PERFORMANCE BASED AIR NAVIGATION IMPLEMENTATION PLAN FOR THE SAM REGION – CNS SYSTEMS

Seminar/Workshop on the Implementation of the Performance Based Air Navigation Plan for the South American Region

(Lima, Peru, 9 to 13 May 2011)

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CONTENTS

- Objective
- CNS aspects considered in the Plan
- Analysis of the current CNS systems situation
- Implementation strategy of the performance objectives
- Conclusions

OBJECTIVE

Taking in consideration the new requirements derived from the ATM Operational Concept, the regional planning for the improvement and strengthening of the aeronautical communications, navigation and surveillance services is presented, through the identification of specific performance objectives and their short and medium term implementation strategy (2012 -2018)

CNS ASPECTS CONSIDERED IN THE PLAN

COMMUNICATIONS

Communication systems contemplated in this plan respond to short- and medium-term expectations of the operational requirements in the Region. Accordingly, this plan has taken into account the following communication systems:

a) Aeronautical message handling system (AMHS).

b) ATS interfacility data communication (AIDC).

c) Controller/pilot data Relationship communications (CPDLC).

d) D-ATIS.

d) SAM ATN network.

CNS ASPECTS CONSIDERED IN THE PLAN

NAVIGATION

The navigation systems contemplated in this plan respond to short- and medium-term operational requirements of the Region. In this respect, this plan for navigation systems has taken into account:

- the ground navigation infrastructure; and

- the GNSS requirements concerning the operations foreseen in the CAR/SAM PBN Roadmap approved through Conclusion 46 of GREPECAS/14.

CNS ASPECTS CONSIDERED IN THE PLAN

SURVEILLANCE

The surveillance systems contemplated in this plan respond to short- and medium-term operational requirements in the Region. Accordingly, this plan considers the following systems:

a) ADS-B
b) ADS-C
c) MLAT
d) SSR
e) The combination of the aforementioned tools.

ANALYSIS OF CNS SYSTEMS CURRENT SITUATION

COMMUNICATIONS – AERONAUTICAL FIXED SERVICE

AFTN service: The circuits foreseen have been fully implemented. However, and given their average life cycle, maintenance of the existing centres is a significant problem.

ATS speech service: The circuits foreseen have been fully implemented. Circuits are analog and operate without any major problem.

AMHS service: This service has been implemented in most SAM States.

Memoranda of Understanding (MoU) have been drafted for the interconnection of AMHS systems.

ANALYSIS OF CNS SYSTEMS CURRENT SITUATION

AERONAUTICAL MOBILE SERVICE

VHF T/A: Services have been implemented as indicated in FASID Table CNS 2A, ensuring coverage in most of the selected areas, with problems at low levels in selected airspaces. In the case of terminal areas and aerodromes, many facilities do not follow the recommendation of having different frequencies for APP and TWR services. The PDC service has not been implemented at the level required.

HF: Although required in FASID Tables CNS 2 A and 2B, the HF service is not being operationally used in many States of the Region. It is mainly provided at some States that have oceanic areas in their FIRs.

ATIS: Implemented according to Table CNS 2A, but in an insufficient number. Use is made of conventional audio recorders and analog VHF transmitters.

VDL / CPDLC: Not yet implemented en-route/continental area or terminal area/aerodromes.

VDL/PDC: Implemented in very few airports for terminal area/aerodrome.

HFDL / CPDLC: Application for en-route/oceanic area that has not yet been implemented.

Satellite/CPDLC: Service implemented in some oceanic FIRs for FANS-equipped aircraft.

D-ATIS: Implemented in very few airports.

NAVIGATION SERVICES

Conventional radio aids: All conventional radio navigation aid systems (NDB, VOR, DME and ILS) have been implemented and fully installed pursuant to Table CNS 3 (radio navigation aids). Regarding NDBs, a deactivation process is underway, starting with those stations where the NDB is installed next to a VOR/DME.

GNSS: In the Region, ABAS is being implemented in selected airspaces of the Region for en-route, terminal area and NPA operations.

GBAS implementation trials in Brazil and Chile.

ANALYSIS OF CNS SYSTEMS CURRENT SITUATION

SURVEILLANCE

Radar systems: Conventional surveillance systems (PSR and SSR) have been implemented and installed almost entirely in the SAM Region according to Table CNS 4 A (surveillance system). The surveillance systems specified in this table cover most of the terminal areas of the States in the Region. However, not all the routes in the Region are covered.

Radar data exchange: It only exists in very few States of the Region.

ADS-B and MLAT: No services have been enabled to date.

ADS-C: Service provided by some oceanic FIRs, with FANS-equipped aircraft.

PERFORMANCE OBJECTIVE IMPLEMENTATION STRATEGY

For the implementation of CNS systems in the SAM Region, the following performance objectives have been taken into consideration:

- Improvements to the aeronautical fixed service in the SAM Region;
- Improvements to the aeronautical mobile service in the SAM Region;
- Improvements to the navigation systems in the SAM Region; and
- Improvements to the air surveillance service in the SAM Region

PERFORMANCE OBJECTIVE IMPLEMENTATION STRATEGY

REGIONAL PERFORMANCE OBJECTIVE: SAM 08 IMPROVEMENTS TO THE AERONAUTICAL FIXED SERVICE IN THE SAM REGION				
Benefits				
Safety	• Reduction of operational coordination errors between adjacent ACCs. • Increased ATM situational awareness. • Reduced pilot and controller workload.			
Environmental protection and sustainable development of air transport	• Increased capacity and availability of aeronautical fixed service in support of ATS, MET, AIS and SAR applications. • Support to ATFM / CDM.			
Metrics	• Number of States interconnected to the AMHS. • Number of States that have operationally implemented AIDC. • Percentage of phases implemented for improving the regional ATN network.			
2012 – 2018 ***Strategy***				
ATM OC COMPONENTS	**TASKS**	**PERIOD**	**RESPONSIBILITY**	**STATUS**
AOM ATM-SDM DCB CM AUO	a) Complete the implementation of AMHS systems in those States that do not have such systems yet.	(*) - 2013	States	In progress
	a) Agreement for AMHS interconnection through the establishment of MoUs	(*) - 2014	States	In progress
	a) Implement communication services for the centralised ATFM	2015 - 2018+	States	Valid
	a) Implement AIDC in the automated centres of the SAM Region;	(*) - 2013	States	In progress
	a) The operational implementation of AIDC for the automatic hand-off of flight plans between ACCs of adjacent States.	(*) - 2014	States	In progress
	a) Improve the regional ATN network	2012 -2015	States	Valid
	a) Monitor implementation progress	2012-2017	GREPECAS	Valid
Relation-ship with GPIs	GPI/6: ATFM, GPI/9: situational awareness, GPI/ 16: decision support and alerting systems, GPI/18: aeronautical information, GPI/17: data link applications, GPI/19: meteorological systems, GPI/22: communication infrastructure.			

