

NAT Data Link Special Emphasis Items

INTRODUCTION

The purpose of this North Atlantic Operations Bulletin is to provide background information and guidance material to North Atlantic (NAT) operators that could be included in pilot and dispatcher training programs and operations manuals to best prepare them for FANS 1/A (CPDLC/ADS-C) operations in the NAT to include the use of CPDLC route clearance uplinks.

The NAT OPS SEI (Special Emphasis Items) addresses CPDLC issues and Sections 3 and 4 of this bulletin are particularly important to review and understand.

INCLUDED

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Introduction

FANS data link is utilized in the NAT Region for communication via Controller Pilot Data Link Communication (CPDLC) and position reporting via Automatic Dependent Surveillance-Contract (ADS-C).

AIS publications of the NAT ATS Provider States should be consulted to determine the extent of current implementation in each of the NAT OCAs. Operational procedures to be used are specified in the **ICAO Doc 10037 Global Operational Data Link (GOLD) Manual**. These procedures are intended to facilitate the uniform application of Standards and Recommended Practices contained in:

- Annex 2 — Rules of the Air,
- Annex 10 — Aeronautical Telecommunications and
- Annex 11 — Air Traffic Services,
- The provisions in the Procedures for Air Navigation Services — Air Traffic Management (PANS ATM, Doc 4444) and, when applicable, the Regional Supplementary Procedures (Doc 7030).

Chapter 4 of the GOLD 'Flight Crew Procedures' is intended to assist operators in the development of appropriate procedures, documentation and training programs that ensure flight crews are knowledgeable in data link operations specific to aircraft type.

Chapter 4 is constructed as follows:

- General overview
- Differences between voice communications and CPDLC
- Logon procedures
- CPDLC messaging
- ADS-C contracts
- Non routine and emergency procedures.

This Bulletin may be updated, as necessary, as progress is made toward improved FANS 1/A (CPDLC/ADS-C) data link connectivity in the NAT region.

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NAT OPERATIONS BULLETIN – FANS 1/A (CPDLC/ADS-C) SPECIAL EMPHASIS ITEMS

1. Purpose of Bulletin – FANS 1/A (CPDLC/ADS-C) Special Emphasis Items.

- 1.1 The purpose of this bulletin is to provide background information and guidance material to North Atlantic (NAT) operators that could be included in pilot and dispatcher training programs and operations manuals to best prepare them for FANS 1/A (CPDLC/ADS-C) operations in the NAT to include the use of CPDLC route clearance uplinks.
- 1.2 With the increasing application of performance-based separations within the NAT Region, it is important that FANS 1/A (CPDLC/ADS-C) data link operations are functional so as to reduce impact and workload on both ATC and flight crews.
- 1.3 Operator attention is directed to Attachment A, which provides a “quick reference” for FANS 1/A (CPDLC/ADS-C) flight crew procedures. It is intended to be used as an aid for operators developing pilot training material.
- 1.4 The following is an explanation of the terms “should”, “must” and “shall” as used in this bulletin.
 - a) “Should” is used to indicate a recommended practice or policy that is considered as desirable for the safety of operations.
 - b) “Shall” and “must” are used to indicate a practice or policy that is considered as necessary for the safety of operations.

2. FANS 1/A (CPDLC/ADS-C) Overview

- 2.1 Data link services, such as CPDLC and ADS-C, provide communications and position report information that are intended to support safer and more efficient air traffic management and increase capacity.
- 2.2 **Controller Pilot Data Link Communications (CPDLC)**
 - 2.2.1 CPDLC significantly improves ATC intervention capabilities through enhanced communications which allows the exchange of uplink and downlink messages between an aircraft and an ATS Unit.
 - 2.2.2 An aircraft can have a maximum of two CPDLC connections established concurrently, each with a different ATS Unit.
 - a) A CPDLC connection immediately becomes active when established if **no** previous CPDLC connection exists at that time. An active CPDLC connection allows an ATS Unit and the aircraft to exchange CPDLC messages. The ATS Unit with which an aircraft has an active CPDLC connection is referred to as the Current Data Authority (CDA).
 - b) An inactive connection Next Data Authority (NDA) can be established upon completion of the logon procedure if a previous CPDLC connection exists with the aircraft.
 - 2.2.3 Under normal circumstances, the ATS Unit with the CDA connection will manage its CPDLC connections, including transferring and terminating the connection when no longer needed. CPDLC transfers will be initiated before the aircraft transits from the current ATS Unit to another CPDLC-capable ATS Unit, and will terminate the connection as the aircraft leaves the ATS Unit’s airspace. These transfers are automatic and should be seamless to the crew without any action required.
 - 2.2.4 Should a datalink transfer fail to complete, the transferring ATS Unit will be alerted, which may result in a request to the crew to disconnect CPDLC and to either perform a re-logon to recycle the transferring process, or to logon to the next ATS Unit.

