

1.2 The drafting of the Guide on technical considerations in support of ATFM implementation, which is still pending, was agreed at the Ninth Meeting of the Review Committee of Project RLA/06/901, and involved a one-week mission by an expert to Lima, Peru, to develop the guide.

1.3 The SAM/IG/17 meeting reviewed the planning tables related to the surveillance area contemplated in Volume II of the eANP, *Aeronautical mobile services and AMSS* Table CNS II CARSAM 2, the CAR/SAM ASTERIX SAC allotment plan Table CNS II-CARSAM-4, and Surveillance systems Table CNS II-CARSAM-5.

1.4 The SAM/IG/17 meeting analysed the results obtained at the Fourteenth Meeting of Civil Aviation Authorities (RAAC/14) concerning planning of air navigation implementation activities in the CNS area for the period 2017-2019, in relation to modules ASBU B0 – SUR: Initial ground surveillance capability, B0-SURF: Safety and efficiency of surface operations (A-SMGCS Level 1-2), and B0 – TBO: Improved safety and efficiency through the initial application of en-route data link services and the identification of indicators and goals for the period 2017-2019. See **Appendix A** to this working paper.

1.5 The delegate of Brazil presented the SAM/IG/17 meeting with information on the status of satellite ADS B, on the way the service was provided, and on the associated costs. Consideration was given to the possibility for the Secretariat to invite representatives of the satellite ADS B provider to participate at the SAM/IG/18 meeting, so that the group could obtain further information in this regard.

2 Discussion

Project for the improvement of ATM situational improvement (Project C2)

2.1 The Fourth meeting of the GREPECAS Programmes and Projects Review Committee reviewed the activities corresponding to Project C2 on the improvement of ATM situational awareness.

2.2 Activities under this project involve the development of guides to support the implementation of improvements to situational awareness at ATS units in the South American Region.

2.3 It is expected that the *Guide on technical considerations in support of ATFM implementation* will be ready by mid-November 2016. In this regard, and with the support of Project RLA/06/901, a mission by an automation expert from Brazil has been scheduled for the first week of November 2016 to the ICAO South American Office for drafting the guide.

2.4 Once this guide has been drafted, the activities contemplated under Project C2 will have been finalised. A description of the project and its deliverables is contained in **Appendix B** to this working paper.

2.5 The Meeting should consider the implementation of a new project or the addition of new activities to Project C2, such as the implementation of ADS B multilateration and A-SMGCS systems, taking into account CNS activities (surveillance area) presented at the RAAC/14 meeting, the action plan for ADS B implementation in the SAM Region, and the CAR/SAM regional unified surveillance strategy.

Surveillance planning tables contained in Volume II of the eANP

2.6 At the SAM/IG/17 meeting, Argentina, Chile, Ecuador Paraguay, Peru, and Venezuela presented updated information on surveillance requirements. In this regard, the Secretariat updated tables CNS II CARSAM 2 and 5 of the eANP Volume II, which are shown in **Appendix C** to this working paper. ICAO will circulate the new Volume II of the eANP by mid-October 2016.

CAR/SAM regional unified surveillance strategy

2.7 The GREPECAS/16 meeting approved the *CAR/SAM regional unified surveillance strategy*, taking into account the status of implementation of surveillance systems, the surveillance considerations set forth in the fifth edition of the GANP, endorsed by the 39th Session of the ICAO Assembly (A39), the SAM performance-based air navigation implementation plan (PBIP), and the planning of CNS (surveillance) air navigation implementation activities for the period 2017-2019. It then updated the CAR/SAM regional unified strategy, shown in **Appendix D** to this working paper for discussion by the Meeting.

Action plan for ADS B implementation

2.8 Colombia presented its ADS B achievements and implementation plans at the PPRC/4 meeting. In this regard, it published regulation RAC/4 item 4.2.2.6, establishing a mandate for ADS-B as of 1 January 2020. Colombia has conducted an awareness-raising meeting with Colombian operators and has scheduled other meetings to monitor the equipment on board all aircraft, since this regulation applies to all scheduled and non-scheduled commercial aviation and general aviation operators.

2.9 In this sense, the PPRC/4 meeting considered that it was important to adopt the lessons learned in other States that have made progress in the implementation of ADS B. The SAM/IG meeting developed an initial action plan for ADS B implementation. **Appendix E** to this working paper contains updated information on the plan. In order to follow up ADS B implementation, each State should designate a focal point in the same way as is currently done with the follow up to the implementation of procedures, services, and systems in the SAM/IG.

3 Suggested action

3.1 The Meeting is invited to:

- a) take note of the information presented herein;
- b) analyse the aspects set forth in section 2 and the corresponding appendices; and
- c) review other matters it may deem appropriate.

APPENDIX A

AIR NAVIGATION IMPLEMENTATION PLAN - PERIOD 2017- 2019

<i>B0 – SUR: Initial ground surveillance capability</i>						
ELEMENTS	SCOPE	INDICATORS / METRICS	GOALS: %/ Date			STATUS
			2017	2018	2019	
Implementation of ADS-B and MLAT	All States	Indicator: % of ADS B and/or multilateration implemented for higher air navigation levels Goal to 2019: 10% domestic implementation of coverage ADS-B and/or Multilateration for higher air navigation levels	6%	8%	10%	Current status 5% of ADS B and/or Multilateration ADS B Systems installed in Colombia (13), Guyana (1), Peru (1) and Paraguay (6) Multilateration in Colombia and Ecuador (2)
Surveillance interconnection systems	All States	Indicator: % of coverage in flight transferring control area between adjacent AAC of the Region Goal to 2019: 30% of coverage in flight transferring control area between adjacent AAC of the Region	10%	20%	30%	5% of coverage in flight transferring control area between adjacent AAC of the Region There is radar coverage in the radar transferring between AAC Montevideo and AAC Ezeiza
Implementation of the ACC automation system	All States	Indicator: % of ACC automation systems implemented Goal: 100% of ACC automation systems implemented 2019	95%	10%		90% of automated systems implemented in AAC

B0-SURF: Safety and efficiency of surface operations (A-SMGCS Level 1-2)						
ELEMENTS	SCOPE	INDICATORS / METRICS	GOALS: %/ Date			STATUS
			2017	2018	2019	
A-SMGCS Level 1*		Indicator: % of applicable international aerodromes that have implemented A-SMGCS Level 1 Support metrics: Number of applicable international aerodromes that have implemented A-SMGCS Level 1 4 A-SMGCS Level 1* by the end of 2019		2	2	New implementation
A-SMGCS Level 2*		Indicator: % of applicable international aerodromes that have implemented A-SMGCS Level 2 Support metrics: Number of applicable international aerodromes that have implemented A-SMGCS Level 2 2 A-SMGCS Level 2* by the end of 2019			2	New implementation

<i>B0 – TBO: Improved safety and efficiency through the initial application of data link en-route</i>						
ELEMENTS	SCOPE	INDICATORS / METRICS	GOALS: %/ Date			STATUS
			2017	2018	2019	
Implementation of ADS C	All States with oceanic FIRS	Indicator: % of oceanic FIRs with ADS C requirement implemented Goal to 2019: 100% of oceanic FIRs with ADS C implemented	90%	100%		To date 82% ADS C implemented in oceanic FIRS
Implementation of CPDLC	All States	Indicator: % of CPDLC systems implemented in FIRs oceanic and continental areas Goal to 2019: 100% of CPDLC systems implemented in oceanic FIRs 5% of CPDLC implemented in continental area		2		To date 82% of oceanic FIRs with CPDLC implemented 0% of CPDLC implemented in continental area

APPENDIX B

C2 SAM PROJECT DESCRIPTION

SAM Region	PROJECT DESCRIPTION (PD)	PD N° C2	
Programme	Project Title	Starting Date	Ending Date
ATM Automation and Situational Awareness <i>(Programme Coordinator: Onofrio Smarrelli)</i>	<p style="text-align: center;">Improve ATM Situational Awareness in the SAM Region</p> <p style="text-align: center;"><i>Project Coordinator: Paulo Vila (Peru)</i></p> <p style="text-align: center;"><i>Contributing experts: José Rubira, Marcos Vidal and Jorge Otiniano (Peru); Javier Vittor (Argentina), Ivan Salas (Ecuador)</i></p>	October 2011	November 2016
Objective	Develop guidelines supporting the implementation of improvements in the situational awareness of ATS units in the South American Region		
Scope	<p>Guidelines supporting the implementation of various applications, such as common traffic visualization, common meteorological conditions visualization and communications in general</p> <ul style="list-style-type: none"> • Analysis of the current surveillance infrastructure and identification of necessary improvements to support en route and terminal airspaces, airspace classification, PBN and ATFM • Implementation of ADS-B, ADS-c and/or MLAT surveillance systems at selected airspaces • Minimum common electronic information and data bases required in support of decision-making process and alert systems towards an interoperable situational awareness among centralized ATFM units • Implement flight plan data process systems (new FPL format) and data communications tools among ACC's • Implement advanced automation support tools to contribute towards the sharing of aeronautical information 		
Metrics	<p>Drafting of following documents:</p> <ul style="list-style-type: none"> • Regional surveillance strategy for the implementation of systems in support of improvement of situational awareness – revised • Evaluation of the surveillance systems coverage in the SAM Region - completed • Guideline on technical/operational considerations for ADS-B implementation – completed • Guideline on technical/operational considerations for MLAT implementation - completed • Guideline on technical considerations in support of ATFM implementation – completed • Guideline for the presentation of MET products in graphic format – completed • Action plan for ADS-B implementation in the SAM Region 		

Strategy	<ul style="list-style-type: none"> • All tasks will be conducted by experts nominated by States and organizations of the SAM Region members of the Project <i>Improve ATM situational awareness in the SAM Region</i>, under management of the project coordinator. Communications among project members, as well as between the project coordinator and programme coordinator, shall be carried out through teleconferences and the Internet. • Once studies are completed, the results will be submitted to the ICAO programme coordinator as a final consolidated document for its analysis, review, approval and presentation at the GREPECAS PPRC
Goals	<ul style="list-style-type: none"> • Regional surveillance strategy for the implementation of systems in support to situational awareness improvement for July 2012 (completed) • Guideline on technical/operational considerations for ADS-B implementation for October 2012 (completed) • Guideline for the drafting of SIGMET in graphic format (December 2013) (completed) • Guideline for technical/operational considerations for MLAT implementation for March 2015 (completed) • Guideline for technical considerations in support of ATFM implementation (By May 2016) • Action plan for ADS-B implementation in the SAM Region (November 2014) (completed)
Justification	<ul style="list-style-type: none"> • Improve situational awareness has been identified as a great support for ATM, contributing in the increase of safety and in flight efficiency • In addition, a close relationship with the other programmes and their respective projects is necessary, with the aim of collecting the operational requirements demanded by the mentioned applications and their respective tentative implementation dates • This project contributes to the implementation of modules B0 ASUR, B0 SURV, B0 NOPS and B0 AMET of the <i>Air Navigation System Performance-Based Implementation Plan for the SAM Region (SAM PBIP)</i>
Related Projects	<ul style="list-style-type: none"> • Air Navigation Systems in Support of PBN • Automation • ATFM • ATN Ground-ground and Air-ground Applications

Project Deliverables	Relationship with Performance Based Regional Plan aligned with ASBU	Responsible	Status of Implementation ¹	Delivery Date	Remarks
<i>Evaluation of surveillance infrastructure and identification of surveillance systems improvements</i>					
Evaluation of surveillance systems coverage in the SAM Region	PFF SAM CNS 04 ANRF B0 ASUR	Paulo Vila (Peru)		Completed October 2012	The evaluation of coverage was carried out in connected to the drafting activities of the Guideline on technical/operational considerations for ADS-B implementation. The results are presented as Appendix A to the Guideline and can be downloaded from site http://www.icao.int/SAM/Pages/eDocumentsDisplay.aspx?area=CNS
<i>Drafting of regional plan for ADS-B and MLAT implementation</i>					
Guideline on technical/operational considerations for ADS-B implementation	PFF SAM CNS 04 ANRF B0 ASUR	José Rubira (Peru) Marco Vidal (Peru)		Completed October 2012	The Guideline was approved for use in the interested States of the SAM Region, by the Eleventh Workshop/Meeting of the SAM Implementation group (SAM/IG/11) held in Lima from 13 to 17 May 2013 and can be downloaded from the following website http://www.icao.int/SAM/Pages/eDocumentsDisplay.aspx?area=CNS
Guideline on technical/operational considerations for MLAT implementation	PFF SAM CNS 04 ANRF B0 ASUR	Ivan Salas (Ecuador)		Completed October 2015	The Guideline was presented in the Fifteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/15) held in Lima from 11 to 15 May 2015 for initial review and was circulated to all SAM Region States. The final approval is foreseen for the Sixteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/16) to be held in Lima from 19 to 23 October 2015.

¹ **Gray:** Activity has not started
Green: Activity has or will deliver planned milestone as scheduled
Yellow: Activity is behind schedule on milestone, but still within acceptable parameters to deliver milestone on time
Red: Activity has failed to deliver milestone on time, mitigation measures need to be identified and implemented

Project Deliverables	Relationship with Performance Based Regional Plan aligned with ASBU	Responsible	Status of Implementation ¹	Delivery Date	Remarks
Guideline on technical considerations in support of ATFM implementation	PFF SAM ATM 05 B0 NOPS	Pending designation		November 2016	The guideline will be supported with the CAR/SAM ATFM Manual approved through GREPECAS Conclusion 16/35.
Guideline for the presentation of MET products in graphical format	PFF SAM MET 03 ANRF B0 AMET	Jorge Otiniano (Peru)		Completed October 2014	The document guideline was delivered to the Secretariat (MET) of SAM Region for its review by the corresponding meteorology specialists. The Guideline was review by the OPMET information exchange Meeting of SAM Region (27 – 29 October 2014) and will be used as guideline for the implementation of SIGMET graphic in Argentina, Chile, Ecuador, Paraguay and Peru by the second half of 2015 sponsored by the technical cooperation regional project RLA/06/901.
Action plan for ADS-B implementation in SAM Region	ANRF B0 ASUR	Paulo Vila (Peru)		Completed November 2014	The action plan for the regional implementation of the ADS B was presented an approved in the Fourteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/14) Lima, Peru, from 10 to 14 November 2014. The document can be downloaded from the following website as part of the final report of the SAM/IG/14 (Appendix C, Agenda Item 7) http://www.icao.int/SAM/Pages/MeetingsDocumentation.aspx?m=2014-SAMIG14
Monitoring activities for the implementation of improvement to the ATM Situational Awareness in the SAM Region		Programme Coordinator and Project Coordinator		October 2011 November 2016	
Resources necessary	Experts in the carrying out of the deliverables				

APPENDIX C**TABLE CNS II CARSAM 2-- AERONAUTICAL MOBILE SERVICE AND AMSS****EXPLANATION OF THE TABLE**

Column

1	The name of the State and the locations within the same where the service is provided.
2	The required services or functions are provided. Suitable abbreviations for these services or functions are listed below.
ACC-L	Area control service for flights up to FL 250. ACC-
SR-I	Area radar control service up to FL 250.
ACC-SR-U	Area radar control service up to FL 450. ACC-U Area control service up to FL 450.
AFIS	Aerodrome flight information service. APP Approach control service.
APP-L	Approach control services below FL 120. APP-I Approach control service below FL 250.
APP-PAR	Precision approach radar service up to FL 40.
APP-SR-I	Surveillance radar approach control service up to FL 250. APP-SR-L Surveillance radar approach control service up to FL 120. APP-SR-U Radar approach control service up to FL 450. APP-U Approach control service below FL 450.
ATIS	Automatic terminal information service.
D-ATIS	Data link-automatic terminal information service. CLR Clearance delivery.
FIS	Flight information service. VHF-
ER	VHF Extended range.
GP	Facility providing VHF or HF en-route general purpose system (GPS) communication. These facilities provide air-ground radiotelephony for all categories of messages listed in Annex 10, Volume II, 5.1.8. This system of communication is normally indirect, i.e. exchanged through the intermediary of a third person who is usually a communicator at an aeronautical station.
SMC	Surface movement control up to limits of aerodrome. TWR Aerodrome control service.
VOLMET	VOLMET broadcast.

