site based on flight strip printing times, e.g. 30 minutes expected at most sites, and other values up to a maximum of 60 minutes at other sites.*

### 2.2.4. Ground System Processing of Routes

This section contains route loadability rules for FANS equipped aircraft. 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. The following definitions apply:

- Fix. As used below, the term ‘fix’ means published intersections, waypoints, or navaids. A fix may also be a fix-radial-distance (FRD), 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.
- a. **General Rules.**
    - i. Use of an airway as a route element requires a published entry and exit point for the airway, (e.g. ..SJN.J108.GINGR..),
    - ii. An implied airway/airway junction (i.e. no fix between airways) is NOT loadable,(e.g. .J4..J65.).
    - iii. If a named fix is published at the implied junction, it may be added to make the route loadable, (e.g. .J4.ABI.J65.). *Note- This is the preferred option.*
    - iv. A navaid radial is NOT a loadable route element in a DataComm clearance, e.g. .AIR111. or .ABQ092R.).

- v. An FRD may be used in place of a navaid radial, or unnamed airway junction, (e.g. ..TCH..TCH094074..MTU..) *Note- Use a named fix, if available. Some PlaceBearingDistance (PBDs) are also an issue for some aircraft and may not be loadable.*
  - vi. Unpublished, named (Ghost) fixes are not loadable, e.g. KMSY..TIKDP..).
  - vii. 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.
- b. **Departure Phase** (ADR/PDR, ADAR/PDAR, CDR, IFR Preferential Route, Playbook Routes, etc.)
- i. The first route element after departure must NOT be an airway, (e.g. KPHX.J65..).
  - ii. The first route element may be a fix, or a 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..).
- c. **Arrival Phase** (AAR/PAR, ADAR/PDAR, APR, CDR, IFR Preferential Route, Playbook Routes, etc.)
- i. The last route element prior to destination must NOT be an airway, (e.g. ..J78.KAMA).
  - ii. The last route element must be a fix, or a 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).
  - iii. Arrival procedures, i.e., STARs, should be filed with a published arrival transition.
- d. **Dynamic Routes.** 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 – see Section 3 for details.
- i. 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 lat/longs or name (e.g., NATW) will be considered part of the "AS FILED" clearance.
  - ii. If the filed route does not match the enroute automation processed route then the initial CPDLC departure clearance will be a UM79, clearing the flight to where it rejoins the route, as long as this join point is within the ground system navigational database.
  - iii. If a UM79 is not possible, the ground system will attempt to generate a UM80. Some dynamic routes may be eligible for a UM80 if the en route NAV database contains all relevant route elements. However, it

is expected that the majority of flights flying international routes with NAT Tracks will not be eligible for a UM80.

- iv. For both initial and revised clearances, if a UM79 or UM80 is not possible, then the controller will revert to a voice clearance.
- e. **Other.** Additional filing guidelines are designed to minimize discons and auto-loading issues. These include the following undesirable filings:
  - i. Three (3) Letter Identifiers being utilized as origin and destination airports.
  - ii. "XXX" indicating an incomplete route. This will prevent a CPDLC or PDC departure clearance from being generated.
  - iii. *Any custom non-published points inserted into the route.*

*Note: Some undesirable route elements are also being applied by ground automation today based on local facility adaptation, e.g., coded routes or Traffic Flow Playbook routes. The FAA is working to remove or significantly reduce any automation-applied adapted route elements that cause loadability issues.*

### 3. Initial CPDLC Clearance Generation

Approximately 30 minutes prior to the proposed departure time (specifically at a parameter time configured to the site's current strip printing time), the en route ground system (ERAM) triggers strip printing in the tower with the planned route. The ground system will evaluate the route for CPDLC after ground system route processing.

#### 3.1. Clearance Type Determination

The following summarizes the ground system determination of the type of CPDLC departure clearance that a flight will receive as an initial clearance. Within this section the ground system processed route, after route conversion of either an original filed route or a subsequent amended route, will be referred to as the Data Comm route. The en route automation ground system may add, delete or modify SIDs and transitions based on adaptation rules for the application of PDR/ADRs.

##### 3.1.1. User Preferences

The ground system first determines which type of clearance the flight will receive CPDLC, PDC or voice, based on previous user designation. *Note: The tower controller does not have the capability to modify the flight plan hierarchy codes. The controller can revert to voice*

##### 3.1.2. Cleared as Filed

- a. If the route of flight contained in the original filed flight plan is not altered by the ground system route processing automation from what it

received, the ground system will create a Cleared as Filed (CAF) CPDLC clearance for the initial departure clearance.

- b. If the filed flight plan included a SID/transition, the UM169 will include the SID/transition name and the phrase “THEN AS FILED”; if there is no SID, and no climbout instructions then the phrase will be “AS FILED”.
- c. The ground system will build a Cleared as Filed clearance using UM169 and UM19 (when applicable).
- d. The CAF clearance will not include a route clearance variable but will include any applicable SID and transition in a UM169. It will also include Climb Via instructions in a UM169 in lieu of a UM19 initial altitude, when applicable. If automation or controller adds, modifies or removes a SID and/or departure transition, then the flight is not eligible for an CAF Initial clearance, and the an Initial UM79 will be sent instead.

### 3.1.3. Initial UM79

- a. If the Data Comm route, starting from the first element after the transition fix (if applicable) is changed in any way from the original filed, the flight is not eligible for a CAF initial clearance. The ground system will attempt to create an initial UM79 specifying the route from departure transition to the route element where the original route is rejoined. Example:
  - Original Filed Route: KSLC.LEETZ3.HOLTR..TCH..CYS..EMI
  - Data Comm Route: KSLC.PECOP3.BAM..OTT..EMI
  - UM79 Clearance: CLEARED TO EMI VIA BAM OTT,  
PECOP3.BAM, AFTER EMI CLEARED TO KBWI ARPT AS  
FILED, CLIMB VIA SID {3 lines condensed for space}
- b. When the filed route can be rejoined within the FAA NAV database, the ground system will uplink an INITIAL UM79 DCL message with “AFTER [position] CLEARED TO [airport] ARPT AS FILED”, plus other elements as required (e.g. expected altitude, departure frequency, etc.).
- c. If the SID has been removed from the original filed route by en route automation, the Data Comm route does not match and the flight is not eligible for a CAF initial clearance. The ground system will create an initial UM79, which includes text in the UM169 “NO DPP” or “NO SID” to explicitly indicate that SID (and transition if applicable) has been removed. The “NO SID” tag is used if other elements of a local departure procedure still apply, e.g., climbout such as FLY HDG xxx.  
*Note: The NO DPP or NO SID text is also included if a subsequent revision removes the SID.*



- d. If the Data Comm route, starting from the first element after the transition fix, is unchanged, and en route automation adds a SID and transition, then the flight is not eligible for a CAF initial clearance and the system will generate an initial UM79. Example:
- Original Filed Route: KSLC..TCH
  - Data Comm Route: KSLC.LEETZ3.HOLTR..TCH
  - UM79 Clearance: CLEARED TO TCH VIA HOLTR, LEETZ3.HOLTR, AFTER TCH CLEARED TO KBWI ARPT AS FILED, CLIMB VIA SID
- e. If the Data Comm route, starting from the first element after the transition fix is unchanged, and the SID and transition, or just the transition is changed by en route automation, then the flight is not eligible for a CAF initial clearance and the system will generate an initial UM79.