2.2.5 It is imperative that equipped aircraft are logged on CPDLC/ADS-C prior to oceanic entry. This can be accomplished with an initial logon with a “domestic” FANS capable ATS Unit which then allows for an automatic transfer to the oceanic ATS Unit. If entering from an area where a data link connection has not been established, initiate the logon with the oceanic ATS Unit between 15 and 25 minutes prior to the boundary. Pilots should ensure the correct CPDLC identifier is populated for the “active centre” [active ATC] (CDA).

2.3 Automatic Dependent Surveillance-Contract (ADS-C)

2.3.1 ADS-C uses various systems on board the aircraft to automatically provide aircraft position, altitude, speed, intent and meteorological data, which can be sent in a report to an ATS Unit or AOC facility ground system for surveillance and route conformance monitoring.

2.3.2 When the ATS ground system receives a logon request message, the Flight Data Processing System (FDPS) will automatically initiate ADS contracts with the aircraft. These contract requests are dealt with by the avionics systems and are transparent to the flight crew. The following contracts are typically formed and provide alerts to the controller;

- a) Periodic contract with a typical interval of 10-14 minutes. Aircraft avionics will send an updated position report which will include level, time and NEXT and NEXT+1 waypoints inserted in the active flight plan.
- b) Event contract for the following events:
 - Waypoint change event (WCE). Waypoint change event will trigger an automatic position report (which will include level, time and NEXT and NEXT+1 waypoints) whenever the aircraft passes a waypoint contained within the active flight plan, or whenever a crew amends a waypoint that is either NEXT waypoint or NEXT+1 waypoint in the active flight plan.
 - Lateral deviation event (LDE). Deviation contract that will trigger an automatic position report (which will include level, time and NEXT and NEXT+1 waypoints) whenever the aircraft deviates from the cleared route beyond Strategic Lateral Offset (SLOP) provisions.
 - Level range deviation event (LRDE). Deviation contract that will trigger an automatic position report (which will include level, time and NEXT and NEXT+1 waypoints) whenever the aircraft deviates from the cleared level by 300ft or more.
 - Vertical Rate Change Event (VRE). Deviation contract that will trigger an automatic position report (which will include level, time and NEXT and NEXT+1 waypoints) whenever the rate of descent exceeds 5000 feet per minute.
- c) Demand contract which can be used by the controller to trigger an instantaneous position report by the aircraft avionics.
- d) Emergency contract ADS-C also supports emergency alerting. An ADS-C emergency report is a periodic report that is tagged as an ‘emergency’ report, allowing the emergency situation to be highlighted to ATC.

3. FANS 1/A (CPDLC/ADS-C) LOGON and Subsequent Transfers.

- 3.1 The logon is the first step in the data link process and is initiated either by the flight crew, or automatically following data link transfer from a previous ATS Unit. Once the logon is complete, the ATS Unit will request a CPDLC connection and/or ADS-C contracts, which should be automatically accepted by the aircraft.
- 3.2 Provisions concerning the establishment of FANS (CPDLC/ADS-C) connection are contained within Annex 10, Volume II, Chapter 8, 8.2.8 and ICAO Doc 4444, paragraph 14.2.
- 3.3 An initial logon request, when the aircraft is south of 82° North, is required regardless of whether or not ATS surveillance services are being provided. CPDLC provides communication redundancy and controllers will in many cases use CPDLC for communication even though the pilot is maintaining a listening watch on the assigned Direct Controller Pilot Communication (DCPC) VHF frequency.
- 3.4 At and north of 82° North, data link services cannot be guaranteed for aircraft equipped with Inmarsat SATCOM due to limitations in satellite coverage. However, this does not prevent flights from trying to establish a data link connection. Such limitations do not apply to aircraft equipped with Iridium SATCOM.