- 3 Number of voice VHF channels for the corresponding services indicated in column 2.
- 4 Number of VHF channels for data communication for the corresponding services indicated in column 2.
- 5 HF network designators for the corresponding services indicated in column 2.
- 6 Requirement for HF data link (x) for the corresponding services indicated in column 2.
- 7 Requirement for satellite voice communications (x) for the corresponding services indicated in column 2.
- 8 Requirement for satellite data communications (x) for the corresponding services indicated in column 2.
- 9 Requirement for Mode S data communications (x) for the corresponding services indicated in column 2.
- 10 Remarks.

Country and location	Service or function	VHF voice	VHF data	HF voice	HF data	Satellite voice	Satellite data	Mode S	Remarks
1	2	3	4	5	6	7	8	9	10
ANGUILLA (United Kingdom)									
TQPF THE VALLEY/Wall Blake, Anguilla I.	TWR	1							
ANTIGUA AND BARBUDA									
TAPA SAINT JOHNS/ V.C. Bird Antigua I.	APP TWR SMC APP-SR-I D-ATIS	1 1 1 1 1							
ARGENTINA									
SAEU BUENOS AIRES	ACC GP	11 2	2	SAM-1 SAM-2	X	X	X		
SABE BUENOS AIRES/ Aeroparque Jorge Newbery	APP TWR ATIS GP	5 5 1 1							
SAEZ BUENOS AIRES/ Ezeiza, Ministro Pistarini	APP ATIS TWR GP	5 1 5 1							
SADF BUENOS AIRES/San Fernando	APP TWR	3 3							
SARI CATARATAS DEL IGUAZU/My. Carlos Eduardo K.	APP TWR ATIS	2 2 1							
SAVF COMODORO RIVADAVIA	ACC GP	3 1	1	SAM-1	X	X	X		
SAVC COMODORO RIVADAVIA/General Mosconi	APP TWR GP	4 4 1							
SACF CORDOBA	ACC-U GP	6 1	1	SAM-1					
SACO CORDOBA/Ing. A. Taravella	APP TWR GP	6 6 1							
	ATIS	1							
SARF FORMOSA/Formosa	APP TWR	2 2							
SASJ JUJUY/Gobernador Guzmán	APP TWR	2 2							

Country and location	Service or function	VHF voice	VHF data	HF voice	HF data	Satellite voice	Satellite data	Mode S	Remarks
1	2	3	4	5	6	7	8	9	10
SAZM MAR DEL PLATA/ Brig. Gral. B. de la Colina	APP TWR ATIS	5 5 1							
SAMF MENDOZA	ACC GP	3 1	1	SAM-1					
SAME MENDOZA/EI Plumerillo	APP TWR ATIS GP	4 4 1 1							
SAZN NEUQUEN/Presidente Perón	APP TWR ATIS	1 1 1							
SARP POSADAS/Libertador Gral. D. José de San Martín	APP TWR	2 2							
SARR RESISTENCIA	ACC GP	3 1	1	SAM-1	X				
SARE RESISTENCIA/ Resistencia	APP TWR ATIS	3 3 1							
	GP	1							
SAWG RIO GALLEGOS/ Piloto Civil N. Fernández	APP TWR ATIS GP	3 3 1 1							
SAWE RIO GRANDE/ Rio Grande	APP TWR	3 3							
SAAR ROSARIO/Rosario	APP TWR ATIS	2 2 1							
SASA SALTA/Salta	APP TWR GP	2 2 1							
SAZS SAN CARLOS DE BARILOCHE/San Carlos de Bariloche	APP TWR ATIS GP	3 3 1 1							
SANT TUCUMAN/Tte. Benjamin Matienzo	APP TWR GP	2 2 1							

Country and location	Service or function	VHF voice	VHF data	HF voice	HF data	Satellite voice	Satellite data	Mode S	Remarks
1	2	3	4	5	6	7	8	9	10
SAWH USHUAIA/Malvinas Argentinas	APP TWR GP	3 3 1							
ARUBA									
TNCA ORANJESTAD/ Reina Beatriz, Aruba I.	APP-SR-L APP-L TWR SMC D-ATIS	1 1 1 1 1							
BAHAMAS									
MYBS ALICE TOWN/ South Bimini, Bimini I.	TWR	1							
MYSM COCKBURN TOWN/ San Salvador I.	TWR	1							
MYGF FREEPORT/Intl., Grand Bahama I.	APP-U APP-L TWR SMC	1 1 1 1							
MYEG GEORGETOWN/ Georgetown, Exuma Intl.	APP-L TWR	1 1							
MYEM GOVERNOR=S HARBOUR/ Governor=s Harbour, Eleuthera I.	APP-L TWR	1 1							
MYNA NASSAU	ACC-U GP ACC-L	3 1 1							
MYNN NASSAU/Intl., New Providence I.	APP-I TWR SMC APP-SR-I D-ATIS	1 1 1 1 1							
MYEH NORTH ELEUTHERA/ New Providence I.	TWR	1 1							
MYLS STELLA MARIS/Long Island I.	TWR	1							
MYAT TREASURE CAY/ Treasure Cay, Abaco I.	TWR APP-L	1 1							
MYGW WEST END/West End, Grand Bahama I.	TWR	1							
BARBADOS									
TBPB BRIDGETOWN/ Grantley Adams Intl.	APP-U APP-I TWR SMC APP-SR-U D-ATIS	1 5 1 1 1 1							

Country and location	Service or function	VHF voice	VHF data	HF voice	HF data	Satellite voice	Satellite data	Mode S	Remarks
1	2	3	4	5	6	7	8	9	10
BELIZE									
MZBZ BELIZE/Intl.	APP-I APP-I TWR SMC D-ATIS	1 1 1 1 1							
BERMUDA									
TXKF BERMUDA/ L. F. Wake Intl.	APP CLR D-ATIS SMC TWR	2 1 1 1 2							
BOLIVIA									
SLCB COCHABAMBA/Jorge Wilsterman	TWR APP-I SMC	1 2 1	1	SAM-1 SAM-2		X			
SLLP LA PAZ	ACC-U ACC-U GP ACC-L	1 1-ER 1 1							
SLLP LA PAZ/EI Alto Intl.	APP-I TWR SMC	3 1 1							
SLVR SANTA CRUZ/Viru-Viru Intl.	APP-I TWR SMC	3 1 1							
SLTJ TARIJA/Oriel Lea Plaza	APP-I TWR	1 1							
SLTR TRINIDAD/Tte. Av. Jorge Henrich Arauz	APP-I TWR SMC	2 1 1	TBD	SAM-2			X		
BRAZIL									
SBAZ.. AMAZONICA	ACC-SR-U VOLMET	24 8		SAM-2 SAT-1 SAT-2					
SBAO.. ATLANTICO	ACC-U								
SBBE BELEM/Val de Cães Intl.	APP-SR-I TWR SMC ATIS	4 1 1 1	TBD						
SBCF BELO HORIZONTE/ Tancredo Neves Intl.	APP-SR-I TWR SMC CLR ATIS	4 1 1 1 1	TBD	SAM-2					

Country and location	Service or function	VHF voice	VHF data	HF voice	HF data	Satellite voice	Satellite data	Mode S	Remarks
1	2	3	4	5	6	7	8	9	10
SBBV BOA VISTA/ Boa Vista Intl.	APP-I TWR SMC	1 2 1							
SBKP CAMPINAS/Viracopos Intl.	APP-SR-I TWR SMC	1 1 1							
SBCG CAMPO GRANDE/ Campo Grande Intl.	APP-SR-I TWR ATIS SMC	1 1 1 1							
SBCR CORUMBA/ Corumba Intl.	AFIS APP-I	1 1							
SBCZ CRUZEIRO DO SUL/ Cruzeiro do Sul Intl.	AFIS	1							
SBCY CUIABA/Marechal Rondon Intl.	APP-SR-I TWR	1 1							
SBCW CURITIBA	ACC-SR-U VOLVMET	10 2	TBD	SAM-2					
SBCT CURITIBA/ Afonso Peña Intl.	APP-SR-I TWR ATIS SMC CLRD	3 2 1 1 1							
SBFL FLORIANÓPOLIS/ Hercilio Luz Intl.	APP-SR-I TWR SMC ATIS	3 2 1 1							
SBFZ FORTALEZA/ Pinto Martins Intl.	APP-SR-I TWR SMC CLRD ATIS	2 1 1 1 1							
SBFI FOZ DO IGUAÇU/ Cataratas Intl.	APP-SR-I TWR	2 1							
SBMQ MACAPA/ Macapa Intl.	APP-I TWR	1 1							
SBEG MANAUS/Eduardo Gomes Intl.	APP-SR-I TWR SMC ATIS	4 1 1 1							
SBNT NATAL/Augusto Severo Intl.	APP-SR-I TWR SMC CLRD ATIS	4 2 1 1 1							
SBPP PONTA PORÁ/ Ponta Porã Intl.	AFIS	1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
SBPA PORTO ALEGRE/ Salgado Filho Intl	APP-SR-I TWR SMC CLRD ATIS	4 1 1 1 1							
SBRE RECIFE	ACC-SR-U VOLMET	16	TBD	SAT-2					
SBRF RECIFE/Guararapes Intl.	APP-SR-I TWR SMC ATIS CLRD	4 1 1 1 1							
SBGL RIO DE JANEIRO/ Galeão Antonio Carlos Jobim Intl.	APP-SR-I TWR SMC CLRD ATIS DATIS	6 2 1 1 1 1	TBD						
SBSV SALVADOR/Deputado Luis Eduardo Magalhães Intl.	APP-SR-I TWR SMC ATIS	4 1 1 1							
SBSN SANTAREM/ Santarem Intl.	APP-I TWR	2 1							
SBSL SÃO LUIS/Marechal Cunha Machado Intl.	APP-I TWR	1 1							
SBGR SÃO PAULO/ Guarulhos Intl.	TWR SMC CLRD ATIS DATIS	3 1 1 1 1	TBD						
SBIT TABATINGA/ Tabatinga Intl.	AFIS	1							
SBUG URUGUAIANA/ Rubem Berta Intl.	AFIS	1							
CAYMAN ISLANDS (United Kingdom)									
MWCB CAYMAN BRAC/ Gerrard Smith Intl.	TWR SMC	1 1							
MWCR GEORGETOWN/ Owen Roberts Intl.	APP-I TWR SMC D-ATIS	1 1 1 1							
CHILE									
SCFA ANTOFAGASTA/ Cerro Moreno	APP-SR-I TWR SMC	2 1 1		SAM-1					Both APP frequencies are ER

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
	GP	1							
SCAR ARICA/Chacalluta	APP-I TWR SMC	1 1 1							
SCIE CONCEPCION/ Carriel Sur	APP-I TWR SMC	1 1 1							
SCDA IQUIQUE/Gral. Diego Aracena	APP-SR-I TWR SMC GP	2 1 1 1-ER							
SCTZ PUERTO MONTT Tepual	ACC-U ACC-U GP	2-ER 1-ER 1-ER		SAM-1					
SCTE PUERTO MONTT/ El Tepual	TWR SMC	1 1							
SCCZ PUNTA ARENAS	ACC-U GP APP-SR-I	3-ER 1 2		SAM-1					
SCCI PUNTA ARENAS/ Pdte. C. Ibáñez del Campo	TWR SMC	1 1							
SCEZ SANTIAGO	ACC-U	4-ER	2	SAM-1					Satelital red oceánico SITA
	GP APP- SR-I	2-ER 4							
SCEL SANTIAGO/ Arturo Merino Benitez	CLRD TWR SMC ATIS	1 2 2 1	1						2 freq. TWR 2 freq. SMC RWY 17R/17L
SCQP TEMUCO/Freire/La Araucania	APP-L TWR SMC	1 1 1							
COLOMBIA									
SKEC BARRANQUILLA	ACC-U GP	2 1	2	CAR-A	X				
SKBQ BARRANQUILLA/ Ernesto Cortissoz	APP-SR-I TWR SMC ATIS CLRD	2 1 1 1 1	1						
SKED BOGOTA	ACC-U GP	5 1-ER	4	SAM-2	X	X			
SKCL CALI	ACC-SR-I GP	1 1		SAM-1	X				
SKCL CALI/Alfonso Bonilla Aragón	APP-SR-I TWR SMC ATIS	1 1 1 1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
SKCG CARTAGENA/Rafael Núñez	TWR	1							
SKCC CUCUTA/Camilo Daza	APP-I TWR	1 1							
SLLT LETICIA/Alfredo Vásquez Cobo	APP-SR-I TWR	1 1							
SKRG RIO NEGRO/ José María Córdova	APP-SR-I TWR SMC ATIS	1 1 1 1							
SKSP SAN ANDRES I./ Sesquicentenario	APP-SR-I APP-I TWR SMC	1 1 1 1							
SKBO SANTA FE DE BOGOTA/Eldorado	APP-SR-I TWR SMC ATIS CLRD	3 2 2 1 1							
COSTA RICA			1						
MROC ALAJUELA/ Juan Santamaría Intl.	APP-SR-I TWR SMC D-ATIS GP	2 1 1 1 1							
MRLB LIBERIA/Tomás Guardia Intl.	APP-I TWR SMC	1 1 1							
MRLM LIMON/Limón Intl.	AFIS	1							
MRPV PAVAS/Tobías Bolaños Intl.	TWR SMC	1 1							
CUBA									
MUCM CAMAGUEY/ Ignacio Agramonte	APP-SR-L TWR	1 1							
MUCC CAYO COCO/ Jardines del Rey	APP-L TWR	1 1							
MUCL CAYO LARGO DEL SUR/Vilo Acuña	APP-L TWR	1 1							
MUHA HABANA	ACC-SR-U ACC-SR-I GP-U	5 3-ER 2							
MUHA HABANA/José Martí	APP-SR-L APP-SR-I TWR SMC D-ATIS	1 1 1 1 1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
MUHG HOLGUIN/Frank Pais	APP-SR-L TWR	1 1							
MUCU SANTIAGO DE CUBA/ Antonio Maceo	APP-SR-I TWR SMC	1 1 1							
MUVR VARADERO/Juan Gualberto Gomez	APP-SR-L TWR SMC	1 1 1							
CURACAO									
TNCF Curacao	ACC-U GP	3-ER 1	2		X	X	X		
TNCC WILLEMSTAB/Hato, Curacao I.	APP-I TWR SMC APP-SR-I D-ATIS	1 1 1 1 1							
DOMINICAN REPUBLIC									
MDBH BARAHONA/ Maria Montes Intl.	TWR SMC	1 1							
MDCY EL CATEY/ El Catey Intl.	TWR APP SMC D-ATIS	2 1 1 1							
MDEH EL HIGÜERO/ Dr. Joaquin Balaguer Intl.	TWR APP SMC	2 1 1							
MDLR LA ROMANA/ La Romana Intl.	APP-L TWR SMC	1 1 1							
MDPP PUERTO PLATA/ Gregorio Luperon	APP-SR-I TWR SMC	1 1 1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
MDPC PUNTA CANA/Punta Cana Intl.	APP-L TWR SMC	1 1 1							
MDST SANTIAGO/Cibao Santiago Intl.	APP-L TWR SMC	1 1 1							
MDCS SANTO DOMINGO	ACC-U ACC-SR-U GP	4 1 1	1						
MDSD SANTO DOMINGO/ De las Américas Intl.	APP-SR-I TWR SMC D-ATIS CLRDR	1 1 1 1 1							
ECUADOR									
SEGU GUAYAQUIL	ACC-U ACC-U FIS APP-	1 5-ER 5-ER		SAM- 6					
SEGU GUAYAQUIL/ Simón Bolívar	SR-I APP-I TWR SMC ATIS	2 1 1 1 1							
SELT LATACUNGA/Cotopaxi	TWR SMC	1 1							
SEMT MANTA/Eloy Alfaro	APP-I TWR SMC	1 1 1							
SEQU QUITO/Mcal. Sucre	APP-SR-I TWR SMC ATIS	2 1 1 1							
EL SALVADOR									
MSLP SAN SALVADOR/ El Salvador Intl.	APP-I APP-I APP-SR-I TWR SMC GP D-ATIS	1 1 1 1 1 1 1							
MSSS SAN SALVADOR/ Ilopango Intl.	APP-I TWR TWR SMC	1 1 1 1							
FRENCH ANTILLES (France)									
TFFF FORT-DE-FRANCE Le Lamentin, Martinique	APP-U APP-I TWR	1 1 1							