#### **3.1.4. Initial UM80**

- a. If a CAF or a UM79 is not possible for this initial CPDLC departure clearance, and the en route ground system has NAV database information for the entire route, and the ground system can process the entire route, then the ground system will uplink a UM80 with the entire route of flight.

#### **3.1.5. Exceptions**

- a. If the flight is eligible for a CAF clearance but the flight plan remarks includes "FRC", the ground system will build an initial UM80 when possible. If the ground system cannot convert the route to its destination, then an initial UM79 will be built instead.
- b. If the flight is eligible for a CAF clearance but CAF eligibility has been disabled or deselected by the controller for the flight, e.g., the controller wants to send the entire route, the ground system will build an initial UM80 when possible. If the ground system cannot build a UM80, such as for an international flight, then the session will be terminated and controller and pilot will coordinate via voice. Note: This is one of the conditions when the system will not try to build a UM79. If either the pilot or the controller wants a full route clearance and it cannot be generated, then the controller will handle via voice procedures.
- c. Voice Clearance. If the filed route is not identical to the ground system processed route and the ground system could not create a CPDLC clearance with an initial UM79 or a UM80, then the controller will be

notified and the clearance will be provided via voice, using current voice procedures.

- d. Incomplete Route (XXX). If the user files XXX or the ground automation cannot process the route to its destination, the ground system will not create a PDC or CPDLC clearance for the flight. This will be handled via voice.

## **3.2. Initial CPDLC Clearance Contents**

### **3.2.1. Departure Procedure Information**

- a. The CPDLC clearance will include departure procedure/SID text (when applicable) and altitude instructions in the form of an initial MAINTAIN altitude or a Climb Via instruction. Whether a Climb Via instruction or a Maintain altitude instruction is included will be based on facility operations. The ground system will provide automation support for the appropriate options, e.g., adapted defaults for controller/system selection in generating the DCL and rules to ensure appropriate combinations.
- b. If applicable, the ground system will provide additional departure procedure/SID transition information by inserting required data elements, e.g., the first filed route fix for a SID/Transition combination.
- c. If there is no published departure procedure (SID or SID plus transition) in the original filed route and it is identical to the ground system processed route, and the controller adds a SID or SID plus transition, the ground system will generate a CAF clearance.

### **3.2.2. Controller/System Approval**

- a. The controller reviews the clearance. At facilities running in automode, no controller approval is required for a CPDLC or PDC clearance unless FRC is in the flight plan or there are revisions to the flight plan or clearance data.
- b. The ground system automation formats the clearance into a FANS-1/A clearance using UM79, UM80, UM169, and UM19 message elements as appropriate, and once a successful aircraft Logon and Session establishment has been completed with TDLS the DCL will automatically be sent to the aircraft otherwise TDLS will place the approved DCL in the queue. (See Appendix for sample messages).
- i. Note: The ground system initiates flight plan correlation and connection establishment as described in the following section.

### 3.3. Gate Request Message

- a. If required operationally at the departure tower, the user "opts in" for receiving a GREQ message from TDLS by providing user preferences in the Subscriber Database
- b. Independent from session establishment, the ground system will send a Gate Request (GREQ) message to the user/airline host system, as described in the TDLS-CSP IRD, and Appendix C, upon clearance approval by the controller(or by the ground system in automode) and when operationally applicable.
- c. The user/airline host system responds to the GREQ message with two messages: a system acknowledgement (ACK) on receipt of the GREQ and a GREQ response message within an operationally appropriate time period (currently, 2 minutes for a PDC). The GREQ response message from the user/airline host system contents are specified by the TDLS-CSP IRD and include the departure parking gate, if known or "G" if gate is unknown.

## 4. Logon and Connection Establishment

### 4.1. Logon

#### 4.1.1. Pilot Logon

At the appropriate time, and while still at the departure parking gate, the aircrew logs-on using facility ID or KUSA (with NSDA turned on) as the single logon Identifier for all participating TDLS facilities supporting DCL operations. This can be done any time after the airline has filed the flight plan with the FAA.

#### 4.1.2. Ground System Logon Processing

The Ground system will accept valid log-ons, provided that log-on contains the registration number, correct departure airport Facility ID e.g., KUSA, Flight Identification, and a matching Flight Plan on file. The position in the log-on request must be within an adapted distance of the departure airport. Specifically:

- a. When a log-on request message (FN\_CON) has valid and required data, the ground system will accept the log-on and send a positive log-on response (FN\_AK). In all other cases the ground system will send a negative response (FN\_AK).

- b. If the log-on is attempted and no response is received, or a negative response is received, the aircrew may attempt another log-on or may choose to revert to voice for their departure clearance.

*Note: Actual flight plan correlation and CPDLC connection occurs only after the tower controller approves the CPDLC clearance at some point after P Time-30 minutes. If the aircrew logs on prior to controller approval, the ground system will wait until the controller approval and FP correlation has been completed to initiate a CPDLC connection. If the controller approves the clearance prior to the log-on request from the aircrew, the ground system will initiate the connection establishment once TDLS is in receipt of FP correlation and detection of a successful logon. The DCL will be automatically sent to the aircraft once an ATC CPDLC connection is established.*

## **4.2. Connection Establishment**

### **4.2.1. Correlation**

- a. Upon approval of the CPDLC clearance by the controller (or by the ground system if the facility is operating in automode) and when there is an accepted logon, the ground system will attempt to correlate the flight plan data with the logon data. If correlation fails, an error message is provided to the controller, and the controller and pilot coordinate via voice.
- b. Note: Flight data items used for correlation from the aircraft are the aircraft registration/tail number, the Flight ID and the lat/long position reported in the log-on. Flight ID (ABC123), Tail Number/Registration, and lat/lon in position variable are used. The ICAO facility ID is used, e.g., logging on to KUSA, but correlation uses lat/lon to determine if matches departure airport in flight plan.
- c. When an update (change) to flight data items used for correlation are received for a FP that is correlated with a log-on, the CPDLC connection associated with that flight plan will first be terminated, and the crew will then need to re-accomplish the log-on.
- d. Block List. If the aircraft has been identified as ineligible for CPDLC service due to logon problems, e.g., excessive logons that caused the flight to be on the “block” list, the ground automation will provide failure information to the controller when flight plan correlation is attempted. The controller and pilot will coordinate to resolve any block list issues. This may include coordination with the dispatcher and FAA personnel at a central national position.

