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INFORMATION PAPER

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Nineteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/19)
Online, 27 – 29 October 2021

Agenda Item 4: Global and Interregional Activities

OPERATIONALIZATION OF CPDLC IN CONTINENTAL AIRSPACE IN BRAZIL

(Presented by Brazil)

EXECUTIVE SUMMARY

This paper aims to announce the implementation of Controller Pilot Data Link Communications (CPDLC) in the Brazilian upper continental airspace, its technical and operational characteristics, as well as to share the planning efforts carried out and good practices.

Strategic Objectives:	• Air Navigation Capacity and Efficiency
References:	• *SAM/IG/25 Final Report.*

1. Introduction

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

1.2 The LANDELL Project was set to make the CPDLC operational for ATS provision over selected sectors of Recife and Amazonica 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.

2 Discussion

2.1 CPDLC, an acronym for Controller Pilot Data Link Communications, employs preformatted, standardized messages corresponding to the standard phraseology used in radiotelephony in the provision of Traffic Services (ATS).

2.2 The 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.

2.3 Brazil, through the SIRIUS Brazil Program aims the evolution of the national ATM and considers the operationalization of CPDLC as one of its developments.

The LANDELL Project – Operationalization of CPDLC in Continental Airspace in Brazil

2.4 The work carried out for the operationalization of CPDLC 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.

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

a) The self-development of an Air Traffic Control and piloting simulator using data link;

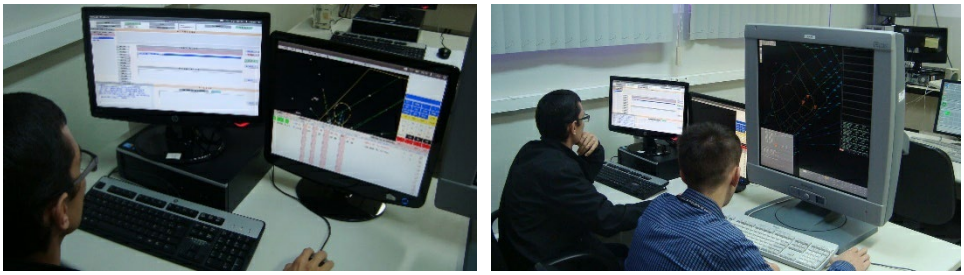

Fig. 01 – Air Traffic Control and Piloting Simulator using data link

b) Evaluating human-machine interface and the automated functionalities available in the national ATC system;
c) Defining new HMI requirements for the ATC System for optimization of ATCO screen windows, process automation, awareness of data link connection status, among others;

Fig. 02 – Evolution of the Brazilian ATC System

d) Continuous participation and monitoring of experienced professionals from the technical and operational area, from the development of new HMI requirements, testing and solving bugs, to its effective operational implementation, in order to avoid any development rework and additional costs;

Fig. 03 – Collaborative Development of the ATC System

e) 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.

f) Identifying the DECEA rules that would be impacted by the introduction of CPDLC in the ATC, re-issuing related legislation and drafting new publications;

g) Establishing a methodology to determine ATC airspace capacity using CPDLC;

h) Adjusting the methodology to measure ATC sector's capacity for extracting workload variables;

i) Ensuring that the technical parameters of the ground-ground and air-ground networks enable a safe CPDLC operation in the Brazilian continental airspace;

j) Carrying out performance tests for the national data link using laboratory aircraft and aircrafts from national and international airlines;

k) Identifying cognitive and psychomotor human skills necessary for CPDLC operation in continental airspace, definition of technical and operational know-how necessary for ATCOs, creation of a specific CPDLC course, development of a training and a capacity building strategy for all ATCOs;

Fig. 04 – CPDLC Course

l) Identifying hazards, performing risk assessment and classification, developing the CPDLC Continental Safety Risk Management Document and coordinating and implementing mitigation and/or corrective solutions;

m) Developing and implementing a solution to enable the timely updating of repetitive flight plans (RPL) with information of aircraft registration – a requirement for the CPDLC data link logon;

n) Planning and executing Technical and Operational Proofs of Concept;

Fig. 05 – Proofs of Concept at AZ ACC and RE ACC

o) Developing and executing a strategy for dissemination of the Project, its characteristics, and benefits, in order to raise awareness among users and reduce resistance to the new operational reality; and

Fig. 06 – Continental CPDLC Symposia and Seminars

p) Analyzing the workload before and after CPDLC implementation.

2.6 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 km^2 and in class A airspace, above FL250, in sectors 1 to 5 of Amazonica FIR and sectors 1 to 6, 9 and 10 of Recife FIR.

