



INTERNATIONAL CIVIL AVIATION ORGANIZATION
AFI PLANNING AND IMPLEMENTATION REGIONAL GROUP
NINETEENTH MEETING (APIRG/19)
(Dakar, Senegal, 28 to 31 October 2013)

Agenda Item 3: Performance Framework for Regional Air Navigation Planning and Implementation

3.4 Communications, Navigation and Surveillance (CNS)

NAVIGATION SYSTEMS

(Presented by the Secretariat)

SUMMARY	
This working paper presents the report of the Fifth Meeting of APIRG Communications, Navigation and Surveillance Sub-group (CNS/SG/5, Nairobi, Kenya, 16-19 September 2013) on Navigation systems, for consideration by APIRG/19.	
Action by the meeting is at paragraph 3.	
References: APIRG/18 Report	
<i>Strategic Objective(s):</i>	This working paper related to the Strategic Objectives A and C.

1. INTRODUCTION

1.1 The Fifth Meeting of the APIRG Communications, Navigation and Surveillance Sub-group (CNS/SG/5) was held in Nairobi, Kenya from 16 to 19 September 2013. It was attended by sixty one (61) delegates from twenty four (24) Contracting States and three (3) international Organizations. This working paper presents the report of the CNS/SG/5 on radionavigation systems.

2. DISCUSSION

Status of implementation and performance of ARNS

2.1 The CNS Sub-Group reviewed the implementation status and the performance of conventional radio navigation aids (VOR, DME, ILS) in the AFI Region since APIRG/18 meeting in March 2012. The Sub-Group noted that little progress has been achieved since APIRG/18 meeting in the elimination of deficiencies, and requested the States concerned to implement remedial action by 30 September 2014. **Appendix 3.4A** to this working paper presents the list of deficiencies affecting aeronautical radionavigation.

Global Navigation Satellite Navigation System (GNSS)

2.2 The CNS Sub-Group recognized that GNSS services were being introduced throughout the AFI Region to support the implementation of performance-based navigation (PBN) in accordance with the regional strategy adopted by APIRG. Considering that GNSS has the potential to meet performance requirements for all phases of flight and improve safety and efficiency of air navigation, it is essential that the air navigation service providers using GNSS identify the vulnerabilities of this system; and develop the necessary mitigations.

2.3 The CNS Sub-Group discussed the GNSS vulnerabilities, including interference due to low power signals received from core satellite constellations or satellite-based augmentation systems, intentional corruption of the navigation signals to cause aircraft to deviate and follow a false flight path (spoofing), ionospheric and other atmospheric effects, system failure or human factors. Guidance was provided to the States based on ICAO provisions contained in Annex 10 – Aeronautical Telecommunications, Volume 1 (Radionavigation Aids), and GNSS Manual (ICAO Doc 9849). The CNS Sub-Group recalled APIRG Conclusion 16/22 on Recording of GNSS parameters, and formulated the following draft conclusion:

DRAFT CONCLUSION 19/XX: ASSESSMENT AND MITIGATION OF GNSS VULNERABILITIES

That States providing GNSS services should:

- a) Assess and report GNSS vulnerabilities in their airspace, including:**
 - i). unintentional and intentional interference;**
 - ii). ionospheric scintillation in equatorial regions;**
 - iii). other vulnerabilities as may be identified; and**

- b) Implement appropriate mitigation measures depending on**
 - i). the airspace in question; and**
 - ii). the operations that must be supported.**

2.4 The CNS Sub-Group noted that the current PBN/GNSS Task Force of APIRG was not designed to address specific technical issues related to GNSS such as GNSS vulnerabilities or related spectrum requirements. It therefore agreed to include in its proposed work programme provision of assistance to States in addressing technical aspects of GNSS.

Ground-Based Augmentation System (GBAS)

2.5 The CNS Sub-group was apprised by ASECNA on a feasibility study on the implementation of Ground Based Augmentation System (GBAS) Category I operations at Dakar Leopold Sedar Senghor (LSS) International Airport, in Senegal. The study showed that GBAS CAT-I performance was achievable. The next step of the study will include the implementation of an automatic monitoring system for GNSS performance at LSS Airport.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the report of the Fifth Meeting of the APIRG Communications, Navigation and Surveillance Sub-group on Navigation systems as presented in this working paper;
- b) review and update the list of deficiencies affecting aeronautical radionavigation service in the AFI Region as provided in Appendix 3.4A to this working paper and request States with deficiencies to implement remedial action by 30 September 2014; and
- b) review and adopt the above draft conclusion on assessment and mitigation of GNSS vulnerabilities.