Country and location	Service or function	VHF voice	VHF data	HF voice	HF data	Satellite voice	Satellite data	Mode S	Remarks
1	2	3	4	5	6	7	8	9	10
	APP-SR-I	1							
	D-ATIS	1							
	SMC	1							
TFFR POINTE-A-PITRE/ Le Raizet, Guadeloupe	APP-U	1							
	APP-I	2							
	TWR	1							
	APP-SR-I	1							
	D-ATIS	1							
	SMC	1							
TFFJ SAINT-BARTHELEMY/ Saint-Barthelemy	AFIS	1							
TFFG SAINT MARTIN/ Grand Case, Guadeloupe	AFIS	1							
FRENCH GUIANA (France)									
S000 CAYENNE	ACC-U	2		CAR-A					
	GP	1		SAM-2					
				SAT-2					
S0CA CAYENNE/ Rochambeau	APP-SR-I	1							
	TWR	1							
	SMC	1							
	ATIS	1							
GRENADA									
TGPZ LAURISTON/ Carriacou	TWR	1							
TGPY SAINT GEORGES/ Point Salines	APP-L	1							
	TWR	1							
	SMC	1							
GUATEMALA									
MGFL FLORES/Flores	APP-L	1							
	TWR	1							
MGGT GUATEMALA/ La Aurora	APP-SR-I	1							
	TWR	1							
	SMC	1							
	D-ATIS	1							
	GP	1							
MGPB PUERTO BARRIOS/ Puerto Barrios	TWR	1							
MGSJ SAN JOSE/San José	TWR	1							
GUYANA									
SYGC GEORGETOWN	ACC-U	1	1	CAR-A		X			
	ACC-U	1-ER		SAM-2					
	GPS	1							
	ACC-L	1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
SYCJ TIMEHRI/ Cheddi Jagan Intl.	APP-L TWR SMC FIS	1 1 1 1							
HAITI									
MTCH CAP HAITIEN/Intl.	APP-L TWR	1 1							
MTEG PORT-AU-PRINCE	ACC-SR-U GP	2 1	1						
MTPP PORT-AU-PRINCE/Intl.	APP-SR-I APP-I TWR SMC D-ATIS	1 1 1 1 1							
HONDURAS									
MHRO COXEN HOLE/Juan Manuel Gálvez Intl.	TWR SMC	1 1							
MHLC LA CEIBA/ Golosón Intl.	APP-L TWR SMC	1 1 1							
MHLM SAN PEDRO SULA/ La Mesa Intl.	APP-I TWR SMC GP D-ATIS	1 1 1 1 1							
MHTG TEGUCIGALPA (CENAMER)	ACC-SR-U GP	7 1	3	CAR-A SAM-1	X	X	X		
MHTG TEGUCIGALPA/ Toncontin	APP-I TWR SMC GP D-ATIS	1 1 1 1 1							
JAMAICA									
MKJK KINGSTON	ACC-SR-U ACC-U GP	1 5 1	2		X	X	X		
MKJP KINGSTON/Norman Manley Intl.	APP-SR-1 APP-I TWR SMC D-ATIS	1 1 1 1 1							
MKJS MONTEGO BAY/ Sangster Intl.	APP-SR-I APP-I TWR SMC D-ATIS	1 1 1 1 1							
MEXICO									

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
MMAA ACAPULCO/Gral. Juan Alvarez Intl.	APP-SR-I APP-SR-L D-ATIS SMC TWR GP	1 1 1 1 1 1							
MMAS AGUASCALIENTES/ Jesus Teran Intl.	TWR	1							
MMBT BAHIAS DE HUATULCO/ Bahías de Huatulco	TWR	1							
MMSL CABO SAN LUCAS/	TWR	1							
MMCP CAMPECHE/ Ignacio Alberto Acuña Ongay Intl.	TWR	1							
MMUN CANCUN/ Cancún Intl.	APP-L APP-I SMC TWR D-ATIS CLRDR GP	1 1 1 1 1 1 1							
MMCM CHETUMAL/ Chetumal Intl.	TWR	1							
MMCT CHICHEN-ITZA/ Chichen-Itza Intl.	TWR	1							
MMCU CHIHUAHUA/ Gral. Roberto Fierro Villalobos Intl.	APP-I TWR D-ATIS GP	1 1 1 1							
MMMC CIUDAD ACUÑA/ Ciudad Acuna Intl.	AFIS	1							
MMCE CIUDAD DEL CARMEN/ Ciudad del Carmen Intl	TWR	1							
MMCS CIUDAD JUAREZ/ Abraham González Intl.	APP-I TWR	1 1							
MMCN CIUDAD OBREGON/ Ciudad Obregon Intl.	TWR	1							
MMCV CIUDAD VICTORIA/ Gral. Pedro Jose Mendez Intl.	TWR	1							
MMCB CUERNAVACA/ Gral. Mariano Matamoros Intl.	TWR	1							
MMCZ COZUMEL/ Cozumel Intl.	TWR	1							
MMCL CULIACAN/ Fidel Bachigualato	APP-I TWR GP	1 1 1							
MMDO DURANGO/ Pte.Guadalupe Victoria, Intl.	TWR	1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
MMGL GUADALAJARA/ Don Miguel Hidalgo y Costilla Intl.	APP-SR-I	1							
	APP-SR-L	1							
	D-ATIS	1							
	SMC	1							
	TWR	1							
	CLRD	1							
	GP	1							
MMGM GUAYMAS/ Gral. José María Yáñez Intl.	TWR	1							
MMHO HERMOSILLO/ Gral. Ignacio Pesqueira Garcia Intl.	APP-I	1							
	D-ATIS	1							
	TWR	1							
	SMC	1							
MMZH IXTAPA- ZIHUATANEJO/ Ixtapa-Zihuatanejo Intl.	APP-I	1							
	TWR	1							
MMLP LA PAZ/ Gral. M. Márquez de León Intl.	APP-I	1							
	TWR	1							
MMLO LEON/ Guanajuato	APP-L	1							
	TWR	1							
MMLM LOS MOCHIS/ Valle del Fuerte Intl.	TWR	1							
MMLT LORETO/ Loreto Intl.	TWR	1							
MMZO MANZANILLO/ Playa de Oro Intl.	APP-L	1							
	TWR	1							
MMLM MATAMOROS/ Gral. Servando Canales	APP-L	1							
	TWR	1							
MMMZ MAZATLAN/ Gral. Rafael Buelna Intl.	ACC-SR-L	4	5		X	X	X		
	ACC-SR-U	4							
	APP-I	1							
	SMC	1							
	TWR	1							
	D-ATIS	1							
	GP	1							
MMID MERIDA/ Lic. M. Crescencio Rejón Intl.	ACC-SR-L	3	3	CAR-A	X	X	X		
	ACC-SR-U	4							
	APP-I	1							
	D-ATIS	1							
	GP	1							
	TWR	1							
MMLL MEXICALI/ Gral R. Sánchez Taboada Intl.	APP-I	1							
	TWR	1							
MMMx MEXICO/ Lic. Benito Juárez Intl.	ACC-SR-L	5							
	ACC-SR-U	5	3		X	X	X		
	APP-SR-I	1							
	APP-SR-L	1							
	D-ATIS	1							
	GP	1							
	SMC	1							
	TWR	1							
CLRD	1								

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
MMMT MINATITLAN/ Minatitlan Int.	TWR	1							
MMAN MONTERREY/ Aeropuerto Del Norte Intl.	TWR	1							
MMMY MONTERREY/ Gral. Mariano Escobedo Intl.	ACC-SR-L	2	3		X	X	X		
	ACC-SR-U	2							
	APP-SR-I	1							
	APP-SR-L	1							
	D-ATIS	1							
	GP	1							
	SMC	1							
	TWR	1							
MMMM MORELIA/ Gral. Francisco Mujica Intl.	APP-L	1							
	TWR	1							
MMNG NOGALES/ Nogales Intl.	AFIS	1							
MMNL NUEVO LAREDO/ Quetzalcoatl Intl.	APP-L	1							
	TWR	1							
MMOX OAXACA/ Oaxaca Intl.	TWR D-	1							
MMPG PIEDRAS NEGRAS/Intl.	ATIS	1							
MMPA POZA RICA/ Tajin Intl.	TWR	1							
MMPB PUEBLA/ Hermanos Serdan Intl.	TWR	1							
MMPs PUERTO ESCONDIDO/ Puerto Escondido Intl.	TWR	1							
MMPE PUERTO PEÑASCO/ Puerto Peñasco Intl.	TWR	1							
MMPR PUERTO VALLARTA/ Lic. Gustavo Díaz Ordaz Intl.	APP-SR-I	1							
	APP-SR-L	1							
	D-ATIS	1							
	SMC	1							
	TWR	1							
MMQT QUERETARO/ Queretaro Int.	TWR	1							
MMRX REYNOSA/ Gral. Lucio Blanco Intl.	APP-L	1							
	TWR	1							
MMIO SALTILLO/ Plan de Guadalupe Intl.	TWR	1							
MMSC SAN CRISTOBAL DE LAS CASAS/ San Cristobal de las Casas Intl	TWR	1							
MMSF SAN FELIPE/ San Felipe Intl.	AFIS	1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
MMSD SAN JOSE DEL CABO/San José del Cabo Intl.	APP-I TWR GP	1 1 1							
MMSP SAN LUIS POTOSI/ Ponciano Arriaga Intl.	TWR	1							
MMTM TAMPICO/ Gral.Francisco Javier Mina Intl.	APP-I TWR GP	1 1 1							
MMTP TAPACHULA/ Tapachula Intl.	TWR	1							
MMEP TEPIC/ Tepic Intl.	TWR	1							
MMTJ TIJUANA/ Gral. Abelardo L. Rodríguez Intl.	APP-SR-I APP-SR-L D-ATIS GP TWR SMC	1 1 1 1 1 1							
MMTO/TOLUCA/ Lic. Adolfo Lopez Mateos	TWR GP	1 1							
MMTC TORREON/ Torreón Intl.	APP-L TWR	1 1							
MMTG TUXLA GUTIERREZ/ Gral. Angel Albino Corzo Intl.	TWR	1							
MMPN URUAPAN/ Gral. Ignacio Lopez Rayon Intl.	TWR	1							
MMVA VILLAHERMOSA/ C.P.A. Carlos Rovirosa	APP-L TWR	1 1							
MMVR VERACRUZ/Gral. Heriberto Jara Intl.	APP-L TWR	1 1							
MMZC ZACATECAS/Gral. Leobardo Ruíz Intl.	APP-I TWR	1 1							
MONTSERRAT (United Kingdom)									
TRPM PLYMOUTH/ Blackburne, Montserrat I.	APP-L TWR	1 1							
NETHERLANDS									
TNCB KRALENDIJK/ Flamingo, Bonaire I.	APP-I TWR	1 1							
TNCE ORANJESTAD/ F.D. Rossevelt, St. Eustacius I.	TWR	1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
NICARAGUA									
MNMG MANAGUA/Augusto César Sandino Intl.	APP-I	1							
	TWR	1							
	SMC	1							
	GP	1							
	D-ATIS	1							
MNPC PUERTO CABEZAS/ Puerto Cabezas	TWR	1							
PANAMA									
MPBO BOCAS DEL TORO/ Bocas del Toro	AFIS	1							
MMPCH CHANGUINOLA/ Cap. Manuel Niño	TWR	1							
MPDA DAVID/Enrique Malek	TWR	1							
	SMC	1							
MPMG PANAMA/Marcos A. Gelabert	TWR	1							
	SMC	1							
	CLRD	1							
MPZL PANAMA	ACC-U	2							
	ACC-SR-U	1							
	APP-SR-I	3							
	GP	1							
MPTO PANAMA/Tocumen	TWR	1							
	SMC	1							
	ATIS-D	1							
	CLRD	1	1	CAR-A SAM-1	X	X	X		
PARAGUAY									
SGFA ASUNCION	ACC-U	1							
	ACC-U	1-ER							
	GP	1							
SGAS ASUNCION/ Silvio Pettirossi	APP-SR-I	1							
	APP-I	2							
	TWR	1							
	SMC	1							
SGES CIUDAD DEL ESTE/ Guarani	APP-SR-I	1	1	SAM-1 SAM-2	X				
	TWR	1							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
PERU									
SPOU AREQUIPA/ Rodríguez Ballón Intl.	APP-SR-I TWR SMC	1 1 1							
SPHI CHICLAYO/ Cap. José Quiñones Gonzáles	TWR SMC	1 1							
SPZO CUZCO/Velazco Astete	APP- I TWR ATIS	1 1 1							
SPQT IQUITOS/Cnel. FAP Francisco Secada Vignetta	APP-SR-I TWR SMC	1 1 1							
SPIM LIMA	ACC-SR-U	4 -ER		SAM-1					
SPIM LIMA-CALLAO/Jorge Chávez Intl.	APP-SR-I TWR SMC CLRD ATIS	3 1 1 1 1							
SPSO PISCO/Pisco	APP-I TWR SMC	1 1 1							
SPTN TACNA/Cnel. FAP Carlos Ciriani Santa Rosa	APP-I TWR	1 1							
SPRU TRUJILLO/Cap. Carlos Martínez de Pinillos	APP-I TWR	1 1							
PUERTO RICO (United States)									
TJBQ AGUADILLA/Rafael Hernández Intl.	TWR	1							
TJFA FAJARDO/Diego Jiménez Torres	TWR	1							
TJMZ MAYAGUEZ/Mayaguez	SMC TWR	1 1							
TJPS PONCE/Mercedita	TWR SMC APP-L	1 1							
TJZS SAN JUAN	ACC-U GP-U	11	4	CAR-A CAR-B NAT-A	X	X	X		
TJSJ SAN JUAN, PUERTO RICO/Luis Muñoz Marín Intl.	D-ATIS TWR	1 2							

