



Agenda Item 3: Performance based navigation implementation in the SAM Region

**SUBSEQUENT SECURITY MEASURES FOR THE
IMPLEMENTATION OF RNAV 5**

Presented by the Secretariat

Summary	
<p>This working paper presents information on the activities carried out in relation to the identification of difficulties that may impede or delay the RNAV 5 implementation in the South American Region and the assessment of subsequent measures to be adopted by the States, in order to guarantee that the RNAV 5 implementation will maintain or improve the safety levels in the operational areas.</p>	
References:	
<ul style="list-style-type: none">• Doc. 9859 Manual of Safety Management• Report of SAMIG/6 meeting• Workshop/seminar for the evaluation of the systems risks before the implementation of RNAV-5 and the ATS Routes Network Optimisation of SAM Region.	
ICAO Strategic objectives:	<i>A – Safety</i> <i>C. Environmental Protection and Sustainable Development of Air Transport</i>

1 Background

1.1 During the TELECON RNAV5/01, when analyzing Item 2 – *Application of the subsequent actions to reduce the risk rate resulting from RNAV 5 safety plan* and Conclusion SAM/IG/6-2 regarding this item, it was noted that some of the States, ATS providers and aircrafts operators had not completed the actions in respect to the subsequent measures that were proposed during the safety assessment, in order to reduce the risk and risk rate resulting shown in the Appendix 1 to chapter 4 of the safety plan for the RNAV5 implementation in the SAM Region (see Appendix I of Item 3 of SAMIG/6 Meeting).

1.2 Under the above, and after exchanging views among the participants, it was concluded that it would be necessary to monitor the adoption of measures to ensure that the RNAV 5 implementation would remain within acceptable safety margins.

1.3 For this purpose, given the volume of information related to the subsequent measures, and in order to facilitate its analysis during the conference call, the Secretariat was requested to prepare a document that would allow States and international organizations to monitor and also to seek the way to identify what difficulties States and users may have to successfully implement the RNAV5 in the agreed date. In this regard, the Secretariat prepared a table that States should complete with the steps that were taken with respect to each subsequent action of the safety plan, as well as a questionnaire requesting information on any difficulties encountered by States for a successful implementation.

1.4 The Secretariat sent both documents to RNAV 5 to focal points of the States and of the international organizations and the subject was reanalyzed during TELECON RNAV5/02 and 03.

2 **Analysis**

2.1 During TELECON RNAV5/03 a brief analysis of the situation was made, due that only three States had provided the required information, for which it was agreed that such monitoring be made in SAM/IG/7.

2.2 In order to comply with the above, consultation to the States on the RNAV 5 implementation and possible difficulties, is submitted as **Appendix A** and the Chart monitoring the subsequent measures of the RNAV5 safety plan to reduce the risk, is shown as **Appendix B**.

2.3 A summary on the status of the implementation of the subsequent measures of the safety plan is shown as **Appendix C** to this working paper, according to the information received from the States.

3. **Suggested action**

3.1 The meeting is invited to take note of the information submitted in this working paper and:

- a) Complete the information on Appendix A;
- b) Complete the information of Appendix B; and
- c) Take additional action, if pertinent.

APPENDIX A

SURVEYS TO STATES ON POSSIBLE DIFFICULTIES FOUND TO RNAV IMPLEMENTATION

Identified difficulties	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
1. Does your administration foresee difficulties in RNAV5 implementation on September 2011?		NO	YES					NO					YES	NO	Uruguay: in some areas Venezuela: no difficulties foreseen.
2. If so, please confirm which or which of the areas are difficulties foreseen: a) OPS b) AIR c) ATM d) AIS (Aeronautical Publications e) Others			AIS												Guyana: A training seminar is planned for ATCOs and AIS. Uruguay: AIS/ATM
3. Please confirm which are the specific problems identified?			*					*					YES		Brazil: depending on the information to be published in the AIP, more time in advance regarding implementation date, could be necessary Uruguay: AIS difficulties in the compliance with delivery target dates for documentation for publication. ATM lack of manuals, training, personnel.

Identified difficulties	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
4. Do you consider that any additional action by ICAO could help to resolve identified inconveniences?			-					-					YES		Uruguay: organize training workshops.

