



International Civil Aviation Organization

Regional Aviation Safety Group - Middle East

Sixth Meeting (RASG-MID/6)
(Bahrain, 26-28 September 2017)

Agenda Item 5: Update from and Coordination with MIDANPIRG

GNSS VULNERABILITY

(Presented by IATA)

SUMMARY

This paper presents the challenges associated with GNSS vulnerability including GPS signal interference and seeks the meeting agreement for the development of a RSA on the subject.

Action by the meeting is at paragraph 3.

REFERENCES

- ATM SG/3 Report
- CNS SG/7 Report
- MIDANPIRG/16 Report
- PBN SG/2 Report
- RSC/5 Report

1. INTRODUCTION

1.1 The Global Positioning System (GPS) provides operators with Positioning, Navigation, and Timing (PNT) services.

1.2 Aviation relies heavily on GPS for area navigation and precision approach. Aircraft avionics such as the Flight Management Systems (FMS) require GPS timing for a large number of onboard functions including Terrain Avoidance Warning System (TAWS) or Enhanced Ground Proximity Warning Systems (EGPWS). Onboard avionics are highly integrated on commercial aircraft and are very dependent on GPS timing data.

1.3 IATA members have experienced incidents of interference to GPS navigation during en-route as well as on descent towards precision approach at international airports. Attached at **Appendix A** list of reported incidents in the MID Region.

2. DISCUSSION

2.1 The Second Meeting of the Performance Based Navigation Sub-group (PBN SG/2) (Sharm, El Sheikh, Egypt, 22-25 February 2015) highlighted that one of the challenges in

implementing PBN is GNSS vulnerability. The meeting agreed that the subject should be addressed by the CNS SG meeting.

2.2 The Seventh meeting of the CNS Sub-Group (CNS SG/7) held in Cairo, Egypt June 2016, highlighted that GNSS signal disruption cannot be ruled out completely and States/ANSPs must be prepared to deal with loss of GNSS signals, and that States conduct risk assessment and implement mitigation strategies using the ICAO guidance.

2.3 During that meeting it was agreed to collect data of actual interference and requested States as well as IATA to collect data using the GNSS Interference Report Form. When enough data is collected, it will be analyzed and appropriate measures would be recommended for implementation in the Region.

2.4 The RSC/5 meeting held in January 2017 agreed that the subject should be presented to the Third MIDANPIRG/RASG-MID Coordination meeting (MRC/3).

2.5 The subject was addressed by MIDANPIRG/16 meeting. The meeting was apprised of the outcomes of the ACAC/ICAO MID Workshop on GNSS (Rabat, Morocco, 5 April 2016) and the CNS SG/7 meeting (Cairo, Egypt, 31 May - 02 June 2016) related to GNSS. The meeting encouraged States to implement the recommendations emanating from the ACAC/ICAO MID Workshop on GNSS.

2.6 The MIDANPIRG/16 meeting noted that ACAC and ICAO are planning to organize a joint Workshop on GNSS in November 2017 and encouraged States to actively participate in this Workshop. The Workshop will be held in Rabat, Morocco from 7 to 8 November 2017.

2.7 The MIDANPIRG meeting agreed that the subject should be addressed to the RASG-MID/6 meeting in order to agree on measures to ensure effective reporting of GNSS interferences, which could be mandated by the States' regulatory authorities. The meeting invited the RASG-MID to consider the development of a RASG-MID Safety Advisory (RSA) related to GNSS vulnerabilities, highlighting the Standard Operating Procedures (SOPs) for pilots, including the reporting procedures. The meeting noted that ICAO developed new guidance on GNSS monitoring for inclusion in the GNSS Manual (Doc 9849); the corresponding updates to Annex 10 will also become applicable by November 2018.

2.8 The subject was also presented to the Third Meeting of the Air Traffic Management Sub-Group (ATM SG/3) (Cairo, Egypt, 22-25 May 2017). The meeting encouraged stakeholders to support the development of the RSA on GNSS vulnerabilities.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) review the reported incidents at **Appendix A** and recommend solutions;
- b) encourage States to attend the ACAC/ICAO Joint Workshop on GNSS (Rabat, Morocco from 7 to 8 November 2017); and
- c) encourage stakeholders to support the development of the RSA on GNSS vulnerabilities taking into consideration the outcome of the ACAC/ICAO Workshop and provide data/inputs, if required, in a timely manner.