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
	SMC	1							
	APP-SR-I	2							
TJVQ VIEQUES/Antonio Rivera	TWR	1							
SAINT KITTS AND NEVIS									
TKPK BASSETERRE/Golden Rock, Saint Kitts I.	APP-L	1							
	TWR	1							
TKPN CHARLESTOWN/Newcastle, Nevis I.	TWR	1							
SAINT LUCIA									
TLPC CASTRIES/Vigie	TWR	1							
	SMC	1							
TLPL VIEUX-FORT/Hewanorra Intl.	APP-L	1							
	TWR	1							
	SMC	1							
SAINT VINCENT AND THE GRENADINES									
TVSV BEQUIA/J. F. Mitchel	TWR	1							
TVSC CANOUAN/Canouan	TWR	1							
TVSV KINGSTOWNE/E.T. Joshua	APP-L	1							
	TWR	1							
TVSM MUSTIQUE/Mustique	TWR	1							
TVSU UNION ISLAND/Union Island	TWR	1							
SINT MAARTEN									
TNCM PHILISBURG/Princess Juliana, St. Maarten I.	APP-I	1							
	TWR	1							
	SMC	1							
SURINAME									
SMNI NEW NICKERIE/Maj. Fernandes	TWR	1							
	SMC	1							
SMPM PARAMARIBO	ACC-U	1-ER							
	GP	1							
SMZO PARAMARIBO/Zorg en Hoop	TWR	1							
	SMC	1							
SMJP ZANDERY/Johan A. Pengel	APP-I	1							
	TWR	1							
	SMC	1							
TRINIDAD AND TOBAGO									
TTZP PIARCO	ACC-SR-U	3							
	ACC-U	4	2	CAR-A	X	X	X		
	GP	1		CAR-B					
				SAM-2					

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
TTPP PORT OF SPAIN/ Piarco Intl., Trinidad I.	APP-I	1							
	APP-SR-I	2							
	TWR	1							
	SMC	1							
	ATIS	1							
TTCP SCARBOROUGH/ Crown Point, Tobago I.	APP-I	1							
	TWR	1							
	SMC	1							
TURKS AND CAICOS ISLANDS (United Kingdom)									
MBGT GRAND TURK/ Grand Turk Intl.	APP-L	1							
	TWR	1							
MBPV PROVIDENCIALES/ Intl.	APP-L	1							
	TWR	1							
MBSC SOUTH CAICOS/Intl.	APP-L	1							
	TWR	1							
UNITED STATES									
KZNY NEW YORK	GP-U	1-ER	1	CAR-A CAR-B	X	X	X		
	ACC-U	3							
URUGUAY									
SUCA COLONIA/ Departamental de Colonia	TWR	1							
SULS MALDONADO C/C Carlos A. Curbelo Intl Laguna del Sauce	TWR	1							
	SMC	1							
	ATIS	1							
SUAA MONTEVIDEO/Angel S. Adami Intl.	TWR	1							
SUEO MONTEVIDEO	ACC-U	3	1	SAM-1 SAM-2 SAT-X*	X	X	X		
SUMU MONTEVIDEO/ Carrasco Intl. Gral. Cesareo Berisso	APP-SR-I	1							
	APP-I	1							
	SMC	1							
	TWR	1							
	ATIS	1							
SURV RIVERA/Cerro Chapeau Intl.	TWR	1							
SUSO SALTO/Intl. Nueva Hesperides	TWR	1							
VENEZUELA									
SVBC BARCELONA/Gral. José Antonio Anzoátegui Intl.	APP-SR-I	2							
	TWR	2							
	SMC	1							
	ATIS	1							
	GP	1							
SVZM MAIQUETIA	ACC-SR-U	6							
	GP	1		CAR-A SAM-2					

Country and location 1	Service or function 2	VHF voice 3	VHF data 4	HF voice 5	HF data 6	Satellite voice 7	Satellite data 8	Mode S 9	Remarks 10
SVM I CARACAS/Maiquetía, Simón Bolívar	APP-SR-L	2	1						
	TWR	2							
	SMC	2							
	ATIS	1							
	CLRD	1							
SVMC MARACAIBO/ La Chinita Intl.	APP-SR-I	2							
	TWR	1							
	SMC ATIS	1							
	GP	1							
SVMG MARGARITA/Intl. Del Caribe, General Santiago Marino	APP-SR-I	1							
	TWR	1							
	SMC	1							
	ATIS	1							
	GP	1							
SVJC PARAGUANA/Josefa Camejo	APP	1							
	TWR	1							
	SMC	1							
	ATIS	1							
SVSA SAN ANTONIO DEL TACHIRA/San Antonio del Tachira	APP	1							
	TWR	1							
	SMC	1							
SVVA VALENCIA/Zim Valencia	APP	1							
	TWR	1							
	SMC	1							
	ATIS	1							
	GP	1							
VIRGIN ISLANDS (United Kingdom)									
TUPJ ROADTOWN/ Beef Island	APP-L	1							
	TWR	1							
	ATIS	1							
TUPW VIRGIN GORDA/ Virgin Gorda	TWR	1							
VIRGIN ISLANDS (United States)									
TISX SAINT CROIX/Henry E. Rohlsen, St. Croix	APP-I	1							
	TWR	1							
	SMC	1							
TIST SAINT THOMAS/ Cyril E. King	APP-I	1							
	TWR	1							
	SMC	1							
	D-ATIS	1							

Table CNS II-CARSAM-4 ASTERIX SAC CODE ASSIGNMENT PLAN TO THE CARIBBEAN AND SOUTH AMERICAN REGIONS

State/Territory	SAC Code Format								Hexadecimal SAC Code
	B7	B6	B5	B4	B3	B2	B1	B0	
Anguilla (United Kingdom)	1	1	1	0	0	0	0	0	E0
Antigua & Barbuda	1	1	1	0	0	0	0	1	E1
Argentina	1	1	1	0	0	0	1	0	E2
Aruba (Kingdom of Netherlands)	1	1	1	0	0	0	1	1	E3
Bahamas	1	1	1	0	0	1	0	0	E4
Barbados	1	1	1	0	0	1	0	1	E5
Belize	1	1	1	0	0	1	1	0	E6
Bolivia	1	1	1	0	0	1	1	1	E7
Brazil	1	1	1	0	1	0	0	0	E8
Cayman Islands (United Kingdom)	1	1	1	0	1	0	0	1	E9
Chile	1	1	1	0	1	0	1	0	EA
Colombia	1	1	1	0	1	0	1	1	EB
Costa Rica	1	1	1	1	1	1	0	0	EC
Cuba	1	1	1	0	1	1	0	1	ED
Dominica	1	1	1	0	1	1	0	1	EE
Dominican Republic	1	1	1	0	1	1	1	1	EF
Ecuador	1	1	1	1	0	0	0	0	F0
El Salvador	1	1	1	1	0	0	0	1	F1
Guadeloupe, French Antilles (France)	1	1	1	1	0	0	1	0	F2
Martinique, French Antilles (France)	1	1	1	1	0	0	1	1	F3
French Guiana (France)	1	1	1	1	0	1	0	0	F4
Grenada	1	1	1	1	0	1	0	1	F5
Guatemala	1	1	1	1	0	1	1	0	F6
Guyana	1	1	1	1	0	1	1	1	F7
Haiti	1	1	1	1	1	0	0	0	F8
Honduras	1	1	1	1	1	0	0	1	F9
Jamaica	1	1	1	1	1	0	1	0	FA
Mexico	1	1	1	1	1	0	1	1	FB
Montserrat (United Kingdom)	1	1	1	1	1	1	0	0	FC
Curacao(Kingdom of Netherlands)	1	1	1	1	1	1	0	1	FD
Nicaragua	1	1	1	1	1	1	1	0	FE
Panama	1	1	1	1	1	1	1	1	FF
Paraguay	1	1	0	1	0	0	0	0	D0
Peru	1	1	0	1	0	0	0	1	D1
Puerto Rico (United States)	1	1	0	1	0	0	0	1	D2
Saint Kitts and Nevis	1	1	0	1	0	0	1	1	D3
Saint Lucia	1	1	0	1	0	1	0	0	D4
Saint Vincent and Grenadines	1	1	0	1	0	1	0	1	D5
Sint Maarten ((Kingdom of Netherlands)	1	1	0	1	0	1	1	0	D6
Suriname	1	1	0	1	0	1	1	1	D7
Tortola	1	1	0	1	1	0	0	0	D8
Trinidad and Tobago	1	1	0	1	1	0	0	1	D9
Turks and Caicos Is. (United Kingdom)	1	1	0	1	1	0	1	0	DA
United States (For sharing with CAR Region)	1	1	0	1	1	0	1	1	DB
Uruguay	1	1	0	1	1	1	0	0	DC
Venezuela	1	1	0	1	1	1	0	1	DD
Virgin Islands (United Kingdom)	1	1	0	1	1	1	1	0	DE
Virgin Islands (United States)	1	1	0	1	1	1	1	1	DF

TABLE CNS II-CARSAM-5- SURVEILLANCE SYSTEMS PLAN

EXPLANATION OF THE TABLE

Column

- 1 Name of State/Territory and location of the radar station
- 2 Air traffic services unit served by the facility
- 3 PSR/Function - Primary surveillance radar/Function
E - En-route area control centres
T - Terminal
- 4 Coverage of primary surveillance radar in nautical miles
- 5 SSR/MSSR/Function - Secondary surveillance radar/ Monopulse secondary surveillance radar/Function
E - En-route area control centres
T - Terminal
- 6 SSR/MSSR/Modes - Modes A, C or S
- 7 Coverage of secondary surveillance radar in nautical miles
- 8 ADS-B/Function — Automatic dependent surveillance-Broadcast/ Function
E — En-route area control centres
T — Terminal
- 9 ADS-C/Function — Automatic dependent surveillance-Contract/ Function
C — Continental Airspace
O — Oceanic Airspace
- 10 MLAT/Function — Multilateration /Function
E — En-route area control centres
T — Terminal
- 11 Remarks

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Presidente Roque Saenz Paña Airport	Resistencia ACC			E/T	A/C	200				*MSSR
	P. Roque Saenz TWR									
Puerto Madryn, Airport	Com. Rivad. ACC			E/T	A/C	200				*MSSR
	Trelew TMA									
Quilmes	Ezeiza ACC			E/T	A/C	200				*MSSR
	Buenos Aires APP									
Rio Gallegos, Airport	Com. Rivad. ACC			E/T	A/C	200				*MSSR
	Rio Gallego,TMA									
Rosario,Airport	Ezeiza ACC						E/T			
San Carlos de Bariloche, Airport	Ezeiza ACC			E/T	A/C	200				*MSSR
	Bariloche TMA/APP									
Salta	Cordoba ACC			E/T	A/C	200				*MSSR
	Salta TMA/APP									
San Luis, Airport	Córdoba ACC			E/T	A/C	200				*MSSR
	Ezeiza ACC									
San Julian , Airport	Com. Rivad. ACC			E/T	A/C	200				*MSSR
	San Julian Airport									
Santa Rosa, Airport	Santa Rosa TMA/APP			E/T	A/C	200				*MSSR

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
	Bermuda TWR			T	A/C	250				
BOLIVIA										
Cochabamba	Cochabamba APP			E/T	A/C					
	La Paz ACC									
La Paz	La Paz ACC			E	A/C					
	La Paz APP			T	A/C					
BRASIL										
Barcelos	Manaus ACC	E	180	E	A/C	220				*MSSR
Barra do Carcas	Brasilia ACC	E	180	E	A/C	220				*MSSR
Belém	Manaos ACC	T	60	E	A/C	220				*MSSR
Belém	Belem APP	E	180	T	A/C	220				*MSSR
Boa Vista	Manaus ACC			E	A/C	220				*MSSR
Bom Jesus da Lapa	Recife ACC	T	60	E	A/C	220				*MSSR
Brasilia	Brasilia APP			T	A/C	220				*MSSR
Cachimbo	Manaus ACC	T	60	E	A/C	220				*MSSR
Campinas	Campinas APP	T	60	T	A/C	220				*MSSR
Campo Grande	Campo Grande APP	E	180	T	A/C	220				*MSSR
Cangucu	Curitiba ACC	E	180	E	A/C	220				*MSSR
Catanduvas	Curitiba ACC	E	180	E	A/C	220				*MSSR
Chapada Dos Guimaraes	Brasilia ACC	E	180	E	A/C	220				*MSSR
Conceição do Araguaia	Manaus ACC	T	60	E	A/C	220				*MSSR
Confins	Confins APP	T	60	T	A/C	220				*MSSR
Congonhas	São Paulo APP	E	180	T	A/C	220				*MSSR
Cruzeiro do Sul	Manaus ACC	T	60	E	A/C	220				*MSSR
Cuiabá	Cuiabá APP	T	60	T	A/C	220				*MSSR

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Curitiba	Curitiba APP	T	60	T	A/C	220				*MSSR
Eduardo Gomes	Manaus APP	E	180	T	A/C	220				*MSSR
Eirunepé	Manaus ACC			E	A/C	220				*MSSR
Fernando Noronha	Recife ACC	T	60	E	A/C	220				*MSSR
Florianópolis	Florianópolis APP	E	180	T	A/C	220				*MSSR
Fortaleza	Recife ACC	T	60	E	A/C	220				*MSSR
Fortaleza	Fortaleza APP	T	60	T	A/C	220				*MSSR
Foz do Iguazu	Foz do Iguacu APP	T	60	T	A/C	220				*MSSR
Galeão	Galeão APP	E	180	T	A/C	220				*MSSR
Gama	Brasília ACC	E	180	E	A/C	220				*MSSR
Guajaramirim	Manaus ACC	T	60	E	A/C	220				*MSSR
Guarulhos	Sao Paulo APP			T	A/C	220				*MSSR
Imperatriz	Manaus ACC			E	A/C	220				*MSSR
Jacarcacanga	Manaus ACC			E	A/C	220				*MSSR
Jaraguari	Curitiba ACC	E	180	E	A/C	220				*MSSR
Macapa	Manaus ACC	E	180	E	A/C	220				*MSSR
Maceió	Recife ACC	E	180	E	A/C	220				*MSSR
Manaus	Manaus ACC	E	180	E	A/C	220				*MSSR
Manaus	Manaus APP	T	60	T	A/C	220				*MSSR
Manicoré	Manaus ACC			E	A/C	220				*MSSR
Mombaça	São Paulo APP	T		T	A/C	220				*MSSR
Morro da Igreja	Curitiba ACC	E	60	E	A/C	220				*MSSR
Natal	Recife ACC		180	E	A/C	220				*MSSR
Natal	Natal APP	E	180	T	A/C	220				*MSSR
Palmas	Brasília ACC	T	60	E	A/C	220				*MSSR
Petrolina	Recife ACC	E	180	E	A/C	220				*MSSR
Pico do Couto	Brasilia ACC			E	A/C	220				*MSSR
Porto Alegre	Porto Alegre APP	E	180	T	A/C	220				*MSSR