Instrucciones para el llenado del formulario - Instructions to fill in the form

- Cumplida: colocar **SÍ** en el casillero correspondiente. / Accomplished: place **YES** in the corresponding box
- No cumplida: colocar **NO** en el casillero correspondiente y, de ser el caso, hacer comentarios en columna de observaciones/ Not complied: place **NO** in the corresponding box and if such were the case, make comments in the remarks column

APPENDIX B

FOLLOW-UP OF ULTERIOR MEASURES OF RNAV5 SAFETY PLAN TO REDUCE RISKS

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
1. Non-RNAV5 aircraft flying on RNAV5 routes															
Inability of the aircraft to maintain RNAV5 route															
1.1 RNAV5 operational approval of aircraft with potential for approval.		YES	*										NO	YES	Venezuela: continuous
1.2 Direct access of ATS units to updated database of RNAV5-approved aircraft		NO	NO										NO	NO	Brazil: there are doubts as to whether this mitigating measure would be a problem that is not responsibility of the ATCO to supervise airspace. Venezuela: in process.
1.3 Improve surveillance in the necessary areas (implement VHF, HF, ADS-CPDLC, ADS-B, Radar and other types of communications)		NO	YES										YES	YES	Uruguay: in bidding process. New VHF AM stations and AMHS moved in addition to SSR Mode S for Montevideo. With the acquisition of 2100 ADS C will be implemented. Digital voice IP recently acquired.
1.4 Direct access of ARO/AIS units to updated database of RNAV5-approved aircraft		NO	NO										NO	YES	Brazil: data base could be outdated. This mitigating measure would only be possible if this data base were updated online by CADs. Uruguay: both the SIIA and the en-route navigation charts are updated and regularly suffer amendments. No data base for RNAV5 approved

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															aircraft is available. Venezuela: radar coverage in all the territory.
1.5 Training of operators and air navigation service providers		NO	YES										NO	YES	Venezuela: in process.
1.6 Applicable contingency procedures upon identifying a non-RNAV5 aircraft on an RNAV5 route		NO	YES										NO	NO	Brazil: foreseen in AIP SUP Model prepared for SAM/IG/6.
1.7 Updating and, if applicable, development of the Operational Manuals of the ANSP, incorporating the appropriate procedures		NO	NO										NO	YES	
1.8 Designate a responsible party in each State to maintain the database of RNAV5-approved aircraft		YES	*										NO	YES	Uruguay: Lovrich and Ledesma but not in written. Venezuela: safety.
2. Loss of RNAV5 capacity on board															
Inability of the aircraft to maintain the RNAV5 route															
2.1 Standardization of operator procedures in case of loss of RNAV5 capability		NO	NO										NO	NO	Uruguay: in view that there is none approved.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
2.2 Improve surveillance in the necessary areas (implement VHF, HF, ADS-CPDLC, ADS-B, Radar and other types of communications)		NO	YES										YES	YES	Uruguay: in bidding process, new VHF AM moved and AMHS. Recently acquired Voice IP. Venezuela: radar coverage in all the territory.
2.3 Applicable contingency procedures upon identifying an aircraft that has lost RNAV5 capability		NO	YES										NO	YES	Brazil: foreseen in AIP SUP Model prepared for SAM/IG/6. Venezuela: in continental flight
2.4 Training of operators, including training of the crew in the application of contingency procedures		NO	*										NO	YES	Venezuela: continuous
2.5 Training of air navigation service providers		YES	NO										NO	YES	
2.6 ATC simulations		NO	NO										NO	YES	Brazil: ATC simulations will not be necessary. Uruguay: will be improved with a simulator acquired by the IAA (aeronautical training centre).
2.7 RNAV system integrity oversight plan													NO	NO	Uruguay: we have a surveillance plan. As approval is achieved, integration to the plan will occur.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
3. Lack of GND NAVAID coverage															
Inability of the aircraft to maintain RNAV5 route		NO	NO										NO		Brazil: depends on the study to be carried out in order to determine coverage and geometry of radio navigation aids. Uruguay: in process.
3.1 Publish the areas with no GND NAVAIDS RNAV5 (DME/DME) and VOR/DME coverage													-	NO	Venezuela: next amendment to AIP
3.2 Ensure an appropriate coverage by:		YES	-										-	-	
a) Implementing the required GND NAVAIDS; or		YES	NO										-	NO	Brazil: depends on the study to be carried out in order to determine coverage and geometry of radio navigation aids.
b) Establish GNSS and/or INS as requirement to use the route affected.		NO	YES										YES	YES	Uruguay: in bidding process, new VHF AM moved and AMHS. Recently acquired Voice IP
3.3 Improve surveillance in the required areas (implement VHF, HF, ADS-CPDLC, ADS-B, Radar and other types of communications)		YES	NO*										NO	YES	Uruguay: specific training received in acquired equipment, general training required on new technologies, networks, fiber, IP voice.
3.4 Training of operators and air		NO	NO										NO	YES	