AMHS INSTALLED IN THE SAM REGION

STATE	MANUFACTURER	YEAR OF INSTALLATION
ARGENTINA	RADIOCOM	2005
BOLIVIA	THALES	END OF 2011
BRASIL	RADIOCOM	2009
CHILE	THALES	2010
COLOMBIA	COMSOFT	2009
ECUADOR (Guayaquil)	RADIOCOM	2007
GUYANA	SKYCOM	2011
PANAMA	COCESNA	2009
PARAGUAY	RADIOCOM	2007
PERU	COMSOFT	2009
SURINAME	INTELCAN	2011
VENEZUELA	RADIOCOM	2010

ACTION PLAN FOR THE INTERCONNECTION OF AMHS

ITEM	ACTIVITY	RESPONSIBLE	EXPECTED RESULT	STATUS	FINALIZATION DATE
1	2	3	4	5	6
1	Review of the ATN Regional Plan as regards AMHS implementation	Secretariat	Revised ATN ground ground applications plan (Table CNS 1Bb)	Completed	Jun 2009
2	Review and assignment of intra-regional routers IP addressing	Secretariat	Assignment of IP addressing	Completed	Jun 2009
3	Review of CAAAS addressing plan	SAM States	Revised CAAS addressing Plan	Completed	Jun 2009
4	Prepare interconnection protocol tests to determine bandwidth required for transmission of AMHS messages between MTAs through REDDIG	RLA/06/901 project CNS Expert	Protocol interconnection tests. A guide for the operational interconnection of AMHS systems was drafted	Completed	Dec 2009
5	Preparation of Guide for the Operational Interconnection of AMHS Systems in the SAM Region	RLA/06/901 project CNS Expert	Guide for the operational interconnection of AMHS systems in the SAM Region	Completed	Oct 2009
6	Drafting of a model MoU for the interconnection of AMHS	Argentina	Model MoU for the interconnection of AMHS	Completed	Oct 2009
7	MoU for the interconnection of AMHS currently implemented in the SAM Region: a) Argentina-Brazil b) Argentina-Chile c) Argentina-Peru d) Argentina-Paraguay e) Brazil-Colombia f) Brazil-Paraguay g) Brazil-Peru h) Chile-Peru i) Colombia-Perú j) Colombia-Panama k) Colombia-Venezuela l) Peru-Venezuela m) Suriname-Brazil n) Venezuela- Guyana o) Venezuela Suriname p) Brazil-Guyana q) Suriname-Brazil r) Guyana-Surinam The AMHS interconnection MoU in Bolivia, Ecuador, French Guiana (France) and Uruguay should be drafted once AMHS installation is completed at national level.	SAM States involved	MoU for interconnection of AMHS systems between SAM States having AMHS implemented.	Valid a), b) c), d), f), g) & i) completed	e) May 2011 h) May 2011 j) Oct 2011 k) Oct 2011 l) May 2011 m) May 2011 n) Oct 2011 o) Oct 2011 p) Oct 2011 q) Jun 2011 r) Oct 2011

ACTION PLAN FOR THE INTERCONNECTION OF AMHS

ITEM	ACTIVITY	RESPONSIBLE	EXPECTED RESULT	STATUS	FINALIZATION DATE
1	2	3	4	5	6
8	Phase I Interconnection trials between MTAs of: a) Argentina-Brazil b) Argentina-Paraguay c) Brazil-Paraguay d) Colombia-Peru e) Argentina-Chile f) Argentina-Peru g) Brazil-Peru Types of tests to carry out: Network transportation; Network connectivity; Message exchange; Preparatory phase.	Argentina, Brazil, Colombia, Paraguay, Peru and REDDIG Administration	Interconnection trials between Argentina, Brazil, Chile and Paraguay MTAs	Valid a) network transportation and connectivity trials carried out with the Manaos node. MoU was updated, since Brazilian entrance node will be Curitiba. Network connectivity, and transport and exchange of messages tests will be repeated b) network transportation and connectivity, and message exchanges trials carried out. c) MoU was updated, as entrance node to Brazil will be Curitiba, and the network connectivity, and transport and exchange of messages tests will be carried out. d) Operational interconnection trials completed. e), f) and g) No tests carried out	a) Mar 2011 b) May 2011 c) May 2011 e) Mar 2011 f) May 2011 g) May 2011
9	Operational interconnection implementation at the following MTAs: a) Argentina-Paraguay b) Argentina-Brazil c) Argentina-Chile d) Argentina-Peru e) Brazil-Paraguay f) Brazil-Peru g) Colombia-Peru	Argentina, Brazil, Chile, Colombia, Paraguay and Peru	Operational implementation of AMHS systems	Colombia and Peru completed	a) Jun 2011 b) Jun2011 c) Jun 2011 d) Jun 2011 e) Jun 2011 f) Jun2011

