Organización de Aviación Civil Internacional

WORKING PAPER

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Lima, Peru, 22 to 24 July 2019

Agenda Item 3: Determination of services and facilities
3a: Airspace users outline
3b: Potential solutions

NON-ASSIGNED AIRSPACE AT HIGH SEAS

Presented by COCESNA on behalf of Costa Rica, Belize, El Salvador, Guatemala, Honduras and Nicaragua)

SUMMARY

This working paper presents information regarding the current and future technical and operational capabilities of COCESNA to facilitate the provision of Air Traffic services in the non-assigned airspace over the Pacific Ocean, which COCESNA seeks to include as part of its area of responsibility. The implementation of the Performance Based Communication and Surveillance (PBCS) concept and early use of new technology such as the space-based ADS-B and the use of mature technology such as ADS-C and CPDLC among other topics are also presented to support COCESNA´s case to assume responsibility of the non-assigned airspace in order to provide a safe and efficient service.

1 Introduction

1.1 COCESNA – (Corporación Centroamericana de Servicios de Navegación Aérea) –is a nonprofit and public organization which provides Air Navigation Services in the Central American region. As a means of achieving a complete and balanced integration of aeronautical services in the Central America region, on the 26th February 1960, five Central America countries (Costa Rica, Honduras, Guatemala, El Salvador and Nicaragua) signed an agreement that established COCESNA. The country of Belize formally joined COCESNA in 1996.

1.2 COCESNA is governed by a Constitutive Agreement through which the Central American member States have delegated the administration of the upper airspace to COCESNA for the provision of Air Navigation Services, Air Traffic Services, Aeronautical Information Services, Aeronautical Telecommunications and other services with the possibility of providing these services to other states through bilateral and multilateral agreements.

1.3 COCESNA is governed by a Board of Directors, which is its highest-ranking collegiate body. This Body is composed of the Directors of Civil Aviation of each of the States that are signatories of

the Constitutive Agreement and its functions outline the guidelines, plans, programs and projects of the Organization. The main COCESNA executive is its Executive President, appointed by the aforementioned Board of Directors for a period of five years, extendable in a rotation system established by the same Member States. This model of regional integration makes COCESNA a unique Organization in which the signatory States are directly represented making them an integral part of COCESNA.

1.4 In October 1976, COCESNA was the recipient of the 11th Edward Warner Award, ICAO's highest honor. The inscribed gold medal and certificate of recognition were bestowed on COCESNA "for its contribution in the provision of efficient and coordinated services for air navigation and communications which has remarkably increased the safety of international flights in the Central American region."

1.5 COCESNA provides ISO 9001-2015 certified Air Navigation services to its airspace users and stakeholders that has been proven to be of a high level of safety and efficiency with a high level of client satisfaction fostering the development of aviation and air transport and, in general, for the socioeconomic development benefits of its member states and the Central America region.

1.6 COCESNA has coordinated the expansion of the Central American FIR/UIR a total of five times since the initial assignation of the FIR/UIR. The additional volumes of airspace annexed in the expansion programs are over Caribbean Sea and also over the Pacific Ocean, with the last FIR expansion being implemented on March 22nd 2001, during which the Mazatlán FIR assigned COCESNA part of its airspace for the provision of air traffic services.

1.7 Based on the existing and future technical CNS infrastructure, ATM operational capability, experience in management of the Central American airspace and safe and efficient Air Navigation service record, the Central American States and COCESNA are interested in expanding its area of responsibility to include the non-assigned airspace over the high seas in the Pacific Ocean referred to as the non-assigned airspace.

1.8 Accordingly, the Board of Directors issued Resolution ROCD 2019/216 authorizing the Executive President with broad powers, including the delegation to participate on behalf of the States of Belize, Guatemala, Honduras, El Salvador, Nicaragua and Costa Rica, in the meetings organized by ICAO for the coordination of the non-assigned airspace at high seas, pertaining to the Pacific Ocean, with the purpose of carrying out the pertinent actions in order to ensure that the responsibility of providing the air traffic services in the aforementioned airspace of undetermined sovereignty is assigned to the Central American States through COCESNA as an adequate body through a regional air navigation agreement in accordance with the provisions of Annex 11 of the Chicago Convention.