### **4.2.2. Connection**

- a. When correlation is successful, the ATC ground system will attempt to establish a CPDLC connection with the aircraft by sending a CR1 (to

which the aircraft responds with a CC1). Upon receipt of a DR1 or other error indication in response to the CR1, the ground will retry sending the CR1 to the aircraft one time, after an adaptable parameter of time.

- b. Upon a successful CPDLC connection, the ATC ground automation and avionics may notify the controller or aircrew of the availability of CPDLC service for the flight. The ground system provides a controller display indication. Some avionics will provide an aural notification to the aircrew.
- c. If the controller/system approves the departure clearance and there is no accepted log-on available, the ground system will “wait” until there is an accepted log-on, and perform flight plan correlation, then attempt to establish the CPDLC connection.

### **4.3. ReLogon and Callsign Changes**

The following section describes expected behavior when a departing flight on the ground is the continuation of a delayed inbound arrival and when two flights on the ground have a hull swap.

- 4.3.1. Continuation Flight. Nominal Desired Scenarios. The departing flight will modify its callsign (AID), e.g., DL416 becomes DL416P. Timing and sequence determine the ground system processing.
  - a. Prior to P-30.
    - Pilot had already logged on with old AID (DL416), before P-30 or after P-30 and before controller processes DL416, which means there is no active session.
    - Pilot does a new logon with DL416P. The ground system accepts the Logon and replaces with new AID DL416P.
    - The AOC amends the callsign (AID) from DL416 to DL416P. The amendment by the AOC has to be prior to any strip printing or the ground system rejects (baseline). Alternately, the AOC cancels the DL416 and refiles as DL416P.
    - No session was ever established. Once the tower controller approves the desired flight plan, DL416P after P-30, the ground system will initiate connection establishment with the aircraft.
  - b. After P-30, after session already started for DL416 (old).
    - Pilot coordinates with tower controller via voice.
    - Controller removes (RS) DL416 and may manually terminate the session.
    - The ground system closes the logon for DL416. If the controller did not manually terminate the session, the ground system will

terminate it after the session timer expires (nominally 5-10 min or as locally adapted).

- Meanwhile, pilot relogs on with new AID DL416P. *Note: Some avionics would terminate the connection if it is still established on the relogon.*
- Dispatch enters a new flight plan for DL416P. When received, the controller/system processes the new flight plan.
- Flight plan correlation is successful, a new session is established, and the DCL once approved is automatically sent to the aircraft.

#### 4.3.2. Continuation Flight Non-Nominal Undesired Scenarios

- a. Prior to P-30.
  - Pilot does not send a new logon with DL416P (The ground system still has logon for DL416).
  - When controller/system processes the flight at P-30, flight plan correlation would fail (AID mismatch), the controller is notified of the error, and the clearance is delivered via voice. No further CPDLC will be available.
- b. After P-30, after session already started for DL416 (old).
  - Pilot does not logon again or controller does not remove the old flight plan, or pilot relogs on prior to flight plan fixing. These cases will result in flight plan correlation failure and session termination errors. No further CPDLC will be available.
  - If dispatch does not refile, the flight will be handled via voice.

#### 4.3.3. Hull Swap Nominal Desired Scenarios

- a. Prior to P-30.
  - Pilot is logged from Aircraft with tail number N123GQ before the tower controller processes the associated flight plan, which means there is no active session
  - Hull swap and pilot moves to new aircraft. Pilot sends a new logon with tail number N456GQ. The ground system accept the logon and creates a new logon entry for tail number N456GQ
  - The AOC amends the Tail Number (REG) from N123GQ to N456GQ. The amendment by the AOC has to be prior to any strip printing or the ground system rejects (baseline). Alternately, the AOC cancels the N123GQ and refiles as N456GQ.
  - At P-30, the tower controller receives and approves the desired flight plan, with N456GQ tail number, the ground system will initiate connection establishment with the aircraft.

- b. After P-30, after session already started for N123GQ (old)
  - Pilot coordinates with tower controller via voice
  - Controller removes (RS) the old flight plan and may manually terminate the session
  - The ground system closes the logon for N123GQ. If the controller did not manually terminate the session, the ground system will terminate it after the session timer expires (nominally 15min)
  - Meanwhile, pilot logs on from new aircraft with tail number N456GQ
  - Dispatch enters a new flight plan for N456GQ. When received, the tower controller/system processes the new flight plan
  - New flight plan is successfully correlated with the new logon from N456GQ, a session is established, and DCL is approved, the clearance is automatically sent to the aircraft.

#### 4.3.4. Hull Swap Non-Nominal Undesired Scenarios

- a. Prior to P-30.
  - Pilot does not send a new logon with N456GQ (The ground system still has logon for N123GQ).
  - When controller/system processes the flight at P-30, flight plan correlation would fail (REG mismatch), the controller is notified of the error, and the clearance is delivered via voice. No further CPDLC will be available.
- b. After P-30, after session already started for N123GQ (old)
  - An amendment to the tail number on the flight plan will result in flight plan correlation failure and session termination error. No further CPDLC will be available.
  - If dispatch does not refile, the flight will be handled via voice

## 5. DCL Delivery and Uplink Response

### 5.1. Departure Clearance Delivery

Once a successful ATC connection has been established and the Departure Clearance has been approved by the controller, the DCL will be automatically sent to the aircraft for flight crew review and approval.

If appropriate and after the first accepted uplinked clearance the aircrew may request a subsequent Departure Clearance using only DM25 [REQUEST CLEARANCE] feature in the avionics. *See section 6.3 for additional information.*

- a. The aircrew should not append free text to this DM25. If free text is concatenated with the DM25, the ground system will respond with an error, UM159, for unexpected data.
- b. If the aircrew uses any other message type to request the Departure Clearance, the Ground System will respond with an error message: If the downlink is a DM67, the error will be a UM159 with UM169 "MESSAGE NOT SUPPORTED BY THIS ATSU".