ACTION PLAN FOR THE IMPLEMENTATION OF A NEW SAM DIGITAL NETWORK

ACTIVITIES	ACTION TO BE TAKEN BY	DELIVERABLE	TARGET DATE	REMARKS
1	2	3	4	5
1 Identify current voice and data services requirements, as well as those scheduled to be implemented in the short, medium and long term in the SAM Region, in support of air navigation	SAM/IG Group for the implementation of CNS improvements	List of services requirements in support of air navigation for the SAM Region, including those scheduled for the short, medium and long term	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)
2 Analysis of band width required for the services identified in Activity 1	SAM/IG Group for the implementation of CNS improvements	Amount of band width required to support the requirements specified in Activity 1	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)
3 Determination of costs for the band width increase in REDDIG	SAM/IG Group for the implementation of CNS improvements	Implementation costs of new REDDIG services	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)
4 Study of the new REDDIG technological platform and determination of its cost	SAM/IG Group for the implementation of CNS improvements	Definition of the REDDIG technological platform	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)
5 Study of a ground SAM IP structure supporting the services required and defined in Activity 1, as well as of the band width requirements defined in Activity 2	SAM/IG Group for the implementation of CNS improvements	Definition of a SAM ground IP network model structure	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)

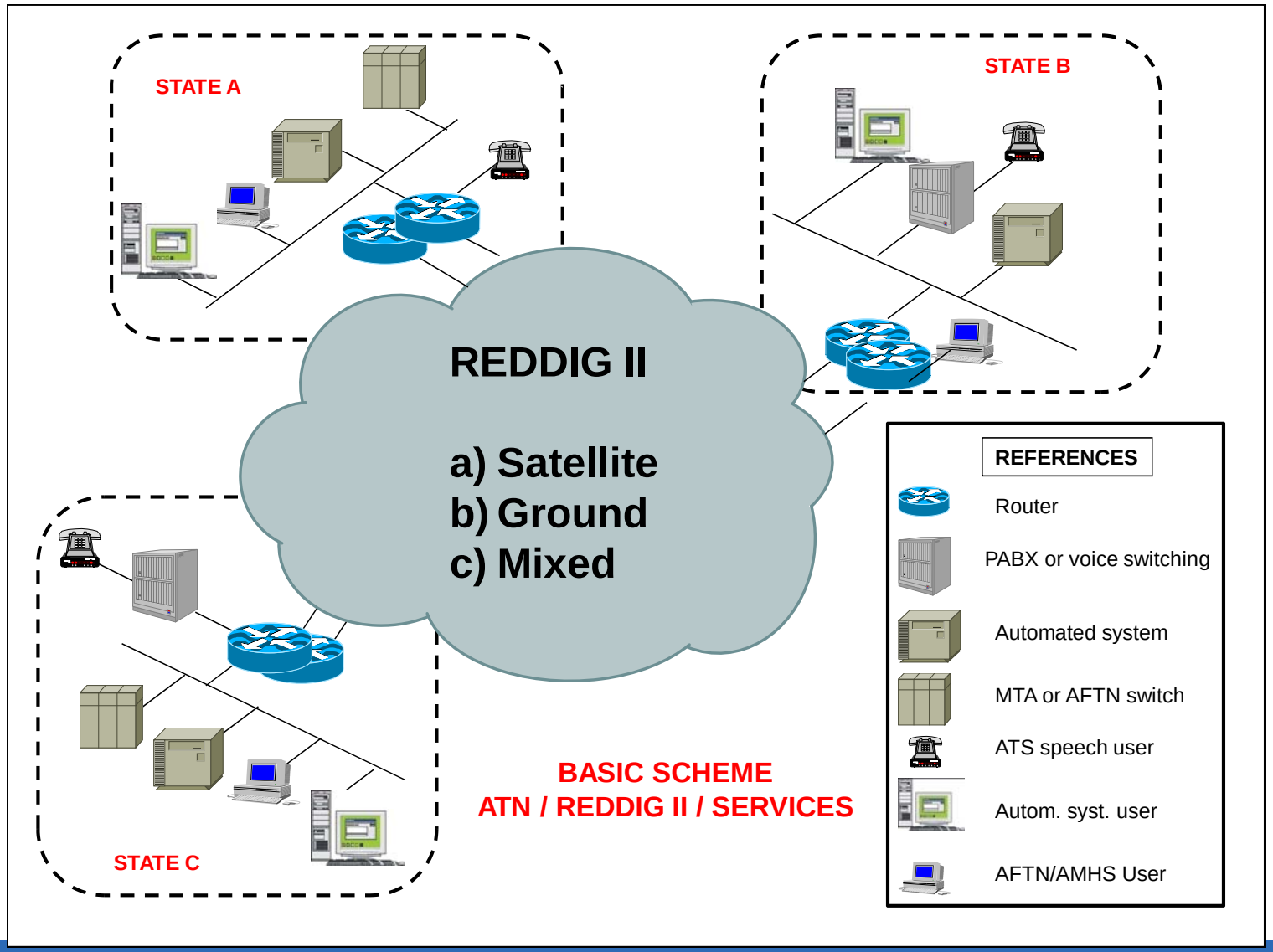
ACTION PLAN FOR THE IMPLEMENTATION OF A NEW SAM DIGITAL NETWORK

ACTIVITIES	ACTION TO BE TAKEN BY	DELIVERABLE	TARGET DATE	REMARKS
1	2	3	4	5
6 Determination of costs for the implementation of Activity 5	SAM/IG Group for the implementation of CNS improvements	Implementation costs of SAM ground IP network structure	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)
7 Study on the structure of a mixed (ground and satellite) SAM digital network structure	SAM/IG Group for the implementation of CNS improvements	Model definition	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)
8 Determination of the costs for the implementation of Activity 7	SAM/IG Group for the implementation of CNS improvements	Implementation costs of a mixed (ground and satellite) digital network structure	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)
9 Comparisons between the network infrastructure models specified in Activities 4, 5 and 7	SAM/IG Group for the implementation of CNS improvements	Comparative study between the ground IP and mixed (satellite and ground) satellite network models	SAM/IG/5	Completed. Refer to study for the implementation of a new digital network in the SAM Region (Appendix B to this Agenda Item)
10 Determination of SAM network infrastructure model, on the basis of results of Activity 9	SAM/IG Group for the implementation of CNS improvements	Definition of a SAM network infrastructure model	SAM/IG/5	The model network infrastructure definition for the SAM Region, found in the study for the implementation of a new digital network for the SAM Region, will be circulated to States for its review. It is expected that by SAM/IG/7 meeting the network infrastructure model for the SAM Region will be defined upon
11 Holding of a seminar/workshop on new satellite and ground networks technology	Secretariat	Technological solutions for the new network configuration in the SAM Region	Mar 2011	