1.9 The Central American flight information region (FIR) encompasses over 2.6 million square kilometers (one of the largest in the CAR region) which includes not only the continental area of the six Members States, but also extensive maritime areas in the Caribbean Sea and Pacific Ocean.

1.10 That in accordance with Annex 11 of the Chicago Convention, in section 2.1.2, the indeterminate sovereign airspace, in which air traffic services have to be provided, will be determined through regional air navigation agreements, approved by the Council ICAO, normally at the proposal of regional meetings, establishing in section 2.1.3 of the aforementioned annex, in note 1, that the responsibility for the provision of these services may rest with a State or an appropriate Organization, as is the case with COCESNA.

1.11 COCESNA increases the efficiency of its Air Traffic Services by means of a seamless Central American sky. This promotes increased operational capacity and safety in the air space under COCESNA’s responsibility.

1.12 Together with the Central American Member States, COCESNA implemented a long term capital expenditure investment plan to modernize the Air Navigation Systems, utilizing as reference the Global Air Navigation Plan (GANP), the Regional Implementation Plans, Member State air navigation plans and COCESNA Strategic Plan. This enables COCESNA to anticipate the specific needs of the region by considering an optimum cost-benefit analysis that facilitates the optimization of capacity and efficiency of the Air Navigation Services offered within the Central American airspace.

2 Discussion

Expansion of the FIR

2.1 COCESNA provides its services in the Airspace within the Central American Flight Information region (FIR MHCC).

2.2 Derived from international agreements endorsed by ICAO, the Central American Airspace has been expanded as increased in accordance with the operational requirements of the airspace users, primarily in order to improve the operational safety.

2.3 This expansion has been made possible as a result of multiple capital expenditure project investments involving the acquisition of state-of-the-art aeronautical equipment and systems, the recruitment and training of high-quality human resources, and the implementation of optimized airspace (PBN and conventional routes).

