

# TopSky plugin for EuroScope

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*- version 2.4 -*

Data Link Functions

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## General

The TopSky plugin includes some datalink functionality. As there is no VATSIM standard for this, the plugin uses Hoppie's ACARS network (<http://www.hoppie.nl/acars>). A separate password (logon code) is needed, and it can be requested from that site. Note that whereas the plugin includes everything that is necessary to utilize the ACARS network, pilots will have to install separate software in addition to their pilot clients.

The plugin supports Departure Clearance (DCL and PDC) and Controller-Pilot Data Link Communications (CPDLC). DCL/PDC is discussed in chapter 1 and CPDLC in chapter 2.

To start using the data link functions, first connect to the VATSIM network. Then connect to the Hoppie network:

- Open the **CPDLC Setting Window**
- Enter/check the login callsign (four characters, use should be coordinated in LoA/LOP)
- Enter your personal logon code
- Select whether to provide CPDLC or DCL/PDC services or both
- Left-click on the "Connect" button

Wait a moment to see if the connection is successful (the "Connect" button changes to "Online" with a green background, stays that way at least 10 seconds, and no error messages regarding the connection appear in the **Personal Queue Window**). The Hoppie logon code expires after 120 days of inactivity. If that happens, the connection will fail and a new logon code has to be requested.

Only CTR and FSS stations should provide CPDLC services as it is a relatively slow communication method. When providing DCL/PDC only, the login callsign should be the airport identifier if possible. Also remember to advertise your login callsign in your controller information so the pilots will know that the service is available, there's basically no other way for them to know about it.

Failure messages regarding the connection will be put into the **Personal Queue Window**, and if the connection is lost, an error message dialog will be displayed in the center of the radar screen. Note that if multiple EuroScope instances are used, the proxy instances will not be able to access the CPDLC message windows or change the network connection status.

Whereas the real CPDLC system consists mostly of pre-formatted messages, Hoppie's network contains only free text messages. Free text messages are available in the real system as well but to minimize the risk of misunderstandings, they should not be used if a pre-formatted message is available.

With no pre-formatted messages, the plugin will probably sometimes fail to parse the message contents correctly. The longer the message, the more likely it is that the parsing will go wrong. When in doubt, open the message in the **CPDLC Current Message Window** and see what it says.

The example track labels and the data field colors in this document do not represent any specific setup and are only meant to highlight the items specific to each function. The colors used are the default colors for plugin types **A** on the left and **B** on the right. In the examples, aircraft ABC123 is assumed by you, the next controller is “IDA”, the aircraft is climbing through FL100, and its cleared level is FL180. This is the label before any messages arrive:



When the aircraft requests to start a CPDLC connection, it sends a “REQUEST LOGON” message. The message is displayed in the **CPDLC Current Message Window** and the Callsign field gets blinking square brackets around it (not on proxy ES instances). The plugin automatically denies requests for aircraft not entering your sector. To approve the request, use the “Start CPDLC” button in the Callsign menu. To deny the request, left-click on the message in the **CPDLC Current Message Window** and select “UNABLE” (it is also possible to approve it there if necessary, but the Callsign menu is the primary way to do it).

When the request has been accepted, the Callsign field will get steady square brackets around it. This indicates that the aircraft is CPDLC connected and you are able to exchange CPDLC messages with it.



To terminate the CPDLC connection of an aircraft, use the “End CPDLC” button in the Callsign menu.

Many CPDLC messages display information in the track labels, but it is good practice to keep the **CPDLC Current Message Window** open as there are some messages that are only displayed there, and it’s also the only place to check if the plugin interpreted the message correctly. It is found in the “ControlTools” or “Tools” menu, depending on the plugin version. Additionally, you may want to activate a warning sound when a new CPDLC, DCL or PDC message arrives. This is done in the “Settings” or “Setup” menu.

CPDLC/DCL/PDC-related plugin windows and menus are shown in this document with bold text. For more information on them, refer to the General part of the plugin manual set.

**Note:** While it is possible to answer any message in the **CPDLC Current Message Window** using the “Manual Reply” option, the track label menus should always be used to answer correctly recognized messages, as using the manual reply method will not update the track label values.

# 1 Departure Clearance (DCL/PDC)

## 1.1 General

The plugin supports three different ways to get a departure clearance by data link.

ARINC-623 DCL is a service used in Europe and many other parts of the World, but not in the US. It is a direct ATC-to-pilot data link communication over the ACARS network. Some US airports are also providing a FANS-1/A DCL service (referred to in this document as CPDLC DCL from now on). It differs from the European system in that the communication is done using CPDLC, and requires a logon before the clearance request.

PDC is primarily used in the US (but also in some other locations such as Australia). The clearance is not sent directly from ATC to the pilot, but to a host system provided by the airline or some other service provider, and delivered to the pilot from there.

Pilots may be talking about PDCs when referring to any of the three types, the received DCL clearance request is for a “predep clearance”, and even some plugin items refer only to PDC, but try not to get confused, it’s all referring to the same functionality, sending a departure clearance by data link.