ACTION PLAN FOR THE IMPLEMENTATION OF A NEW SAM DIGITAL NETWORK

ACTIVITIES	ACTION TO BE TAKEN BY	DELIVERABLE	TARGET DATE	REMARKS
1	2	3	4	5
12 Acceptance process for the implementation of the network infrastructure model determined by Activity 10, through a public bidding process	SAM/IG Group for the implementation of CNS improvements	Acceptance of the public bidding process for the implementation of a SAM network infrastructure	SAM/IG/5	
13 Preparation of technical specifications for the implementation of the SAM network infrastructure specified in Activity 10	SAM/IG Group for the implementation of CNS improvements	Technical specifications for the implementation of a SAM network infrastructure	SAM/IG/6	Experts will be hired for a 15-day period to draft the definite technical specifications
14 Presentation of technical specifications to a bidding process	SAM/IG Group for the implementation of CNS improvements	Public bidding process for the implementation of the SAM network structure	Dec 2011	
15 Evaluation of offers presented	SAM/IG Group for the implementation of CNS improvements	Assessment of offers	Mar 2012	
16 Determination of winning bidder	SAM/IG Group for the implementation of CNS improvements	Designation of winning bidder for the network implementation	Jun 2012	

PERFORMANCE OBJECTIVE IMPLEMENTATION STRATEGY



BASIC SCHEME
ATN / REDDIG II / SERVICES

PERFORMANCE OBJECTIVE IMPLEMENTATION STRATEGY

REGIONAL PERFORMANCE OBJECTIVE: SAM 09
IMPROVEMENTS TO THE AERONAUTICAL MOBILE SERVICES IN THE SAM REGION

Benefits	
Safety	• Reduction of operational coordination errors between adjacent ACCs, making ATS coordination more efficient. • Reduction of pilot and controller workload;
Environmental protection and sustainable development of air transport	• Assured coverage and quality of communications in ATS service; • Increased availability of communications for the ATS service; • Support to AIM/MET service; • Assured radio frequency spectrum assigned to aviation for the communication service;
Metrics	• Percentage of compliance with FASID Table 2-A. • Number of CPDLC systems implemented. • Number of D-ATIS systems implemented.

2012 – 2018 Strategy

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
AOM **ATM-SDM** **DCB** **CM**	a) Complete the implementation of the services required in Table CNS 2-A "Aeronautical Mobile Service - AMSS"	(*) - 2014	States	In progress
	b) Continental en-route: Complete coverage of VHF communications in the lower airspace, when operations so require.	2012- 2015	States	Valid
	c) Oceanic en-route: Maintain the HF service according to the requirements of Table CNS 2B HF network designators for CAR/SAM aeronautical stations.	2012-2017	States	Valid
	d) Implement CPDLC in oceanic areas.	(*) - 2018	States	In progress
	e) Implement CPDLC in selected continental areas.	2012- 2018	States	Valid
	f) Terminal area: Implementation of different VHF channels for control tower and APP services at all aerports where a single channel is used for APP and control tower services.	(*) - 2015	States	In progress
	g) Implementation of D-ATIS services.	2012-2017	States	Valid
	h) Protection of the radio frequency spectrum used for current and foreseen communication services	2012-2018	States ICAO	Valid
	i) Monitor implementation progress	2012-2018	GREPECAS	Valid
Relation-ship with GPIs	GPI/6: ATFM, GPI/9: Situational awareness, GPI/17: Data link applications, GPI/19: Meteorological systems, GPI/22: Communication infrastructure, GPI 23: Aeronautical radio spectrum.			