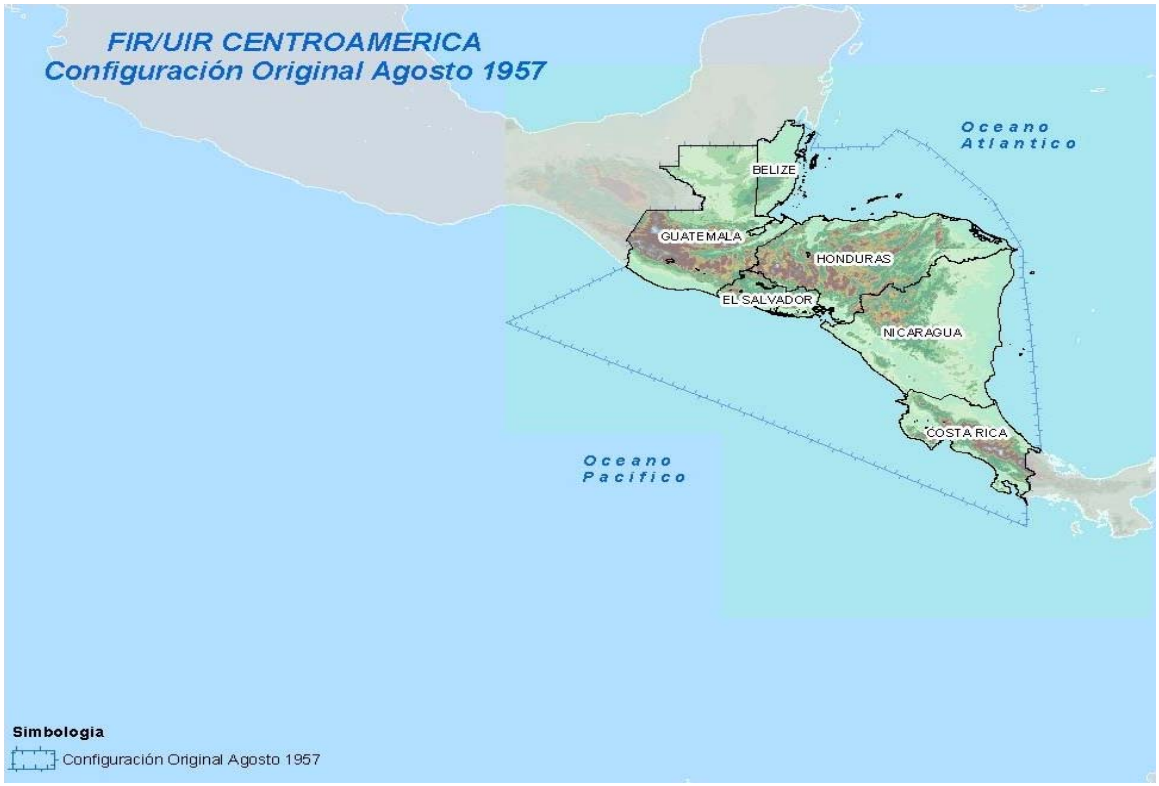
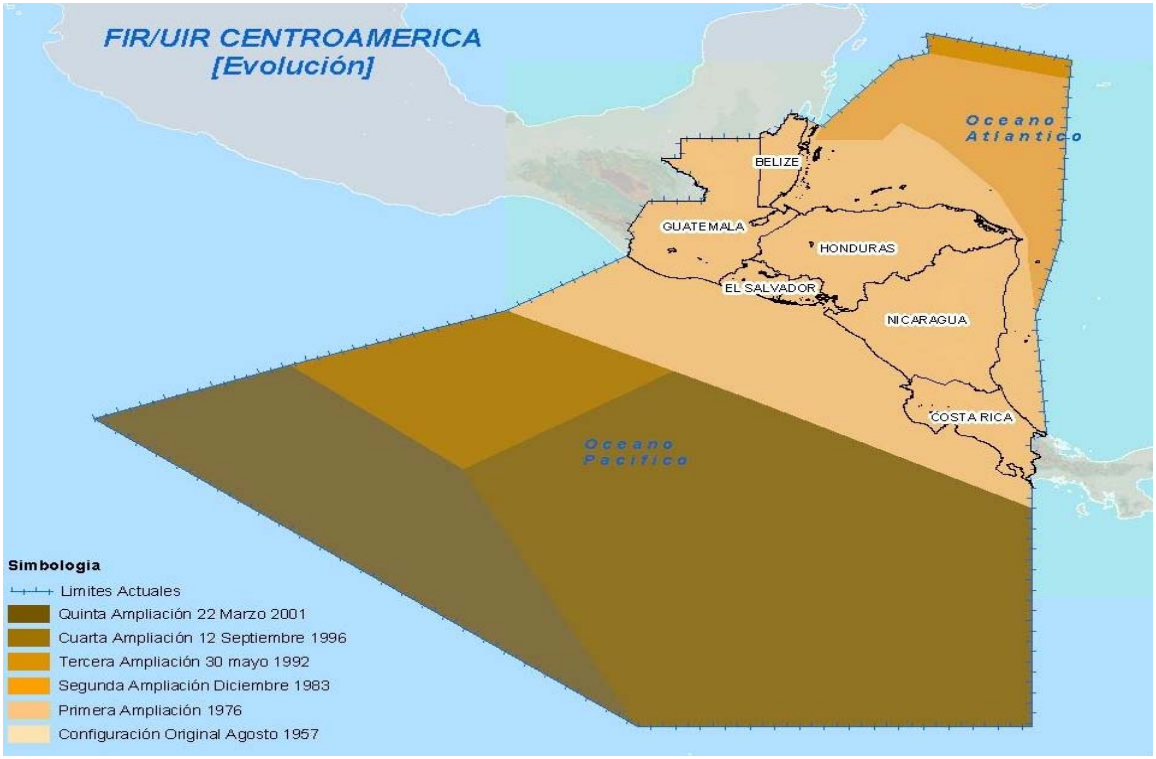


