19 ottobre 2022

(English text at the bottom)

CPDLC GUIDELINE - HARMONIZATION ACROSS EUROPE

Gentili Colleghi,

Nell'ambito dell'attività di armonizzazione dell'utilizzo del CPDLC in Europa, EUROCONTROL ha pubblicato un interessante guida informativa.

Questo documento intende fornire al lettore una visione completa circa lo stato di utilizzo operativo del CPDLC in tutta Europa, delle sue problematiche e dei requisiti previsti, nell'ottica di una sempre maggiore armonizzazione delle operazioni.

È destinato a quegli utenti operativi, piloti e controllori del traffico aereo, con la necessità di avere una visione generale delle questioni relative al CPDLC; come ad esempio questioni tecniche e/o operative, nonché delle modifiche previste per soddisfare il messaggio minimo impostato come obbligatorio.

La guida ha una struttura suddivisa in sei sezioni.

La sezione 2 descrive la copertura del CPDLC in Europa, le tipologie di messaggi che un pilota può ricevere, nonché le attuali discrepanze del servizio tra le diverse aree dello spazio aereo, insieme alle implementazioni previste nell'ottica di una sempre maggior armonizzazione delle operazioni.

• le sezioni 3 e 4 propongono una serie di orientamenti e requisiti basati sugli insegnamenti tratti dall'utilizzo operativo del CPDLC in Europa, sia per i piloti che per i controllori.

• la sezione 5 si concentra e documenta le questioni di attuazione esistenti nel funzionamento del CPDLC in Europa.

• la sezione 6 fornisce una visione delle future evoluzioni previste per il CPDLC, sulla base delle lezioni apprese indicate nelle sezioni da 1 a 5.

Di seguito il documento di EUROCONTROL.

Buona lettura.

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CPDLC GUIDELINE - HARMONIZATION ACROSS EUROPE

Dear Colleagues,

As part of its harmonization of the use of CPDLC in Europe, EUROCONTROL has published an interesting information guide.

This document intends to give to the reader a comprehensive view of the status of the CPDLC operational usage across Europe, its issues as well as the foreseen requirements leading to harmonized operations.

It is intended for operational users such as flight crews and ATCO with a need to have an overall view on CPDLC related matters: i.e. technical and operational matters, as well as foreseen changes to meet the minimum message set as mandated.

The guideline structure is divided into six sections.

The section 2 describes the CPDLC coverage in Europe, the messages that a pilot might receive, as well as the current service discrepancies between different airspace areas, together with the foreseen evolutions towards harmonized operations.

• section 3 and 4 propose a set of guidance and requirements based on lessons learnt from operational CPDLC usage over Europe, for pilots as well as controllers.

• section 5 focuses and documents existing implementation issues in the operation of CPDLC over Europe.

• section 6 provides a view of foreseen CPDLC evolutions, based on lessons learnt expressed in sections 1 to 5.

Here below the EUROCONTROL document.

Enjoy the reading.

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GUIDELINES

FOR HARMONIZED USAGE OF CPDLC ACROSS EUROPE

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1. Introduction

1.1. Document goal and scope

This document intends to give to the reader a comprehensive view of the status of the CPDLC operational usage across Europe, its issues as well as the foreseen requirements leading to harmonized operations. It also contains well-targeted communication materials for specific groups; in particular pilots and controllers, aiming to streamline and focus on specific messages and topics.

This document is an outcome of CRO-808 ticket managed by the Datalink Support Group (DSG) to harmonize the CPDLC usage across Europe.

1.2. Targeted audience

This document is intended for operational users such as flight crews and ATCO with a need to have an overall view on CPDLC related matters i.e. technical and operational matters, as well as foreseen changes to meet the minimum message set as mandated.

1.3. Document structure

The section 2 describes the CPDLC coverage in Europe, the messages that a pilot might receive, as well as the current service discrepancies between different airspace areas, together with the foreseen evolutions towards harmonized operations.

- section 3 and 4 propose a set of guidance and requirements based on lessons learnt from operational CPDLC usage over Europe, for pilots as well as controllers.
- section 5 focuses and documents existing implementation issues in the operation of CPDLC over Europe.
- section 6 provides a view of foreseen CPDLC evolutions, based on lessons learnt expressed in sections 1 to 5.

1.4. Acronyms

Here follows a list of acronyms used in this document.

Acronym	Description
ACC	Area Control Centre
ACM	ATC Communications Management
AMC	ATC Microphone Check
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATN	Aeronautical Telecommunication(s) Network
ATS	Air Traffic Services
ATSU	Air Traffic Service Unit
CDA	Current Data Authority
CM	Context Management
CSP	Communication Service Provider
DCT	Direct
DLIC	Data Link Initiation Capability
DPMF	Datalink Performance Monitoring Function
DSG	Datalink Support Group
EASA	European Union Aviation Safety Agency

Acronym	Description
EU	European Union
FANS	Future Air Navigation Systems
FL	Flight Level
FMS	Flight Management System
FPL	Flight PLan
GAT	General Air Traffic
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HMI	Human Machine Interface
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
LAC	London Area Control
LoA	Letter of Agreement
LOF	Log-On Forwarding message (OLDI)
MCDU	Multifunction Control and Display Unit
MUAC	Maastricht Upper Area Control Centre
NAN	Next Authority Notified message (OLDI)
NDA	Next Data Authority
NSAP	Network Service Access Point
OLDI	On-Line Data Interchange
PA	Provider Abort
R/T	Radio Telephony
SIB	Safety Information Bulletin
UM	Uplink Message
VDL	VHF Data Link
VHF	Very High Frequency

Table 1 Acronyms list

2. Current status of CPDLC in Europe

This section describes the CPDLC service implementation in Europe in terms of coverage and usage.

2.1. Service coverage

CPDLC Datalink is mandated for all IFR GAT flights operating above FL285 in European airspace (28 member states plus Norway). Some ANSPs provide a service at lower levels.

Some states are still in the process of deploying CPDLC. For more information on where a service can or cannot be expected see Figure 1.