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
navigation service providers															
3.5 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating the appropriate procedures		NO	NO										NO	YES	Brazil: depends on the study to be carried out in order to determine coverage and geometry of radio navigation aids.
4. NAVAID coverage failure															
Inability of the aircraft to maintain RNAV5 route															
4.1 Standardisation of operator procedures in case the aircraft cannot maintain RNAV5 route		NO	*										NO	NO	
4.2 Specific procedures to be applied in case of degradation of RNAV5 navigation capability of the aircraft		NO	*										-	YES	
4.3 Compliance with the Maintenance plan for the verification of ground radio aids		NO	*										-	YES	Brazil: depends on the study to be carried out in order to determine coverage and geometry of radio navigation aids.
4.4 Publish critical GND NAVAIDS for RNAV5 routes		NO	NO										-	YES	

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
4.5 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating the appropriate procedures		NO	NO										-	YES	Brazil: depends on the study to be carried out in order to determine coverage and geometry of radio navigation aids.
4.6 Disseminating information about solar storms that might affect the satellite and HF systems		NO	NO										-	NO	Venezuela: will request to MET on capacity to carry out this measure.
5. Volcanic eruption															
Volcanic ash															Bolivia: not applicable.
Reduced availability of the route network															
5.1 Re-routing of air traffic		-	NO										YES	YES	Uruguay: conventional ATS routes.
5.2 Training of operators, including training of the crew on the application of contingency procedures			*										NO	NO	Venezuela: in process
5.3 Determine ATC sector capacity		-	YES										NO	NO	Venezuela: in process
5.4 ATFM		-	YES										NO	NO	Venezuela: in process
5.5 Updating of LOAs between MET/ATM services		-	NO										NO	YES	
5.6 Develop regional contingency procedures		-	NO										-	YES	Venezuela: LOAs adjacent States.
5.7 Alternate routes		-	YES										YES	YES	Venezuela: agreements among States

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
5.8 Updating of the operational manuals of the operator		-	*										NO	NO	
5.9 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating the procedures foreseen in Chapter 15 (15.8 of Doc 4444)		-	NO										NO	YES	
6. Adverse meteorological effects															
Large deviations															
6.1 Updating of LOAs between MET/ATM services		YES	NO										NO	YES	
6.2 Alternate routes		NO	NO										YES	YES	
6.3 QMS/MET/AIS		YES	NO										YES	YES	Bolivia: in process. Uruguay: AIS has presented documentation of the QMS. The same is in an adjustment stage to external pre-audit process.
6.4 Updating of the operational manuals of the operator and the ANSP		NO	NO*										-	YES	Venezuela: ANSP
7. Operational manuals of operators – ANSP not updated															
Wrong application of procedures															
Implement SMS		NO	YES										NO	YES	

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
8. Inadequate civil/military coordination															
Unauthorised entry of civil aircraft in restricted airspaces		-	-										NO		Uruguay: the SIAA is updated and suffers amendments. Integrated system of aeronautical information (AIP, NOTAM, AIP Supplement, AIC, etc.)
Unauthorised entry of military aircraft from restricted airspaces into ATS routes		-	-										NO		
8.1 Updating of video charts		NO	YES										NO	YES	
8.2 Updating of LOAs and general civil/military ATM procedures		NO	YES										NO	YES	
8.3 ATFM		NO	YES										NO	NO	
8.4 Training of ATCOs and pilots		NO	YES										NO	YES	
8.5 Restructuring of segregated sectors/airspaces		NO	YES										NO	YES	
8.6 Optimise or, if applicable, implement a civil/military coordination committee		NO	YES										NO	YES	
8.7 Flexible use of airspace		NO	YES										NO	NO	Venezuela: committee in process