Figure 1.1 COCESNA FIR EXPANSION EVOLUTION



Current CNS/ATM Capacity

2.4 COCESNA supports its Air Navigation services based on the following CNS infrastructure:

- AMS VHF communications above FL200.
- VSAT Communications Network.
- Primary communications network via microwave links.
- Redundant communications network via terrestrial, leased and VSAT links.
- Centralized aeronautical message handling.
- DVOR, DME, ILS Navigational Aids.
- Main Surveillance network layer Secondary comprised of Mode S MSSR and PSR
- Secondary surveillance network layer with ADS-B receivers.
- FANS 1A, ADS-C and CPDLC services for surveillance and communications in oceanic areas.
- GNSS Service coverage to RNAV, RNP

2.5 The CENAMER Area control center as well as different Member State Approach Control Centers in Central America, have been updated to the state of the art AIRCON 2100 system. This upgrade has endowed them with the most recently available ATC system functions and capabilities; for instance, AIDC/NAM Class 3 protocol, ADS-B 1090 MHz data processing, the latest version MOPS DO-260B and Asterix format Category 21, version 2.4., The integration of MLAT systems in Axterix Category 20 is also possible.

2.6 CENAMER is connected via AIDC with seven Control Centers, internally with the APPs of Managua (Nicaragua), El Salvador (El Salvador Control) y Guatemala (APP La Aurora) and in the near future with Belize and Costa Rica. Connections have also been made with the adjacent FIR: Cuba (La

Habana), Mexico(Mérida), Panamá (Panama) and Ecuador (Guayaquil). The Bogotá FIR is about to begin connection tests whereas Jamaica FIR is in the process of coordinating the tests.

2.7 COCESNA has established a radar data sharing strategy between the Control Centers of Central America and the adjacent FIRs. This has improved the surveillance coverage and automated the Air Navigation Services, which grants the overlap of radar coverages and facilitates the automation of Air Navigation Services and optimization of the availability of surveillance data.

2.8 COCESNA has implemented a NOTAM International office (NOF) at its headquarters in Tegucigalpa Honduras and is currently embarked on a regional project to implement Initial Flight Plan processing to reduce high frequency of received/transmitted FPL errors in the Central American Region. In virtue of this implementation, COCESNA seeks an improvement of the safety and efficiency of Air Traffic Services.

2.9 Regarding the Implementation of Performance Based Communication and Surveillance concept, COCESNA will work with its service provider to development the Required Communications and Surveillance Performance parameters (RCP/RSP) in the Pacific Ocean airspace area.

Current implementation of the ADS-B

2.10 The following figure shows the surveillance coverage achieved at FL 400 with radars and ADS-B ground stations, within the continental space is shown:

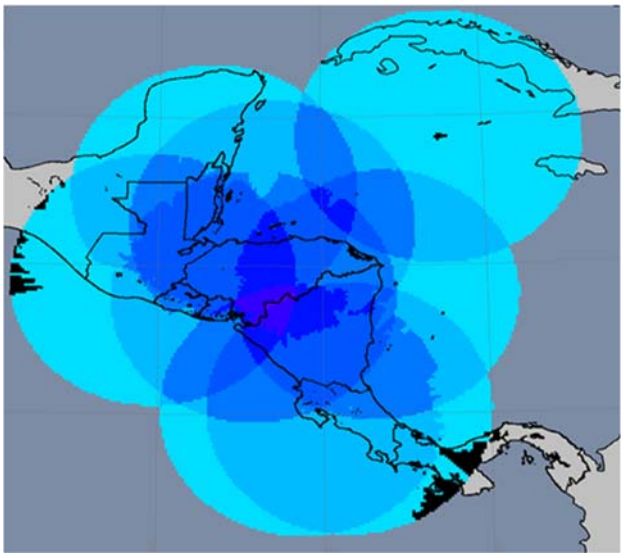


Figure 1.2 Surveillance coverage (Radars and ADS-B) within the FIR of Central America.