Unless an aircraft is on the approved exemption list, crews are required to logon to datalink and only then can CPDLC be used. For aircraft type and model exemptions refer to (EU) 2019/2012 of 29 November 2019.
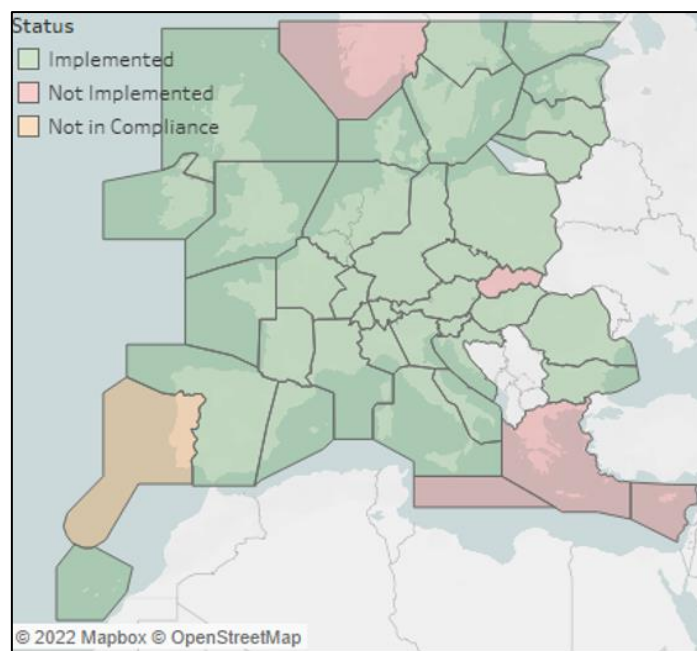
Figure 1: CPDLC operational status December 2021 and forecasts

The following table shows the area where CPDLC service is limited or not implemented at all.

Centre	Current Datalink service operational restrictions
Portugal (LPPC)	DLIC service is provided, but ACM, AMC and ACL services are not provided.
France (LFEE, LFFF, LFMM, LFRR, LFBB)	All Datalink services are provided with an operational restriction, expected to be lifted in Q2 2022: flight crew clearance requests are not supported and a systematic controller response "Unable" is uplinked.
Germany (EDUU)	Airspace control in the south-eastern part of Germany below FL315 is delegated to Munich ACC (EDMM). In this airspace, Datalink services are available only after prior coordination (i.e. when EDUU agrees to take or maintain control of flight). Datalink services are provided only to Logon-List a/c
MUAC (EDYY)	Datalink services are provided only to Logon-List a/c
Switzerland (LSAG, LSAZ)	Datalink services are provided only to Logon-List a/c

Table 2: Countries where CPDLC is partially supported or not supported at all

2.2. Transfer across boundaries

In most cases, once a flight is connected to CPDLC, the transfer between ANSP areas of responsibility (Data Authorities) is triggered by ground systems via OLDI LOF/NAN messages and flight crews will be aware when they receive the 'welcome' message from the receiving Data Authority.

This occurs regardless of whether the controller uses the CPDLC frequency transfer message or transfers by voice.

The status of the OLDI associated technical feature is called LOF/NAN coverage, this coverage is monitored by the DPMF. However, a unit/ANSP reporting to be capable needs to have LOF/NAN procedure agreements (LoA's) with each neighbouring unit. The implementation needs to be harmonized, fully completed and in use across CPDLC mandated airspace. The fall back procedure via CMContact function shall only be used in case LOF/NAN is not agreed between two units or fails. However, this is considered as a temporary fall back solution as it requires capacity on the CPDLC frequencies.

The map below shows the LOF/NAN interconnection status between adjacent ANSPS. A LOF/NAN connectivity between two adjacent ACCs can have the following status:

- **Not operationally available**: the LOF/NAN connectivity between the two concerned ANSPs not implemented.
- **Available, not monitored**: the LOF/NAN connectivity is reported to be working by the two associated ANSPs. However NM/DPMF was not able to check the proper functioning
- **Available, monitored OK**: the LOF/NAN connectivity is reported to be working by the two associated ANSPs. NM/DPMF was able to check and confirm the proper functioning.
- **Available, monitored NOK**: the LOF/NAN connectivity is reported to be working by the two associated ANSPs. NM/DPMF was able to check the proper functioning and have found some issues preventing it from working properly (see 5.1.1)

Figure 2: LOF/NAN ANSP support, January 2022

In cases of LOF/NAN connectivity issues (on the map above: Not operationally available or Available, monitored NOK), this cross-border transfer may fail and a manual logon may need to be performed on approaching the Next Data Authority (NDA).

2.3. Commonly used message set

ATC-Messages can be initiated by the Cockpit (downlink messages) or by the Air Traffic controllers (uplink messages).

- Downlink messages: These need to be supported by the ATS system and are subject to local implementation.

- Uplink messages: If these are supported in an ATS system, they are also supported by the cockpit.

The following list of **uplink messages** are commonly used by ATCOs and can be expected by crews in any area reported as operational in Figure 1.

	Uplink Message	Notes
MANDATORY	MAINTAIN [level]	
	CLIMB TO [level]	
	DESCEND TO [level]	
	PROCEED DIRECT TO [position]	Message very likely to be received from ATC
	FLY HEADING [degrees]	
	CONTACT [unit name] [frequency]	Message very likely to be received from ATC. This message requires a voice call on the next frequency unlike MONITOR [unit] ON [frequency].
	SQUAWK [code]	
	CHECK STUCK MICROPHONE [freq]	
OPTIONAL	MAINTAIN [speed]	
	MAINTAIN [speed] OR GREATER	
	MAINTAIN [speed] OR LESS	
	FLY HEADING [degrees]	
	CURRENT ATC UNIT	

Table 3: Most commonly used CPDLC uplink messages over Europe

Note: For time-critical instructions and for those with traffic restrictions, ATCOs will use voice as CPDLC is not intended for use in these situations and may take up to 2 min. Therefore, it is still needed to pay attention to the voice frequencies and not only rely on an active CPDLC connection.

The **downlink message set** can be manually triggered by the cockpit crew and sent to the controller in charge. The following messages are supported by the ATS systems:

Downlink Message	Notes
REQUEST [level]	
REQUEST CLIMB TO [level]	
REQUEST DESCENT TO [level]	
REQUEST DIRECT TO [position]	
DUE TO WEATHER	Optional addition
DUE TO AIRCRAFT PERFORMANCE	Optional addition

Table 4: Most commonly used CPDLC downlink messages over Europe

Since the cockpit downlink message set may include more messages from the standard that are supported by the ATS system, a "service not available" error is returned to the cockpit crew in the event of such a message.