## 5.2. Initial CPDLC Clearance Uplink Response

### 5.2.1. Clearance Contents

The Ground system will automatically send a DCL as follows:

- a. Upon ATC connection establishment with the aircraft the Ground System delivers the pre-approved, stored departure clearance to the aircraft using FANS-1/A message elements UM80, UM169, UM19, and UM79, as appropriate. A sub-set of the elements may be sent in a message (see Appendix A for message samples).
- b. The clearance will contain either Cleared as Filed or a full or partial route, and all other relevant data elements from the flight plan or locally applied procedures. It will contain an expected cruise altitude, a departure frequency, and either a Climb Via text or a Maintain altitude. It may also contain climbout instructions, a beacon code, a SID/transition from the departure airport and/or STAR/transition at the arrival airport.
- c. For uplinks with FMS Loadable Routes a FAA produced route string representing the CLEARED ROUTE will be appended at the end of the DCL as supplemental information to assist flight crews in route and legs 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.
- d. The clearance type will be based on the following (see *CPDLC Generation section above for details*):
  - When a filed route matches the en route automation processed route the ground system will uplink a "CLEARED AS FILED" DCL message. *Note: If there is a departure procedure/SID, the terminology will be "THEN AS FILED".*
  - An initial UM79 when a CAF clearance cannot be generated and the flight is eligible for a UM79.



- An initial UM80 when the ground system cannot create a CAF or initial UM79 clearance
  - When the ground system cannot create a CAF, an initial UM79 or a UM80 clearance, the controller will revert to voice, using current voice procedures.
- e. The ground system uplinks the appropriate clearance to the aircraft as a positive response to the DM25 clearance request if requested by the flight crew.

#### 5.2.2. CPDLC Clearance Format and Guidelines

- a. The uplink does not contain a departure runway or SID in the loadable portion (UM80 or UM79), though it will normally contain a SID and transition as appropriate in a non-loadable UM169 free text element within the clearance.

*Note: The SID is included in the non-loadable portion because FAA systems cannot include the departure runway in the uplink and this is required for correct loading of the SID. Although departure runway cannot be provided within the initial production system, inclusion of departure runway is an important feature for aircrew and the FAA is investigating how to provide it in future versions of the production system.*

- b. If the [routeclearance] variable in an uplink contains an arrival procedure/transition, then the last waypoint in the [routeinformation] variable must be the same as the first fix in the arrival transition (if specified) or the arrival procedure (if a transition is not used). If the uplink contains an arrival transition, the arrival transition name must be included in the procedureretransition field of the procedurename variable.
- c. The ground system will include the optional lat/long field for Published identifiers (waypoint names) in the route information variable of Departure Clearance uplinks.
- d. UM169 [freetext] elements will include no more than 80 characters.
- e. When an airway is included in the filed flight plan with published named waypoints for the entry and exit points, the entry and exit point will be designated by the published named waypoints in the routeclearance variable.
- f. When an airway intersects with another consecutive airway with no intersecting waypoint in the flight plan and the proposed uplink would contain a route, i.e., not CAF, the ground system will prevent an uplink from being constructed and terminate the CPDLC session with the aircraft. The controller and pilot will then need to resolve the issue via voice.

- g. UM79 will be used when the clearance includes a route change ending at the specified position (the “TO” point) which may be a point after the SID or the SID Transition (if these are present) up to and including the last en-route point prior to the first point in the first Arrival, Approach, or associated Transition in the aircraft’s cleared route.
- h. When a UM79 is used for the initial departure clearance, the uplink will include a UM169 free text stating that the rest of the route is unchanged following the “TO” point in the uplink (e.g. an initial UM79 with a "TO" point of MCB will be followed by a UM169 with “AFTER MCB CLEARED TO KBWI ARPT AS FILED” and then the initial altitude information (Climb Via SID or MAINT altitude)  
*Note: The position variable in a UM169 does not allow for the same level of resolution as a lat/lon in the position variable of a UM79. Because each avionics display this UM79 position differently, the UM169 position will not always match the level of a UM79 position. A UM169 lat/lon position will be truncated (not rounded) to the minute and be sent as Direction, Hours, Minutes. Example: UM79 position displayed as N21 20 22.1 W157 55 44.8 , UM169 sent as N2120W15755 .*
- i. For a UM79, when the “TO” point is an airway exit waypoint, the Ground System will include the “TO” point as the last element in the routeinformation field. When the “TO” point is not an airway exit waypoint, the ground system will omit the “TO” point as the last element in the routeinformation field.
- j. If the arrival procedure and/or arrival transition is changed from what was filed, the initial DCL clearance will be a UM80 (this ensures loadability of the arrival), unless the flight is not eligible for a UM80, in which case it will revert to a voice clearance.
- k. The Ground System will not include the departure or arrival airport in UM79 routeclearance variable.
- l. When a UM80 contains an arrival procedure without a published arrival transition fix, the ground system will prevent an uplink from being generated and sent. Any existing session will be terminated, the controller will be notified, and the controller and pilot will coordinate via voice. *Note: See Appendix D for details and additional information on future approach.*

## 6. Pilot Response to Clearance

### 6.1. FMS Load and Review

The aircrew loads the revised CPDLC clearance into the FMS and reviews it. If acceptable, the flight crew executes the route in the FMS, addressing any potential discons or loading issues.

## 6.2. Downlink Response

Upon acceptance and loading into the FMS, the aircrew selects the appropriate downlink message.

- a. If acceptable, a positive response is generated, i.e., DM0 [WILCO] or .DM3 [ROGER].
- b. If unacceptable, or if a “Partial Load” or “Load Failure” indication occurs, the crew downlinks DM1 [UNABLE].
- c. If a DISCON is present when the clearance is loaded, the aircrew may downlink a DM2 [STANDBY] response while trying to resolve. If the aircrew cannot resolve the DISCON, the aircrew downlinks DM1 [UNABLE] and reverts to voice.

*Note: Aircrew should not add a “DUE TO” clarification (DM65, DM66 or DM67) to the REJECT/UNABLE of a CPDLC clearance – revert to ATC voice procedures with Clearance Delivery when a “REJECT/UNABLE” response is required. If the crew appends a “DUE TO” to a DM1 [UNABLE], the controller will receive the UNABLE portion without the “DUE TO” rationale.*

## 6.3. Additional DM25 Requests

- a. If the aircrew requests a clearance again after sending the WILCO to the initial CPDLC clearance, the Ground System will provide an indication to the controller and a proposed CPDLC departure clearance using a UM80 reflecting the full route as held in current the Ground System data.
- b. The controller will manually approved the CPDLC departure clearance and the Ground System will transmit to the aircraft. For some flights, such as international flights, a UM80 may not be able to be sent, in which case the system will attempt to generate a UM79 or advise the controller to revert to voice.

*Note: If the original DM25 request is still open, then the ground system will send an open transaction error back to the aircraft.*

# 7. AOC/FOC Dispatch Message Generation and Response

## 7.1. Dispatch Message Delivery

### 7.1.1. User Preference

Users may opt out of receiving the Dispatch message by using the Subscriber Data Base capability.

