CPDLC Issues

Controller Pilot Data Link Communications (CPDLC) is a means of communication between pilots and Controllers using data link to exchange short messages, most notably clearances. It is a relatively new capability in domestic aviation and has experienced rapid advancement and acceptance, but has also exhibited some growing pains.

Reports suggest that culpability for CPDLC operational errors may be distributed between hardware and software glitches and human factors. When hardware or software glitches do occur, aircrew confusion often results. Similarly, misunderstanding, expectation bias, and complacency continue to challenge aircrews during CPDLC operations, while displayed message formats can be overly complex and spread out, also contributing to crew miscues.

As CPDLC adapts and matures, this month *CALLBACK* presents Part 121 incidents that highlight CPDLC hardware glitches, software bugs, and familiar aircrew missteps. Ponder how you might mitigate these interesting scenarios.

Keep It Simple for Safety

After observing a deviation following a CPDLC issued track change, this Center Controller resolved the problem with the crew and then candidly addresses some CPDLC drawbacks.

■ *Aircraft X departed Portland and was handed off to the Sector [Controller] on a 200 [degree] heading. [The warning area] complex was in use, and the heading was enough to clear it. I wanted to give a fix to route [Aircraft X] around it so I could hand [Aircraft X] off to High Altitude without releasing control. The next fix on Aircraft X's flight plan was ONP, but going direct would still conflict with airspace, so I sent a new route of COGOK..ONP as filed via CPDLC to go around the airspace. Aircraft X turned direct ONP, then, about 15 seconds later, acknowledged the CPDLC route. They then called and asked about the free text in the message that had COGOK in it and stated they didn't know what that meant. I turned them back to a heading of 190 to remain clear of airspace and explained that the route should be COGOK and then ONP, not direct ONP. The message out on my CPDLC menu stated, "Cleared to ONP via COGOK, due to airspace restriction."*

Pilots still seem to be struggling with these reroutes and just seeing the fix they are cleared to and disregarding how

they are cleared to it. Airspace was never violated, and the situation was okay, but I want CPDLC to be a tool that I can use to help when I'm busy. Instead, it seems that for the more complex functions, it turns more into something that I need to constantly watch to make sure the pilots are doing it correctly. I would recommend either better training for pilots on how to read and load these routes or a change to how the routes are displayed. It seems like it would make more sense to have the route come across in plain language like a verbal clearance would be given, such as, "Cleared direct COGOK, direct ONP, rest of route unchanged." However it is resolved, there still seems to be confusion that needs to be straightened out.

Who Got the Clearance?

This B737 First Officer experienced two major flight safety risks rooted within the CPDLC framework of clearance reception and confirmation between aircraft and ATC.

■ *Level at cruise and FL380, Center stated he uplinked a clearance for us to descend and maintain FL340. The clearance showed 'accepted' on Center's system. We never received, and therefore never accepted, any descent clearance. After being informed of the discrepancy, both pilots double checked the CPDLC log, and there was no descent clearance in the log. This highlights the issue that CPDLC clearances do not contain an aircraft call sign. There is no way for pilots to ensure the communication was intended for their aircraft. Either a different aircraft somehow received our CPDLC clearance and accepted it, or Center's system showed 'accepted' for a clearance that we never received. Either is a major safety issue.*

Reread if You Reroute

This B737 Captain received a revised CPDLC clearance. Familiarity, complacency, and expectation bias are implicated in the situation that developed.

■ *ATC issued a revised clearance via CPDLC. Clearance was, "Load new route to LEV. Rest of route unchanged." Free text stated, "GLADZ.LEV.../IAH." I did not notice the route portion of the message because it was so short, and thought the clearance was only to proceed direct to ZZZ. The First Officer did not notice the error either and programmed the FMC for direct LEV with abeams as I*

directed, without GLADZ. ATC noticed we had turned to LEV and not GLADZ, and asked if we were proceeding direct to LEV. He stated that he must not have sent the message correctly and then verbally cleared us direct to LEV. I believe he was trying to be kind and let us off the hook. In seeing the CPDLC message, "Load new route to LEV," I simply assumed it was to go just direct LEV and failed to read all of the message, and used the LOAD prompt to load the FMC from the CPDLC clearance. I wanted to manually program the FMC with the direct [route] in order to utilize the 'abeam waypoints' function. It was expectation bias. In the future, I will…read all of the incoming CPDLC message, ask for confirmation from the other pilot, and use the 'load new route' function, and then reverify the clearance from the CPDLC against the FMC before executing the new route in the FMC, using the pilot monitoring to verify that the new clearance loaded correctly.