2.4. Divergences in uplink message set support

A limited number of ANSPs are supporting the following additional uplink messages.

Message
CLIMB TO REACH [level] BY [position]
DESCEND TO REACH [level] BY [position]
CLIMB TO CROSS [position] AT [level] OR ABOVE
DESCEND TO CROSS [position] AT [level] OR BELOW
DESCEND TO [level] MAINTAIN [IAS] OR LESS/MORE
STOP CLIMB AT [level]
STOP DESCENT AT [level]

Message
CLIMB [level], WHEN PASSING [level] PROCEED DIRECT TO [position]
CLIMB /DSC [level], WHEN PASSING [level] RESUME OWN NAVIGATION
DIRECT TO [position] WHEN PASSING [level] + …
STATE PREFERRED (ODD/EVEN) FLIGHT LEVEL
STATE TOP OF DESCENT
CLEARED TO [position] VIA ROUTE [routeclearance]
TURN [direction] HEADING [degrees]
PROCEED DIRECT TO [POSITION] + DESCEND TO REACH [FL] BY [POSITION]
CONTINUE PRESENT HEADING
MAINTAIN PRESENT SPEED OR GREATER/OR LESS
MAINTAIN MACH 0.xx AND ON CONVERSION … …MAINTAIN IAS xyz KTS
REDUCE SPEED BY MACH 0.04 DUE TO DELAY AT DEST
REDUCE TO MINIMUM CLEAN SPEED
RESUME NORMAL SPEED
RESUME OWN NAVIGATION
NO SPEED RESTRICTION
CROSS [position] AT OR AFTER [time]
SQUAWK IDENT
MONITOR [unitname] [frequency]
WHEN CAN YOU ACCEPT FL
WHEN READY
REPORT ASSIGNED HDG AND SPEED TO [unitanme] [FREQ]
ROGER 7500

Table 5: Extra CPLDC messages supported by some ANSPs

2.5. Specific ANSPs behaviours

2.5.1.1.   ROGER + REQUEST FORWARDED

In the absence of a specific CPDLC uplink message, some ANSPs might answer to a crew CPDLC request with the combination of messages UM 183 [freetext = "ROGER"] + UM211 REQUEST FORWARDED. This message can be seen on ACCs managed by the following ANSPs: DFS, NATS, Skyguide and MUAC.

2.6. CPDLC usage by ATC

Moving from voice to CPDLC is a huge cultural and procedural change for ATC and there are many tactical occasions where it is not appropriate due to the imminent urgency of the instruction in busy airspace.

CPDLC offers the potential to:

- reduce R/T congestion and reduce the likelihood of blocked transmissions and especially undetected simultaneous transmissions
- decrease miscommunication, misunderstandings
- reduce the need to repeat instructions or correct read back errors
- be progressively more reliable with approximately 98% of CPDLC messages sent being successful
- second communication line that supports ATCOs/Pilots during problems with R/T-contact
- time savings especially for "administrative" and non-time critical activities
- More flexible sharing of tasks between Executive-ATCO and Coordinator-ATCO through possible integration of the Coordinator-ATCO in the communication with the cockpit

- time savings are potentially available for essential tasks (traffic planning, conflict detection, on-top services...) and contributes to an increase in capacity in the units

As the COVID-19 crisis delayed the CPDLC adoption in Europe, the first step will be to come back to LOGON and usage rates as of Feb. 2020 (airborne mandate of IR 29/2009). In the medium term, a second goal will be to have every CPDLC equipped flight logged on to the CPDLC network in Europe. To have this process as transparent as possible between all stakeholders it is necessary to have harmonized knowledge and procedures, a uniform application and lived best practices – on the ground and in the cockpit.

3.   Harmonised guidelines for pilots

This section describes good practices for crews and airlines in their day-by-day operation. Each proposed guideline is expressed in the title of the section, followed by a rationale that clarifies the operational or technical reason for it. These guidelines are divided in two main categories, day to day usage and safety oriented.

3.1.   CPDLC normal usage guidelines

3.1.1.   Connection establishment (logon) or transfer

This section describes guidelines related to datalink logon by the crew, also known as CM LOGON. The initiation of datalink needs to be done from the cockpit via a "CM LOGON request" to the appropriate ATC unit. For that process to succeed, it is important that appropriate CPDLC information was included in the flight plan. In addition, major ANSPs in Central Europe implement the LOGON List (LL) in order to prevent aircraft known to have connectivity issue from Logging on, hence degrading the overall network performance.

3.1.1.1. Properly indicate CPDLC support in flight plan

> **_Rationale_**
>
> To have access to CPDLC service at all equipped ATC units in Europe, the FPL has to be filled appropriately. The following information needs to be included in the FPL:
>
> * Field 10a: **J1** (indicating ATN over VDLM2)
>
> * Field 7: **Aircraft-ID**, ICAO callsign
>
> * Field 18: Aircraft ID: **24bit address** (CODE/ indicator)
>
> If any of these parameters are not present or not valid, the Logon will be refused.

Note: If an aircraft is exempted from IR 29/2009, this has to be entered accordingly in the flight plan field 18: **DAT/CPDLCX**. Supplementary information such as the equipment with FANS 1/A should also be filed in addition to CPDLCX.

3.1.1.2. Register aircraft to the EUROCONTROL CPDLC Logon list

> **_Rationale_**
>
> Firstly, to successfully LOGON, the aircraft needs to be suitably equipped. ANSPs in Central Europe (EUROCONTROL/Maastricht, Skyguide/Switzerland and DFS/Germany) are using the EUROCONTROL DPMF LOGON List in order to ensure an acceptable overall performance. Only aircraft with acceptable avionics performance are permitted to connect. It is therefore highly recommended to register aircraft in the LL, otherwise aircraft would not be allowed to use CPDLC over these centres.

Note: Detailed information about the LOGON List and the process of applying to be added to that list can be found via the following link:

Logon List - WikiLink (eurocontrol.int)

3.1.1.3. Perform logon at least 15 minutes prior entering applicable airspace

> **_Rationale_**
>
> As there are different lower Flight Level limits for CPDLC services in Europe, an initial LOGON request is advised for flights at least 15 min before entering the corresponding airspace. For departures, an initial LOGON request after R/T-transfer is recommended to the corresponding airspace that provides CPDLC services.
>
> The CPDLC connection can be performed later or while on the ground if the first CPDLC sector will be entered less than 10 minutes after take-off.
>
> While it can be possible to logon while aircraft is on the ground, the following facts are to be outlined:
>
> * The LOGON will be refused if the flight plan is not yet active
>
> * The VDL Mode 2 radio coverage might be inconsistent on the ground causing failure in LOGON
>
> * Some ANSPs have inactivity timers so a ground LOGON followed by a significant delay in departure can result in a CPDLC disconnect initiated by the ground.