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
8.8 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating the procedures foreseen in Chapter 16 (16.1) of Doc 4444 and the standards and recommended practices of Annex 2 and 11		NO	YES										NO	YES	Venezuela: in process
9. Discrepancy of aeronautical information concerning the route network															
Lack of integrity of the data published by the States															
Loss of separation															
9.1 Implement quality management system (QMS) in AIS		NO	NO										NO	YES	Uruguay: the AIS has presented the document on QMS. The same is in stage of adjustment to external pre-audit process.
9.2 Comply with AIRAC cycles States ANSPs		YES	YES										YES	YES	Uruguay: compliance of AIRAC cycles is carried out for more than 10 years.
Outdated airborne navigation database, if used													-		
Loss of separation		YES	YES										YES		Uruguay: compliance of AIRAC cycles is carried out for more than 10 years.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
9.3 Comply with AIRAC cycles		YES	YES										YES	YES	Uruguay: the GIS/TF/1 generated model documents to exchange information among States and with other organizations.
9.4 Improve and/or formalise coordination between States and navigation database providers		NO	NO										NO	YES	
9.5 Publish specific navigation database regulations		YES	*										YES	YES	Uruguay: DNA has an inspection programme for users.
9.6 Schedule operator inspections		NO	*										-	YES	
9.7 Comply with navigation database regulations established by the States		YES	YES										YES	YES	Uruguay: AIS has already presented QMS documentation. The same is in a state of adjustment to external pre-audit process.
9.8 Increased ATCO workload		NO	NO										NO	No	Uruguay: compliance of AIRAC cycles is carried out for more than 10 years. Venezuela: in process
10. Inadequate airspace design															
10.1 Analyse sector workload after route optimisation		YES	YES										NO	NO	Venezuela: in process
10.2 Provide a sufficient number of air traffic controllers		NO	NO										NO	NO	Venezuela: in process
10.3 Drafting of the safety plan for sectors		NO	NO										NO	NO	Venezuela: in process

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
10.4 ATFM		NO	YES										NO	YES	
10.5 Updating of ATCO training		NO	NO										NO	NO	
10.6 Analysis of airspace capacity after RNAV5 route optimisation		NO	NO										NO	NO	
10.7 Airspace redesign applying continuous descent operations (CDO)		NO	NO										NO	YES	
10.8 Implementation of RNAV5 SIDs/STARs		YES	YES										NO		
11. Navigation deviations due to technical errors															
Deviation due to engine failure															
Deviation due to a contingency															
11.1 Use of the lateral deviation (LD) reporting form		-	-										-	NO	
11.2 Monthly delivery of LD data to CARSAMMA		-	-										-	NO	
11.3 Training of ATCOs in the completion of the lateral deviation reporting form		-	-										-	NO	

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
11.4 Use of data available in CARSAMMA for visualising potential technical errors		-	-										-	NO	
11.5 Operator inspection programmes		-	-										-	YES	
11.6 Implement ATC system alarms to detect lateral deviations		-	-										-	NO	Venezuela: survey on automation
12. Navigation deviations due to operational errors															
Lack of coordination between ACCs															
12.1 Implement measures to reduce operational errors in the ATC coordination loop between adjacent ACCs (GREPECAS15/36)		-	-										-	YES	
12.2 Use of the lateral deviation (LD) reporting form		-	-										-	NO	
12.3 Investigation of each LD, taking the necessary risk mitigation measures, and monthly delivery of LD data to CARSAMMA		-	-										-	NO	