Note: Data link services for Northbound flights that fly north of 82° North and are not equipped with Iridium SATCOM data link are terminated at 82° North.

- 3.5 If not already logged on prior to North Atlantic entry, pilots should initiate a FANS 1/A (CPDLC/ADS-C) logon in the following circumstances;
- Flights departing airports in close proximity to the oceanic boundary that have not established a FANS logon with the ATS Unit prior to the oceanic ATS Unit.
 - Flights that will enter the NAT Region from an area where data link connections have not been established or maintained or,
 - When instructed to do so by ATC (i.e. following a failed data link transfer).
- 3.6 Pilots should enter the CPDLC/ADS-C 4 letter identifier located on the charted FIR boundary for the appropriate ATS Unit ensuring that the aircraft registration and flight number are correct.
- 3.7 Once the unique aircraft registration and flight number are correlated by the FDPS, the ATS Unit will automatically establish the appropriate CPDLC connections and the ADS-C contracts.
- 3.8 Because of the necessity for the Oceanic ATS Units to ensure FANS data link capability, all flights equipped with and prepared to operate FANS 1/A (or equivalent) CPDLC and ADS-C data link systems **must** have either an established FANS 1/A (CPDLC/ADS-C) connection, or make an initial logon between 15 and 25 minutes prior to the oceanic boundary.

If no logon is detected by ATS Unit prior to the oceanic boundary, the air traffic controller will be alerted and a late revision to the oceanic clearance could occur.

- 3.9 Under normal circumstances following initial logon, data link operations are seamless. However, the data link communications network is complex and made up of a number of components which can result in unsuccessful operation. Whenever a connection or transfer issue is identified, the controlling ATS Unit will normally try a reset of the connection by requesting the logon be re-cycled, even though the aircraft may be indicating that the connection is working normally.
- 3.10 Despite indications in the cockpit of the correct active centre (CDA), ATC may issue an instruction to “DISCONNECT CPDLC AND LOG ON TO [ATSU].” It is vitally important to act on this instruction to ensure that the current flight profile can be maintained.

4. CPDLC Route Clearance Uplinks

- 4.1 CPDLC route clearance uplinks are used by ATC to amend oceanic routing.
- 4.2 If a clearance is received that can be automatically loaded into the FMS (e.g. via a LOAD prompt), the flight crew should load the clearance into the FMS and review it before responding with WILCO.
- 4.3 Flight crews must be familiar with the proper loading and execution of the following CPDLC route clearance uplinks;
- a) PROCEED DIRECT TO (position)
 - I. Instruction to proceed directly to the specified position
 - b) CLEARED TO (position) VIA (route clearance)
 - I. Instruction to proceed to the specified position via the specified route
 - II. This uplink may not show the “VIA ROUTE CLEARANCE” until it is loaded
 - III. This is not a “direct” to the CLEARED TO waypoint. It is a clearance to the waypoint via the route specified.
 - c) CLEARED (route clearance)
 - I. Instruction to proceed via the specified route
 - II. This uplink may not show the “ROUTE CLEARANCE” until it is loaded
 - d) AT (position) CLEARED (route clearance)
 - I. Instruction to proceed from the specified position via the specified route
 - II. This uplink may not show the “ROUTE CLEARANCE” until it is loaded

Note. — Experience shows that flights crews often misunderstand the uplink message CLEARED TO (position) VIA (route clearance) when they fail to load the message and incorrectly fly directly to the CLEARED TO position. Or, even after loading, they perceive the clearance as “direct” to the “CLEARED TO” position.

Note. — FMS waypoint weather data (winds and temperature) may be lost depending on the route clearance message received. Flight crews should verify the weather data as they may need to re-enter the weather data for proper FMS predictions.

5. Operator/Aircraft Eligibility.

- 5.1 Operators should ensure that all flights filed to operate in Data Link Mandate (DLM) airspace are:
- a) Equipped with and prepared to operate FANS 1/A (or equivalent) CPDLC and ADS-C datalink systems. (NAT Regional Supplementary Procedures (ICAO Doc 7030) paragraphs 3.3.2 and 5.4.2 for CPDLC and ADS-C respectively).