Note: To ensure that pilots select the correct designator for the planned LOGON (with the current controlling ATS unit or next planned unit) airlines are recommended to provide appropriate information to the cockpit crews (unless technically covered in the cockpit by corresponding charts or system information).

3.1.1.4. Perform initial logon to next ACC if aircraft is expected to leave the current ACC in less than 15 minutes

Rationale

If the initial connection (CM LOGON) is established too late within the current ACC, the transfer procedure to the next ACC might fail.

In case you plan to leave the current ACC within the 15 next minutes, and if no CPDLC connection is currently established, it is advised to perform directly a CM LOGON to the next ACC.

3.1.1.5. Perform logon with information in line with the flight plan

Rationale

A CM Logon request may be systematically refused if the following elements are not correctly entered in the CM Logon request and in the FMS:

* The address of the first ACC with whom CPDLC will be performed

* Aircraft-ID exactly as included in the flight plan with no hyphens or symbols

* Departure and destination exactly as indicated in the flight plan

3.1.1.6. If safe to do so, try again later if initial CM Logon fails

Rationale

The ground systems on rare occasions may take some time to synchronize but a second attempt will be successful. Crews are therefore encouraged to try a second login later on.

A "connection terminated" message should only occur as a flight is transferred from one centre to another so if one is displayed at other times, the crew need to LOGON again unless told not to by ATC.

3.1.1.7. Do not mention "CPDLC equipped" on any voice contact in any ATSU in European airspace

Rationale

ATS systems provide information about active CPDLC connections for the Air Traffic Controllers. Some ATS systems even display if an aircraft is equipped with CPDLC according to FPL data "J1". Therefore:

* Keep it short: the wording "CPDLC" shall not be part of an initial call when entering a new sector.

* The information "CPDLC equipped" shall not be mentioned via R/T.

* Especially in ANSPs where J1 equipage is displayed to the controller, pilots may be requested to logon to CPDLC by the first ACC sector.

3.1.1.8. Do not mention CPDLC technical issues over R/T

Rationale

R/T frequencies are to be used for ATC purpose only. **General** issues with CPDLC or CPDLC cockpit components shall be reported through the appropriate reporting procedures of your airline. In case of concerns about technical reliability and functionality, it is recommended to terminate CPDLC connection and report the issues to the operator.

Note: The most important exception from this rule are problems with a specific ATC CPDLC dialog. If there is a problem with a CPDLC message and its status, R/T should be used in case of doubt to clarify the situation in a timely manner.

3.1.1.9. Double-stack (FANS 1/A+ATN) aircraft FANS 1/A to LOGON 15 minutes prior to the Oceanic Entry Point when flying westbound

> **Rationale**
>
> If routing through Shannon airspace then this should be handled by the ground system. If routing through Scottish airspace, as currently their ground system cannot automatically switch an ATN connected flight to FANS 1/A, crews will need to handle this manually.

3.1.1.10.   Ensure that CPDLC ground designator corresponds to the unit name to which the flight is in voice contact

> Also called Current Data Authority (CDA) in the FMS, this represents the centre to which the aircraft is connected. It shall match the unit name to which the flight is in relation via voice. The following picture shows that the aircraft is connected to LFBB.
>
> In case the CDA changes without the appropriate frequency change of the ATC unit in VHF contact, double check any profile changing uplink as transfer of control was potentially not performed.
>
>
>
> *Figure 3: Current Data Authority (CDA) along with Next Data Authority (NDA) displayed in Airbus DFU displays*

3.1.1.11.   If transfer to next authority fails, LOGON manually

> **_Rationale_**
>
> If the automatic LOGON transfer from Current Data Authority (CDA) to Next Data Authority (NDA) fails, a new LOGON will be required. Most of the time, ground systems should transfer the connection between centres from CDA to NDA but occasionally this may fail.
>
> Note: A successful LOGON to a Centre should result in an automatic system transfer to the next Centre but this cannot be guaranteed. (See section 2.2)

3.1.1.12.   Do not use DISABLE CPDLC feature while on climb or cruse phase

> **_Rationale_**
>
> Collins avionics datalink equipment (CMU900 and RIU-40x0) are set to produce aural alerts in the cockpit when loss of ATN coverage is detected. This feature was introduced to provide pilot awareness of the unavailability of CPDLC service in the area the aircraft is located.
>
> However, based on experience, this feature may also produce distractions to pilots when flying over areas of intermittent coverage or during transitions between airspaces below and above local ATN implementation Flight Level.
>
> The probability of flying over areas with intermittent coverage is currently low and decreasing, as the ATN deployment is complete in most of the European airspace.
>
> The following is therefore advised:
>
> * Taking off and climbing from origin airport. During this phase CM Logon should be usable. In this phase, "Disable CPDLC" setting should <u>NEVER</u> be used.
>
> * Flying en-route over airspace covered by the European DLS IR regulation (above local implementation FL). Equipped aircraft is ATN connected. During this phase CM Logon and CPDLC should be usable. In this case, "Disable CPDLC" setting should <u>NEVER</u> be used.
>
> NOTE: The airspace volume missing DLS coverage over Europe is currently low, and decreasing, as rollout completes in the remaining regions.
>
> * Preparing for descent approach to destination airport. Aircraft is ATN connected and CPDLC active. In this case, prior to using the "Disable CPDLC" setting, the current CPDLC session needs to be closed.
>
> If, for some reason, "Disable CPDLC" has been applied in a flight, the aircraft should be applied a power cycle in order to reset the settings to enabled. This is necessary to avoid disabling 8208 functionality for the following flight.

3.1.2. Operational usage

3.1.2.1. Consider voice as the primary means of communication for tactical clearances

> **_Rationale_**
>
> It is important to be aware that CPDLC usage is always at the discretion of the controller depending on(not ordered by preference) suitability, workload, training, operational procedures, technical or coverage issues.

Priority tactical instructions will continue to be issued via conventional VHF voice. This both applies for uplink (requests from an ATCO) and for downlink (requests from crews)

Lower priority strategic routine instructions will be ideally issued via Datalink, still requiring a timely response from the crew to avoid timeout failures.