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
12.4 Training of ATCOs in the application of procedures to avoid ATC coordination errors and completion of the lateral deviation reporting form		-	-										-	NO	
12.5 Use of data available in CARSAMMA to visualise potential errors		NO	NO										YES	NO	Uruguay: YES by the administration NO by ATCOs.
12.6 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating procedures to reduce operational errors in the ATC coordination loop between adjacent ACCs		NO	NO										YES	YES	
12.7 Implement ATC system alarms to detect lateral deviations		NO	NO										NO	NO	Venezuela: survey on automation
12.8 Implement AIDC		NO	NO										NO	NO	

Instrucciones para el llenado del formulario - Instructions to fill in the form

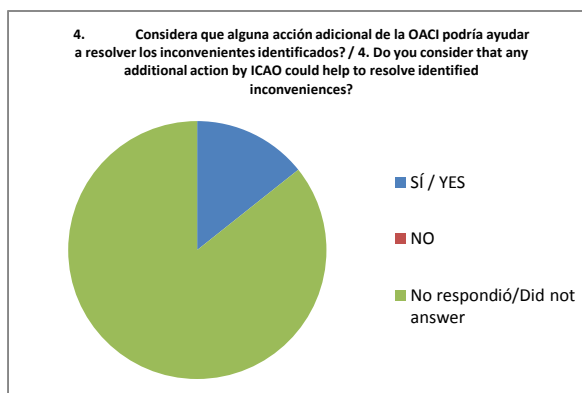
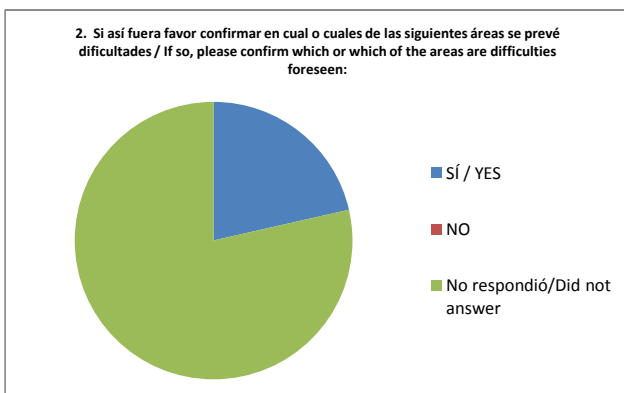
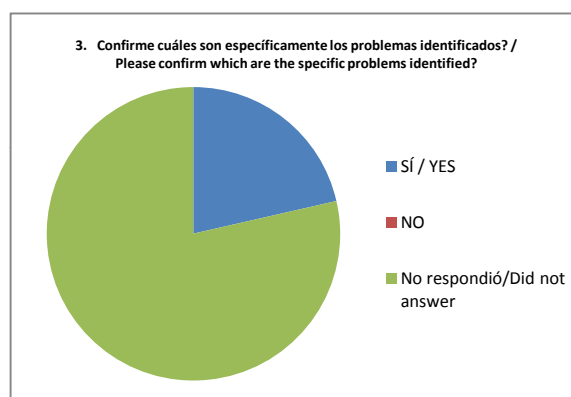
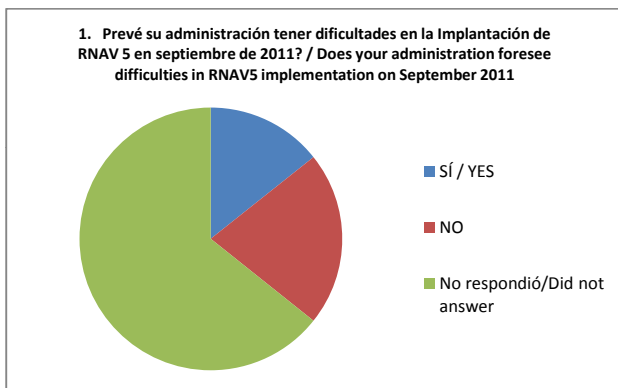
- Cumplida: colocar **SÍ** en el casillero correspondiente. / Accomplished: place **YES** in the corresponding box
- No cumplida: colocar **NO** en el casillero correspondiente y, de ser el caso, hacer comentarios en columna de observaciones/ Not complied: place **NO** in the corresponding box and if such were the case, make comments in the remarks column

