



International Civil Aviation Organization

Ninth Meeting of the MIDANPIRG AIM Sub-Group (AIM SG/9)

(Virtual Meeting, 20 - 21 September 2022)

Agenda Item 3: Global and Regional Developments

NOTAM TEMPLATE ON GNSS INTERFERENCE

(Presented by AIM Forum go-team)

SUMMARY

This paper presents the meeting with the standard NOTAM template to be used for GNSS Interference, to facilitate operators in filtering and searching through the NOTAMs.

Action by the meeting is at paragraph 3.

REFERENCES

- Nineteenth Meeting of the Middle East Air Navigation Planning and Implementation Regional Group MIDANPIRG/19 & Ninth Meeting of the Regional Aviation Safety Group-Middle East RASG-MID/9 Report;
- Eleventh Meeting of the MIDANPIRG Communication, Navigation and Surveillance Sub-Group (CNS SG/11) Report
- RASG-MID guidance material to GNSS vulnerabilities
- ICAO ANNEX 15 “AERONAUTICAL INFORMATION SERVICES”
- Doc 9849, Global Navigation Satellite System (GNSS) Manual Third Edition, 2017

1. INTRODUCTION

1.1 GNSS is a key technology of the Communications, Navigation, and Surveillance (CNS) infrastructure. GNSS can support navigation applications in all phases of flight as well as surveillance application like ADS-B. GNSS is also used in safety nets like the GPWS (Ground Proximity Warning Systems) and provides the time reference that is used to synchronize systems and operations in ATM.

1.2 GNSS/GPS vulnerability, including intentional and unintentional signal interference, has been identified as a major safety risk as GNSS is embedded into numerous critical infrastructures. Especially the intentional interference presents significant threat to flight operations ~~and passengers~~. Therefore, such interference needs to be monitored and its operational risk needs to be assessed.

1.3 The GNSS/GPS Interference was published in 10th MID Annual Safety Report (2021) as one of the emerging safety risks in ICAO MID region.

1.4 The RASG-MID released the guidance material to GNSS vulnerabilities to mitigate the safety and operational impact of GNSS service disruption. The guidance recommends pilots to report GNSS interference and ANSP to issue appropriate advisories and NOTAM.

1.5 To support the joint-effort reporting the GNSS/GPS Interference in the region, this working paper highlights States responsibilities to report GNSS interference and proposes a standard NOTAM template to be used for GNSS Interference, to facilitate operators in filtering and searching through the NOTAM.

2. DISCUSSION

2.1 DOC 9849, GNSS Manual indicates that State ANS providers have the responsibility to report the status of air navigation services. If the status of a service changes or is predicted to change, users should be notified via direct communications from ATS and/or via a NOTAM or aeronautical information system (see Annex 15 and the Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)).

2.2 Moreover, the GNSS Manual states that ANS providers must be prepared to act when anomaly reports from aircraft or ground-based units suggest GNSS signal interference. If an analysis concludes that interference is present, ANS providers must identify the area affected and issue an appropriate NOTAM.

2.3 A huge number of outage events were reported by pilots in 2021. NOTAM had been issued by Member States' NOFs for the purposes of reporting GNSS service status notification. Furthermore, the promulgated NOTAM related to GNSS had various Q codes and terminologies (GPS unreliable, GPS Signal interference, GPS Jamming, Loss of GPS Signal, etc.,) making it difficult for operators to filter and search through the NOTAM and hence, the MIDANPIRG/19 meeting tasked the AIM SG in coordination with IATA to develop a standard NOTAM template to be used for GNSS Interference and to be attached to the RSA-14.

2.4 National and international coordination of actions to prevent and mitigate GNSS interference is essential. To facilitate the reporting process, the use of a standard form allows for the tracking of reported anomalies and is helpful to the coordination of efforts.

2.5 The following GNSS Radio Frequency Interference (RFI) NOTAM template describes the different fields and values that shall be used in a GNSS NOTAM in compatibility with ICAO formatting rules. It addresses only GNSS Radio Frequency Interference (RFI) events notified by NOTAM.

Item Q – Qualifier: the following qualifiers shall be mentioned in item Q:

Qualifier FIR: This Item shall contain the ICAO location indicator of the FIR within which the flights may be impacted by the RFI. If more than one FIR of the same country is impacted, the ICAO nationality letters of that country (e.g. OE) should be followed by ‘XX’.

Qualifier NOTAM CODE: the following NOTAM code qualifiers (second and third letter) shall be used as appropriate for GNSS RFI event notification in the case of:

GNSS airfield specific operations – QGA [GNSS AIRFIELD]

GNSS area wide operations – QGW [GNSS AREA]

Followed by the appropriate fourth and fifth letters from the below list:

LF – interference from [INTERFERENCE FM]

AU – Not available (specify reason if appropriate) [NOT AVBL]

For cancellation NOTAM the following 4TH and 5th letters shall be used:

AK – Resumed normal operations [OKAY]

AL – Operative (or re-operative) subject to previously published limitations/conditions [OPR SUBJ PREVIOUS COND]

e.g.

QGWLF (where GNSS area wide interference)

QGWAU (Where GNSS is not available in the area)

Qualifier TRAFFIC: the « IV » should be used as a traffic qualifier, indicating that both IFR and VFR traffic may be impacted by the RFI

Qualifier PURPOSE: the code NBO should be used to notify RFI events:

N = NOTAM selected for the immediate attention of flight crew members. Due to their importance, these NOTAM require the immediate attention of flight crew members. Flight crew members may request specific delivery of such NOTAM or their inclusion in specific Pre-flight Information Bulletins.

