



Agenda Item 1: ANS context (ATM/CNS) Global and Regional level

IMPLEMENTATION OF CPDLC IN THE BRAZILIAN CONTINENTAL AIRSPACE

(Presented by Brazil)

Summary

This information paper aims to announce the recent implementation of Controller Pilot Data Link Communications (CPDLC) in the Brazilian upper continental airspace, its technical and operational characteristics, share the planning efforts carried out and the good practices recognized during the multidisciplinary work and present the phased plan for expanding the use of the data link application in all FIRs in the country. CPDLC is in use in the Recife FIR and in most part of the Amazônica FIR, and Brazil intends to implement the data link application in all FIRs by 2024.

References:

- International Civil Aviation Organization (ICAO). *Global Air Traffic Management Operational Concept* – Doc 9854. First Edition, 2005.
- International Civil Aviation Organization (ICAO). *Global Air Navigation Plan* – Doc 9750. 4th Edition, 2013.
- International Civil Aviation Organization (ICAO). *Annex 10 - Aeronautical Telecommunications*.
- International Civil Aviation Organization (ICAO). *Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)* – Doc 4444, 2016.

1. Introduction

1.1 CPDLC employs preformatted, standardized messages corresponding to the standard phraseology used in radiotelephony in the provision of Air Traffic Services (ATS).

1.2 The data link application is recommended by the International Civil Aviation Organization (ICAO) as one of the enabling technologies of air traffic management concepts of the future, and provides greater automation and management of communications, having as main benefits the reduction of congestion in voice channels, greater availability and coverage for aeronautical communications, reduced misunderstandings in communications during the ATS provision, and decrease in the workload of air traffic controllers and pilots.

1.3 Brazil, through the Department of Airspace Control (DECEA) and its SIRIUS BRAZIL Program for ATM evolution, has been working in cooperation with stakeholders, such as the Communications Service Provider (SITA On Air), the ATC automation systems developer (ATECH), Brazilian Air Force operational and technical teams and aeronautical community to implement CPDLC in the Brazilian continental airspace.

1.4 The LANDELL Project was set to make the CPDLC operational for ATS provision over selected sectors of Recife and Amazônica FIRs, which were strategically selected because of the fleet characteristics (CPDLC capabilities are already implemented in aircraft at international routes), low complexity of airspace and low traffic volume.

1.5 The work carried out for CPDLC implementation in continental airspace in Brazil is entitled LANDELL Project in honor of the distinguished Brazilian priest, researcher and scientist, Roberto Landell de Moura, pioneer in the transmission of sound and wireless telegraphic signals by means of electromagnetic waves. The LANDELL Project represented the beginning of a new era for aeronautical communications in Brazil.

2. Discussion

2.1 The first studies started in 2013. From 2016 on, the main challenges were recognized, as shown below in a non-exhaustive list:

- a) The self-development of an Air Traffic Control and piloting simulator using data link;
- b) Evaluating human-machine interface and the automated functionalities available in the national ATC system and defining new HMI requirements for the ATC System for optimization of ATCO screen windows, process automation, awareness of data link connection status, among others;
- c) Developing the operationalization phases, the prototype scenario for the implementation of continental CPDLC and the recommendations to be considered for the Operations Manuals and ACC Operational Models update;
- d) Identifying the DECEA rules that would be impacted by the introduction of CPDLC in the ATC, re-issuing related legislation and drafting new publications;
- e) Establishing a methodology to determine ATC airspace capacity using CPDLC and adjusting the methodology to measure ATC sector's capacity for extracting workload variables;
- f) Ensuring that the technical parameters of the ground-ground and air-ground networks enable a safe CPDLC operation in the Brazilian continental airspace;
- g) Carrying out performance tests for the national data link using laboratory aircraft and aircrafts from national and international airlines;
- h) Identifying cognitive and psychomotor human skills necessary for CPDLC operation in continental airspace, defining technical and operational know-how necessary for ATCOs, creating a specific CPDLC course, developing ATCO training and capacity building strategy;
- i) Identifying hazards, performing risk assessment and classification, developing the CPDLC Continental Safety Risk Management Document and coordinating and implementing mitigation and/or corrective solutions;
- j) Planning and executing technical and operational proofs of concept.

1.6 On September 9th, 2021, CPDLC through the FANS 1/A and FANS 1/A+ data link system became operational in Brazil in an area corresponding to more than 3.5 million km² and in class A airspace, above FL250, in sectors 1 to 5 of the Amazônica FIR and sectors 1 to 6, 9 and 10 of the Recife FIR.