APÉNDICE/APPENDIX C

Dificultades identificadas	SÍ / YES	NO	No respondió/Did not answer
1. Prevé su administración tener dificultades en la Implantación de RNAV 5 en septiembre de 2011? / Does your administration foresee difficulties in RNAV5 implementation on September 2011	2	3	9
2. Si así fuera favor confirmar en cual o cuales de las siguientes áreas se prevé dificultades / If so, please confirm which or which of the areas are difficulties foreseen:	3	0	11
a) OPS			
b) AIR			
c) ATM			
d) AIS (Publicaciones aeronáuticas/Aeronautical publications)			
e) Otros/Other			
3. Confirme cuáles son específicamente los problemas identificados? / Please confirm which are the specific problems identified?	3	0	11
4. Considere que alguna acción adicional de la OACI podría ayudar a resolver los inconvenientes identificados? / 4. Do you consider that any additional action by ICAO could help to resolve identified inconveniences?	2	0	12

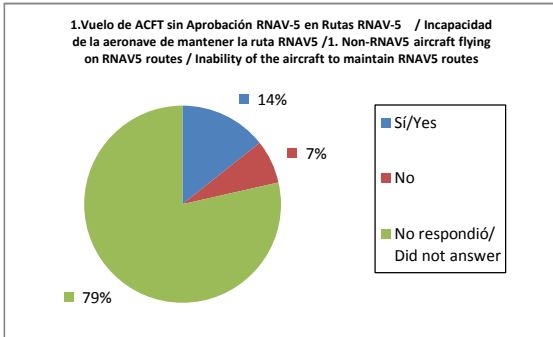
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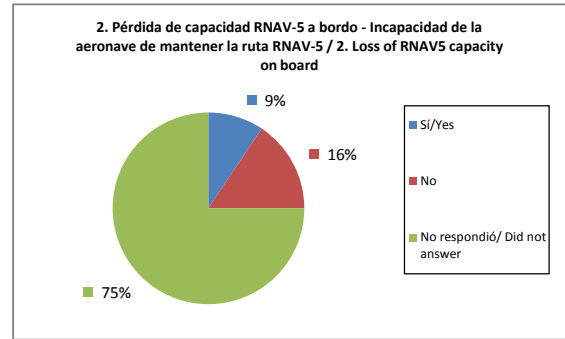