6. Flight Planning Provisions

- 6.1 Operators must file the correct ICAO Flight Plan annotations in Items 10 and 18 to indicate that FANS 1/A (CPDLC/ADS-C) required are operational for the flight;
- a) Item 10a (Radio communication, navigation and approach aid equipment and capabilities).
 - Insert “J2” to indicate FANS 1/A (or equivalent) CPDLC HF DL and/or “J5” to indicate FANS 1/A (or equivalent) Inmarsat CPDLC SATCOM and/or “J7” to indicate FANS 1/A (or equivalent) CPDLC Iridium SATCOM data link equipment and operation;

b) Item 10b (Surveillance equipment and capabilities)

- Insert “D1” to indicate FANS 1/A (or equivalent) ADS-C equipage and operation.

Note: Although J2, J5 or J7 meet the eligibility requirements for NAT DLM airspace, some ATS Units will only initiate CPDLC connections if a flight has filed J5 or J7.

7. Additional Requirements

- 7.1 Since SATCOM is required in oceanic airspace to maintain data link connectivity, pilots should ensure that SATCOM is functional prior to oceanic entry.
- 7.2 Even though a CPDLC connection may be active, flight crews are responsible for responding to SATVOICE calls, conducting HF SELCAL checks or maintaining a listening watch on the assigned frequency while in the NAT region.
- 7.3 Prior to exiting NAT oceanic airspace and transitioning into a domestic area, the transferring ATS Unit will uplink the appropriate voice frequency. If no such message is received prior to exiting, crews should request the frequency by voice to ensure contact with the ATS Unit *before* oceanic exit.

8. Contingency Procedures

- 8.1 FANS 1/A (CPDLC/ADS-C) procedures for loss of data link connectivity.
- **FANS 1/A (CPDLC/ADS-C) Data Link Equipment Failure Prior to Departure.** If a flight experiences a FANS data link failure **PRIOR TO DEPARTURE**, the flight should flight plan so as to remain clear of NAT DLM airspace
 - **FANS 1/A (CPDLC/ADS-C) Data Link Equipment Failure After Departure But Prior to NAT DLM Airspace.** If a flight experiences a FANS data link failure **AFTER DEPARTURE BUT PRIOR TO ENTERING AIRSPACE**, the flight should contact ATC and request a revised clearance that will keep it clear of NAT DLM airspace.
 - **FANS 1/A (CPDLC/ADS-C) Data Link Equipment Failure After Entering NAT DLM Airspace Track.** If a flight experiences a FANS data link failure **WHILE OPERATING IN NAT DLM AIRSPACE**, ATC must be immediately advised. Such flights may be re- cleared to exit NAT DLM airspace, but consideration will be given to allowing the flight to remain in the airspace, based on tactical considerations.

9. Websites

The ICAO EUR/NAT Office Website is at: www.icao.int/eurnat. Click on **EUR & NAT Documents >> NAT Documents** to obtain NAT Operations and NAT Region Update Bulletins and related project planning documents.

10. Contacts

The following individuals may be contacted for information or to provide feedback on FANS 1/A (CPDLC/ADS-C) operations:

UK NATS Manager International Coordination Shanwick Oceanic NATS Prestwick Centre Fresson Avenue PRESTWICK KA9 2GX Direct line: +44(0) 7973847091 E-mail: jain.brown@nats.co.uk	NAV CANADA Gander Area Control Centre P.O. Box 328 Gander, NL A1V 1W7 Attn: Jeffrey Edison Manager, ACC Operations Direct line: +1 709-651-5223 E-mail: edisonj@navcanada.ca
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ATTACHMENT A – SUMMARY OF FANS 1/A (CPDLC/ADS-C) SPECIAL EMPHASIS ITEMS CONTAINED IN THIS NAT OPS BULLETIN

Special Emphasis Items for FANS 1/A (CPDLC/ADS-C) Procedures. The Special Emphasis Items (SEI) listed below should be incorporated into operator training programs and operations manuals with the intent of raising pilot and dispatcher awareness of the importance of following proper FANS 1/A (CPDLC/ADS-C) procedures in the NAT.

Planned Vertical and Horizontal Boundaries for NAT Region DLM Airspace

- ☑ Phase 2B, commencing 7 December 2017: FL 350 to FL 390 (inclusive) throughout the ICAO NAT region;
- ☑ Phase 2C, commencing 30 January 2020: FL 290 to FL 410 (inclusive) throughout the ICAO NAT Region.