### 7.1.2. Dispatch Message Delivery

- a. When a CPDLC clearance is uplinked to the aircraft, the ground system will provide a Dispatch message including required parts of the clearance except the beacon code to the user host system via the user-supplied 7-character IATA address, as defined in the Appendix B and in the TDLS-CSP IRD.
- b. In addition to clearance contents, for “CLEARED AS FILED” clearances or initial UM79 clearances, the dispatch message will include the full route from the ground automation processed flight plan.
- c. The dispatch message will include a header “CPDLC DCL DISPATCH MSG – NOT TO BE USED AS A CLEARANCE”, and any contents sourced from the uplinked CPDLC clearance will be included as text.
- d. When the ground system receives a pilot response of WILCO, ROGER or UNABLE to the CPDLC uplink message, it will provide the pilot response to the AOC/FOC in a Dispatch message update, as a Pilot Response Dispatch Message, as defined in the TDLS-CSP IRD.

### 7.1.3. Dispatch Message Response

*Note: In this context, some CSPs may provide user host functions to their clients.*

- a. Users shall be capable of distinguishing an initial or updated Dispatch Message from a PDC clearance.
- b. Upon receipt of an initial or updated Dispatch Message, the user host system shall send a system acknowledgement back to the Ground System.
- c. The user shall ensure that the Dispatch Message is not forwarded to the aircrew/aircraft.

## 8. Revised CPDLC Uplinks

For aircraft participating in CPDLC departure clearances, one or more Revised Departure clearances may be sent by ATC prior to aircraft departure (see Appendix A for sample messages). For aircraft receiving PDC clearances, revisions will be handled via voice.

### 8.1. Revised Clearance Approval

All CPDLC clearance revisions will be reviewed and approved by tower ATC before being transmitted to the aircrew. These include revisions generated by changes to the flight plan and revisions initiated by the controller for locally applied clearance information, e.g., frequency.

## 8.2. Revised Clearance Content/Constraints

Revised clearances will contain some or all of the same information as the initial Departure Clearance. In general, formatting rules and notes listed for the initial DCL clearance also apply to DCL revisions.

### 8.2.1. Content

- a. The uplink will never contain a departure runway or SID in the loadable portion (UM79, UM80, or UM83), though it may contain a SID and transition, climbout instructions, initial altitude or Climb Via instruction, etc., as appropriate in a non-loadable UM169 free text element(s).
- b. No altitude or speed constraints will be included in the loadable part of the message (UM79, UM80, UM83), other than those automatically loaded from the aircraft's NAV Database with an uplinked STAR contained in the route clearance variable. Revisions may be sent as a UM80, UM83, or UM79, according to the information being revised.
- c. Revisions include a free text header information indicating which portions of the departure clearance have been revised, e.g., "DPP" or "ALT". Revised clearances may include truncated text strings when required to meet overall message length constraints, e.g., 80 characters.
- d. A revised CPDLC clearance may contain information that is unchanged but is repeated to reduce ambiguity, such as the initial altitude, Climb Via text, climbout, SID and transition fields. Whenever part of the departure procedure or related route portion is changed, the ground system will resend the entire departure procedure. For a revised CPDLC departure clearance with a UM79 or UM80, the ground system will include non-blank fields for the SID, transition, climbout, climb via or MAINT ALT in the revised uplink whether or not there was a change.

### 8.2.2. UM79

- a. The UM79 route message will be used when the clearance includes a route change ending at the specified position (the "TO" point), which is a point after the SID or the SID Transition (if these are present) up to and including the last en-route point for which the en route automation has NAV data and has performed route processing for, prior to the first point in the first Arrival, Approach, or associated Transition in the aircraft's active route.
- b. When constructing a UM79, the Ground System will not include the departure airport or the destination airport in the route clearance element.

### 8.2.3. UM83

- a. When the UM83 capability is enabled in the ground system automation, a UM83 will be used when the revision includes a route change starting at a specified position (the “AT” point) which is the last point in the SID or the SID Transition (if these are present) or any point after that, excluding any point within the Arrival, Approach, or associated Transitions.
- b. If any portion of the route is outside the FAA automation NAV database, then the flight will revert to voice.
- c. The Ground System will not include a departure airport in the UM83 route clearance.
- d. When the “AT” point is an airway entry point, the Ground System will include the “AT” point as the first element in the route information field. When the “AT” point is not an airway entry point, the ground system shall omit the “AT” point as the first element in the route information field. *Note: Initial implementation will have UM83 disabled.*

### 8.2.4. UM80

- a. A UM80 will be used when the revision includes a route change and UM79 or UM83 is not appropriate according to rules above. This includes when the use of UM83 is disabled in the ground system automation.
- b. If a UM80 cannot be generated, the controller will revert to voice clearances.
- c. When a UM80 or UM83 (if applicable) contains an arrival procedure without a published arrival transition fix, the ground system will prevent an uplink from being generated and sent. Any existing session will be terminated, the controller will be notified, and the controller and pilot will coordinate via voice. *Note: See Appendix D for details.*
- d. After receiving an UNABLE, if a revised flight plan is received by the ground system, the ground system will construct a UM80 reflecting the full revised route. For international flights a UM80 may not be able to be sent, so the system will attempt to generate a UM79 or advise the controller to revert to voice.

## 8.3. Revised Dispatch Message

- a. When a revised CPDLC clearance is sent to the aircraft, the Ground System will provide a Revised Dispatch message including required parts of the clearance as defined in the TDLS-CSP IRD and summarized in Appendix B: CPDLC Error Processing

- b. The examples below include CPDLC error processing that include Cause, Result, and resultant Error Messages. The two tables include both Ground Error processing and Aircraft Error processing. The list is representative of known capabilities and system behavior that will be updated as new information becomes available.

### CPDLC Ground Error Processing

<b>Cause</b>	<b>Result</b>	<b>ERROR Message</b>
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 & UM169 "FREETEXT NOT SUPPORTED".	UM159 unexpectedData & 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

<b>Cause</b>	<b>Result</b>	<b>ERROR Message</b>
DM62 received with appended data that is not a DM67 Freetext	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
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 pilot response	Disregard the received message and send a CPDLC message containing message element UM169 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



- c. , with the exception of a beacon code, to the user host system via the user-supplied 7-character /IATA address.
- d. The Revised Dispatch Message will include a header “CPDLC DCL DISPATCH MSG – NOT TO BE USED AS A CLEARANCE” and any contents sourced from the uplinked CPDLC clearance, in text format. It will also include the type of revision in the header information, e.g., RTE.
- e. When a revised clearance contains a route revision, the ground system will include the full route from the ground automation processed flight plan in the revised Dispatch message regardless of whether or not a full route was sent to the aircrew in the revised uplink.
- f. User systems should be capable of distinguishing the Revised Dispatch Message from a PDC clearance. Upon receipt of the Revised Dispatch Message the user/airline host system will send an acknowledgement back to the Ground System. The Airline Host shall ensure that the Revised Dispatch Message is not forwarded to the aircrew/aircraft.