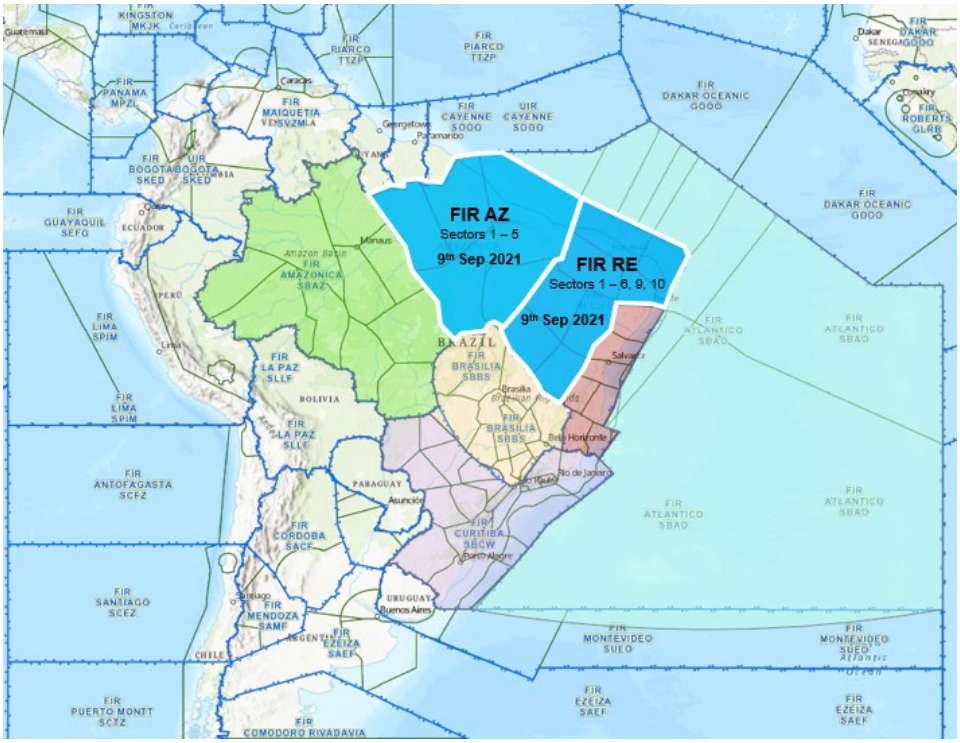

Fig. 07 – Continental CPDLC Airspace

2.7 CPDLC is used as an additional means 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.

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

2.9 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.

2.10 The operationalization 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 due to the implementation and, at the same time, to allow the monitoring of the technical performance, the use of operational doctrines and specific adjustments to maintain or improve safety levels.

2.11 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.

2.12 The operating hours in phase 1 are from 2000Z to 0200Z and in phase 2, from 1800Z to 0600Z (each of these phases will last 2 months). Phase 3, scheduled to start in January 2022, characterizes the use of CPDLC operating without hours restrictions in the provision of air traffic services.

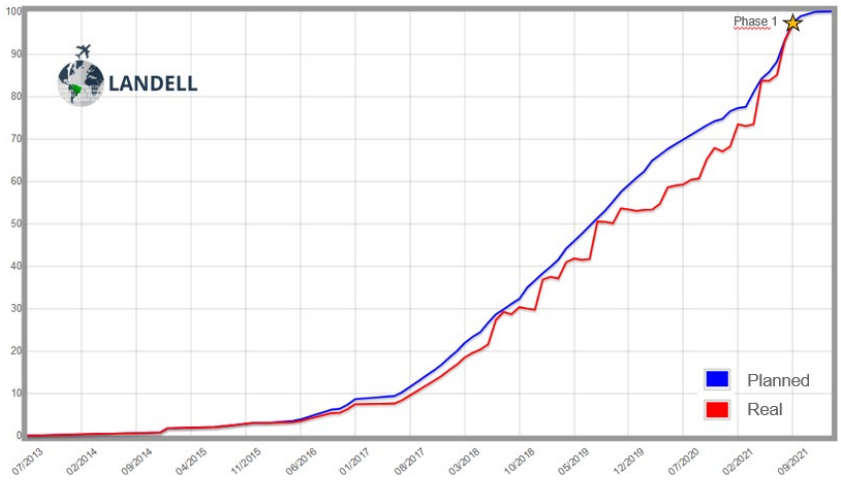

Fig. 08 – S curve of the LANDELL Project

2.13 The transition between the phases will occur simultaneously and in a coordinated way between Recife and Amazonico Centers to avoid discontinuity of the operations and will be informed through aeronautical publications.

2.14 DECEA maintains a concession contract for data link services with SITA On Air. A vast network of VHF data link ground stations has been deployed to provide coverage throughout the continental airspace above FL245 and some selected Terminal areas.