"Thanks, Tower!"

This Tower Controller resolved a B737 crew's CPDLC question prior to departure. Although CPDLC format is well-defined, complexity and confusion were culprits nonetheless.

■ *This was a CPDLC clearance issue where the crew was confused by the format. Aircraft X called me at Clearance Delivery asking why they had 'climb via SID' and no SID. I explained to them the format and hypothesized exactly what they had, describing the three pages, and where each element lies. They said they saw it then, had both missed it, and thanked me for clarifying.*

The difference in what is presented to us (ATC) versus what is presented to them (flight crews) is as varied as a child's knowledge and a post graduate degree. There is inherent risk in over-complicating technology in a safety related system when a very large gap in technology and trainability exists…. Change the CPDLC departure clearance format so it is intuitive and makes sense for the flight crews' flows, not for the engineers who designed it.

Loading Trait or CPDLC Glitch?

When a CPDLC issued clearance was loaded per procedure and didn't look right, this B737 Captain contacted ATC.

■ *At cruise, we were given a CPDLC clearance that read, "BLD ZZZ." Per the recent pilot bulletin, we loaded the route using the LOAD prompt. All…the FMC loaded was direct BLD…. That was a strange clearance, so we questioned ATC…. ATC explained it was supposed to be direct BLD, rest of route unchanged. We told ATC that we did not see that on the CPDLC clearance. ATC thanked*

us and said they have had some weird instances with their CPDLC. Later with a separate Controller, ATC was going to hand us off and asked what we were navigating to. We said, "Direct BLD like the last Controller said." ATC gave us direct to an arrival fix…. We continued to a normal landing.

Multi-Tasking Hazards

This air carrier Captain experienced difficulty with CPDLC messages during the descent. Human factors and specific CPDLC peculiarities are noted in the self-critique.

■ *In our descent to Chicago Midway (MDW), we were handed off to a new ATC frequency via CPDLC. We acknowledged and checked in. Center then sent us three CPDLC messages in less than two minutes. We received and acknowledged the first message to descend and maintain FL210. We heard the chime again and saw, "Cross MEGGZ at 11,000 feet." I verified MEGGZ at 11,000 feet in the FMC and on the Mode Control Panel and thought that I acknowledged the CPDLC. We did not see the clearance to proceed direct MEGGZ, which was sent also, but in a separate message. We also had the ACARS chime in the midst of this for landing data, as we were late to accomplish the Descent Checklist. As we were descending through FL200, ATC inquired if we had received the direct MEGGZ and the cross MEGGZ at 11,000 feet messages, because ATC was not showing an acknowledgment from us. We responded that we had received the crossing MEGGZ at 11,000 feet, but not the direct to MEGGZ. When we reviewed the CPDLC log page, we saw the direct to [MEGGZ] message, which we had not acknowledged, and we saw that we had not actually acknowledged the descent to cross MEGGZ at 11,000 feet, either.*

First, with expectation bias, I was not thorough, when I heard the chime and saw the ATC message, to ensure I did not have more than one open ATC message. I also missed verifying on the second page of the notification that I accepted. We should have been finished with receiving landing data prior to this stage of flight.

Recommendations regarding CPDLC: The ATC message should remain or flash if a message is not acknowledged, and if there is any way that the audible chime could be different from an ACARS chime, that would also be helpful.
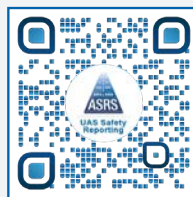
NASA ASRS
UAS/Drone Safety Reporting

Anyone involved in UAS/Drone operations can file a NASA ASRS report to describe close calls, hazards, violations, and safety related incidents.

ASRS Alerts Issued in August 2024	
Subject of Alert	**No. of Alerts**
Aircraft or Aircraft Equipment	4
Airport Facility or Procedure	9
ATC Equipment or Procedure	8
Hazard to Flight	1
Other	6
TOTAL	**28**

August 2024 Report Intake	
Air Carrier/Air Taxi Pilots	5,699
Flight Attendants	1,864
General Aviation Pilots	1,619
Military/Other	949
Controllers	366
Mechanics	254
Dispatchers	166
TOTAL	**10,917**