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Porto Espiridiao	Manaus ACC	T	60	E	A/C	220				*MSSR
Porto Seguro	Recife ACC	E	180	E	A/C	220				*MSSR
Porto Velho	Manaus ACC	E	180	E	A/C	220				*MSSR
Recife	Recife APP	E	180	T	A/C	220				*MSSR
Río Branco	Manaus ACC	T	60	E	A/C	220				*MSSR
Río de Janeiro	Galeão APP	E	180	T	A/C	220				*MSSR
Salvador	Recife ACC	T	60	E	A/C	220				*MSSR
Salvador	Salvador APP	E	180	T	A/C	220				*MSSR
Santa Teresa	Brasília ACC	T	60	E	A/C	220				*MSSR
Santarém	Manaus ACC	E	180	E	A/C	220				*MSSR
Santiago	Curitiba ACC	E	180	E	A/C	220				*MSSR
Sao Felix do Araguaia		E	180	E	A/C	220				*MSSR
S. Feliz do Xingu				E	A/C	220				*MSSR
Sao Gabriel Cachoeira	Manaus ACC	E	180	E	A/C	220				*MSSR
Sao Luiz	Manaus ACC	E	180	E	A/C	220				*MSSR
Sao Roque	Brasília ACC	E	180	E	A/C	220				*MSSR
Sinop	Brasilia ACC	E	180	E	A/C	220				*MSSR
Tabatinga	Manaus ACC	E	180	E	A/C	220				*MSSR
Tanabi	Brasília ACC	E	180	E	A/C	220				*MSSR
Tefé	Manaus ACC	E	180	E	A/C	220				*MSSR
Tirios	Manaus ACC			E	A/C	220				*MSSR
Tres Marias	Brasilia ACC	E	180	E	A/C	220				*MSSR
Vilhena	Manaus ACC	E	180	E	A/C	220				*MSSR
CHILE										
Antofagasta	Santiago ACC			E	A/C	250				MSSR
	Antofagasta APP			E/T						

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Carahue	Iquique ACC			E						
	Santiago ACC			E	A/C	250				MSSR
	Puerto Montt ACC			E						
Chañaral	Concepcion APP			E/T						
	Santiago ACC			E	A/C	250				MSSR
	Antofagasta TMA/APP			E						
Concepción	Iquique ACC			E						
	Santiago ACC			E	A/C/S	250				
	Puerto Montt ACC			E						
Coyhaique	Concepción APP			E/T						
	Puerto Montt ACC			E	A/C	250				MSSR
	Punta Arena ACC			E						
Iquique	Santiago ACC			E						
	Antofagasta TMA/APP			E/T	A/C	250				MSSR
	Iquique ACC			E/T						
Puerto Montt	Santiago ACC			E						
	Puerto Montt ACC	E/T	80	E/T	A/C	220				MSSR
	Punta Arenas ACC			E						
	Santiago ACC			E						

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Punta Arenas	Punta Arenas ACC	E/T	80	E/T	A/C/S	220				
	Santiago ACC	E		E						
Santiago	Santiago ACC	E/T	80	E/T	A/C/S					
	Oceánico ACC									
	Santiago TWR									
Talagante	Santiago ACC			E/T	A/C	250				MSSR
	Concepción APP			E						
Vallenar	Antofagasta APP			E/T	A/C	250				MSSR
	Santiago ACC			E						
	Iquique ACC			E						
COLOMBIA										
Araracuara	Bogotá ACC			E/T	A/C	250				*MSSR
	Villavicencio APP									
Bucaramanga	Barranquilla ACC			E/T	A/C	250				* <2005
	Bogotá ACC									
	Bucaramanga APP									
	Cúcuta APP									
Cali	Bogotá ACC	T	80	T	A/C	250				*MSSR
	Cali APP									
Carepa	Barranquilla ACC	E/T	80	E/T	A/C/S	250				*MSSR

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Tablazo	Bogotá ACC	ET	80	E/T	A/C	250				*MSSR
	Bogotá APP									
	Cali APP									
	Pereira APP									
	Rio Negro APP									
	Villavicencio APP									
Tubará (Barranquilla)	Barranquilla ACC	E/T	80	E	A/C	250				*MSSR
	Barranquilla APP									
	San Andrés APP									
Villavicencio	Villavicencio APP	T	80	E/T	A/C	150				
COSTA RICA										
El Coco	El Coco APP	E/T	60	E/T	A/C	250				*MSSR
Volcan Poas	El Coco APP			E/T	A/C/S	250				*MSSR Mode S
	CENAMER ACC									
CUBA										
Camagüey	Habana ACC	T	60	T	A/C	200	E/T			*MSSR
	Camagüey APP									
Habana	Habana TMA			T	A/C	200	T			*MSSR
	Habana APP									
Holguín	Habana ACC			E/T	A/C	200	E/T			*MSSR

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Menocal	Santiago de Cuba TMA									
	Holguín APP									
	Habana ACC			E/T	A/C	200	E/T			*MSSR
	Habana TMA									
	Habana APP									
Varadero	Varadero APP			E	A/C	200			T	*MSSR
	Habana ACC			E	A/C	200	E			*MSSR
Sta. Clara	Habana ACC			E	A/C	200	E			*MSSR
Gran Piedra	Santiago de Cuba TMA			E/T	A/C	200	T			
DOMINICA										
DOMINICAN REPUBLIC										
Puerto Plata	Puerto Plata APP	T	70							
Punta Cana	Santo Domingo ACC	T	70	E/T	A/C	250				*MSSR
	Punta Cana APP									
Santo Domingo	Santo Domingo ACC	E/T	70	E/T	A/C	250				*MSSR
	Santo Domingo APP									
ECUADOR										

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Guayaquil	Guayaquil ACC			E	A/C					*MSSR
	Guayaquil APP	T	50	T	A/C	250				*MSSR
Quito APP	Guayaquil ACC			E	A/C	250				*MSSR
	Quito APP	T	50	T	A/C	250				*MSSR
San Cristobal	Guayaquil ACC			E	A/C	250				*MSSR
EL SALVADOR										
El Salvador	El Salvador APP	T	80	T	A/C	200				*MSSR
Ojo de Agua	El Salvador APP			E/T	A/C	250				*MSSR
FRENCH ANTILLES										
Fort-de-France	Fort-de-France APP			T	A/C	200				*MSSR
Point-à-Pitre	Point-à-Pitre APP			T	A/C	250				*MSSR
GRENADA										
	Point Salines APP									
GUATEMALA										
C. Guatemala	La Aurora APP	T	80	T	A/C	250				*MSSR

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
San José Escuintla	San José APP			T	A/C	250				*MSSR
Santa Elena	Tikal APP			T	A/C	250				*MSSR
GUYANA										
	Georgetown ACC									
HAITI										
	Port-au-Prince ACC			E/T	A/C	250				*MSSR
	Port-au-Prince APP			T	A/C	250				*MSSR
HONDURAS										
San Pedro Sula	La Mesa APP			T	A/C	250				*MSSR
JAMAICA										
Kingston	Kingston APP	T	60	E/T	A/C	250				*MSSR
Montego Bay	Montego Bay APP	T	60	T	A/C	250				*MSSR
Mount Denham	Kingston ACC	E	120	E	A/C	250				*MSSR
MEXICO										
Acapulco	Acapulco APP			T	A/C	240				*MSSR

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
MONTSEERRAT (United Kingdom)										
CURACAO										
Willemstad	Curaçao ACC	E/T	120	E/T	A/C	256				
	Curaçao APP									
SINT MAARTEN										
Saint Maarten	Juliana APP	T	60	T	A/C	256				
NICARAGUA										
Managua	Managua APP			T	A/C/S	250				*MSSR Mode S
Bluefields	Bluefields TWR			T	A/C	250				
PANAMA										
Panamá	Panamá ACC	T	60	E/T	A/C	200				
	Panamá APP									
PARAGUAY										
Asunción	Asunción ACC	T	60	E/T	A/C/S	250				*MSSR Mode S

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C&S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Roque Alonso	Roque Alonso Aeródromo						E/T			
Mcal Estigarribia	Mcal Estigarribia						E/T			
Bahía Negra	Bahía Negra						E/T			
Concepción	Concepción						E/T			
Minga Guazú	Guaraní						E/T			
San Juan Bautista	San Juan Bautista						E/T			
Ciudad del Este	Ciudad del Este APP	T	60	E/T						
PERU										
Ayacucho	Lima ACC			E	A/C/S	250				
Arequipa	Lima ACC			E/T	A/C/S	250				
	Lima APP			E/T	A/C/S	250				
Cajamarca	Lima ACC			E	A/C/S	250				
Cusco	Lima ACC			E	A/C/S	250				

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
Iquitos	Lima ACC			E/T	A/C/S	250				
	Iquitos APP			E/T	A/C/S	250				
Lima	Lima ACC	E	60	E	AC/S	250				
Pucallpa	Lima APP	T	60	T	AC/S	250				
	Lima ACC			E/T	A/C/S	250				
Talara	Pucallpa APP			E/T	A/C/S	250				
	Lima ACC			E	A/C/S	250				
PUERTO RICO (United States)										
Pico del Este	San Juan ACC	E/T	200	E/T	A/C	200	E			*MSSR
San Juan	San Juan APP	E/T	60	E/T	A/C	180	T			
SAINT KITTS AND NEVIS										
SAINT LUCIA										
	Santa Lucia APP									
SAINT VINCENT & THE GRENADINES										
	E.T.Joshua APP									
SURINAME										

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
TRINIDAD & TOBAGO										
Piarco (15 NM north)	Piarco ACC Piarco APP	E/T	60	E/T	A/C	250				*MSSR
TURKS & CAICOS IS. (United Kingdom)										
Grand Turks	Miami ACC San Juan ACC			E	A/C	250				*MSSR
URUGUAY										
Carrasco	Montevideo ACC Carrasco APP	E/T	80	E/T	A/C	180				
Durazno	Montevideo ACC Carrasco APP			E/T	A/C	256				*MSSR
VENEZUELA										
Barcelona	Barcelona APP Maiquetia ACC	E/T	60	E/T	A/C	250				*MSSR
Barquisimeto	Barquisimeto APP	E/T	60	E/T	A/C	250				*MSSR

State(Territory)/Location Estado(Territorio)/Ubicación	ATS Unit Served Unidad ATS Servida	PSR		SSR			ADS-B	ADS-C	MLAT	Remarks Observaciones
		Function Función	Coverage Cobertura (NM)	Function Función	Modes Modos (A,C& S)	Coverage Cobertura (NM)	Function	Function	Function	
1	2	3	4	5	6	7	8	9	10	11
VIRGIN IS. (United States)										
Saint Thomas	San Juan ACC	E/T	60	E/T	A/C	180				
	San Juan APP									
COCESNA										
Cerro Santiago, Guatemala	CENAMER ACC			E/T	A/C/S	250				*MSSR-Mode S
Grand Cayman, Cayman I.	CENAMER ACC Owen Roberts TWR			E/T	A/C/S	250				*MSSR-Mode S
Mata de Caña, Costa Rica	CENAMER ACC			E/T	A/C/S	250				*MSSR-Mode S
Puerto Cabezas, Nicaragua	CENAMER ACC			E/T	A/C/S	250				*MSSR-Mode S
Dixon Hill, Honduras	CENAMER ACC			E/T	A/C/S	250				*MSSR-Mode S
Monte Crudo, Honduras	CENAMER ACC			E/T	A/C/S	250				*MSSR-Mode S

APPENDIX D



**SURVEILLANCE STRATEGY FOR THE
CAR/SAM REGIONS**

**First Edition
Rev 2.0**

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1. Introduction

1.1 General Considerations

Within the context of the GREPECAS/14, the Surveillance Regional Plan was updated and it was recognized that further analysis on that matter should take place by CNS Committee. The CNS Surveillance Task Force (CNS/SUR/TF) was then created and tasked, among other activities, to define a unified Air Surveillance Strategy for CAR/SAM Regions.

Subsequently, this initial document is the result of the task assigned to CNS Committee - CNS/SUR/TF, in which the preliminary elements for a Regional CAR/SAM Strategy in short, medium and long term for ADS-C and ADS-B use have been integrated into an Unified Regional Strategy for the Implementation of Surveillance Systems.

This surveillance strategy is derived from the “Global Air Navigation Plan for CNS/ATM Systems” (Doc. 9750) and the “CAR/SAM Regional Air Navigation Plan” (Doc. 8733) and NAM/CAR performance based regional plans (Regional Performance Based Air Navigation Implementation Plan RPBANIP) and SAM (Performance Based Air Navigation Implementation Plan for the SAM Region SAM PBIP), since technology is not an end in itself and should be based on clearly established operational requirements for ATM evolution.

The main objective of this strategy is to propose the surveillance systems that are suitable to be applied in short and medium terms within CAR/SAM Region and to define an evolutionary path that will promote safety, interoperability and cost effectiveness of the required infrastructure to meet the future ATM needs.

The surveillance strategy should be seen as a guidance document to all stakeholders, without any regulatory or mandatory requirements. Appropriate regulations should be published by Air Navigation Authorities when the use of new surveillance techniques is to be introduced in the States.

This strategy is a live document and should be reviewed and updated every two years.

1.2 Scope of the Surveillance Strategy

The surveillance strategy should be seen as a link between the Global Air Navigation Plan (GANP Doc. 9750) and the stakeholders’ strategy for the air surveillance applications. The Global Air Navigation Plan (Fifth Edition 2016) is conceived to provide complementary guide to the entire sector in the air transport progress during period 2013-2028.

The GANP (Fourth Edition) explores the need for aviation planning to be more integrated at regional and State levels and discusses solutions that are required to introduce the consensus-based strategy for the modernization of the systems engineering of aviation system block upgrades (ASBU) and enter a roadmap for surveillance systems on ground, air-air and avionics.

Implementation of surveillance systems should be based on a harmonized strategy for the CAR/SAM Regions that would take into account the operational requirements and relevant cost-benefit analyses. It should also be based on Action Plans to ensure that CAR/SAM States, Territories and International Organizations implement the necessary systems in accordance with consistent timescales.

The surveillance technologies considered in this strategy to meet present and future ATM expectations are listed bellow and briefly explained in Annex C:

- Primary Radar (SMR/ASDE);
- Secondary Surveillance Radar (SSR);
- Automatic Dependent Surveillance-Broadcast (ADS-B);
- Automatic Dependent Surveillance-Contract (ADS-C); and
- Multilateration.

In order to provide a global view of the surveillance strategy, the operational drivers, the required surveillance infrastructure and the regional studies and trials proposed in this document have been displayed in each chapter in a chronological presentation.

The timeframes illustrated in this document define the tentative dates when surveillance systems are estimated to become regionally operational. Nevertheless, some of the surveillance systems described in this strategy will be used to solve local issues prior to the timescales in this document, and thereby will migrate from pioneer areas into bigger regional areas.

In other words, new surveillance technologies implementation policy for CAR/SAM Region should be first based on a voluntary initiatives in pocket areas, using certified existing equipage which is to be followed by an implementation in wider areas supported by the Implementing Rule related to the upgraded equipage.