APPENDIX A

Flight	Date	Area	Flight	ACFT	Duration	Remark
AF6752	28/11/15	CAI FIR	Landing 05C	B777		from 1000ft to gnd
AF508	06/12/15	CAI FIR	Landing 05C	A330		
AF166	19/12/15	Baku UIR WPT SUBUT	FL330	B777	6min	on AWY T923 ANP increased to 2,7
AF226	21/12/15	Baku FIR	FL330	B777		
AF166	22/12/15	Caspian sea	Cruise level	B777	30+min	
AF254	22/12/15	Baku FIR	Cruise level	B777	20min	
AF503	17/12/15	CAI FIR	Take off 23C	A340		Nav fm/gps pos disagree, gps 2 fault until FL70
AF259	28/12/15	Azerbaijanarea /Caspian sea	Cruise level	B777	15min	Loss of GPS (pos ref) with ANP increasing
AF503	04/01/16	CAI FIR	Take off 23C	A330	20min	GPS1 loss on RWY axis, GPS2 lost and recovered w/o action
AF166	13/02/16	Tbilissi area	Cruise level	B777	5min	both gps loss, NAV unable RNP, GPS, RWY POS.
AF166	25/02/16	Tbilissi area	Cruise level	B777		TERR POS, NAV UNABLE RNP, loss of both GPS. GPS2 never recovered from event...
AF503	08/03/16	CAI FIR	Take off 23C	A330	2min	loss of GPS1
AF508	31/03/16	CAI FIR	Landing 05C	A330		By 2000ft loss of GPS1, with NAV FMS POS, GPS pos disagree
AF508	06/06/16	CAI FIR	Landing 05C	A330		tempo loss of GPS1 btn 6,5 IZFC dme/6,2 and 3,9/3,4
AF508	07/07/16	CAI FIR	Landing 05C	A330		GPS pos disagree
AF508	17/08/16	CAI FIR	Landing	A330		Both GPS lost on final btn 1000' and 500'.
AF218	05/09/16	Ankara FIR	Cruise level	A330	10min	Loss of GPS1 then GPS2
AF508	05/07/15	CAI FIR	APP/Landing	A330		During approach to HECA ,many intermittent alarms: NAV FM/GPS disagree on ECAM
	20/08/2015	Doha Airport	climb 1000-10000 ft	B773	30 Sec	Passing 1000ft on ALSEMIM departure ,GPS update lost.INERTIAL displayed .ANP increased to approx.2.5 EICAS"NAV UNABLE" .GPS update returned afetr 30 Sec.Occured once more on climb at 10000ft .GPS update returned afetr few seconds
FZ002	29/08/2015	Doha Airport	Climb	B 737 A6-FDN	7min	Outbound from DOH, we lost both GPS L and GPS R passing 2000ft climbing. Returned at approx 60nm from DOH at FL210. Max ANP seen 0.17
FZ018	28/08/2015	Doha Airport	Climb GND-7000ft	B737 /A6-FDZ	6 min	Shortly after departure from RWY34R from DOH we lost both GPS L/R. After passing 7000ft we got back one GPS. Both GPS was intermittent ON and OFF until passing 50nm out from DOH. Afterwards it was normal.
EK847	29/12/2015	Doha Airport	Approach	B77L		On ILS 34L, EICAS Runway POS ND showed inertial position temporary – then GPS showed again EICAS cleared
EK848	23/01/2016	Doha Airport	Climb 1500-15000 ft	B773		GPS position lost on departure from 1.500ft – 15.000ft between 'turning right' DCT to ALSEM
BA 198	10/06/16	Tehran FIR	30NM EAST OF DASIS UL333	B777 G-YMMH		About 30nm prior to DASIS westbound in Tehran FIR we lost GPS reception from both sensors, we checked with the aircraft around us and the four of them confirmed similar situation, we guessed therefore that there had been some Jamming of the GPS signal in the area. The signal returned some 40nm after DASIS.
BA 109	22/10/2016	Tehran FIR	Cruise level	B777 G-VIIL	2 min	Approximately 200nm from position Alram (Ankara/ Tehran FIR boundary) GPS indication on Nav display briefly Blanked and was replaced by INERTIAL. Shortly after crossing boundary, a repeat event occurred, this time lasting for approximately two minutes
QR 8132	28/11/2106	Tehran FIR	Cruise level 350 ft	B772 A7-BFC	4 min	In cruise FL 350, 30 NM North-West position ENEDA (Tehran FIR) on Airway UT-36 total loss of GPS signal for approximately 4 minutes (04:14UTC) Self recovered South- East ENEDA.

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