The departure clearance functionality is built into the Departure List (but all the messages are also displayed in the CPDLC message windows, just in case). A received clearance request is displayed in the list, and a clearance can be sent by opening a departure clearance menu from the Departure List.

## 1.2 DCL sequence

### 1.2.1 Departure Clearance Request (RCD)

First, the aircraft sends a clearance request message (RCD). In the CPDLC message windows it looks like this (line breaks inserted for clarity):

```
REQUEST PREDEP CLEARANCE
ABC123 A320 TO ESSA
AT EFHK STAND 22
ATIS PAPA
```

### 1.2.2 Flight System Message (FSM)

If the request is correctly formatted, the plugin will automatically send a flight system message (FSM) as a reply (the plugin can be configured to not send this message though). Its content depends on whether everything is OK (flight plan found, departure airport set up to offer data link clearances, etc.). If so, the reply message to the aircraft will look like this (the grey part is left out in the CPDLC message windows):

```
DEPART MESSAGE STATUS
FSM 1312 160213 EFHK
ABC123 RCD RECEIVED
REQUEST BEING PROCESSED
STANDBY
```

The *List CLR* tag item will show a “REQ” or “R” text in yellow (red if the request contained remarks text after the ATIS indicator, in this case see the message in the **CPDLC Current Message Window**). The text will start to blink two minutes before a timeout occurs if a clearance hasn’t been sent.

If a clearance is not sent before the timeout occurs, the data link clearance request is automatically rejected and a message is sent to the aircraft to revert to voice procedures.

### 1.2.3 Departure Clearance Message (CLD)

This is the first (and only) step that requires controller action. The clearance is sent using the **Pre-Departure Clearance menu**, opened using the *Open PDC menu* function. The clearance is sent using the “Send DCL” button, but the option to give the clearance by voice is always there as well (“Voice” rejects the data link clearance request and sends a message to the aircraft to revert to voice procedures). The sent clearance will look like this (the grey part is left out in the CPDLC message windows):

```
EFHK PDC 001
CLD 1314 160213 EFHK PDC 001
ABC123 CLRD TO ESSA OFF 22R VIA VAGIP1N DCT ADIVO
SQUAWK 4625 NEXT FREQ 121.800
QNH 1012
```

Once the clearance is sent, the *List CLR* item will change to “ACK” or “A”, and will start to blink if there is no reply from the aircraft two minutes before a timeout occurs.

If there is still no answer from the aircraft when the timeout occurs, the data link clearance is automatically rejected and a message is sent to the aircraft informing it that the received clearance has been cancelled.

#### 1.2.4 Departure Clearance Readback (CDA)

When the pilot acknowledges the clearance, in reality the aircraft system would send back a readback of the received clearance, which the ATC system would then compare to the sent clearance to check if it was received without errors. In the plugin, a clearance can be answered to with either “WILCO” to accept it or “UNABLE” to reject it.

#### 1.2.5 Flight System Message (FSM)

Once the plugin receives one of these replies, it changes the *List CLR* item to “OK” or a filled box (for WILCO) or clears it (for UNABLE), and a message is sent to the aircraft. For an accepted clearance it will look like this (the grey part is left out in the CPDLC message windows):

ATC REQUEST STATUS FSM 1317 160213 EFHK ABC123 CDA RECEIVED CLEARANCE CONFIRMED
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### 1.3 PDC sequence

The request for a PDC is the same as for a DCL (hence the plugin data file must not have both types defined simultaneously for one airport as the plugin won’t know which one to send). As in DCL(US), there are no FSM messages, but in a PDC there is also no pilot answer to the clearance message. Some sort of readback is therefore usually required on the frequency.

### 1.4 CPDLC DCL sequence

The request for a CPDLC DCL is a “REQUEST CLEARANCE” CPDLC message. There are no FSM messages in the sequence, and once the reply (“WILCO” or “UNABLE”) is received, the sequence is complete.

### 1.5 Abnormal operations

Most failure cases result from the message not being correctly formatted, and the plugin failing to recognize it correctly. Regardless of whether the plugin recognizes the message as belonging to a departure clearance sequence, it will be put into the **CPDLC Current Message Window**, so keep an eye for new messages in it regularly (and archive old messages to keep only relevant messages displayed). In case the system fails, revert to voice/text communications.

## 2 Controller-Pilot Data Link Communications (CPDLC)

### 2.1 General

CPDLC is a means of communication between controller and pilot, using data link for ATC communications. Much like using private chat, but more realistic, and with the extra advantage of displaying data on the track labels and flight lists as well.

As the messages take significant amount of time to get through (receiving a reply to a clearance can take anything from seconds to a couple of minutes), using CPDLC should be limited to situations that are not time-critical. For this reason, it is mostly used in upper airspace area control sectors.

The messages are grouped to dialogs (“discussions”), with an opening message and subsequent replies. Some messages do not need a reply, while for others a specific reply is expected. The available replies are set automatically, so only the correct type of reply can be sent.