3.1.2.2. Actively monitor R/T traffic

<u>Rationale</u>

As voice remains the primary means of communication, the ATC may issue time critical messages at any time. It is therefore very important that crews maintain active monitoring of the VHF frequency.

Note: As CPDLC usage increases, a quieter VHF frequency may no longer equate to spare ATC capacity.

3.1.2.3. Do not read back CPDLC message on R/T

<u>Rationale</u>

Unless specifically requested by ATC, CPDLC message read-backs are not necessary and are inappropriate use of R/T time.

3.1.2.4. Perform non-time critical requests through CPDLC

<u>Rationale</u>

ATC prefer a non-time critical request to be made by CPDLC as it allows them to prioritise the response rather than perhaps distracting them on the R/T at busy times.

3.1.2.5. Consider received UNABLE as potential "not right now" or "no but I can offer you an alternative"

<u>Rationale</u>

ATC may respond UNABLE to downlink requests because, unlike voice, CPDLC does not have the flexibility to explain any reason behind the unable response. So unable does not always mean 'no', it can mean 'not right now', or 'no, but I can offer you an alternative'. You may find that controllers have passed the message on and the request is granted later.
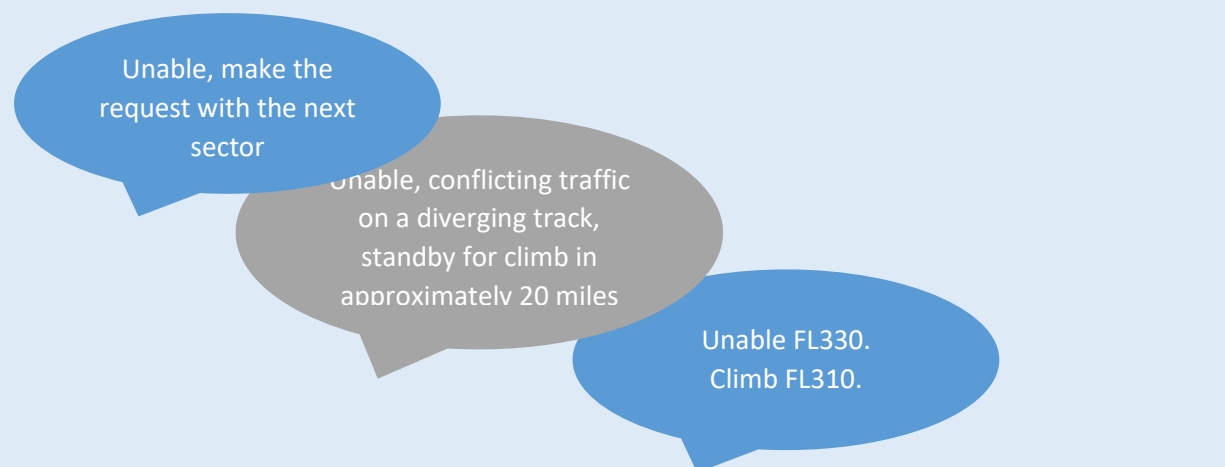

Figure 4: Different possible meanings of CPDLC UNABLE response from an ATCO

3.1.2.6. Answer WILCO to a CPDLC CONTACT message and check in with voice on the frequency specified

Rationale

The ground system needs a timely WILCO response to a CPDLC CONTACT message to allow the next controller to take control of the flight. In addition, CPDLC does not remove the requirement for voice check-in when this frequency is received through a CPDLC CONTACT message.

3.1.2.7. Do not use FREETEXT messages

Rationale

Aircrew should not downlink free text (i.e. freely typed messages) as there is no standard procedure for ATCOs to respond. For safety reasons, some ATC centres are known to forbid FREETEXT message reception and sending.

This is as recommended by ED-110B para 3.3.7.6.2.2 "… free text message elements should not be used in the downlink direction, except when appended to an ERROR message element"

Some avionics HMI implementations may allow aircrew to select among a range of free text elements, or to type free text messages, in situations other than the ones described above. If available, this feature should not be used.

3.2. CPDLC Safety related guidelines

3.2.1. Always erase history of CPDLC message before a flight

Rationale

Several reports mentioned incidents where the crew reacted to a message received in a previous flight and kept in the history. It is therefore advised to erase the history of CPDLC message before every flight.

3.2.2. Always check if a routing clearance contains multiple points (UM79)

Rationale

Attention is required for crew receiving the following uplink message:

CLEARED TO [position] VIA ROUTE [routeclearance]

This message can be presented in various ways, depending on the cockpit display system. There have been reports of crews misinterpreting the clearance and routing directly to the end position. Crews must always check to see if a route clearance is a single or multiple waypoint clearance.

* If the message is **PROCEED DIRECT,** then one waypoint will be in the message

* If the message is **CLEARED TO,** then multiple waypoints will be in the message

Here follows an example of displayed route clearance with intermediate waypoints:

Figure 5 Route clearance with multiple points displayed on a MCDU

3.2.3. Consider prompt action and response when receiving a CPDLC message, as for voice communication

Rationale

Unless WHEN READY is mentioned in a received CPDLC message, the corresponding response and action shall be carried out promptly by the crew. The sequence should always be the processing of the message (WILCO/Unable) first and the execution-taking place immediately afterwards:

Answering the dialog → (prompt) execution of the instruction

3.2.4. Do not interpret STANDBY as a clearance for a REQUEST

Rationale

Downlink requests from the Cockpit need to be analysed and placed in relation to the traffic picture. Appropriate coordination with neighbouring sectors may be necessary. Therefore, controllers can use the "STANDBY" option to prolong the max. duration of a message by 2 minutes. Pilots are not cleared to the request (FL or DCT) with "STANDBY". It **does not** mean that a request is approved. It just means that ATC is in the decision-making process and will reply via CPDLC or R/T to your request.