#### **8.4. Revised Clearance Response**

- a. The aircrew loads the revised CPDLC clearance into the FMS and reviews it. If acceptable, the flight crew activates the route in the FMS.
- b. As with an initial departure clearance, the aircrew responds with the appropriate downlink message. See previous section for details.

### **9. CPDLC Service Termination**

CPDLC Service termination for an individual flight can occur based on controller, the ground system or pilot initiated termination. In addition, the entire CPDLC service may be terminated by a facility.

#### **9.1. Controller Termination**

- a. If the controller needs to cancel or modify a CPDLC message, the controller shall contact the aircraft using voice with the accepted phraseology, e.g., “(flight ID) DISREGARD CPDLC MESSAGE” – followed by the correct clearance via voice as appropriate.
- b. If the controller terminates a CPDLC connection, the ground automation will uplink a UM161 end service message. *Note: There is an open issue about allowing concatenation of error rationale as free text with the UM161. This is being investigated for later releases and coordination with en route CPDLC.*

## 9.2. Pilot Termination

If the pilot needs to terminate the CPDLC connection, the aircraft sends a disconnect request to the ground system, which terminates the connection.

## 9.3. Ground System Termination

- a. If the ground system terminates a CPDLC connection, either due to the nominal case when a flight departs, or due to system error conditions(Appendix B), the ground automation will uplink a UM161 end service message. *Note: This is being investigated for later releases and coordination with en route CPDLC.*
- b. After notification that the flight has taken off and the flight plan has become an active flight plan, the Ground System will disconnect CPDLC with the aircraft at a parameter amount of time after departure. The disconnect time will be an adjustable parameter for each facility (e.g. initially 5-10 minutes).

*Note: Aircrew transiting to another FANS-supporting airspace (e.g. Oakland Oceanic, New York Oceanic) will need to log-on to the next FANS facility. No automatic transfer of the CPDLC connection will occur.*

- c. If ATC or the user deletes the flight plan, or the flight plan times out of the FAA en route automation system, the ground system will prevent any further CPDLC message exchange and will disconnect CPDLC with the aircraft after a time parameter (same time parameter as for when a flight becomes active.) If the deletion involves multiple flight plans in the system, the CPDLC disconnect will occur on controller action.

## 9.4. Enable/Disable CPDLC Service

If FAA personnel need to discontinue the entire CPDLC Service, tower personnel:

- a. May notify the users/ AOC(s) to commence filing flight plans in accordance with PDC procedures. The means of notification will depend upon the operational circumstances at the time; there is no additional automated notification at this point in time directly from the ground system. Current procedures and notification mechanisms are expected to be used, e.g., NOTAM or D-ATIS.
- b. Issue PDC clearances for DCL flights that are eligible to “fallback” to PDCs. If the user has filed the appropriate codes in the ICAO flight plan and/or designated the appropriate preferences in the Subscriber Database, and the clearance has not yet been processed, the ground system will generate a PDC for any initial clearance that is otherwise eligible for a PDC. If not eligible for a PDC, the ground system will

provide the controller with an indication and the flight will revert to a voice clearance.

- c. Issue clearances by voice for those flights which specified FANS CPDLC and did not specify 'PDC' as the fallback choice in the subscriber database or ICAO flight plan, or for which PDCs cannot be generated.

# Appendix A: DCL Production System Message Samples

## General for Initial and Revised Clearances:

Variables enclosed by ( ) are variables received from En Route automation. Variables enclosed in [ ] are Controller entered or local adaptation. Text enclosed in { } is explanatory text in the requirement.

Proceduredeparture and procedure transition (i.e., SIDs) are optional and may either be generated by en route automation (ERAM) as a result of the filed flight plan, or added by the controller or local adaptation. ERAM-provided values take precedence.

UM169 free text is limited to 256 characters by the ground system to facilitate avionics loading.

*Note: In any UM169, keyword should be separated by "." or " " separators and the message should not end with a separator.*

## Revised Clearances:

Header Tags. After the initial DCL has been accepted/WILCO'ed by the aircrew and one or more fields other than the route are amended, the Ground System will construct a Revised DCL containing a header that identifies all of the fields that have changed, using UM169 as follows:

- UM169 containing "REVISED" concatenated with:
  - "DPP" {if applicable when any of the SID, or climbout parameters are changed} ", "
  - "CLIMB-OUT" {if applicable},
  - "ALT" {if applicable when either Maintain altitude of Climb Via text is changed} ", "
  - "EXP ALT" {if applicable} ", "
  - "DPFREQ" {if applicable} ", "
  - "EDCT" {if applicable} ", "
  - "SQUAWK" {if applicable} ", "
  - "CONTACT" {if applicable} ", "
  - "LCLINFO" {if applicable}.

The remainder of the revised DCL contains the actual revised data, using UM80, UM79, UM83, and UM169 as applicable, as follows:

- UM80, UM79 or UM83 {if applicable}
- UM169 containing
  - (proceduredeparture) {if applicable} " " (proceduretransition) {if applicable}, [climb-out-procedure] {if applicable}
- UM169 containing
  - "MAINTAIN" [altitude] or Climb Via Text, as applicable for UM79 or UM80
  - "EXP" (requestedaltitude) [minutes-miles] {" MIN" or " NM" as determined by the adapted value of [minutes-miles]} {if applicable} " " AFT DP {if applicable},
  - "DPFRQ" [frequency] {if applicable}, or "SEE SID" {if applicable}
  - "EDCT"(edcttime) {if applicable},
- UM169 containing {if applicable}
  - "SQUAWK" (beaconcode) {if applicable},
  - [contactinfo],{if applicable},
  - [localinfo] {if applicable}.

Note: UM169 messages are fixed format. Keywords should be separated by ", " or " " when applicable, and the message should not end with a ", " or " ".



