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Agenda Item 5: NACC/WG Collaborative Task Forces Working Session

IMPLEMENTATION OF ADS-C/CPDLC IN THE MEXICAN AIRSPACE

(Presented by SENEAM)

EXECUTIVE SUMMARY

The increase in air traffic in the Mexican Pacific requires technologies that overcome the limitations of radar and VHF. The implementation of ADS-C and CPDLC, aligned with ICAO's ASBU modules, will improve safety and efficiency. ADS-C offers automatic position and trajectory reports, strengthening surveillance in ocean areas. CPDLC complements voice, reduces congestion, and standardizes messages between pilots and controllers.

The benefits are clear: greater safety, capacity, efficiency and harmonization with international practices. Challenges include differences in aircraft equipment, training needs, and cybersecurity. It is also necessary to synchronize procedures with neighboring States to ensure interoperability.

Action:	Suggested actions under item 4 of this working paper.
<i>Strategic Objectives:</i>	<ul style="list-style-type: none">• Safety• Air Navigation Capacity and Efficiency• Economic Development of Air Transport• Environmental Protection
<i>References:</i>	<ul style="list-style-type: none">• Modernization of air traffic control procedures in Mexican space.

1. Introduction

1.1 The sustained increase in air traffic in Pacific airspace, particularly on oceanic and long-range routes, has highlighted the need for technologies that optimize communications and surveillance in areas where conventional systems (radar and VHF) have limitations.

1.2 The implementation of Automatic Dependent Surveillance–Contract (ADS-C) and Controller Pilot Data Link Communications (CPDLC), aligned with the ASBU COMS-B0/1 and COMS-B0/2 modules of the ICAO GANP, will strengthen safety, reduce voice communications congestion and improve the efficiency of air operations in the Pacific region under Mexico's responsibility.

2. Analysis

2.1 Currently, operations in Pacific Ocean airspace rely heavily on HF communications, which are subject to interference and technical limitations. ADS-C offers automatic position and projected trajectory reporting, which improves surveillance capability in procedural separation areas. CPDLC complements voice communications, allowing the transmission of authorisations, requests and standardised messages between pilots and controllers.

The main benefits identified are:

- **Safety:** automatic and accurate position and trajectory reports.
- **Capacity:** reduction of congestion on HF/VHF frequencies.
- **Efficiency:** better route management and reduced workload for pilots and controllers.
- **Harmonization:** compliance with ICAO's global strategy and practices in regions such as NAT and PAC.

However, challenges are identified:

- Variability in aircraft equipment (FANS 1/A and ATN B1).
- Need for technical and operational training for controllers and pilots.
- Cybersecurity requirements in data management.
- Need to synchronize procedures with adjacent States.
- Interoperability.

2.2 The implementation of this technology requires adopting a national implementation plan for ADS-C and CPDLC in the Mexican Pacific, aligned with the GANP, coordinating with airlines and neighbouring states to guarantee interoperability on international routes.

2.3 It is also necessary to invest in the modernization of the terrestrial communications and surveillance infrastructure, something that SENEAM is currently doing through its project to modernize SENEAM's Control Centers.

2.4 Strengthening the training of operational and technical personnel in ADS-C data binding and management and including a cybersecurity component in the implementation strategy is necessary.

3. Support needs

3.1 SENEAM has held discussions with representatives of the FAA and ICAO's NACC Office seeking support from these organizations to carry out this project, taking advantage of the FAA's expertise and ICAO's support.

3.2 The FAA has supported this implementation, supporting the training of the technical and necessary SENEAM personnel who will lead the project; however, the work requires a series of other activities in which not only the work of SENEAM, but of everyone is required to achieve the benefits expected from this implementation.

3.3 The need to integrate the Central American Corporation for Air Navigation Services (COCESNA) into this project has also been identified, due to the coordination of joint operations.

3.4 An overview of the project is presented in **Appendix A** to the present working paper for analysis of the meeting.

4. Conclusions

4.1 The modernization of air navigation services in the Mexican Pacific requires the adoption of advanced technologies that ensure reliable communications and effective surveillance in ocean areas. The implementation of ADS-C and CPDLC represents a critical step in improving safety, increasing airspace capacity, and ensuring international interoperability.

4.2 SENEAM, in coordination with ICAO and regional actors, is prepared to lead this initiative, which will strengthen Mexico's position as a benchmark in the modernization of air traffic management in the Pacific region.