PERFORMANCE OBJECTIVE IMPLEMENTATION STRATEGY

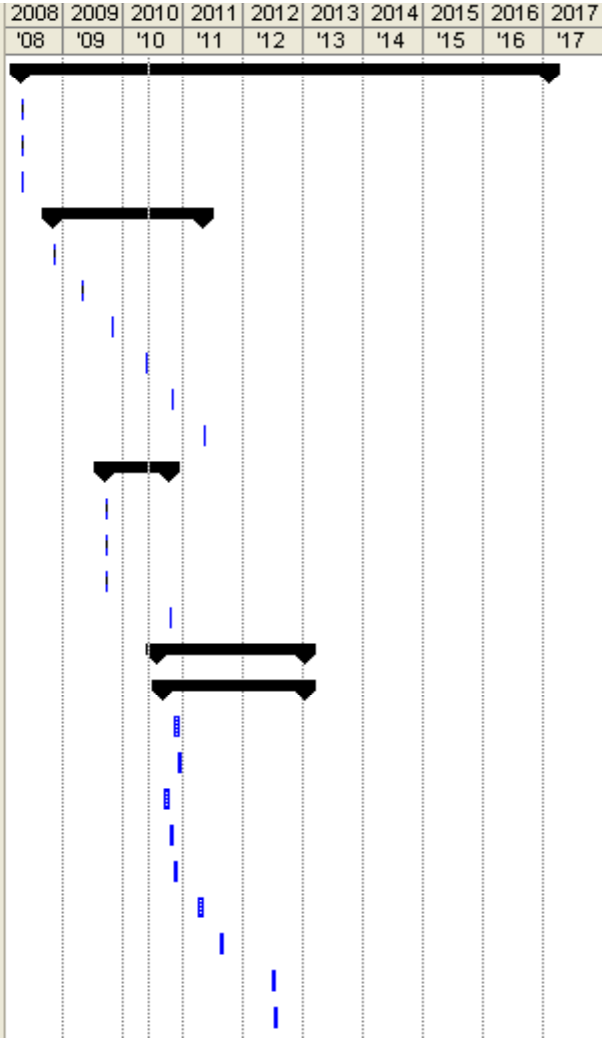
REGIONAL PERFORMANCE OBJECTIVE: SAM 10 IMPROVEMENTS TO NAVIGATION SYSTEMS IN THE SAM REGION				
Benefits				
Safety	• Support to aircraft spacing; • Reduced pilot and controller workload; • Increased landing safety, avoiding CFIT			
Environmental protection and sustainable development of air transport	• Increased airspace capacity and structure; • Assurance of the radio frequency spectrum assigned to aviation for the air navigation service; • Increased integrity of the GNSS system • Support to PBN implementation.			
Metrics	• Number of deactivated NDBs • Number of deactivated VORs. • Number of GLS implemented. • Percentage of VOR/DME systems coverage in support of PBN applications			
2012 – 2018 Strategy				
ATM OC COMPONENTS	**TASKS**	**PERIOD**	**RESPONSIBILITY**	**STATUS**
AOM **ATM-SDM** **TS** **AUO**	a) Complete NDB phase-out.	2012- 2018+	States	Valid
	b) Maintain VOR/DME infrastructure in selected TMA.	2012-2018+	States	Valid
	c) Begin deactivation of VOR systems for en-route operations.	2015-2018	States	Valid
	d) Maintain ILS infrastructure.	2012- 2018	States	Valid
	e) Implement GLS (GBAS landing) at airports with sufficient operational demand.	2015-2018+	States	Valid
	f) Modernise flight trial platforms for GNSS applications.	2012-2017	States	Valid
	g) Protection of the radio frequency spectrum used for current and future radio navigation services	2012-2018	States ICAO	Valid
	h) Implementation of new VOR/DME systems in support of PBN	(*) - 2013	States, ICAO	Valid
	i) Monitor implementation progress	2012-2018	GREPECAS	Valid
Relation-ship with GPIs	GPI/5: RNAV and RNP; GPI/6: ATFM; GPI/7: dynamic and flexible ATS route management; GPI/10: terminal area design and management; GPI/11: RNP and RNAV SIDs and STARs; GPI/12: functional integration of ground and airborne systems; GPI/13: aerodrome design and management; GPI/14: runway operations; GPI/21: navigation systems; GPI 23: aeronautical radio spectrum.			

PERFORMANCE OBJECTIVE IMPLEMENTATION STRATEGY

REGIONAL PERFORMANCE OBJECTIVE: SAM 11 IMPROVEMENTS TO THE ATS SURVEILLANCE SERVICE IN THE SAM REGION				
Benefits				
Safety	• Increased ATM situational awareness; • Improved ATS coordination, reducing coordination errors between adjacent ACCs; • Reduction of pilot and controller workload;			
Environmental protection and sustainable development of air transport	• Facilitates ATS planning; • Increased airspace capacity; • Assurance of the radio frequency spectrum assigned to aviation for the air surveillance service; • Supports the implementation of PBN and random routes.			
Metrics	• Number of ADS-C systems implemented in oceanic FIRs. • Number of adjacent ACCs with exchange of ATS surveillance data. • Percentage of enoure airspace for upper levels with ADS-B coverage. • Number of A-SMGS systems implemented.			
2012 – 2018 Strategy				
ATM OC COMPONENTS	**TASKS**	**PERIOD**	**RESPONSIBILITY**	**STATUS**
AOM **AO** **TS** **CM** **ATM-SDM**	a) implement ADS-B and/or MLAT systems in terminal areas and en-route.	2012-2018	States	Valid
	b) Implement surface movement guidance and control systems (A-SMGCS) at airports with high complexity and traffic.	2013- 2018+	States	Valid
	c) Implement the ADS-C service in all States with responsibility over an oceanic FIR.	(*) - 2018	States	In progress
	d) Implement the exchange of ATS surveillance data between adjacent ACCs.	(*)- 2018+	States	In progress
	e) Protection of the radio frequency spectrum used for current and future radio navigation services	2012 - 2018	States, ICAO	Valid
	f) Monitor implementation progress	2012-2018	GREPECAS	Valid
Relation-ship with GPIs	GPI/5: RNAV and RNP; GPI/6: ATFM; GPI/9: situational awareness; GPI/10: terminal area design and management; GPI/11: RNP and RNAV SIDs and STARs with; GPI/12: functional integration of ground and on-board systems; GPI/13: aerodrome design and management; GPI/14: runway operations; GPI/17: data link applications, GPI/22: communication infrastructure, GPI 23: aeronautical radio spectrum.			