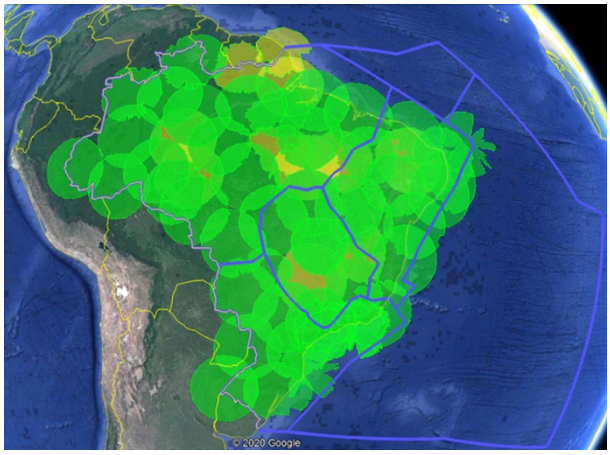

Fig. 09 – Data Link coverage in Brazil

2.15 The processing of CPDLC messages in Brazil's domestic airspace can take place through the POA, VDLm2 or SATCOM subnets. For the purposes of completing item 10 of the flight plan, regarding equipment and data link capabilities, codes J3, J4, J5, J6 or J7 can be used.

2.16 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.

Fig. 10 – Participation of the laboratory aircraft in the data link performance tests

2.17 The results of all tests were presented during the Second Meeting of CP-OPDLWG Joint Project Team (OPDLWG-JPT/02), held in May 2021, to support ongoing efforts to validate Required Communication Performance (RCP) 130. As an example, the table below shows the Actual Communication Performance (ACP) analysis of the fourth data link test and its comparison with the latency requirements for the RCP130.

CPDLC Actual Communication Performance (RCP)					
Period: Jan 01, 2021 to Mar 31, 2021 (3 months)					
Color Key		**95% RCP 130 benchmark**		**99,9% RCP 130 benchmark**	
Meets criteria					
99.00% - 99.9%					
Under criteria		*ACP*	*ACTP*	*ACP*	*ACTP*
Media Type	**Message Counts**	*<=60s*	*<=20s*	*<=120s*	*<=32s*
All Combined	2127	2127	2127	2127	2127
SAT	342	342	342	342	342
VHF	889	889	889	889	889
SAT/VHF	7	7	7	7	7
VHF/SAT	889	889	889	889	889

Fig. 11– 4th Data Link Test – CPDLC ACP

2.18 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. Thus, it will be used in the Brazilian continental airspace in a mixed environment, that is, in sectors where ATS will be provided both for aircraft capable and not capable of using CPDLC.

2.19 However, given the expected operational gains with the CPDLC operationalization for the ATS provision in the selected airspaces, Brazil strongly encourages the fleet upgrade and the priority use of the VDLm2 subnet.

2.20 Since the launch of the project, a team of professionals experienced in data link has followed the operation in the Amazonico and Recife Area Control Centers. To date, no significant technical, operational, or doctrinal problems have been identified.

Plan for Expanding the Use of Continental CPDLC in Brazil

2.21 The use of CPDLC in the other sectors of Amazonica FIR and Recife FIR, as well as Brasília FIR and Curitiba FIR, will continue to expand until 2024, as follows:

a) RE FIR: April 2022;
b) AZ FIR: December 2022;
c) BS FIR: December 2023; and

d) CW FIR: December 2024.

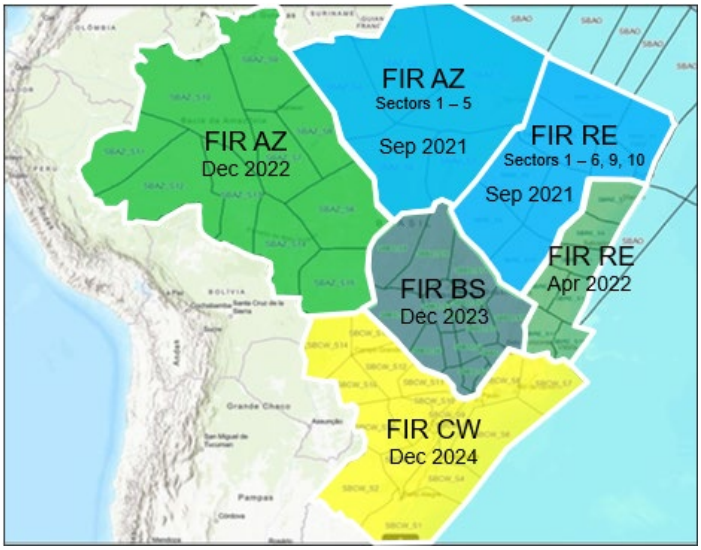

Fig. 12 – CPDLC Operationalization Plan

3 Conclusion

3.1 The implementation of the LANDELL Project is a success case.

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

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