3.2.5. Do not react to CPDLC received message which originate from different ANSP's other

than the VHF sectors controlling you

> ### *Rationale*
>
> In the following picture the PROCEED DIRECT TO VANAD is issued by LFBB centre, the crew needs to ensure that the flight is connected to the same voice VHF centre. The "current data authority" shall be identical to the unit which issues a CPDLC ATC message.
>
>
>
> *Figure 6: CPDLC PROCEED DIRECT received by LFBB displayed on an Airbus DFU*

3.2.6. Always consider relative turns when received TURN [LEFT|RIGHT] XXX degrees (UM215)

> *__Rationale__*
>
> Some aircraft may display TURN messages as such:
>
> <div align="center">
>
> **TURN LEFT 010 DEGREES**
>
> </div>
>
> The leading zero might confuse the crew and make them interpret the value as an absolute course instead of a relative turn. For this reason, some ANSPs prohibit the use of this CPDLC message. This issue is documented in EASA SIB 2014-15_1.
>
> A turn to an absolute course would be expressed with the following message:
>
> <div align="center">
>
> **TURN LEFT HEADING 010**
>
> </div>

3.2.7. Do not misinterpret NEXT DATA AUTHORITY as CONTACT

> *__Rationale__*
>
> Technical availability of ATN Datalink Services may not be misinterpreted as instruction to change frequency. Especially the message "NEXT DATA AUTHORITY" which is automatically generated by the system is not to be interpreted as a request to change a frequency or a CPDLC connection.

3.2.8. Never use voice on Datalink reserved VHF frequencies (136.725 MHz, 136.775 MHz, 136.875 MHz, 136.975 MHz)

> *__Rationale__*
>
> All the frequencies mentioned above are reserved for digital communications. Tuning and using voice on one of these frequencies will severely interfere with the CPDLC traffic exchanged on it. This will potentially affect numerous aircraft and ground facilities and impact a significant number of messages.
>
> Note: A CPDLC message takes several milliseconds to be transmitted on the frequency. Therefore a voice transmitted message which can last for several seconds can interfere and collide with a significant number of CPDLC transmissions.

3.2.9. Do not expect CURRENT ATC UNIT message on every sector transfer

> *__Rationale__*
>
> UM183 CURRENT ATC UNIT <facilitydesignation> <facilityname> <facilityfunction> serves two purposes:
>
> * Inform the flight crew about CPDLC availability for this ACC
>
> * To let the flight crew know the unit name of the ACC (e.g. Maastricht CONTROL)
>
> These elements do not change between two sectors of the same ACC; therefore, UM183 is not necessarily sent for inter-sector transfers.

3.2.10. Do not use VHF3 for voice when using Datalink

> *__Rationale__*

The VHF3 radio while set in DATA mode is used to perform digital communications such as CPDLC. If the crew decides to use it for voice communication, any existing CPDLC communication will be ended (possibly without informing the ground), and no CPDLC logon will be possible.

In case the crew decides to use VHF3 for voice, it should properly disconnect from CPDLC.

3.2.11. Only use REQUEST DCT TO with position parameter not altitude or others

Rationale

Some crews were seen using requests like REQUEST DCT TO **330** or REQUEST DCT TO **H325**, indicating flight level where the standard expects a waypoint such as REQUEST DCT TO **MERLU**.

Such a use of this downlink is forbidden as it could confuse the controller but can also have safety effects on the ground flight data processors.

4. Harmonised guidelines for controllers

4.1. CPDLC normal usage guidelines

4.1.1. Use CPDLC when possible

Rationale

It is clearly understood that CPDLC should only be used for non-time critical instructions. However, CPDLC should be used whenever ATCOs have the equal option to use voice or CPDLC. Simultaneous use of Voice and CPDLC shall be avoided.

EUROCONTROL statistics show that 65% of all uplink messages are frequency change messages (taking into account that many ANSPs only use the mandatory message set). Frequency changes remove administrative, error-prone tasks from the voice procedure and the time-savings are significant. The same effect is seen with Squawk changes and speed instructions as both are almost always time uncritical.

As CPDLC can also be available on the Coordinator-ATCO side, it is additionally possible to have a new executive-planner role understanding. Depending on the local procedures, CPDLC could be used by the Planner Controller in certain situations to support the Radar Controller.

4.1.2. Make sure that your ANSP clearly indicate CPDLC coverage area limits in AIPs

Rationale

As ANSPs have contracts with the CSPs and a certain CPDLC coverage is provided, ANSPs need to clarify via procedures or technical support how to handle datalink communications below the declared minimum flight level. It is highly recommended to focus on that due to reliability issues below that altitude and potentially increased workload on the ATCO side.

4.2. CPDLC safety related requirements

4.2.1. Do not use CPDLC and voice simultaneously for the same flight

Rationale

> Some crews reported to be confused by ATCOs sending CPDLC messages along with vocal instruction. This can be very confusing and lead to extra cockpit workload. This behaviour shall be avoided.

4.2.2. Use CLEARED TO for clearances (UM79)

> ***Rationale***
>
> Integrating route instructions into the avionics is not straightforward, therefore only a few ANSPs support a message with more than one waypoint in the clearance. In order to ensure the remaining route not being wiped from the FMS, the message must be sent as:
>
> **CLEARED TO [position] VIA ROUTE [routeclearance]**

4.2.3. Respond to CPDLC errors in a consistent and documented manner

> **Rationale**
>
> It is recommended to create clear procedures or guidelines on how the ATCOs should behave when CPDLC dialogs do not work as expected. This can be supported by a Q&A for ATCOs, as it is a key element to provide sufficient information and transparency about CPDLC to all users.

4.2.4. Don't use freetext uplink messages (UM183) other than pre-formatted messages defined by ED-110B

> **Rationale**
>
> UM183 [freetext] is used by ATCOs in some ANSPs for manual messages which can be individually typed. As CPDLC is supposed to be as standardized as possible, the option to compose free text messages should be inhibited, as misunderstandings are likely to happen. EUROCONTROL/DPMF has observed clearance-similar freetext-messages that are safety relevant as no WILCO or UNABLE response is possible for the cockpit crew.
>
> As the CPDLC standard and the possible message set does not provide all needed options it is proposed to use pre-formatted freetext messages as defined in ED-110B which can be adapted in each ATS system.

5. Known issues and status of resolution

5.1. Ground issues

This section describes the known implementation issues that are affecting the operational datalink service for both pilots and controllers.

5.1.1. Failure of CPDLC transfers between ACCs

Issue summary: Automatic CPDLC transfer between an ACC and the following one might fail.

Operational impact: This forces the crew to reconnect manually to the following ACC.

Affected ANSPs: ANS-CR, Austro Control, Croatia Control, DFS, DSNA, ENAIRE, MUAC, NATS, and Pansa.