2.11 Additionally, the coverage over part of the FIR is shown in the Pacific Ocean through the ADS-B installed at Coco Island (Costa Rica).

Figure 2.1 Coverage of FL 400 of the ADS-B receiver installed on Coco Island

Meteorological Services

2.12 COCESNA and the Meteorological Watch Office (MWO), located in Tegucigalpa, have signed an operational agreement to ensure the provision of meteorological information required for air navigation safety, continuity and efficiency, taking into consideration ICAO's Standards and Recommended Practices, from Annex 3 – Meteorological Service for International Air Navigation, Annex 11- Air Traffic Services, ICAO PANS ATM Doc 4444 – Procedures for Air Navigation Services, Doc 9377 – Manual on Coordination Between ATS-AIS-MET, Doc 8733Air Navigation Plans, Volume 2-FASID, South America and Caribbean regions.

2.13 In order to provide better service and taking into consideration that the MET dependencies are an important factor for Meteorological Information provision through the Air Navigation Information Services, strong efforts will be put in place to provide a faster, more efficient and permanent flow of information.

Implementations of the oceanic airspace and ADS-C and CPDLC surveillance in the region of the Pacific Ocean

2.14 COCESNA commenced trials for the implementation of the ADS-C/CPDLC in the Pacific Oceanic Airspace since June 2015 and implemented the full service since July 13th, 2017. This solution complemented the preexisting HF communication systems and increased the levels of the air traffic flow safety in the Pacific Ocean airspace.

2.15 In the Pacific Oceanic Airspace COCESNA provides procedural Air Traffic control services via a CENAMER control sector. An ADS-C data link contract (periodic, event, demand and emergency) is established with aircraft within this specific sector provided that aircraft are equipped with the pertinent datalink avionic capabilities declared in its flight systems and with certified crews. The updates for the efficient surveillance are executed every 15 minutes or triggered by an event.

2.16 Presently in the Pacific oceanic airspace, COCESNA implements a longitudinal separation of 80 NM between the aircraft in trail assured by the MACH number technic and 50NM lateral separation for aircraft for approved RNAV/RNP 10 operations.

2.17 In the event that non assigned airspace is granted to COCESNA, the services in this area are going to be provide within the current system architecture of CENAMER control center with the same specifications and facilities as any of the other sectors of control.

Evaluation of the implementation of the Satellite ADS-B in the Pacific Ocean (FIR CENAMER)

2.18 A cost-benefit analysis, risk analysis and definition of the operational concept are being carried out for the implementation of the Space based ADS-B in the Air Oceanic Space of the FIR in Central America. This implementation is being considered specifically for surveillance purposes in the Pacific Oceanic area since this area is not covered by the radar/ ADS-B network of COCESNA. In the oceanic areas a combination of Space Based ADS-B and CPLDC will be used for the ATC coordination. In the near future COCESNA may explore a satellite voice option.

2.19 The preliminary evaluation and analysis conducted by COCESNA, which factored information from the terminated flight plans determine that around 90% of the aircrafts that fly over the Pacific Ocean airspace are presently equipped with ADS-B capability.

2.20 The advantages of implementing the Space based ADS-B in the Pacific Ocean airspace are primarily the reduction of the longitudinal minimal separation between aircraft on the same heading (in trail) and at the same flight level which would allow more aircraft to reach and operate at their optimal flight level. This would effectively diminish fuel consumption, reduce CO_2 emission, optimize the airspace and represent cost savings for airlines with more direct and user preferred routes. Secondly the implementation of Space based ADS-B in the Pacific Ocean airspace would invariably increase ATC traffic situational awareness within this airspace thus improving operational safety.