## Initial DCL Using UM79 - "Cleared To Position Via Route Clearance"

Element #	Msg. #	Parameters						Notes				
1	79	position			route clearance							
2	169	sid	“.”	transition	“,”	climb out		if no transition, no “.” if no climbout, no “.”				
<i>item counts</i>	46	6	1	5	2	32						
3	169	“AFTER”	position	“CLEARED TO”	airport	“ARPT AS FILED,”	“MAINTAIN”	alt	if climb via text = NONE and MAINTAIN alt <> NONE.			
<i>item counts</i>	70	6	16	12	4	16	9	7				
Or 3	169	“AFTER”	position	“CLEARED TO”	airport	“ARPT AS FILED,”	climb via text		if climb via text <> NONE and MAINTAIN alt = NONE.			
<i>item counts</i>	77	6	16	12	4	16	29					
4	169	“EXPECT”	altitude	“ ”	mins/miles	“NM” or “MIN” “AFT DP”	“,”	“DPFRQ”	“nnn.nnn” or “SEE SID”	“,” EDCT “	edct	EDCT is not always included in a DCL.
<i>item counts</i>	54	7	7	1	2	11	1	7	7	7	4	
5	169	“SQUAWK “		beacon	“ ” or “,”	contact info		“,”	local info		Use “,” after beacon if only one of contact info or local info is present.	
<i>item counts</i>	80	7		4	1 or 2	32		2	34			

## Initial DCL Using UM80 – Cleared Route Clearance

Element #	Msg. #	Parameters						Notes				
1	80	departure airport	arrival airport	arrival transition	arrival procedure	route						
2	169	sid	“.”	transition	“,”	climb out		if no transition, no “.” if no climbout, no “.”				
<i>item counts</i>	46	6	1	5	2	32						
3	19	altitude						if climb via text = NONE and MAINTAIN alt <> NONE.				
Or 3	169	climb via text										
4	169	“EXPECT”	altitude	“ ”	mins/miles	“NM” or “MIN” “AFT DP”	“,”	“DPFRQ”	“nnn.nnn” or “SEE SID”	“,” EDCT “	edct	EDCT is not always included in a DCL.
<i>item counts</i>	54	7	7	1	2	11	1	7	7	7	4	
5	169	“SQUAWK “		beacon	“ ” or “,”	contact info		“,”	local info		Use “,” after beacon if only one of contact info or local info is present.	
<i>item counts</i>	80	7		4	1 or 2	32		2	34			

## Revised Initial DCL Using UM79

Element #	Msg. #	Parameters								Notes		
1	79	position				route clearance						
2	169	"+LOAD NEW RTE TO "		position "+"	"AFTER "	position	"CLEARED TO "	arr airport	"ARPT"	"AS FILED"	"ARPT" not inc. if airport=null. Clr limit substitutes for null arr apt.	
item counts	70/80	17	6/11	1	7	6/11	12	5	5	9		
3	169	Sid	"."	Trans	","	Climbout	","	Climbvia text			Use if climb via text <> NONE. If trans=null, no ".". If climbout=null, no extra ",".	
	77	6	1	5	2	32	2	29				
Or 3	169	Sid	"."	Trans	","	Climbout	" , MAINTAIN "	{alt}			Use if MAINTAIN alt <> NONE. If trans=null, no ".". If climbout=null, no extra ",".	
	64	6	1	5	2	32	11	7				
4	169	"EXPECT "	altitude	" "	mins/miles	"NM" or "MIN" "AFT DP"	" , "	"DPFRQ "	"nnn.nnn" or "SEE SID"	" , EDCT "	edct	EDCT is not always included in a DCL.
item counts	54	7	7	1	2	11	1	7	7	7	4	
5	169	"SQUAWK " beacon			" " or " , "	contact info		" , "	local info		Use " , " after beacon if only one of contact info or local info is present.	
item counts	80	7	4		1 or 2		32	2	34			

## Revised Initial DCL Using UM80

Element #	Msg. #	Parameters								Notes		
1	80	departure airport	arrival airport	arrival transition	arrival procedure	route						
2	169	"+LOAD NEW RTE TO "		arr airport	" + "					Clr limit substitutes for null arr apt.		
item counts	24/34	17	6/16	1								
3	169	Sid	"."	Trans	" , "	Climbout	" , "	Climbvia text			Use if climbvia <> NONE. If trans=null, no ".". If climbout=null, no extra ",".	
	43	6	1	5	2	32	2	29				
Or 3	169	Sid	"."	Trans	" , "	Climbout	" , MAINTAIN "	{alt}			Use if MAINTAIN alt <> NONE. If trans=null, no ".". If climbout=null, no extra ",".	
	30	6	1	5	2	32	11	7				
4	169	"EXPECT "	altitude	" "	mins/miles	"NM" or "MIN" "AFT DP"	" , "	"DPFRQ "	"nnn.nnn" or "SEE SID"	" , EDCT "	edct	EDCT is not always included in a DCL.
item counts	54	7	7	1	2	11	1	7	7	7	4	
5	169	"SQUAWK " beacon			" " or " , "	contact info		" , "	local info		Use " , " after beacon if only one of contact info or local info is present.	
item counts	80	7	4		1 or 2		32	2	34			

## Revised Clearance– Conditional Message Examples

The following table is extracted from the S1P1 Production system specification, WSSD 4.0, 5/16/14, Appendix D, WSSD76. This is provided for information only, and is subject to future updates.

*Note* : The basic rule is that whenever part of the departure procedure is changed, you resend the whole departure procedure. If a MAINTAIN altitude was included, it is also sent with the revised DP. If a climbvia was sent with the original DP, it is resent with the revised DP, even if not changed.

Rule 2 is the exception to Rule 1: if only the MAINTAIN altitude is changed (SID, TRANS, CLIMBOUT unchanged), then MAINTAIN altitude can be sent alone.

*Note* : MAINTAIN altitude is the altitude selected by the controller in the MAINT ALT selection.

*Note* : When the controller selects a climb via text other than NONE, the MAINT ALT must be none. And vice versa.

**Table A- 1 Conditional Departure Information Message Examples**

Condition	SID, climbout, climbvia	MAINT [alt]*	UPLINK
any part of DPP changed	SID<>NONE Climbviatxt <> NONE	none	UM169 (procdep) "." (trans) " " (climbout) “, ” (climbviatext) <i>Note: (trans) and (climbout) only if not NONE, but are included even if not changed</i> <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP (and ALT if [climbviatext] is changed)</i>
any part of DPP changed	Climbviatext = NONE	yes	UM169 (procdep) "." (trans) " " (climbout) “, ” MAINTAIN (alt) <i>Note: (trans) and (climbout) only if not NONE, but are included even if not changed</i> <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP (and ALT if [climbviatext] is changed)</i>
SID changed to NONE	Climbout <> NONE Climbvia = NONE	yes	UM169 "SID NONE, " (climbout)UM19 [alt] <i>Note: include (climbout) if &lt;&gt; NONE, even if same</i> <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP (and ALT if [alt] is changed)</i>
SID changed to NONE	CLIMBOUT=N ONECLIMB VIA = NONE	yes	UM169 "DPP NONE"UM19 [alt] <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP (and ALT if [alt] is changed)</i>
CLIMBOUT changed to NONE	SID<>NONEcli mbviatext <> NONE	none	UM169 (procdep) "." (trans) “, ” (climbviatext) <i>Note: (trans) included only if not NONE, but included even if not changed</i> <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP</i>
CLIMBOUT changed to NONE	Climbviatext = NONE	yes	UM169 (procdep) "." (trans)UM19 [alt] <i>Note: (trans) included only if not NONE, but included even if not changed. ProcDep included if applicable</i> <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP</i>
CLIMBOUT changed	SID stays NONE	yes	UM169 (climbout)UM19 [alt] <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP</i>
CLIMB VIA changed	SID<>NONE	none	UM169 (procdep) "." (trans) " " (climbout) “, ” (climbviatext) <i>Note: (trans) and (climbout) only if not NONE, but are included even if not changed</i> <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP</i>
CLIMB VIA changed to NONE		yes	UM169 (procdep) "." (trans) " " (climbout)UM19 [alt] <i>Note: (trans) and (climbout) only if not NONE, but are included even if not changed. ProcDep as applicable</i> <i>Note: 1<sup>st</sup> UM169 should include REVISED ALT</i>