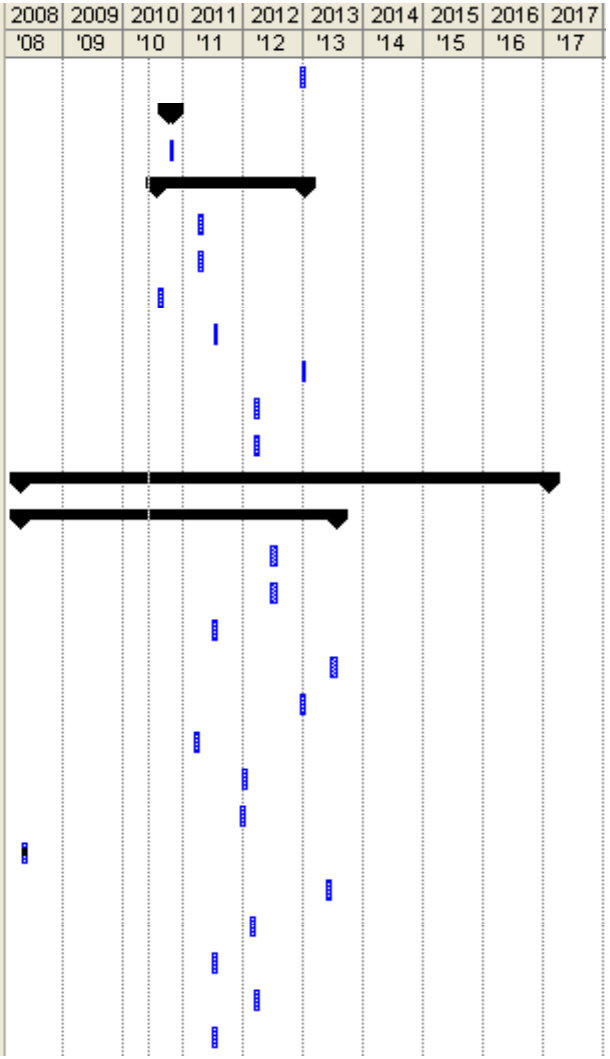
REGIONAL AUTOMATION ACTIVITIES

	Nome da tarefa	Duration	Start	Finish
1	**Plan de Interconexión Región SAM**	**2292 days?**	**Mon 21/04/08**	**Tue 31/01/17**
2	Aprobación del Plan	1 day?	Mon 21/04/08	Mon 21/04/08
3	Creación de la Equipo de Gestión	1 day?	Mon 21/04/08	Mon 21/04/08
4	Ejecución	1 day?	Mon 21/04/08	Mon 21/04/08
5	**Reuniones de coordinación**	**650 days?**	**Mon 03/11/08**	**Fri 29/04/11**
6	SAMIG/2	5 days?	Mon 03/11/08	Fri 07/11/08
7	SAMIG/3	5 days?	Mon 20/04/09	Fri 24/04/09
8	SAMIG/4	5 days?	Mon 19/10/09	Fri 23/10/09
9	SAMIG/5	5 days?	Mon 10/05/10	Fri 14/05/10
10	SAM7IG/6	5 days?	Mon 18/10/10	Fri 22/10/10
11	SAMIG/7	5 days?	Mon 25/04/11	Fri 29/04/11
12	**Establecimiento de MoU**	**272 days?**	**Wed 16/09/09**	**Thu 30/09/10**
13	Argentina - Uruguay	1 day?	Wed 16/09/09	Wed 16/09/09
14	Argentina - Brasil	1 day?	Wed 16/09/09	Wed 16/09/09
15	Brasil - Uruguay	1 day?	Wed 16/09/09	Wed 16/09/09
16	Brasil -Venezuela	1 day?	Thu 30/09/10	Thu 30/09/10
17	**Interconexión de Plan de Vuelo**	**641 days**	**Fri 30/07/10**	**Fri 11/01/13**
18	**OLDI**	**611 days**	**Fri 03/09/10**	**Fri 04/01/13**
19	EZEIZA-SANTIAGO	23 days	Fri 29/10/10	Tue 30/11/10
20	BOGOTA - GUAYAQUIL	18 days	Mon 22/11/10	Wed 15/12/10
21	BOGOTA - PANAMA	20 days	Fri 03/09/10	Thu 30/09/10
22	BOGOTA - BARRANQUILLA	20 days	Thu 30/09/10	Wed 27/10/10
23	BARRANQUILLA - PANAMA	20 days	Mon 01/11/10	Fri 26/11/10
24	SANTIAGO - CORDOBA	20 days	Wed 30/03/11	Tue 26/04/11
25	AMAZÓNICO-BOGOTÁ	20 days	Mon 01/08/11	Fri 26/08/11
26	LIMA - SANTIAGO	20 days	Mon 18/06/12	Fri 13/07/12
27	LIMA - GUAYAQUIL	20 days	Mon 02/07/12	Fri 27/07/12