APÉNDICE/APPENDIX C

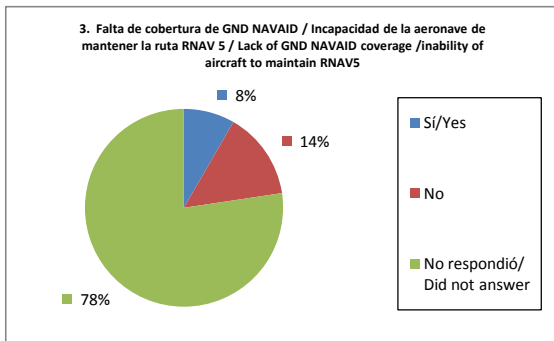
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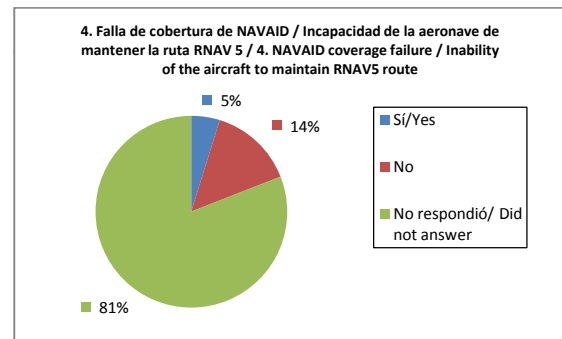
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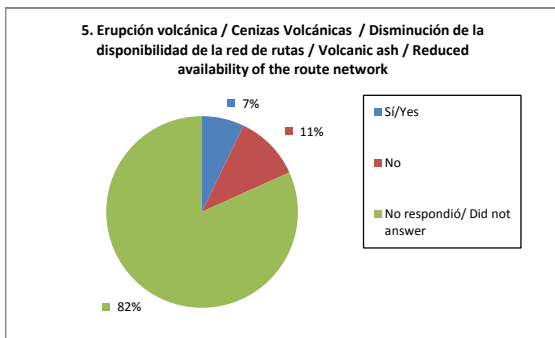
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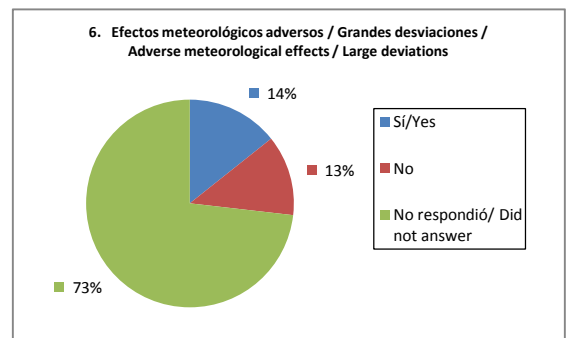
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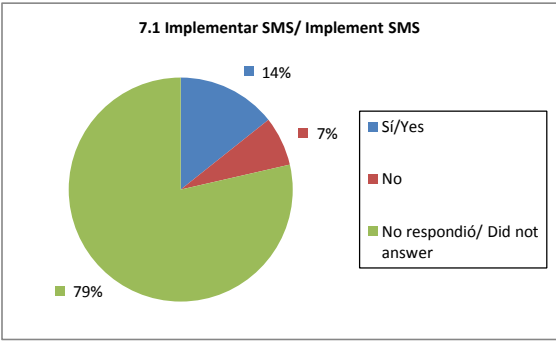
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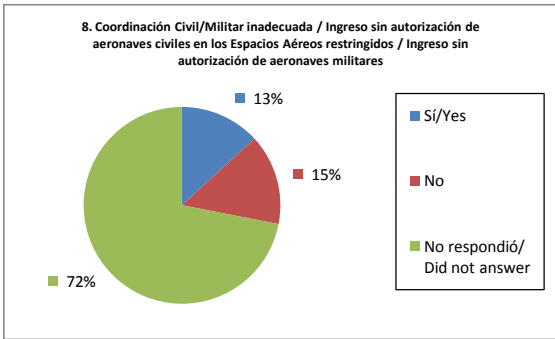
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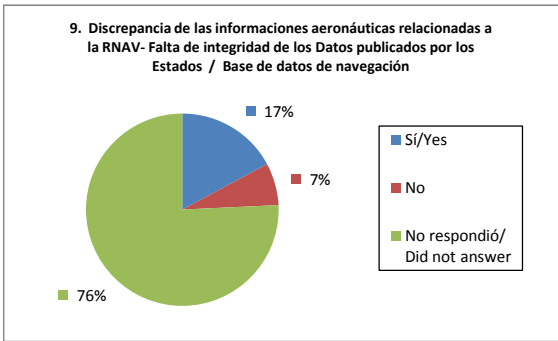
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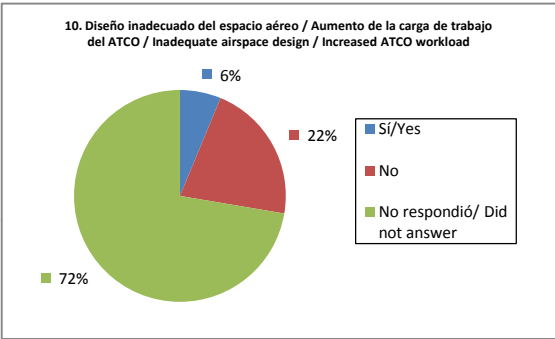
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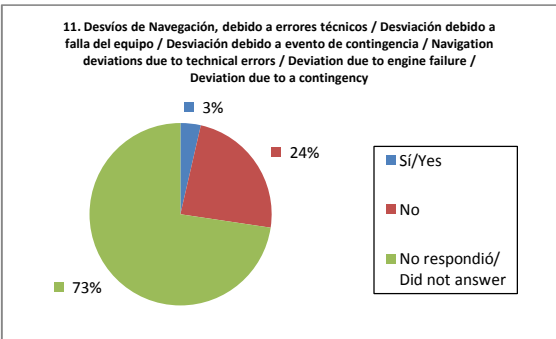
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TOTAL 10



TOTAL 11



TOTAL 12