1.3 **Structure of the Document**

This document is structured as follows:

- Section 1 (this section) presents the general considerations, explains its scope and structure and describes its intended readers.
- Section 2 describes the Surveillance Operational Scenario Evolution, i.e. the envisaged operational drivers for short (2016-2018), medium (2019-2024) and long terms (2025-2030) in the Air Surveillance field, for En-Route and TMA Airspace, Aerodrome Operations and Aircraft Systems.
- Section 3 specifies the Surveillance Infrastructure Evolution required to cope with the foreseen operational environment and specifies a tentative action plan that needs to be accomplished in a timely manner, in order to promote the operational use of the new surveillance technologies.
- **Annex A** provides the meaning of the Acronyms used in this document.
- **Annex B** provides the definitions of the different terms used in this document.
- **Annex C** describes the principles of known surveillance techniques.

1.4 **Intended Readers**

This strategy was developed to the following stakeholders group within CAR/SAM Region:

- The departments of the National Supervisory Authorities of CAR/SAM countries who are responsible for verifying ATM Surveillance Systems;
- The departments of the civil and military ANSP of CAR/SAM states who are responsible for procuring/designing, accepting, and maintaining ATM Surveillance Systems;
- The Airport Operators, who are responsible for procuring/designing, accepting, and maintaining Surveillance Systems at airports level; and
- The Airspace Users, who are the final client of the ATM Surveillance Systems chain.

2. **Surveillance Operational Scenario Evolution**

2.1 **En-Route and TMA Airspace**

The surveillance operational scenario evolution for En-Route and TMA airspace is based on two fundamental principles for ground users in such airspace. These principles are dominant throughout the complete surveillance strategy and are:

- An independent surveillance system to track cooperative targets in TMA and en-route airspace; and
- Dependent cooperative surveillance.

2.1.1 **Short term (until 2018)**

Until 2018, independent surveillance systems will be predominant in CAR/SAM Regions. Until then, target position will be determined by the ground sensors (eg. SSR, MSSR radars), the ADS-C and the ADD initial provision to the ground stations supporting TMA and En Route operations is envisaged, following the increasing rate of Mode S equipped aircraft (new and overhauled) that will be able to transmit ADS-B messages (ADS-B out). The first set of new applications that are envisaged to be supported in CAR/SAM Region are the ground Surveillance (ADS-B out) in a non-radar environment (ADS-B-NRA), in a radar environment (ADS-B-RAD) and Airborne Derived Data (ADS-B-ADD) and multilateration.

2.1.2 **Medium term (2019-2024)**

Independent operation (MSSR, SSR – S Mode), ADS-C continues as well as a wide ADS-B out. It is foreseen that ADS-B-out will reach its whole operational capacity in 2025.

Another set of possible new applications is related to Airborne Surveillance (ADS-B-in, possibly supplemented by TIS-B) including: Airborne situational awareness (ATSA-AIRB), visual separation on approach (ATSA-VSA) and In-trail Procedure in oceanic airspace (ATSA-ITP). ADS-B-in for air traffic situational awareness is expected to be launched after 2020.

It is expected that an integration of airport and airspace surveillance will become more widespread in long term. This requires an increased integration of surveillance information at the SDPD level, which will require updating to process and deliver the new information to surveillance users as the new systems become operational.

2.1.3 **Long term (until 2025-2030)**

Until 2024, the ground service provider will remain responsible for the separation service and for maintaining separation. However, from 2015 onwards, there will be a number of ATM concepts which will begin to drive the evolution of the surveillance environment, these are:

- Enhanced planning with the tasks of the controllers operating in En-Route and TMA sectors becoming increasingly supported by more automation. The controller will make use of more ADD to provide a more accurate view of the situation and improvements in safety nets;
- Surveillance derived information will be made available to support Airborne Traffic Situational Awareness;
- Flight data processing systems will be upgraded to provide full 4D trajectory prediction aligned with the capabilities of 4D FMS;
- The limited delegation of separation tasks to aircrews in low and medium density airspace. This will require additional avionics infrastructure and additional tools for the controller and aircrew; and
- Introduction of preferred routing will require flight information to be displayed in real time to the controller.

2.2 **Aerodrome Operations**

2.2.1 **Short term (until 2018)**

For selected airports, detection of all mobiles within the aerodrome area is permanent throughout the whole strategy timeframe. The use of ADDs to support aerodrome operations is envisaged; and the

implementation of A-SMGCS level I (which may include ADS-B-APT application) and A-SMGCS level II will be enabled by systems such as Multilateration.

2.2.2 Medium term (2018-2024)

Implementation of A-SMGCS level I continue (which may include ADS-N-ATP application) and A-SMGCS level II.

2.2.3 Long term (until 2025-2030)

Where airport operators foresee a benefit, a long term implementation of A-SMGCS level III (which may include the ATSA SURF application) and A-SMGCS IV may start. This may require an ADS-B-in infrastructure and an equipage of selected, appropriate airport vehicles with transponders.

2.3 Aircraft Systems

2.3.1 Short term (until 2018)

In short term, the use of SSR or SSR Mode S transponders for ground based surveillance radar or Multilateration systems will continue. The implementation of new applications for ground surveillance (ADS-Bout). The implementation of new ground Surveillance Applications (ADS-B out), which will require integration between the aircraft navigation system and mode S transponders, in order to transmit intent information to other aircraft and ground users. This is enabled by ADS-B, using 1090 MHz Extended Squitter.

2.3.2 Medium term (2019-2024)

Implementation of ADFS-B out and ADS-B capacity will continue. (ICAO Ver.2) Surveillance integration (via ATN B2).

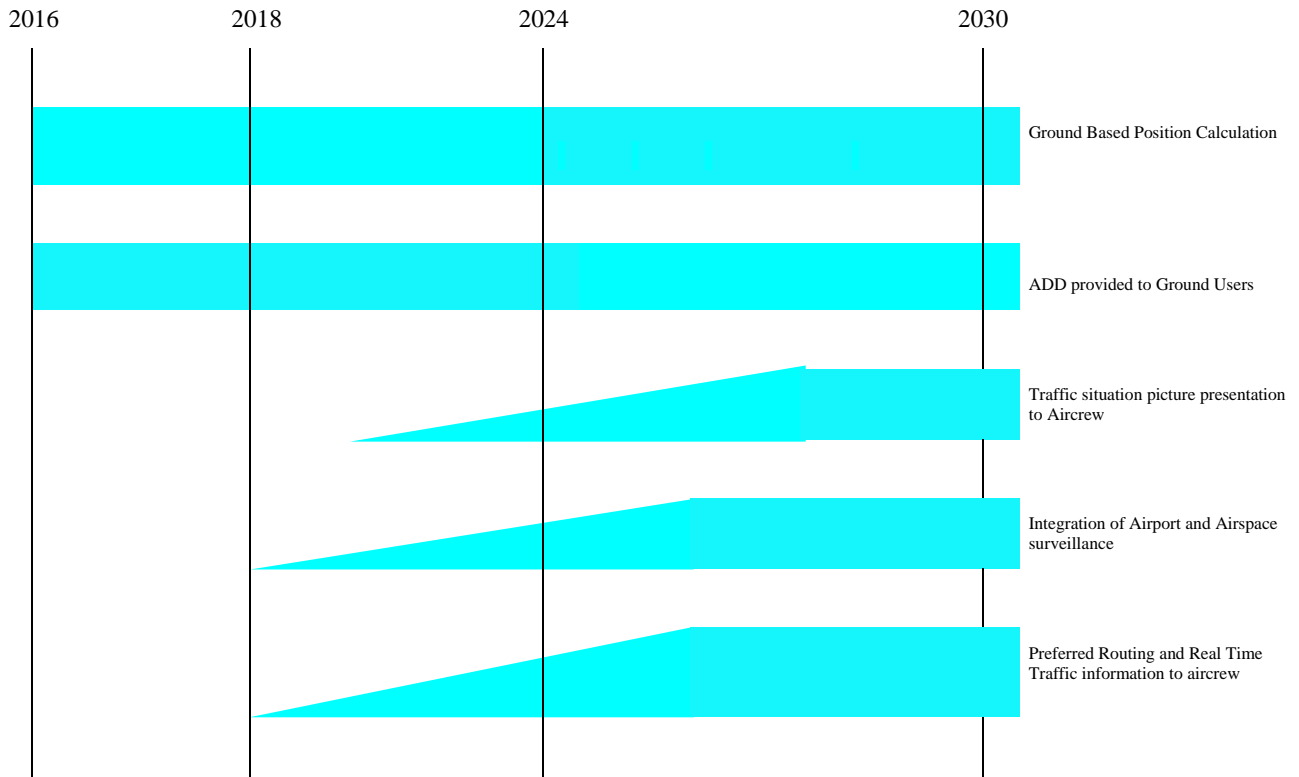
The implementation of ADS-B ASAS situational awareness applications will require an additional airborne SDPS and display system.

2.3.3 Long term (until 2025-2030)

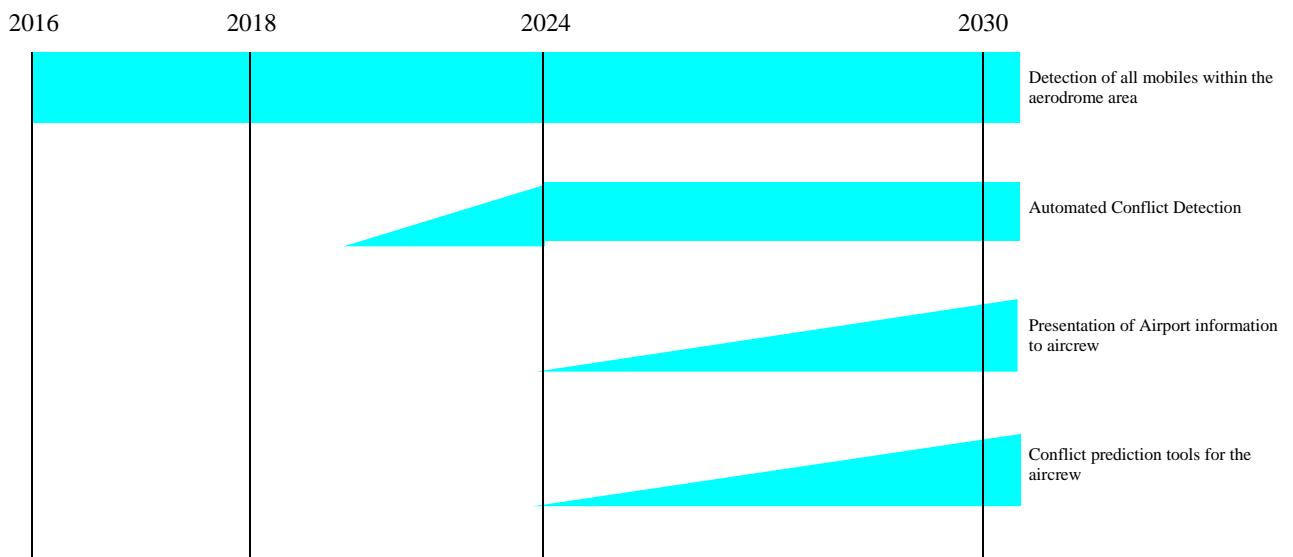
Future ADS-B IN/OUT systems and continuance of airborne systems considered a short and medium terms.

2.4 Operational Drivers Timeframe

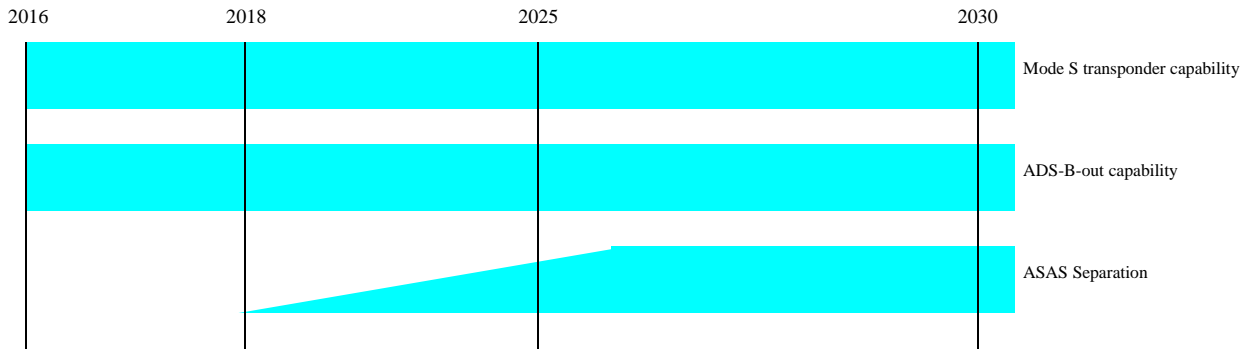
En Route and TMA Airspace



Aerodrome Operations



Aircraft Systems



3. Surveillance Infrastructure Evolution

3.1 En-Route and TMA Airspace

3.1.1 Short term (until 2018)

Co-operative surveillance, in the form of SSR, MSSR radars, will still be the main means of surveillance and will be extensively used for air traffic surveillance by civil agencies for TMA and En-Route services within coverage of (ground based) interrogator station(s).

Implementation of monopulse SSR, Mode S SSR, in medium- and high-traffic en route and terminal areas will continue.

ADS-C surveillance will be operationally used in all oceanic and remote airspace associated with FANS 1/A capacities.

Use of ADS-B (ES Mode S receivers) will begin to provide surveillance for en-route and terminal areas not covered with radar, and to strengthen surveillance in areas covered with SSR Modes A/C and S.

Depending on the percentage of ADS-B equipped aircrafts, wide area multilateration (WAM) implementation should be considered as a possible transition path to ADS-B environment in a shorter timeframe.

3.1.2 Medium term (2019-2024)

SSR Mode S surveillance implementation in high density will continue. State-selected TMAs in order to improve secondary radar performances. Since there will still exist legacy aircrafts that won't be able to reply on mode S, a mixed mode interrogation will be required up to 2024.

Ground implementation for ADS-B (based on ES Mode S receivers) will increase to fill en route and terminal areas not covered with radar and to strengthen surveillance in areas covered with SSR Modes A/C and S.

Surveillance Data Processing and Distribution systems based on surveillance server technology will have to be progressively upgraded, in order to merge legacy radar data and information contained in the ADD and/or from Multilateration position calculations and promote data sharing between States using TCP/IP patterns.

3.1.3 Long term (until 2025-2030)

It is predicted that by 2030 the majority of the SSR and SSR Mode S systems currently installed are at the end of their operational life. Therefore, SSR Mode A/C radars that have completed their life cycle by that time won't be replaced anymore. ADS-B will fully replace those decommissioned SSRs.

3.2 **Aerodrome Operations**

3.2.1 **Short term (until 2018)**

The main technology for calculating the position of mobiles (both aircraft and vehicles) will be Surface Movement (primary) Radar.

Implementation of multilateration will gradually increase, where aircraft respond to SSR Mode A/C or SSR Mode S queries.

3.2.2 **Medium term (2019-2024)**

A-SMGCS Level I/II will provide the benefits at the aerodrome and additional information may be required by the ground systems. The most effective means of achieving this would be via ADS-B, since aircraft will already be equipped and there will be a cost-effective upgrade path for the Multilateration ground stations, although there may be an impact on the avionics.