Technical description: LOF/NAN usage is mandated according IR 30/2009 however, not all the ANSPs are currently fully implementing it. This can result in a failed transfer of the CPDLC connection from one ATSU to the following one and/ or a reversion to the CM Contact procedure.

Associated DSG tickets: CRO-1115, CRO-1112, CRO-1114, CRO-968, CRO-1118, CRO-1127, CRO-1130, CRO-1179 and CRO-1124.

5.1.2. It may be impossible to reply to a received clearance over DFS ACCs

Issue summary: DFS managed ATSUs, due to human error might incorrectly send a clearance message using free text. While this message will be displayed to the crew correctly, it will not be possible for the crew to send the correct operational response.

Operational impact: In that specific case, the flight crew will not be able to indicate that they have received the clearance. They will therefore have to revert to voice.

Affected ANSPs: DFS.

Technical description: Due to a training issue, some controllers might send a clearance with an inappropriate CPDLC message (UM183 FREETEXT); in that case, the avionics HMI will not allow the crew to answer to this message.

Associated DSG ticket: CRO-480.

5.1.3. Next Data Authority arriving too late on-board

Issue summary: Some ANSPs are suffering from an issue affecting the CPDLC message sequences used to perform automatic OLDI transfer between two ANSPs. In that specific case, the automatic transfer to the Next Data Authority (NDA) might fail, forcing the crew to disconnect CPDLC and logon to the NDA manually.

Operational impact: When transitioning to an affected ATSU, automatic flight transfer may fail causing the crew to log on manually to the destination ATSU.

Affected ANSPs: ACG, Bulatsa, CCL, Croatia Control, DFS, EANS, ENAV, EANS, HungaroControl, IAA, and NAV Portugal.

Technical description: This issue is caused by an incorrect sequencing of CPDLC messages sent to the aircraft by the two involved ATSUs (transferring and receiving ATSUs), causing the aircraft to refuse the transfer. In these circumstances, the aircraft may have received the CPDLC-start request from the R-ATSU before it has received the NDA message from the T-ATSU. This race condition results in a rejection of the CPDLC-start-request by the aircraft and the downlinking of DM107 NOT AUTHORIZED NEXT DATA AUTHORITY to the R-ATSU.

Associated DSG ticket: CRO-883

5.1.4. After being transferred by voice from DSNA ACCs to an adjacent ANSP ACC, the CPDLC session may not be closed by DSNA.

Issue summary: On some specific cases, the CPDLC connection is not terminated by DSNA while the flight has already been transferred by voice to the adjacent ANSP ACC.

Operational impact: The flight crew in that case will have to explicitly terminate manually the CPDLC connection to DSNA and manually log-on to the adjacent ANSP ACC.

Affected ANSPs: DSNA.

Technical description: Currently within DSNA systems, the voice transfers and the CPDLC transfers are not coordinated. In other words if a controller wants to transfer a flight to an adjacent ANSP, he will have to perform two distinct transfer actions, one for voice and one for CPDLC. Thus, if the controller forget to transfer the CPDLC session, this session might stay open longer than expected, having the operational impact described above.

Associated DSG ticket: CRO-773

5.1.5. Aircraft being transferred from NATS FDP Systems

Issue summary: On some specific cases, NEXT SECTOR CPDLC NOT IN USE UNTIL NOTIFIED - USE VOICE is sent in error to traffic.

Operational impact: The flight crew shall disregard this message and log-on to the adjacent ANSP ACC.

Affected ANSPs: NATS/EGTT.

Technical description: Issue between NATS subsystems. Some messages (such as "NDA notification" can be sent before received cpcStartCnf message from the aircraft, and the system "loses" the Send NDA notification, and therefore thinks there is no CPDLC in the next ATSU.

Associated DSG ticket: CRO-1053.

5.1.6. Aircraft compatible with both CPDLC baseline 1 and 2 might be unable to logon to specific ANSPS.

Issue Summary: Ground systems may fail to accept Logons from aircraft that support ATS Baseline 2 as well as Baseline 1

Operational Impact: Flights unable to connect to CPDLC

Technical description: ANSP systems are required to accept and process up to 256 ground-initiated and up to 256 air-initiated applications in the Logon request. If the aircraft includes CPDLC V1 anywhere in the list of ground-initiated applications in the Logon request, and other logon conditions are acceptable, then the B1 ground system shall accept the Logon request, indicating support for only CPDLC V1 in the Logon response, otherwise reject the Logon (by responding with an empty list of applications).

Associated DSG tickets: CRO-1214

5.1.7. Some ACCs can send a high volume of redundant/unnecessary messages

Issue Summary: Quick succession of redundant/unnecessary messages

Operational impact: Hinder usage of CPDLC by aircrew

Technical description: Some ACCs send a high volume of messages that are not necessary for the operation of CPDLC. In addition, it takes time to respond to some messages, making it a distraction to pilots. The issue is being discussed at the EUROCONTRO/OFG. The need to transmit some of these messages, or the reply requirements, is being evaluated to alleviate these issues. An example of 10 CPDLC messages sent in three minutes are shown below.

Figure 7 10 CPDLC messages received in 3 minutes

5.2. Aircraft issues

5.2.1. It is not possible to CM LOGON to an ACC if the associated facility designator is not in the aircraft database

Issue summary: Some aircraft NSAP databases listing the ACCs to which the aircraft can connect were reported to be outdated.

Operational impact: A crew might not be able to perform a logon to specific ACCs if they are not represented in this database.

Affected aircraft types: potentially all.

Technical description: When logging on datalink service, a flight crew has to indicate which centre (ATSU) to connect to. This ground facility designator is composed of four letters, e.g. Maastricht UAC is known as EDYY.

To perform this connection, the aircraft needs to convert this ground facility designator into a specific technical address (the NSAP address) using an internal aircraft database. Some aircraft may have an outdated database. Consequently, the crew may not be able to connect to certain ground systems.

If as a crew you are not able to connect to one or more of the following ACC on a specific aircraft, your aircraft NSAP database might be out of date:

EETT, EVRR, EYVC, LKAA, LZBB, LJLA, LHCC, LDZO, LRBB, LBSR, LGGG, LCCC, LMMM

If you believe that your aircraft is equipped with such an outdated, NSAP database, please contact your supplier to understand how this database can be upgraded.

Note:

* This ground facility designator to NSAP address conversion is documented in ICAO EUR NSAP Address Registry.