Operator/Aircraft Eligibility and Flight Planning Provisions;

- Equipped with and prepared to operate FANS 1/A (or equivalent) CPDLC and ADS-C datalink systems. (NAT Regional Supplementary Procedures (ICAO Doc 7030) paragraphs 3.3.2 and 5.4.2 for CPDLC and ADS-C respectively.)
- Insert “J2” to indicate FANS 1/A (or equivalent) CPDLC HF DL, “J5” to indicate FANS 1/A (or equivalent) Inmarsat CPDLC SATCOM and/or “J7” to indicate FANS 1/A (or equivalent) CPDLC Iridium SATCOM data link equipment and operation in Item 10a (Radio communication, navigation and approach aid equipment and capabilities) of flight plan.
- Insert “D1” in field 10b to indicate FANS 1/A (or equivalent) ADS-C equipment and operation.

Flight Crew

- Must ensure a FANS (CPDLC/ADS-C) connection prior to entering NAT oceanic airspace, Connections are essential for ATC to be able to issue the most optimal oceanic clearance, provide more capacity, and to use ADS-C for route conformance along with efficient and expeditious communications through CPDLC.
- Must be proactive in ensuring the flight is connected to the correct ATS Unit.
- Must follow ATC instruction to “DISCONNECT CPDLC AND LOG ON TO [ATSU]” if advised.
- Must ensure SATCOM and HF functionality
- Must be familiar with the proper loading and execution of the following CPDLC route clearance uplinks;
 - a) PROCEED DIRECT TO (position)
 - I. Instruction to proceed directly to the specified position
 - b) CLEARED TO (position) VIA (route clearance)
 - I. Instruction to proceed to the specified position via the specified route
 - II. This uplink may not show the “VIA ROUTE CLEARANCE” until it is loaded
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 - d) AT (position) CLEARED (route clearance)
 - I. Instruction to proceed from the specified position via the specified route
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- Must contact the domestic ATS Unit on the frequency provided *before* exiting oceanic airspace.

Common Pre-Defined Freertext CPDLC Uplink Messages

CPDLC Pre-Defined Uplink Text	Reason ATS Unit would uplink	Crew Action
DIVERGENCE FROM ATC ROUTE AFTER NEXT WAYPOINT IS DETECTED. CHECK FMS	Out of conformance of NEXT+1 waypoint contained within ADS-C report.	Check loaded routing, and confirm if any changes have been made.
YOUR POSITION REPORT INDICATES INCORRECT ROUTING. CHECK FULL DEGREES AND MINUTES LOADED INTO FMC.	Out of conformance contained within ADS-C report.	Check full degrees and minutes loaded to ensure no half or whole degree latitude errors, and report deviations from route to ATC immediately.
CONFIRM ASSIGNED ROUTE DOWNLINK OUT OF CONFORMANCE.	Route contained within 'CONFIRM ASSIGNED ROUTE' downlink out of conformance.	
CHECK FMS AND CORRECT ACTIVE WAYPOINT	Incorrect Sequence (after Weather Dev, the ADS track is moving backward)	
ADS-C DEVIATION DETECTED. VERIFY AND ADVISE.	ADS-C Present Position is off-route	Immediately display the full DEGREES and MINUTES loaded into the FMC for the NEXT waypoint and verify against the cleared route.
ADS-C ESTIMATES APPEAR INACCURATE. CHECK FMS	Estimate for next waypoint contained in ADS differs from ATS Unit estimate	Confirm latest estimate for next Waypoint to ATS Unit
CONFIRM ASSIGNED ROUTE	Request to confirm assigned route	Respond to the uplink. If an anomaly occurs that prevents the pilot from responding, send free text UNABLE TO SEND ROUTE
DATA LINK SERVICES WILL BE TERMINATED WHEN LEAVING SATELLITE COVERAGE AT 82N. AT AND NORTH OF 82N USE VOICE FOR POSITION REPORTS AND OTHER COMMUNICATIONS	Northbound aircraft (not equipped with Iridium SATCOM data link) estimated to exit data link coverage area at 82° degrees North.	Resume voice communications including position reporting at and north of 82° degrees North.

Contingency Procedures

1. Advise ATC immediately of any data link issues that might affect FANS (CPDLC/ADS-C) data link operations.

–END–