#### 2.1.1 Allowed message types

The plugin allows for the following types of messages:

<u>Uplink</u>	<u>Downlink</u>
- Level clearance	Level request
- Heading clearance	Heading request
- Direct-to clearance	Direct-to request
- Speed clearance	Speed request
- Squawk code assignment	Urgency (MAYDAY/PAN/SQ7500)
- Squawk ident instruction	Free text
- Voice contact instruction	
- Free text	

#### 2.1.2 Non-allowed message types

The plugin does not allow the following downlink message types (will be automatically closed and a reply sent informing that the system does not support the message type):

- Any requests containing “When can we expect”, “At pilots discretion” or “Own separation”
- Level requests for a cruise climb, block level, or any level request tied to a position or time
- Lateral requests for an offset, weather deviation or ground track
- Speed requests to maintain a speed range
- Voice contact requests
- Requests for a procedure name and/or type
- Position reports

Note that a non-allowed message type can be classified as “free text” by the plugin if the message parser doesn’t recognize it as a non-allowed type. In this case the automatic reply will not be sent and the message will be left waiting for an answer (if an answer is required).

## 2.2 Uplink clearance sequence

In this example a level clearance is used. The clearance is sent using the CFL menu. To send the clearance using CPDLC, check that the “CPDLC” option is selected. Depending on plugin settings and the aircraft’s altitude, by default it may be selected or deselected. Send the clearance by selecting a level value.

In this case FL200 was selected, and the CPDLC message “CLIMB TO FL200” was sent to the aircraft. The uplinked value is shown in brackets and in “CPDLC UM Clearance” color:



The aircraft has responded with “STANDBY”. The uplinked value changes to “CPDLC Standby” color, and a warning (can be acknowledged by left-clicking on it) is inserted above the label:



The aircraft then eventually answers with “WILCO”. The CFL value is updated accordingly and the label field colors return to normal:



If the aircraft would have answered with “UNABLE”, a warning would have been inserted above the label:



The “+” after the level indicates that there is a reason in the answer message (for example “DUE TO PERFORMANCE”). Read the message in the **CPDLC Current Message Window** to find out what it is.

Left-clicking on the warning acknowledges it and the original CFL value is again shown in the label:





## 2.3 Downlink request sequence

This example shows a level request.

The aircraft has sent a level request for FL200. The value is shown in the PRFL (Pilot Requested Level) field in brackets and in “CPDLC DM Request” color:

<b>[ABC123]</b> IDA	<b>[ABC123]</b> IDA
100 ^	100 ^
180 [200]	180 [200]

The responses to a level request are sent using the CFL menu, which offers the possibilities to respond with “STANDBY”, “UNABLE” or a level clearance (to the requested level or some other level). In the last case the sequence then changes to an uplink clearance – see above for details.

## 2.4 Abnormal operations

As with DCL messages, the most likely failure scenario is the plugin misinterpreting the contents of a received message, so keep an eye on the **CPDLC Current Message Window**. Some other failure scenarios are presented below.

If the plugin has temporarily lost contact with the CPDLC server, “CPDLC COMM FAIL” will be inserted above the labels of all CPDLC connected aircraft in “CPDLC Failed” color:

<b>CPDLC COMM FAIL</b>	<b>CPDLC COMM FAIL</b>
<b>[ABC123]</b> IDA	<b>[ABC123]</b> IDA
100 ^	100 ^
180	180

In case the server connection is not re-established within a certain time, the connection will be automatically closed and a warning message box will be presented. A new connection can be attempted at any time from the **CPDLC Setting Window**.

During temporary connection issues and also when the connection is automatically closed, the “AGCS” system label in the General Information Window will be displayed with “Warning” color until a connection is re-established.

If the CPDLC connection is terminated by the pilot, a “CPDLC P ABT” warning is inserted above the label in “CPDLC Failed” color:

<b>CPDLC P ABT</b>	<b>CPDLC P ABT</b>
<b>ABC123</b> IDA	<b>ABC123</b> IDA
100 ^	100 ^
180	180

Left-clicking on the warning acknowledges it.

If an uplink clearance is not answered in time, a “<message type> P LATE” warning will be inserted above the label in “CPDLC Pilot Late” color:



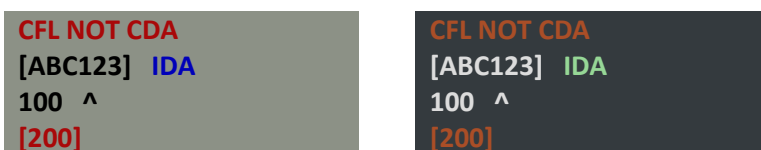
Left-clicking on it opens a menu that gives options to either abort the clearance or answer it yourself with “WILCO” (after confirmation from the pilot of course).

If sending an uplink clearance failed, a “<message type> ERR” warning will be inserted above the label in “CPDLC Failed” color:



Left-clicking acknowledges the warning and aborts the clearance, displaying the previous value in the label.

If an uplink clearance is sent successfully but you are not the currently active ATC unit in the aircraft’s CPDLC system, a “<message type> NOT CDA” warning will be inserted above the label in “CPDLC Failed” color:



Left-clicking acknowledges the warning and aborts the clearance, displaying the previous value in the label.