Although many Multilateration systems are configured with their own data fusion trackers as standard, a possible upgrade to existing SDPDs to support Aerodrome operations will be required.

3.2.3 **Long term (until 2025-2030)**

The introduction of A-SMGCS Levels III/IV at selected aerodromes will require aircrew to be presented, with an airport map and other mobiles for situational awareness and possible conflict prediction tools in the aircraft. Where airports foresee a benefit from these kinds of applications then a TIS-B service may be required to ensure a complete and consistent airport situation picture.

3.3 **Aircraft Systems**

3.3.1 **Short term (until 2018)**

In accordance with ICAO requirements, all aircraft flying within CAR/SAM controlled airspace are required to be equipped with a pressure altitude reporting device. It is not foreseen that there will be significant changes for aircraft systems prior to 2010 on that matter.

Until 2018 the implementation of ACAS II systems throughout commercial and general aviation will be almost completed, using Mode S transponder.

Mode S transponder starts updating to operate in ADS-B environments (ADS-B out).

If aircrafts are operating in airspace where the ground-based ADS-B applications are being used, then the avionic configuration will require changes to deliver the additional aircraft derived data required.

3.3.2 **Medium term (2019-2025)**

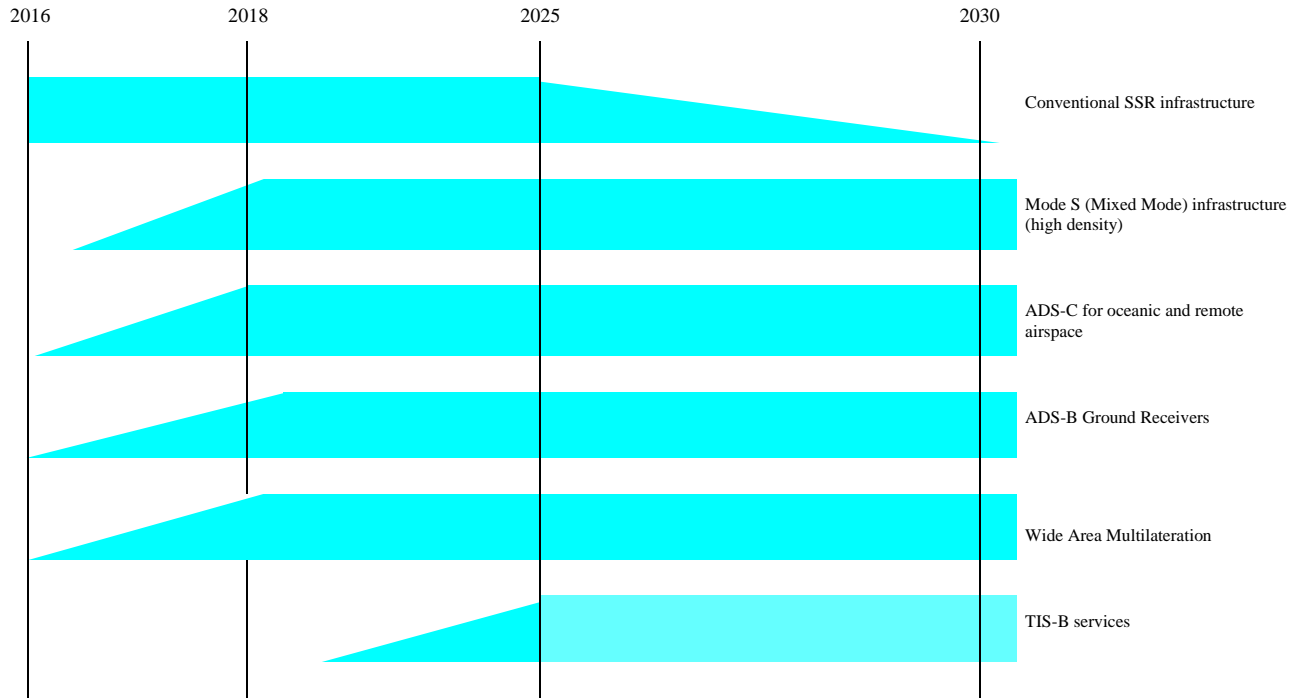
Aircraft operating in airspace where the ADS-B ground based surveillance applications are in use, with avionics configuration to deliver the additional aircraft derived data required.

3.3.3 **Long term (until 2025-2030)**

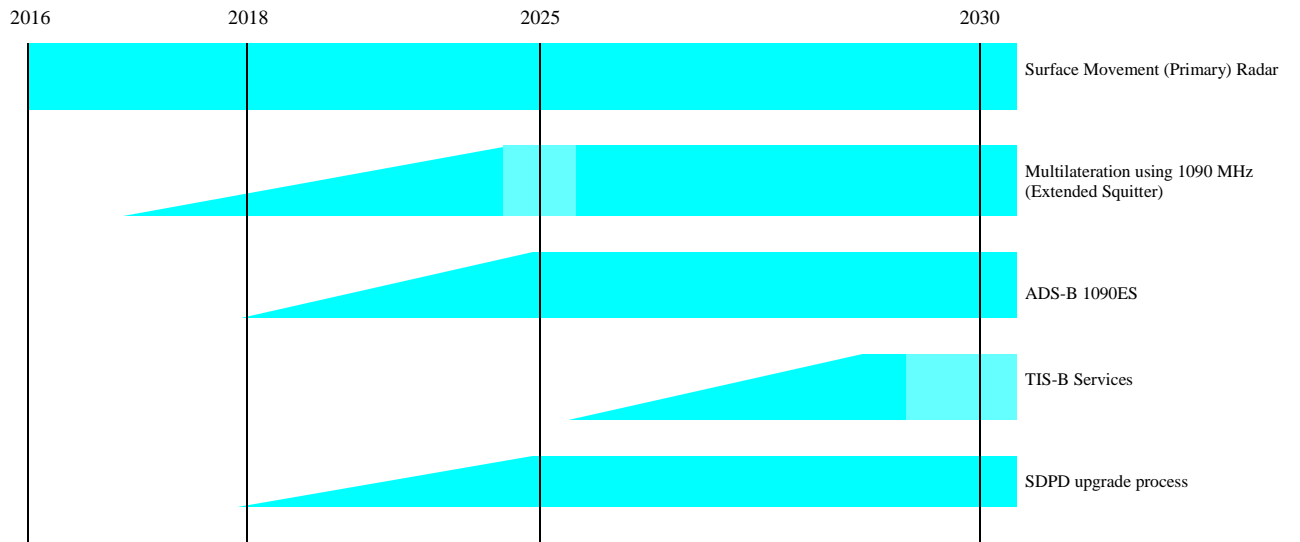
The move from ASAS spacing to ASAS separation and preferred routing may require a high integrity traffic situation picture, therefore the use of TIS-B may be required as well as the implementation of an airborne Surveillance Data Processing System (SDPS) to integrate ADS-B in and TIS-B for presentation of the air situation picture on a graphical display.

3.4 Surveillance Infrastructure Timeframe

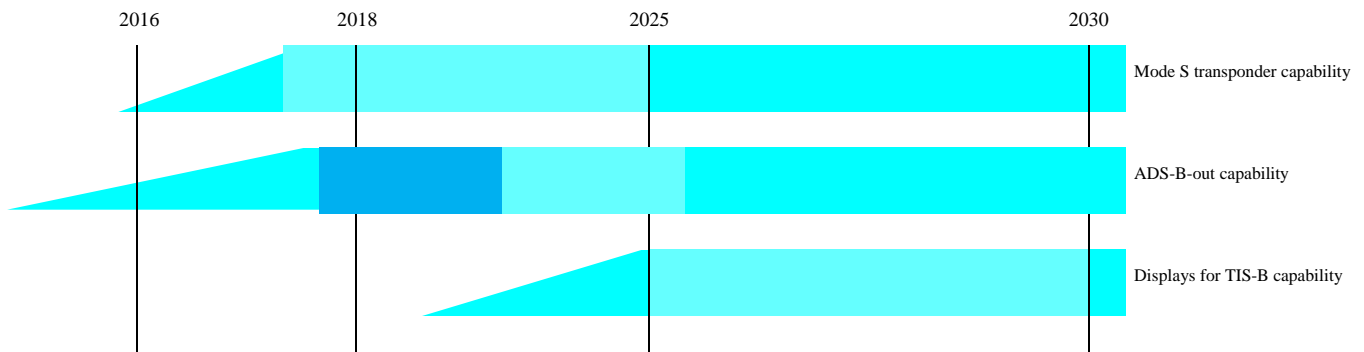
En Route and TMA Airspace



Aerodrome Operations



Aircraft Systems



3.5 Tentative Action Plan

3.5.1 Short term (until 2018)

Regional trials will have to be conducted in order to support the operational introduction of new techniques such as ADS-B and WAM. Such assessments would include Cost Benefit Analysis, safety assessments and detailing operational requirements.

In order to validate the timeframe forecasted by this surveillance strategy and assess the proportions of equipped aircrafts, each State/Territory/International Organization should evaluate the:

- useful life of their radars and the potentiality for their replacement with ADS-B;
- locations of potential ADS-C or ADS-B ground station sites;
- capabilities of existing and planned ATC automation systems to support ADS-C or ADS-B applications;
- maximum density traffic nowadays and expected for the year 2025;
- number of equipped aircrafts operating in the concern airspace;
- number, name and type of equipped aircraft of the airlines that have equipped aircrafts for mode S, ADS-C and ADS-B;
- rate of faulty Mode S airborne equipment and its behavior; and
- categorization of the accuracy/integrity data available in the aircrafts.

The ADS-B deployment should be associated at early stages in coordination with the States/Territory/International Organizations responsible for the control of adjacent areas, and the correspondent ICAO Regional Office. Therefore, a plan for data sharing should be established, based on bilateral agreements, aiming at a coordinated, harmonious and interoperable implementation of ADS-B.

As the increased dependence on ADS-B (1090 MHz Extended Squitter) is expected to grow, there is concern that the band will become saturated as more information is loaded onto the restricted band. Therefore it is required to study whether the use of 1090MHz continues to support the surveillance requirements.

3.5.2 Medium term (2019-2024)

In medium term, the capabilities of current Multi Sensor Trackers are to be assessed in light of the more stringent requirements need to support and process increasing amount of ADD.

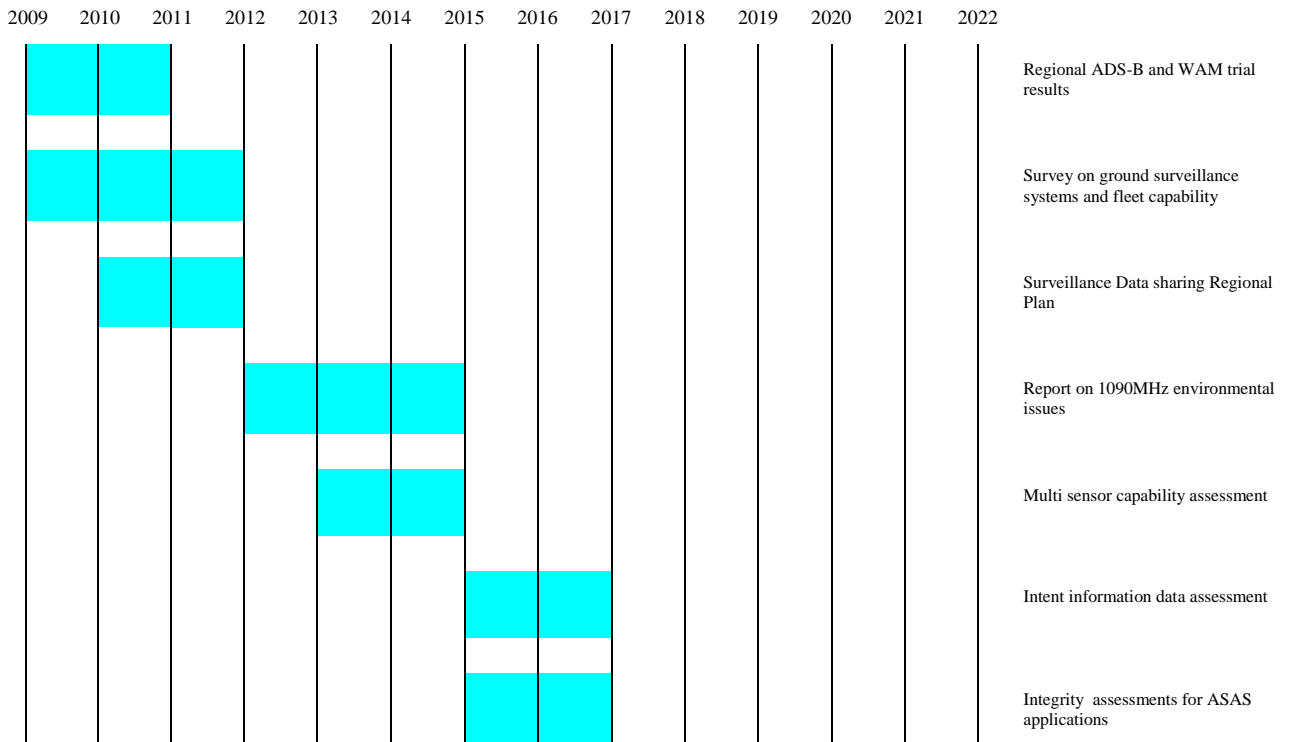
3.5.3 **Long term (until 2025-2030)**

In long term, it is required to identify the impact of the new procedures that are predicted to require ‘intent’ information from the aircraft. The precise definition of intent requires clarification to ensure avionics equipment and ground processing products can be developed in time to deliver the required information.

It is also required to identify whether the integrity requirements of the information presented to the aircrew while performing ADS-B Package I airborne surveillance applications may require the need for the uplink of traffic information to the aircraft to validate the integrity of the navigation data transmitted by ADS-B.

3.5.4 **Studies and Trials Timeframe**

Timeframe of the regional action plan



ANNEX A – ACRONYMS

ACAS	Aircraft Collision Avoidance System
ADD	Aircraft Derived Data
ADS	Automatic Dependent Surveillance
ADS-B	ADS-Broadcast
ADS-C	ADS-Contract
ANC	Air Navigation Commission
ANSP	Air Navigation Service Provider
APP	Approach (Centre or Control)
ASAS	Airborne Separation Assistance System
ASDE	Airport Surveillance Detection Equipment
A-SMGCS	Advanced Surface Movement and Guidance Control System
ATC	Air Traffic Control
ATM	Air Traffic Management
CDTI	Cockpit Display of Traffic Information
CNS	Communications Navigation and Surveillance
CPDLC	Controller Pilot Data link Communications
FDPS	Flight Data Processing System
FMS	Flight Management System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ICAO	International Civil Aviation Organization
M-SSR	Mono-pulse Secondary Surveillance Radar
PSR	Primary Surveillance Radar
RSP	Required Surveillance Performance
SARPs	Standards and Recommended Practices
SDPD	Surveillance Data Processing and Distribution System
SMGCS	Surface Movement Guidance and Control System
SSR	Secondary Surveillance Radar
TCAS	Traffic Collision Avoidance System
TIS-B	Traffic Information Service – Broadcast

ANNEX B – DEFINITIONS

Surveillance is defined as the technique for the timely detection of targets and the determination of their position (and if required, the acquisition of supplementary information relating to targets) and the timely delivery of this information to users in support of the safe control and separation of targets within a defined area of interest.