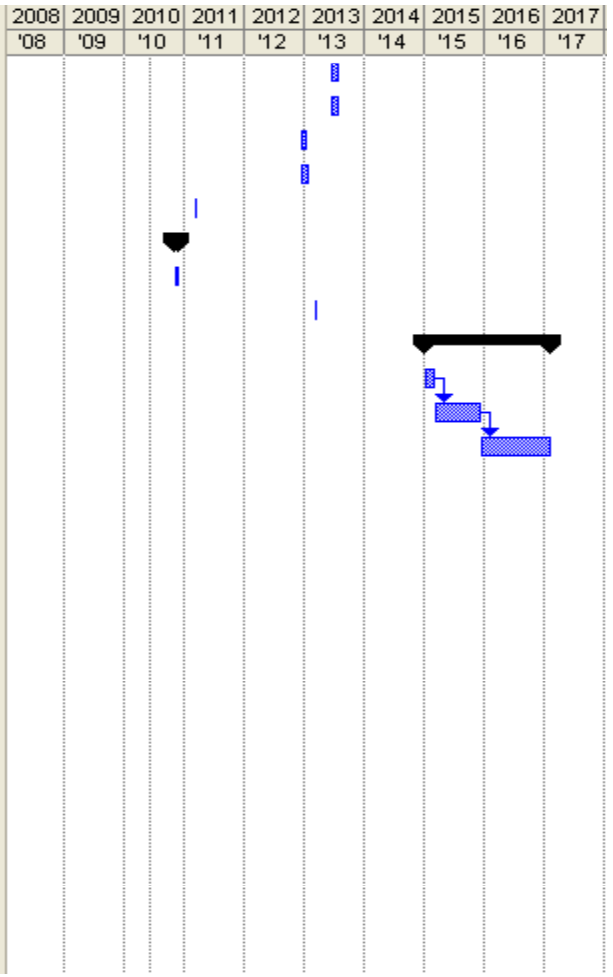
REGIONAL AUTOMATION ACTIVITIES

	Nome da tarefa	Duration	Start	Finish
28	LIMA - BOGOTA	20 days	Mon 10/12/12	Fri 04/01/13
29	**DOC 44444**	**22 days**	**Thu 30/09/10**	**Fri 29/10/10**
30	AMAZONICO - MAIQUETIA	22 days	Thu 30/09/10	Fri 29/10/10
31	**AIDC**	**641 days**	**Fri 30/07/10**	**Fri 11/01/13**
32	CURITIBA-EZEIZA	20 days	Thu 31/03/11	Wed 27/04/11
33	CURITIBA - MONTEVIDEO	20 days	Thu 31/03/11	Wed 27/04/11
34	EZEIZA-CORDOBA	20 days	Fri 30/07/10	Thu 26/08/10
35	EZEIZA - MONTEVIDEO	20 days	Thu 30/06/11	Wed 27/07/11
36	LIMA - AMAZONICO	20 days	Mon 17/12/12	Fri 11/01/13
37	ASUNCIÓN - CURITIBA	20 days	Mon 05/03/12	Fri 30/03/12
38	ASUNCIÓN - EZEIZA	20 days	Mon 05/03/12	Fri 30/03/12
39	**Intercambio de Datos Radar**	**2292 days?**	**Mon 21/04/08**	**Tue 31/01/17**
40	**Conexión Directa al Centro - ASTERIX**	**1370 days?**	**Mon 21/04/08**	**Fri 19/07/13**
41	CORDOBA – SANTIAGO	30 days	Mon 11/06/12	Fri 20/07/12
42	MENDOZA – SANTIAGO	30 days	Mon 11/06/12	Fri 20/07/12
43	EZEIZA – PUERTO MONTT	30 days	Mon 13/06/11	Fri 22/07/11
44	PUNTA ARENAS – C. RIVADAVIA	30 days	Mon 10/06/13	Fri 19/07/13
45	AMAZONICO – BOGOTA	30 days	Mon 03/12/12	Fri 11/01/13
46	CURITIBA – MONTEVIDEO	30 days	Tue 01/03/11	Mon 11/04/11
47	BOGOTA – GUAYAQUIL	30 days	Mon 12/12/11	Fri 20/01/12
48	BOGOTA – PANAMA	30 days	Mon 05/12/11	Fri 13/01/12
49	BOGOTA – BARRANQUILLA	30 days	Mon 21/04/08	Fri 30/05/08
50	BOGOTA – LIMA	30 days	Mon 13/05/13	Fri 21/06/13
51	BOGOTA – MAIQUETÍA	30 days	Tue 31/01/12	Mon 12/03/12
52	BARRANQUILLA – PANAMA	30 days	Mon 13/06/11	Fri 22/07/11
53	BARRANQUILLA – MAIQUETÍA	30 days	Wed 29/02/12	Tue 10/04/12
54	LIMA – SANTIAGO	30 days	Mon 13/06/11	Fri 22/07/11



REGIONAL AUTOMATION ACTIVITIES

	Nome da tarefa	Duration	Start	Finish
55	LIMA – GUAYAQUIL	30 days	Mon 10/06/13	Fri 19/07/13
56	LIMA – AMAZONICO	30 days	Mon 10/06/13	Fri 19/07/13
57	ASUNCIÓN – CURITIBA	30 days	Mon 03/12/12	Fri 11/01/13
58	ASUNCIÓN – EZEIZA	30 days	Mon 10/12/12	Fri 18/01/13
59	MONTEVIDEO-EZEIZA	1 day?	Mon 28/02/11	Mon 28/02/11
60	**ICD Propietário**	**20 days**	**Fri 29/10/10**	**Thu 25/11/10**
61	AMAZONICO - MAIQUETIA	20 days	Fri 29/10/10	Thu 25/11/10
62	Inter-Centro ASTERIX 62,63 (TBD)	1 day?	Mon 04/03/13	Mon 04/03/13
63	**RADNET (TBD)**	**544 days**	**Thu 01/01/15**	**Tue 31/01/17**
64	Especificación	44 days	Thu 01/01/15	Tue 03/03/15
65	Adquisición	200 days	Wed 04/03/15	Tue 08/12/15
66	Instalación	300 days	Wed 09/12/15	Tue 31/01/17



REGIONAL AUTOMATION ACTIVITIES

DRAFTING OF A MEMORANDUM OF UNDERSTANDING

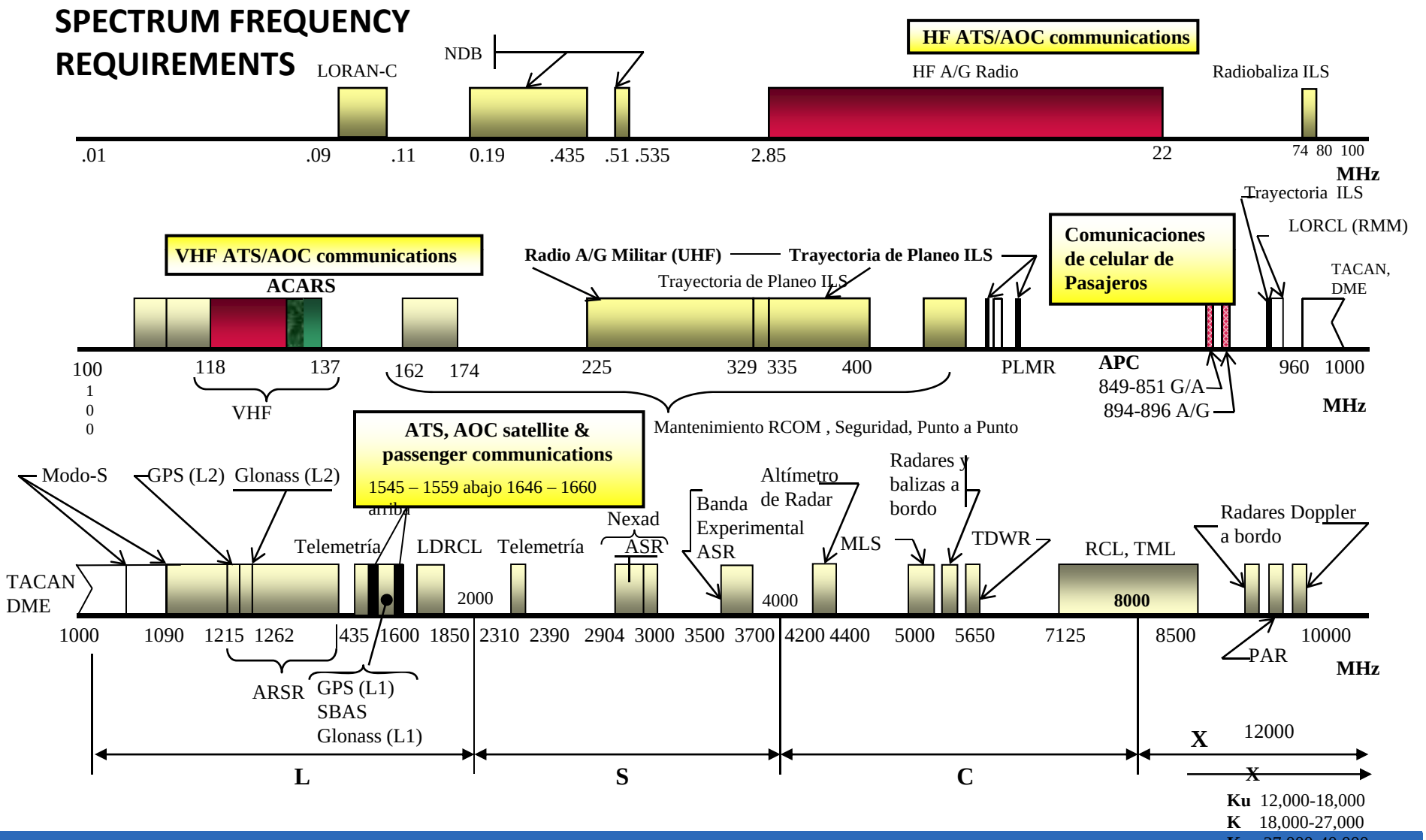
THE MODEL MOU DRAFTED CONTAINS TECHNICAL, OPERATIONAL AND ADMINISTRATIVE ASPECTS FOR THE INTERCONNECTION OF AUTOMATED SYSTEMS BETWEEN ADJACENT ACCs.