IT Developments

Search and Rescue

2.21 COCESNA developed the eXpert-SAR Tracking System to support the Emergency Messaging management received by the COSPAS-SARSAT through the monitoring of the ELT, EPIRB y PLB alerts activation and the coordination of activities between the RCC (Rescue Coordination Center), RSC (Rescue Sub Centers) and all the related entities in charge of rescue activities, and enables the registration of the coordination activities of the assigned parts to the received messages and administers the reports from pilots about alerts of ELT reported to the controllers. The system allows the controller to generate reports via a homing beacon signal on the 121.5 MHz frequency.

2.22 This permits the search and rescue units to obtain more information through the LKP (last know position) generated by the communication between the Radar Control Center and the crew, in case of a non-satellite activation.

2.23 The system is responsible for transmitting the message through AFTN/AMHS network; however, the SAR/TS administers more effectively the delivery of the information, giving an added value to the coordination between the operative units.

ATFM

2.24 An application that grants the flow management of Air Traffic by means of comparing the ATS demand forecast by capacity Sector and provides information to make decisions (CDM) was developed. Based on this information the control sectors can be reconfigured to benefit from the available personnel in the best way possible.

2.25 The provisioning of data from SWIM is still in process, for the purpose of offering a more anticipated and accurate forecast.

Monitoring of ADS-B avionics capacities

2.26 COCESNA is developing a monitoring system for ADS-B aircraft equipage within the Central American FIR. The surveillance data are permanently recorded in ADS-B Asterix Cat 21, Version 2.4 format, and the required information is extracted from the database such as Figure of merit figures, latency, NIC, NAC, SIL, the number of ADS-B aircrafts, MOPS versions, and other data. With the implementation of this monitoring system, COCESNA complies with the ICAO mandate of the monitoring of ADS-B equipage.

Figure 3. ADS-B Capacities Monitoring System

Backup Control Center (Contingency)

2.27 COCESNA needs to guarantee the continuity of Air Traffic services it provides. That's why it created a Backup Control Center, for several contingency situations to comply with the ICAO command, stated in the Annex 11, that expresses the following:

The State(s) responsible for providing air traffic services and related supporting services in particular portions of airspace is (are) also responsible, in the event of disruption or potential disruption of these services, for instituting measures to ensure the safety of international civil aviation operations and, where possible, for making provisions for alternative facilities and services. To that end the State(s) should develop, promulgate and implement appropriate contingency plans (ICAO, 2001, ATT D-1).

2.28 Related to the recommendations above, COCESNA can configure the simulator installed in the Aeronautics Training Institute of COCESNA (in Spanish, ICCAE), located in Ilopango, El Salvador, as an operative Backup Control Center, which has been annually tested to ensure its correct functioning, in case of needed. The Backup Center includes the Air Traffic services as well as the aeronautical information management.

3. Conclusions

- COCESNA is a multi-State organization which has given safe and efficient Air Traffic services in a seamless sky along the region.

- COCESNA possesses extensive experience in providing Air Traffic services in a vast maritime zone in the Pacific Ocean, according to the standard and recommended practices.

- COCESNA has been successful in expanding processes of its area of responsibility in the past.

- COCESNA already operates surveillance and communication systems that might be used in non-assigned airspace, that satisfy the need of the airspace users.

- COCESNA is capable of new investments and has trained personnel to provide Air Traffic services in the mentioned area.

4. Recommendations

4.1 Delegate to the Central American States constituting COCESNA the provision of air navigation services in the unassigned airspace of the high seas.

4.2 Define a roadmap with the Airlines and other stakeholders in order to analyze the operational benefits that could be obtained in case of assigning the non-FIR airspace.

4.3 Promote the development of regional projects that can improve the communication and surveillance systems in the oceanic areas and reduce separations.

References

ICAO. (2001). *Air Traffic Services. Air Traffic Control Service. Flight Information Service. Alerting Service.* Annex 11 to the Convention on International Civil Aviation. International Standards and Recommended Practices.