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**APPENDIX 3.4A
LIST OF DEFICIENCIES IN THE AIR NAVIGATION FIELDS
ARNS**

State Name	Requirements	Facilities or Services	Description of Deficiency	Date first reported	Comments on Deficiency	Description of Corrective action	Executing Body	Target date for implementation	Priority
Angola	Nav aids AFI/7, Rec. 10/4	Huambo	VOR/DME	1998	Not implemented	Implement facility	ENANA	30 September 2014	A
	Nav aids AFI/7, Rec. 10/4	Kuito	VOR/DME	1998	Not implemented	Implement facility	ENANA	30 September 2014	A
	Nav aids AFI/7, Rec. 10/4	Luena	VOR/DME	1998	Not implemented	Implement facility	ENANA	30 September 2014	U
	Nav aids AFI/7, Rec. 10/4	Saurimo	VOR/DME	1998	Not implemented	Implement facility	ENANA	30 September 2014	U
Cameroon	Nav aids AFI/7, Rec. 10/4	Maroua	VOR	1998	Not implemented	Implement facility	Cameroon	30 September 2014	A
Guinea	Nav aids, AFI/7 Rec. 10/4	Kankan	VOR	1998	Not implemented	Implement facility	Guinea	30 September 2014	A
	Nav aids AFI/7 Rec. 10/4	Labe	VOR	1998	Not implemented	Implement facility	Guinea	30 September 2014	A
	Nav aids AFI/7 Rec. 10/4	Nzerekore	VOR	1998	Not implemented	Implement facility	Guinea	30 September 2014	A
Kenya	Nav aids AFI/7 Rec. 10/4	Mandera	VOR/DME	1998	Not implemented	Implement facility	Kenya	30 September 2014	U
Lesotho	Nav aids AFI/7	Maseru	VOR/DME	2002	Not	To	Lesotho	30 September	U

State Name	Requirements	Facilities or Services	Description of Deficiency	Date first reported	Comments on Deficiency	Description of Corrective action	Executing Body	Target date for implementation	Priority
	Rec. 10/4				implem e d	implem e n t		2014	
Liberia	Nav aids AFI/7 Rec. 10/4	Robertsfield	ILS 04	1998	Not implem e n t e d	Implem e n t f a c i l i t y	Liberia	30 September 2014	U
Libya	Nav aids AFI/7 Rec. 10/4	Sarir	VOR/DME	1998	Not implem e n t e d	Implem e n t f a c i l i t y	Libya	30 September 2014	U
Madagascar	Nav aids AFI/7 Rec. 10/4	Antsiranana	VOR	1998	Not implem e n t e d	Implem e n t f a c i l i t y	Madagas c a r	30 September 2014	U
	Nav aids AFI/7 Rec. 10/4	Maintirano	VOR	2002	Not implem e n t e d	Implem e n t f a c i l i t y	Madagas c a r	30 September 2014	U
	Nav aids AFI/7 Rec. 10/4	Morondava	VOR	1998	Not implem e n t e d	Implem e n t f a c i l i t y	Madagas c a r	30 September 2014	U
	Nav aids AFI/7 Rec. 10/4	Sainte Marie	VOR	1998	Not implem e n t e d	Implem e n t f a c i l i t y	Madagas c a r	30 September 2014	A
	Nav aids AFI/7 Rec. 10/4	Toliara	VOR	1998	Not implem e n t e d	Implem e n t f a c i l i t y	Madagas c a r	30 September 2014	U
Sao Tome & Principe	Nav aids AFI/7 Rec. 10/4	Sao Tome	ILS 11	1998	Not implem e n t e d	Implem e n t f a c i l i t y	Sao Tome & Principe	30 September 2014	A
Sierra Leone	Nav aids AFI/7 Rec. 10/4	Freetown/ Lungi	ILS 30	1999	Unservicea b l e	To repair	Sierra L e o n e	30 September 2014	U
	Nav aids AFI/7 Rec. 10/4	Freetown/ Lungi	VOR/DME	1999	Unservicea b l e	To repair	Sierra L e o n e	30 September 2014	U
Somalia	Nav aids AFI/7	Hargeisa	VOR/DME	1998	Not	Implem e n t	Somalia	30 September	U

State Name	Requirements	Facilities or Services	Description of Deficiency	Date first reported	Comments on Deficiency	Description of Corrective action	Executing Body	Target date for implementation	Priority
	Rec. 10/4				implem e d	facility		2014	
	Nav aids AFI/7 Rec. 10/4	Mogadishu	VOR/DME	1998	Not implem e d	Implement facility	Somalia	30 September 2014	U
Sudan	Nav aids AFI/7 Rec. 10/4	Geneina	VOR	1998	Not implem e d	Implement facility	Sudan	30 September 2014	U
	Nav aids AFI/7 Rec. 10/4	Juba	ILS 13	1998	Not implem e d	Implement facility	Sudan	30 September 2014	A
	Nav aids AFI/7 Rec. 10/4	Karina	VOR/DME	1998	Not implem e d	Implement facility	Sudan	30 September 2014	U
Tanzania	Nav aids AFI/7 Rec. 10/4	Dodoma	VOR/DME	1998	Not implem e d	Implement facility	Tanzania	30 September 2014	U
	Nav aids AFI/7 Rec. 10/4	Mbeya	VOR/DME	1998	Not implem e d	Implement facility	Tanzania	30 September 2014	U
	Nav aids AFI/7 Rec. 10/4	Mwanza	DME	1998	Not implem e d	Implement facility	Tanzania	30 September 2014	U
Zambia	Nav aids AFI/7 Rec. 10/4	Mongu	VOR	1998	Not implem e d	Under installation	Zambia	30 September 2014	U
	Nav aids AFI/7 Rec. 10/4	Solwezi	VOR	1998	Not implem e d	Sourcing for funds	Zambia	30 September 2014	U