THE DRAFTED AND SIGNED MOU TO DATE ARE:

ARGENTINA - URUGUAY
ARGENTINA - BRAZIL
BRASIL - URUGUAY
BRASIL - VENEZUELA
CHILE - ARGENTINA

PERFORMANCE OBJECTIVE IMPLEMENTATION STRATEGY

SPECTRUM FREQUENCY REQUIREMENTS



CONCLUSIONS

CNS elementes in a performance Based navigation system

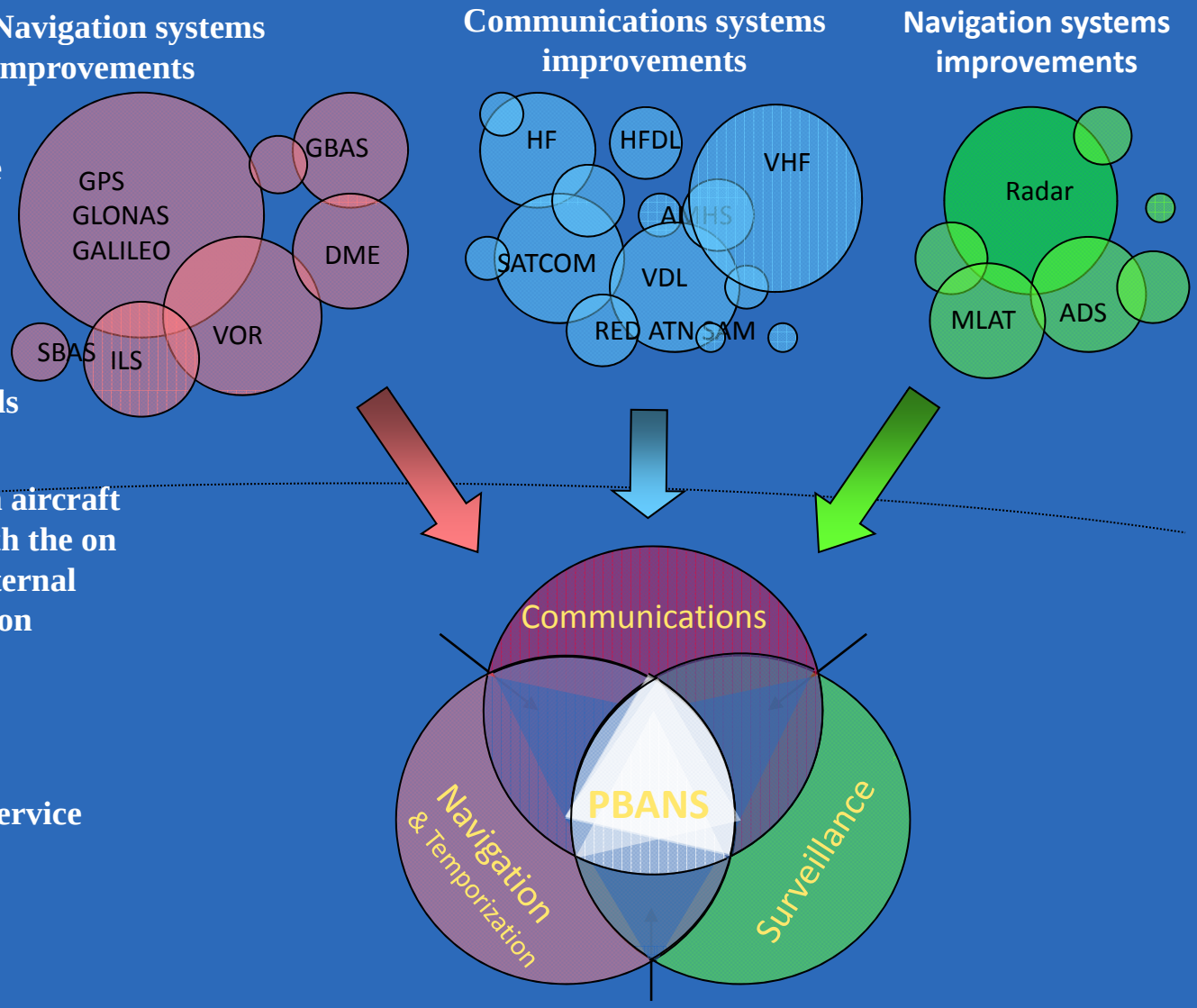
Integrated CNS

Standard services levels

Recognize the modern aircraft ability to integrate with the on board systems and external signals during operation

Inherent redundancy

cost reduction in the service provisioin



THANK YOU.
ANY QUESTIONS?