<b>Condition</b>	<b>SID, climbout, climbvia</b>	<b>MAINT [alt]*</b>	<b>UPLINK</b>
MAINT alt changed to NONE and CLIMBVIA selected		none	UM169 (procdep) "." (trans) " " (climbout) as appl, ", “(climbviatext) <i>Note: 1<sup>st</sup> UM169 should include REVISED ALT</i>
Climbout changed (and climbout <> NONE)	SID<> NONE and SID unchanged	yes	UM169 (procdep) "." (trans) " " (climbout)UM19 [altitude] <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP (and ALT if [alt] changed)</i>
MAINT alt changed	SID, CLIMBOUT, CLIMBVIA unchanged	yes	UM19 [alt] <i>Note: 1<sup>st</sup> UM169 should include REVISED ALT</i>
MAINT alt not changed but part of DPP changed	SID or CLIMBOUT<>NONE	yes	UM169 (procdep) "." (trans) " " (climbout)UM19 [altitude] <i>Note: 1<sup>st</sup> UM169 should include REVISED DPP</i>

## Appendix B: CPDLC Error Processing

The examples below include CPDLC error processing that include Cause, Result, and resultant Error Messages. The two tables include both Ground Error processing and Aircraft Error processing. The list is representative of known capabilities and system behavior that will be updated as new information becomes available.

### CPDLC Ground Error Processing

<b>Cause</b>	<b>Result</b>	<b>ERROR Message</b>
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 & UM169 "FREETEXT NOT SUPPORTED".	UM159 unexpectedData & 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

<b>Cause</b>	<b>Result</b>	<b>ERROR Message</b>
DM62 received with appended data that is not a DM67 Freetext	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
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 pilot response	Disregard the received message and send a CPDLC message containing message element UM169 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

## Appendix C: ICAO FPL DCL Delivery Codes

- The ICAO 2012 Flight Plan is now operational in the NAS and is required for CPDLC service.
- The proposed Data Comm “codes” in Field 18/DAT are an optional mechanism for the user to notify FAA automation to generate a CPDLC or PDC clearance.
  - The codes were created to differentiate FANS 1/A and FANS 1/A+ support. At this time, there are no differences in the ground system support for either mode.
  - ICAO FP codes take precedence over any other user preference mechanism, e.g., SDB
  - Field 10a allows any order and is world-wide; “Z” is required in order to get to DAT/ field
  - No spaces should be included in the actual DAT/ field; they are shown in the table for clarity only.
- Proposed codes include an optional “Fallback” Hierarchy if CPDLC service is not available
- Data Comm S1P1 Production system (IOC 2016) will use ICAO 2012 FPL.
  - Field 10a (Equipage) used to identify aircraft capabilities
  - Field 18 (Other Information) DAT/Codes used to identify flights getting CPDLC or PDC
  - Need to fill in Field 10a in order to get to Field 18 DAT/
  - Field 18 DAT/ Codes will include a primary/secondary hierarchy
- 1.1.1. “1”xxx designates preferred departure clearance delivery mechanism
- 1.1.2. “2”xxx designates “back up” delivery mechanism
- ICAO FPL preferences take priority over any other sources

**Table D - 1 ICAO FPL Field 10a and Field 18 DAT/ Codes**

#	User Preference	Data Comm Capability Description for S1P1 (2016)	ICAO 2012 Fld 10a	Data Comm Fld 18 DAT/ <sup>1</sup>	Comments These apply to FANS in US domestic airspace only.
1a	Voice only*	Not equipped for ACARS or FANS; gets voice only			Default if user is not getting PDC or FANS. Field 10a may be optional.
1b	Voice only*	Equipped for ACARS and FANS but wants voice only	E3J4J7 Z	1VOICE	Optional. Only needed if users want to negate default PDC/CPDLC-DCL value and use voice only.
2a	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, e.g., gate printer.
2b	PDC only*	Equipped only for ACARS PDC	E3 Z	1PDC	

<sup>1</sup> No spaces in actual DAT/ codes

#	User Preference	Data Comm Capability Description for S1P1 (2016)	ICAO 2012 Fld 10a	Data Comm Fld 18 DAT/ <sup>1</sup>	Comments These apply to FANS in US domestic airspace only.
2c	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). Identifies US domestic preference for PDC.
3a	FANS 1/A only	Equipped for ACARS/PDC and FANS but wants FANS 1/A only for CPDLC-DCL	E3J4Jx Z	1FANS	Identifies FANS 1/A CPDLC for US domestic airspace.
3b	FANS 1/A+ only	Equipped for ACARS/PDC and FANS but wants FANS 1/A+ only for CPDLC-DCL	E3J4Jx Z	1FANSP	Identifies FANS 1/A+ CPDLC for US domestic airspace
4a	FANS 1/A/PDC	Equipped for ACARS PDC and FANS 1/A, with primary/secondary CPDLC-DCL fallback preferences	E3J4Jx Z	1FANS <b>2PDC</b>	Code shows PDC/CPDLC-DCL fallback priority preference, e.g., FANS 1/A is primary preference; PDC is secondary for the tower that will be used if FANS CPDLC-DCL primary is unavailable and PDC is feasible.
4b	FANS 1/A+ /PDC	Equipped for ACARS PDC and FANS 1/A+, with primary/secondary CPDLC-DCL fallback preferences	E3J4Jx Z	1FANSP 2PDC	Code shows PDC/CPDLC-DCL fallback priority preference, e.g., FANS 1/A+ DCL is primary preference; PDC is secondary for the tower that will be used if FANS CPDLC-DCL primary is unavailable and PDC is feasible.

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

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