B = NOTAM of operational significance selected for PIB entry. The NOTAM will appear in a Pre-flight Information Bulletin containing all NOTAM relevant to a general Pre-flight Information Bulletin query. NOTAM qualified B, BO, or NBO will appear in the Pre-flight Information Bulletin.

O = NOTAM concerning flight operations. The NOTAM will appear in a PIB containing all relevant NOTAM. NOTAM with qualifiers BO or NBO will appear in the PIB.

Qualifier SCOPE: Depending on the impacted area, one of the following codes should be used:

- A = if the event only impacts aerodrome(s) operations (used QGA)
- E = if the event only impacts en-route traffic (used QWA)
- AE = if the event impacts both Aerodrome and En-route traffic (used QWA)

Qualifier LOWER/UPPER: Depending on the intended jamming range and the traffic in the impacted area. The Upper limit corresponds to the computed jammer range. The lower limit depends on the type of traffic

in the impacted area and the minimum altitude of flying aircraft. Example: if the SCOPE is “En-route”, the minimum En-route altitude of the concerned airspace is FL300 and the jamming range is 12192m then the LOWER/UPPER qualifier is ‘Q) .../300/400/...’ (from ‘Lower’ FL300 up to ‘Upper’ FL400). In the absence of computed lower and upper limits the values 000/999 should be used.

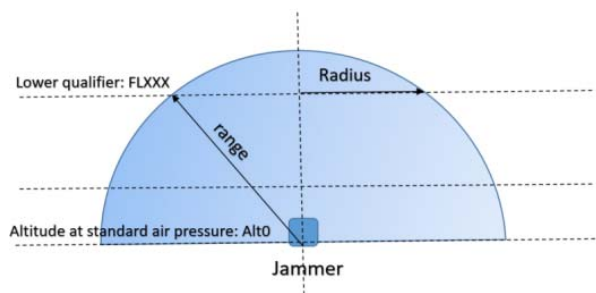
Qualifier GEOGRAPHICAL REFERENCE – Coordinates: this qualifier indicates the interference source coordinates. For NOTAM with ‘Scope’ ‘A’ the Aerodrome Reference Point (ARP) coordinates should be inserted. For NOTAM with ‘Scope’ ‘AE’ or ‘E’ the centre of a circle whose radius encompasses the whole area of interference should be inserted.

Qualifier ‘GEOGRAPHICAL REFERENCE’ – Radius*: The radius of the impacted area should be inserted in this field.

* In some States, military authorities test the capabilities of their equipment and systems occasionally by transmitting jamming signals that deny GNSS service in a specific area. This activity is normally coordinated with State spectrum offices and ANS providers. Military and other authorities operating jamming devices should coordinate with ANS providers to enable them to determine the airspace affected, advise aircraft operators and develop any required procedures. In such event, the Radius should be derived from the jammer range and altitude. It should take into consideration the ‘lower’ qualifier and be calculated as follows:

$$\text{Radius} = \sqrt{(\text{range}^2) - (\text{lower qualifier} - \text{Alt0})^2}$$

Example: Jammer range = 10 km, Altitude Jammer = 500 m, Lower qualifier = FL300 \diamond Radius= 5028m = 2.715 NM



Example of item: Q) ORBB/QGWAU/IV/NBO/E /300/400/3200N04425E

Item A – Location

All FIR location indicators affected by the information should be entered in Item A), each separated by a space. In the case of a single FIR, the Item A) entry must be identical to the ‘FIR’ qualifier entered in Item Q). When an aerodrome indicator is given in Item A), it must be an aerodrome/heliport situated in the FIR entered in Item Q).

Item B – Start of Activity

A ten-digit date-time group giving the year, month, day, hour and minutes, at which the NOTAM comes into force, should be mentioned in Item B). Example: B) 2207011200 (1 July 2022, 12:00 UTC).

Item C – End of Validity

A ten-digit date-time group giving the year, month, day, hour and minute, at which the NOTAM ceases to be in force and becomes invalid, should be mentioned in Item C). This date and time should be later than that given in Item B).

Item E – NOTAM Text

The following standard text shall be used according to Qcode used:

QGAAU – GNSS NOT AVBL

QGWAU – GNSS NOT AVBL WITHIN: *{specify route / geographical area (coordinates / waypoints)}*

or

QGALF – GNSS INTERFERENCE

QGWLF – GNSS INTERFERENCE WITHIN: *specify route / geographical area (coordinates / waypoints)*

When cancelling the NOTAM, the following standard text shall be used:

QGAAK or QGWAK – GNSS OKAY *{when resuming normal operations}*

QGAAL or QGWAK – GNSS OPR SUBJ PREVIOUS COND. *{only to be used where conditions have been published}*

Example GNSS NOTAM

A1234/22 NOTAMN

Q) ORBB/QGWAU/I/NBO/E/300/400/3200N04425E050

A) ORBB

B) 2207011315 C) 2208011315EST

E) GNSS NOT AVBL WITHIN 50NM RADIUS ON 3200N04425E

F) FL300 G) FL400

A1235/22 NOTAMR A1233/22

Q) ORBB/QGAAU/I/NBO/A/000/999/3033N04739E020

A) ORMM

B) 2207010500 C) 2207011630

E) GNSS NOT AVBL

2.6 Based on the above, and to facilitate operators in filtering and searching through the NOTAM on GNSS Interference, the meeting may wish to agree on the following Draft Conclusion:

DRAFT CONCLUSION 9/XX: NOTAM TEMPLATE FOR GNSS INTERFERENCE

That, NOTAM template at para.2.5 be used to disseminate information on GNSS Interference.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note and review the content of this working paper; and
- b) endorse the Draft Conclusion at Para. 2.6.

- END -