1.7 Since April 2022 the CPDLC is available throughout FIR RE.

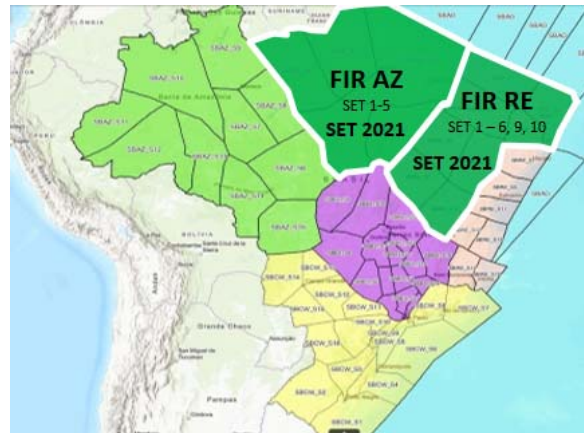


Fig.01 – CPDLC Airspace - September, 2021

1.8 CPDLC FANS 1/A is used as an additional mean to VHF-AM communications for routine communications that do not require prompt action in the provision of air traffic services. The application is not used for vectoring.

1.9 CPDLC is only used in airspace where the ATS surveillance service is provided. The minima separation remains unchanged.

1.10 All CPDLC messages provided in Doc 10037 – Global Operational Data Link Document can be used. An assistant ATCO is not allowed to send any kind of clearance messages, instructions, or traffic information.

1.11 The first implementation was divided into 3 phases in order to enable the gradual integration of the application into the operational routine of the users, to facilitate the assimilation of the CPDLC application by the ATCO, to avoid possible resistance to the implementation and, at the same time, to allow monitoring the technical performance, the use of operational doctrines and specific adjustments to maintain or improve safety levels.

1.12 The implementation phases were based on predetermined periods of operation throughout each day so that, in an evolving manner, they can handle greater air traffic volume.

1.13 The operating hours in phase 1 were from 2000Z to 0200Z and in phase 2, from 1800Z to 0600Z (each of these phases will last 2 months). Phase 3, started in March 2022, characterizes the use of CPDLC operating without time restrictions in the provision of air traffic services.

1.14 There is no application of the Performance-Based Communication and Surveillance (PBCS) concept in the Brazilian continental airspace. In order to verify the adherence of CPDLC to the operational times currently used for communications in air traffic control using voice, 4 tests were carried out to evaluate data link performance in the Brazilian continental airspace.

1.15 After the extensive work to evaluate the performance of the national data link, it was found that it would be possible, for the operational reality of the Amazônica and Recife FIRs, to use VDLM0/A, VDLM2 and SATCOM subnets.

1.16 It is not mandatory for all aircraft to be equipped with CPDLC data link avionics FANS 1/A or FANS 1/A+. There is no airspace segregation.

1.17 CPDLC is used in the Brazilian continental airspace in a mixed communication environment, that is, in sectors where the ATS is provided both for aircraft capable and not capable of using CPDLC.

1.18 CPDLC is already available in all Recife FIR airspace since April 2022. The use of CPDLC will continue to expand until 2024.

1.19 As of October 18, 2022, CPDLC will be operational throughout the Amazônica FIR; as of December 2023, it will be available in the Brasília FIR; and as of December 2024, in the Curitiba FIR, completing all Brazilian upper airspace.

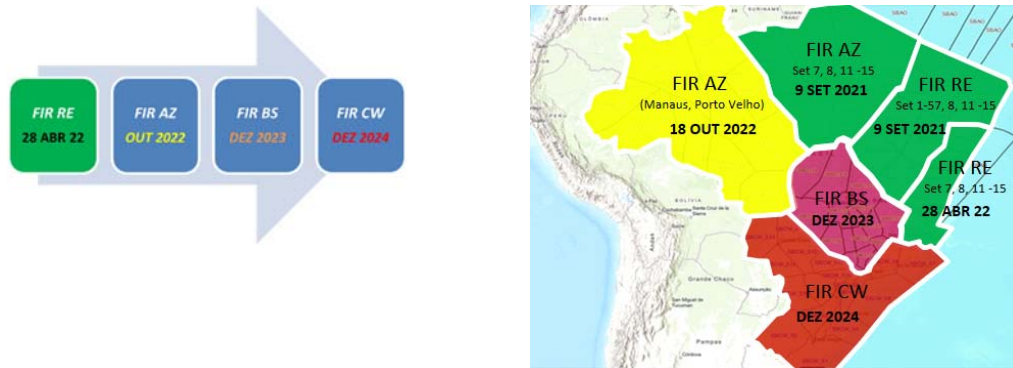


Fig.02 – CPDLC Next Moves Schedule

1.20 Operational experience has shown that there are still few domestic commercial aircraft equipped with CPDLC data link avionics, but most international and general aviation aircraft are ready, and the adherence to the use of CPDLC has been very significant.

1.21 Given the expected operational gains with the CPDLC implementation for the ATS provision in the selected airspaces, Brazil strongly encourages the fleet upgrade and the priority use of the VDLm2 subnet.

1.22 To date, no significant technical, operational, or doctrinal problems have been identified.

3. Conclusion

3.1 The CPDLC implementation in the domestic airspace in Brazil is a success case.

3.2 The Meeting is invited to take note of the information provided