Ground Based Surveillance is defined as ‘ground based techniques for the timely detection of targets and the determination of their position (and if required, the acquisition of supplementary information relating to targets) and the timely delivery of this information to users in support of the safe control and separation of targets within a defined areas of interest’. The ‘defined area of interest’ relates to the ability of the User to select which information is deemed necessary to ensure the safe implementation of the surveillance application within the physical airspace for which they are responsible.

Independent surveillance is a technique where the position of the aircraft is calculated by the ground and is not dependent on position data transmitted by the aircraft.

Dependent surveillance like ADS-B is based on the principle of the target informing the ground system and other targets of its own position. The target may also provide aircraft derived data. Dependent surveillance delivers Aircraft Derived Data (ADD). ADD may contain navigation position, identification and other data from the aircraft.

Cooperative surveillance is a technique that requires the mobile to equip with a dedicated surveillance systems which responds to transmissions from the ground system.

Non Cooperative surveillance is a technique where the position of the aircraft is calculated by the ground and is not dependent on position data transmitted by the aircraft or upon any deliberate interaction in the aircraft with active components e.g SSR transponders.

Basic surveillance delivers to the surveillance user:

- Aircraft position (latitude, longitude and altitude)
- Mode A

Elementary surveillance includes basic surveillance and also delivers to the surveillance user:

- Aircraft identity - Flight Identity or tail registration and 24 bit address,
- Flight Status,
- Aircraft pressure altitude in 100 ft or 25 ft units, if the aircraft is appropriately equipped.

Enhanced Surveillance delivers to the surveillance user a set of Aircraft Derived Data (ADD) to provide additional information to ground or air based ATM systems and safety nets. Enhanced surveillance may be delivered to ground system through Mode S SSR, ADS-B or Multilateration system (through active interrogations).

Aircraft Derived Data Different cooperative surveillance technologies extract different information from the aircraft. In its simplest form, the Mode A and Mode C information provided by the aircrafts SSR transponder can be classified as aircraft derived data or down linked aircraft parameters. When implemented using SSR Mode S, the following current or short term Aircraft Parameters are automatically extracted from the aircraft:

- Air Speed (Indicated Air Speed and Mach Number)
- Ground Speed
- Magnetic Heading Roll Angle
- Selected Altitude Track Angle Rate (or, if not available, True Air Speed)
- True Track Angle Vertical Rate

The enhanced surveillance parameters delivered by ADS-B include the position and longer term intent parameters e.g. 4D trajectory, trajectory change points etc.

Surveillance users are:

- Oceanic ATM Centers
- En-Route ATM Centers
- TMA/Approach ATM Units
- Airports/Tower ATM & Ground Traffic Management Units
- Military Centers
- Airline Aircraft Operations Centre
- Enhanced Tactical Flow Management System
- Data processing systems, such as Flight Data Processing Systems
- ATM Tools, such as Short Term Conflict Alert
- The target
- Adjacent Surveillance Functions
- Non ATM functions (e.g. Search and Rescue).

Surveillance Data Processing and Distribution systems accept information from surveillance sensors, process the information to develop the 'best' estimate of the position of a target and supply this information to users. In addition the SDPD may receive ADD and distribute this to surveillance users attached to the position information.

A-SMGCS is an airport system which provides surveillance to a ground controller. It has four implementation levels that provide different levels of functionality:

Level I A-SMGCS provides:

- Position; the presentation to a controller of the location of an aircraft or vehicle;
- Identification; the presentation to the controller the identity (flight identification or call sign) of the aircraft or vehicle.

Level II A-SMGCS provides a conflict prediction function to alert the controller of:

- Potential collisions (between aircraft/vehicle or aircraft/aircraft) on the runway surface or protected areas
- Potential entry of aircraft or vehicles into restricted areas.

Level III A-SMGCS includes functions that are being defined by the Airports and Environments Business Division to share traffic situation awareness amongst pilots and drivers and the introduction of the automated routing function. The guidance function may be enhanced by:

- Display of the airport map showing taxiways, runways, obstacles and the mobile position to aircrew and drivers;
- Providing dynamic map with updates of the runway status
- Triggering automatically the dynamic ground signs (stop bars, centerline lights, etc.) according to the route issued by the controller.

Level IV A-SMGCS corresponds to the improvement of the functions implemented at the level III. Of particular note to the surveillance strategy, the control function will be complemented by a conflict resolution function in the cockpit or vehicle.

ADS-B Package I is a set of Ground Based Surveillance, Airborne Traffic Situational Awareness and Airborne Spacing applications (reference 6). Note that since reference 6 was published, the application descriptions have been refined, although they remain largely in accordance with the referenced document. The text below summarizes the applications as of November 2005.

ADS-B Package I Ground Based Surveillance Applications are aimed at improving ATC surveillance on the ground for En-Route and TMA airspace and on the airport surface and at enhancing ATC tools through the provision of aircraft derived data enabled by ADS-B. These applications are:

- ADS-B-RAD ATC surveillance for TMA and En-Route airspace in areas that are already covered by radar systems
- ADS-B-NRA ATC surveillance in non-radar areas

- ADS-B-APT Airport surface surveillance
- ADS-B-ADD Aircraft derived data for ATC tools

ADS-B Package I Airborne Surveillance Applications are aimed at improving airborne (cockpit) surveillance in En-Route and TMA airspace as well as on the airport surface. These applications are:

- ATSA-SURF Enhanced traffic situational awareness on the airport surface
- ATSA-VSA Enhanced visual separation on approach
- ATSA-ITP In-trail procedure in oceanic airspace
- ATSA-AIRB Enhanced traffic situational awareness during flight operations

ADS-B Package I Airborne Spacing Applications are aimed at using airborne (cockpit) surveillance capabilities to carry out applications where the flight crew is able to maintain a time or distance from designated aircraft. These applications are:

- ASPA-S&M Enhanced sequencing and merging operations
- ASPA-C&P Enhanced crossing and passing operations

ASAS Applications are a set of operational procedures for controllers and flight crews that make use of the capabilities of Airborne Separation Assistance Systems to meet a clearly defined operational goal.

Airborne Spacing (ASPA) is an ASAS application category where the flight crew is able to maintain a time or distance from designated aircraft. The controller can use new spacing instructions to expedite and maintain an orderly and safe flow of traffic and is still responsible for providing separation in accordance with the applicable ATC separation minima. New procedures and responsibilities are expected with the introduction of Airborne Spacing applications.

Airborne Separation is an ASAS application category where the flight crew is able to provide separation from designated aircraft in accordance with the applicable airborne separation minima. In this application the controller can delegate separation relative to a designated aircraft to the flight crew through a new clearance however the controller is responsible for providing separation in accordance with the applicable ATC separation minima from other aircraft. New procedures and responsibilities are expected with the introduction of Airborne Separation applications.

Airborne Self Separation is an ASAS application where the flight crew is able to provide separation from all known aircraft in accordance with the applicable airborne separation minima. Airborne self separation is not considered within the timescales of this strategy.

ANNEX C – SURVEILLANCE TECHNIQUES

Primary Radar (PSR, SMR/ASDE)

Primary Radar operates by radiating high levels of electromagnetic energy and detecting the presence and characteristics of echoes returned from reflected objects.

Target detection is totally based on the reception of reflected energy, it does not depend on any energy radiated from the target itself, i.e. no carriage of airborne equipment is required.

Secondary Surveillance Radar (SSR)

Secondary Surveillance Radar (SSR) operates by transmitting coded interrogations in order to receive coded information from all SSR transponder equipped aircraft, providing a two way "data link" on separate interrogation (1030 MHz) and reply (1090 MHz) frequencies.

Replies contain positive identification, as requested by the interrogation, either one of 4096 codes (Mode A) or aircraft pressure altitude reports (Mode C). The co-operative concept ensures stable received signal strength and considerably lower transmitted power levels than Primary Radar. SSR enables Basic Surveillance.

SSR Mode S is a development of SSR using the same interrogation and reply frequencies as the SSR but the selective interrogations contain a unique 24 bit address that ensures all transmissions are only decoded by one aircraft's Mode S Transponder having that 24 bit address.

A Mode S station also transmits conventional SSR formats in order to detect SSR only aircraft (Mode A/C) in order to be downward compatible with SSR.

The SSR Mode S transponder is also a fundamental part of the ACAS airborne installation and the ADS-Broadcast when using the 1090 MHz Extended Squitter transmission. SSR Mode S enables elementary and enhanced surveillance.

Automatic Dependent Surveillance-Broadcast (ADS-B)

Automatic Dependent Surveillance - Broadcast (ADS-B) is a surveillance technique that allows the transmission of aircraft derived parameters, such as position and identification, via a broadcast mode data link for use by any air and/or ground users.

Each ADS-B emitter periodically broadcasts its position and other data provided by the onboard aircraft avionics systems. Any user, either airborne or ground based, within range of the emitter may choose to receive and process the information. Three technology options are available, these are ADS-B 1090ES [which has been selected as the initial link for CAR/SAM Region], VDL Mode 4 (Very High Frequency Data Link) and UAT (Universal Access Time). ADS-B enables elementary and enhanced surveillance.

Automatic Dependent Surveillance-Contract (ADS-C)

Automatic Dependent Surveillance - Contract (ADS-C) is a surveillance technique in which aircraft provide, via a data link, data such as position and identification, derived from the onboard aircraft avionics systems. A "contract" is established between the aircraft and the ground to transmit data at a particular event. An event could be time based, position based or as specified in the contract.

Currently ADS-C is usually implemented via SATCOM but any data link having the range capability would suffice. Whilst originally envisaged to be an ATN compliant data link, current implementations exploit a large part of the functionality through the FANS 1/equipment currently carried by many aircraft.

Traffic Information Service – Broadcast (TIS-B)

An air traffic situation picture derived by a ground based Surveillance Data Processing System may be broadcast from the ground to all aircraft within range and equipped with correct receivers. There are three roles of TIS-B, these are:

- TIS-B fundamental service: This 'gap filler service broadcasts information about aircraft that cannot be adequately obtained directly by ADS-B and is used to enhance the availability of surveillance information to users that are not normally able to receive ADS-B transmissions from other aircraft. This service will normally exclude from transmission those aircraft broadcasting ADS-B messages
- ADS-B validation service: This optional service compares aircraft ADS-B state vector data with surveillance data from ground-based sensors and broadcasts validation data
- ADS-B rebroadcast service: The automatic rebroadcast of ADS-B messages received over one data link, translated directly onto other data links for the purpose of extending ADS-B connectivity to users of incompatible data links.

Multilateration

Multilateration is a surveillance technique where aircraft replies from other SSR or SSR Mode S interrogations or spontaneous squitter message from Mode S transponder are passively received by 3 or more ground receiver stations. Using time of arrival techniques the position and altitude of the target can be determined. In some Multilateration systems, active Mode S selective interrogations are used to extract data from the aircraft.

The surveillance strategy distinguishes three levels of functionality, which are:

- Basic operation in which Multilateration uses time of arrival of signals to determine the position of aircraft.
- Elementary operation, which includes basic operation and the addition of active interrogations to extract aircraft identification information from the flight systems
- Enhanced operations, which includes basic operations and the addition of active interrogations to extract any information (including aircraft identification) from the aircraft systems.

APPENDIX E

ACTION PLAN FOR THE CONDUCTION OF ADS-B TRIALS IN THE SAM REGION

IMPLEMENTATION PHASE	TASK	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	STATUS
<p style="text-align: center;">PHASE I</p> <p>Conduction of ADS-B trials, collection and processing of data, submission of results</p>	1	Define trial objectives, aiming at studying the possibility for States to benefit from ADS-B as surveillance system in the Region.	CNS Task Force	Trial objectives	Finalised
	2	Review and describe in detail the activities to be considered for ADS-B trials designed by the GREPECAS mechanism.	Secretariat	Revised regional plan of activities for ADS-B trials	Finalised
	3	Define the equipment and configuration needed to begin trials. Define trial costs.	Rapporteur Project C2	Definition of equipment and its configuration for the trial	Finalised A Thales ADS-B station was used for the trial at no cost.
	4	Define the geographical area where trials will be conducted	Rapporteur Project C2	Geographical area defined (operational concept)	Finalised The terminal area of the Jorge Chavez international airport of Lima, Peru, was selected
	5	Consult States and users about their participation in the trials	Secretariat	Confirmation of participation by States	Finalised
	6	Select the entity, organisation or State in charge of conducting the trials	States	Selection of the entity, organisation or State	Finalised CORPAC, the air navigation service provider of Peru, was selected
	7	Installation of the ADS-B equipment required for the	Selected entity, organisation or State	Equipment installed	Finalised It was installed at the Jorge Chavez

IMPLEMENTATION PHASE	TASK	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	STATUS
		trial in the defined geographical area			international airport of Lima, Peru.
	8	Conduction of trials (data collection).	State (Peru), manufacturer (Thales), Secretariat	Start-up of trials	Finalised Trials were conducted for a period of six months
	9	Processing of collected data	State (Peru), manufacturer /Thales), Secretariat	Processing of data	Finalised Processing of the data collected was done by the air navigation service provider (CORPAC)
	10	Presentation of results obtained	State (Peru), Secretariat	Presentation of results	Finalised Results were presented at the ADS-B workshop (Lima, Peru) and SAM/IG meeting.
PHASE II OPERATIONAL IMPLEMENTATION OF ADS-B	11	Define operational use of ADS-B, based on the airspace concept defined at national level	States	Presentation of results	Valid
	12	Safety assessment based on the defined operational use(s)	States	Presentation of results	Valid In this task, it is important to analyse the behaviour of global positioning satellites in these latitudes.
	13	Drafting of model documents for operational implementation of ADS-B • Drafting of model advisory circulars for	Regional projects RLA/99/901 RLA/06/901 States	Publications in support of ADS-B implementation	Valid December 2016 All model publications on operational use of ADS-B

IMPLEMENTATION PHASE	TASK	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	STATUS
		airworthiness approval and operation with ADS-B <ul style="list-style-type: none"> • Drafting of model AIC to report ADS-B implementation plans • Develop model AIP supplement containing standards and procedures applicable to ADS-B, in accordance with the operational use defined • Review the procedural handbooks of ATS units, in accordance with the operational use defined for ADS-B 			
	14	Publication of documents in support of ADS-B operational implementation	States	Publication of documents	Valid December 2017
	15	Training programme: <ul style="list-style-type: none"> • Establishment of a training programme for ATS personnel on the operational implementation of ADS-B, in accordance with the operational use defined 	Regional projects RLA/99/901 RLA706/901 States	Training programme	Valid December 2016

IMPLEMENTATION PHASE	TASK	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	STATUS
		<ul style="list-style-type: none"> • Establishment of a training programme for airworthiness and operation inspectors on the operational implementation of ADS-B, in accordance with the operational use defined • Establishment of a training programme for pilots on the operational implementation of ADS-B, in accordance with the operational use defined 			
	16	ADS-B implementation	States	ADS-B implementation operational	Valid 2024 ADS B systems installed in Colombia (13), Guayana (2), Peru (1) and Paraguay (6)
PHASE III ADS-B IMPLEMENTATION MONITORING	17	ADS-B implementation Monitoring	SAM/IG Secretariat	ADS-B implementation Monitoring	Valid 2024