* This issue only affects the initial Logon performed by the crew, indeed when transitioning between ACC and ANSPs, a CONTACT <ground_facility_designator> on <frequency> is sent by an ATSU the NSAP address of the associated ground facility designator is embedded in the message (though not displayed), populating an on-board temporary database.

Associated DSG ticket: CRO-889, CRO-900

5.2.2. Aircraft clock misconfiguration is likely to prevent CPDLC from working

Issue summary: Due to internal aircraft synchronisation issue, use of AOA time synchronisation, or GNSS interferences, the A/C clock might be significantly shifted in the past or the future*.*

Operational impact: CPDLC messages might erroneously be considered as obsolete or too recent and be refused by an aircraft or an ATC centre.

Affected aircraft types: potentially all.

Technical description:

> Each CPDLC message contains a timestamp indicating when the message was originally sent. On the other side, when received, the ground system compares this timestamp with the actual time and date. If this time difference exceeds several minutes, possibly due to network congestion, the message will be considered too old and refused by the ground system.
>
> If the aircraft clocking is not accurate, the timestamps generated in CPDLC messages will be incorrect and therefore the subsequent CPDLC messages will be refused.
>
> Note: This issue will also apply when an aircraft receives a message; it will compare the timestamp of the received message with its on-board clock and will therefore discard it if the clock is incorrectly set.
>
> **Associated DSG ticket:** CRO-786, CRO-787, and CRO-1132.

This clock inaccuracy can come from several causes (non-exclusive list):

- An incompatibility is known in some GPS reception devices causing 19.5 years of time difference, more information may be asked from the aircraft manufacturer that document this issue as well as workaround for their respective aircraft.
- Some GPS / GNSS spoofing and jamming is known to occur in certain areas of the world to cause significant clock drifts
- ACARS Label 52 can be used to synchronise ground and air clocks over A/G datalink. It works satisfactorily on Plan Old ACARS (POA), but if used on ACARS over AVLC (AOA), it can lead to incorrect timestamp values. This is due to AVLC retransmissions, if they happen during a Label 52 exchange, the timestamp of the retransmission has been observed to corrupt the actual time value and give a wrong value (several seconds late) to the avionics clock.

6. Evolutions of CPDLC in Europe

6.1. Provider Aborts & Logon List

CPDLC connection losses can be caused by several influencing factors. DSG is providing the possibility to open incident tickets[1] for the investigation of these problems. Therefore, ANSPs and airspace users are welcome to report technical and interoperability issues with certain aircraft, CSPs and ANSPs. Additionally, DPMF is coordinating the usage of the LOGON List, which is intended to prevent aircraft known to suffer a high PA rate from logging on to ANSPs. Currently, MUAC (EDYY), Skyguide (LSAG, LSAZ) and DFS (EDUU) are operating the Logon List.

This LOGON list is likely to be removed in the future when avionics implementations performances are reaching an acceptable level.

6.2. Maximum transaction duration of 2 min to be reduced in the future

CPDLC standard is designed to a maximum duration of uplink and downlink messages latency of 2 minutes. Unless the standard is changed, ANSPs need to deal with that fact. In operations, it is clearly seen that the majority of dialogs is successfully finished with well under 30 seconds. ANSPs are invited to collect data to open the discussion about an adaption of the standard.

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[1] https://ext.eurocontrol.int/ticketingservices/

6.3. CPLDC errors proactive monitoring

In addition to Provider Aborts, it is also necessary to monitor properly CPDLC errors and anomalies. Especially errors with ATC messages (where CPDLC connection is not affected) are potentially reducing acceptance and usage in the long term. It must therefore be kept at a low level. Such a monitoring system is currently maintained and operated by EUROCONTROL and will be extended in the future.

6.4. Support LOGON Rate and usage

In order to proceed as harmoniously as possible in Europe, good operational framework conditions and standards for ATC are needed. It is essential to **increase the LOGON Rate** (the gap between equipped and connected aircraft is excessively high!) and to have more guidance and defined intermediate steps to support acceptance and **beneficial usage**.

It is recommended to implement the following points regarding best practice.

- Prescription of a mandatory LOGON in the respective, national AIPs.
- Especially if the equipment "J1" in the FPL is displayed to the ATCOs or the information is accessible with low effort, the first sector of each unit should ask the flight crew to LOGON to datalink to increase the LOGON Rate and create awareness in the cockpit for this necessary further step (it must become daily routine).
- ATCO procedures for the usage of CPDLC and for responding to special occurrences (like errors, timeouts)
- Support easily achievable benefits and change management. For example, today about 2/3 messages are frequency changes. Pilots may be for instance may be instructed through their operational procedure to use CPDLC for frequency changes.
- Priority must be given to the HMI. Only if CPDLC is displayed as clearly as possible and embedded in the ATS system the usage will increase. The presentation to the ATCOs and aircrew has to be intuitive and user-friendly.

6.5. ATS B2 OLDI processing and backward compatibility with B1

OLDI 5.X – the latest(draft) version of OLDI standards is just about to be launched and it is important to have a homogeneous, coordinated way to implement it in Europe. The focus should be to ensure that all OLDI data received, irrespective of B2 usage, is passed to the next unit completely.

> **Note**: Discrepancies in OLDI 5.0 draft version have been identified; DSG is therefore working on a proposal to change the standard, a 5.X version of the standard is being discussed.

6.6. Future message set

Several ANSPs only work with the mandatory minimum message set. For the future evolution of CPDLC it is important for the pilot community to have a harmonized standard message set in Europe. The mandatory message set is not sufficient to get the best benefits from CPDLC. Therefore, it is highly recommended to implement the following message set on the ANSP side.

Message ref	Description
UM27	CLIMB TO REACH [LEVEL] BY [POSITION]
UM29	DESCEND TO REACH [LEVEL] BY [POSITION]
UM46	CROSS [POSITION] AT
UM47	CROSS [POSITION] AT OR ABOVE
UM48	CROSS [POSITION] AT OR BELOW [LEVEL]

UM79	CLEARED TO [POSITION] VIA [POSITION]
UM107	MAINTAIN PRESENT SPEED
UM108	MAINTAIN [SPEED] OR GREATER
UM109	MAINTAIN [SPEED] OR LESS
UM179	SQUAWK [IDENT]
UM231	STATE PREFERRED LEVEL

Table 6: Future recommended uplinks to be implemented by ANSPs