4.3 SENEAM requests the kind support of the MCAAP project to support the execution of these activities, through the creation of a regional project that covers all the member states of the NAM/CAR region that have operations in the Pacific with the aim of ensuring the standardization of procedures and their application in a homogeneous manner for the benefit of operational safety and the environment.

5. Suggested actions

5.1 Participating States and agencies are invited to:

- a) Support the implementation of ADS-C and CPDLC in the Mexican Pacific.
- b) Participate in interoperability programs and joint tests with Mexico.
- c) (c) To contribute to the development of a regional training programme on data linkage.
- d) Coordinate efforts to ensure the cyber security and resilience of the systems implemented.
- e) (e) Establish a regional working group for the monitoring and evaluation of results.
- f) f) To manage the support of the MCAAP project to this initiative.

APPENDIX A

ADS-C and CPDLC Implementation Project in SENEAM

1. Introduction

The growth of air traffic and the need to optimize airspace management require SENEAM to modernize its communication and surveillance capabilities. The implementation of ADS-C (Automatic Dependent Surveillance – Contract) and CPDLC (Controller Pilot Data Link Communications) will improve operational safety, increase efficiency and reduce voice channel congestion, aligning with the ASBU COMS-B0/1 and COMS-B0/2 modules of the ICAO GANP.

2. Project objectives

- Integrate ADS-C and CPDLC into SENEAM's air traffic control infrastructure.
- Ensure interoperability with FANS 1/A and ATN B1 aircraft.
- Reduce the burden of voice communications and improve the accuracy of surveillance in ocean and domestic areas.
- Establish operational and contingency procedures for data management.
- Develop national capacities in cybersecurity training and management associated with data links.

3. Scope

- Technical field: integration of CPDLC and ADS-C terrestrial systems with the existing communications network (ACARS/ATN).
- Operational scope: application in en-route airspace (oceanic and continental) under the responsibility of SENEAM.
- Regulatory scope: adaptation of procedures with ICAO Doc 4444, GOLD Doc 10037 and Annex 10 Vol II.
- Institutional scope: coordination with airlines, manufacturers, DGAC Mexico and infrastructure providers.
- Regional integration with adjacent States (the United States and the Central American FIR).

4. Project Stages

1) Initial diagnosis

- a) Inventory of SENEAM's communications and surveillance infrastructure.
- b) Identification of aircraft equipped with FANS 1/A and ATN B1.

2) Design and technological integration

- a) Selection of ADS-C/CPDLC system providers (ACARS and ATN compliant).
- b) Integration with existing ATC systems (radar, ADS-B, VHF, AMHS).

3) Development of procedures

- a) Procedures for using CPDLC (log-on, handovers, transfers).
- b) ADS-C procedures (periodic, event, and demand contracts).

4) Training

- a) Courses for controllers, pilots, maintenance technicians and operations personnel.
- b) Use of CPDLC and ADS-C simulators for practical training.

5) Pilot test and validation

- a) Initial implementation in ocean routes (e.g. Mexico – USA/CA).
- b) Evaluation of safety, technical performance and operational acceptance.

6) Full deployment

- a) Progressive expansion to all airspace controlled by SENEAM.
- b) Regulatory adjustments and issuance of mandatory equipment circulars.

5. Required Resources

- Technology: ADS-C/CPDLC systems in control centers (CENAMER, Monterrey, Mexico City and the United States).
- Personnel: controllers trained in data link, technicians in maintenance of FANS/ATN systems.
- Investment: acquisition of infrastructure, software licenses, training and support.
- Cooperation: coordination with ICAO NACC, FAA and COCESNA for regional interoperability.

6. Identified Risks

- Delay in aircraft equipment (not all fleets are ready).
- Possible technical incompatibilities between supplier systems.
- Operational resistance by learning curve in CPDLC.
- Cybersecurity risks in data exchange.

7. Expected Benefits

- Reduced congestion on VHF/HF channels.
- Increased safety through automatic position reports (ADS-C).
- Better route efficiency and reduced pilot/controller workloads.
- Compliance with ICAO international standards and regional harmonization.
- Regional impact on operational safety in the Pacific.
- Benefits in efficiency, reduction of longitudinal separation of aircraft and reduction of fuel consumption.

8. Required Actions

- Create a National Implementation Committee of ADS-C/CPDLC with SENEAM, DGAC, airlines and ICAO NACC.
- Conduct a cost-benefit study for pilot phases and full deployment.
- Initiate data link training program for controllers and technicians.
- Develop a cybersecurity plan linked to CPDLC/ADS-C.
- Establish a 2025-2027 implementation schedule aligned with the GANP.
- Have the support and integration of the United States and COCESNA.