NORTH ATLANTIC TECHNOLOGY AND INTEROPERABILITY GROUP

(NAT TIG)

EIGHTEENTH MEETING

(Washington DC, USA, 10-13 September 2024)

Agenda Item 2: Data Link performance monitoring and analysis, including trials and operations. Reports by States, industry and DLMA

d) Other issues

ANALYSIS OF GNSS INTERFERENCE IN NEW YORK OCEANIC AIRSPACE

(Presented by United States)

SUMMARY

This paper provides follow up activities conducted by the FAA to investigate potential GNSS interference impacts in oceanic airspace.

1. Introduction

1.1 During the TIG/17 meeting, the topic of GNSS interference was addressed in multiple papers:

a) WP/11 from Iceland: GNSS JAMMING AND SPOOFING EFFECTS OBSERVED IN BIRD CTA

b) PR/01 from ICAO EUR/NAT: OUTCOME OF ICAO EUR/MID RADIO NAVIGATION SYMPOSIUM

c) WP/17 from the Data Link Monitoring Agency (DLMA): DATA LINK MONITORING AGENCY (DLMA) PROBLEM REPORT (PR) BRIEFING.

1.2 In follow up to the discussions at the TIG/17 meeting, the FAA coordinated with ISAVIA to:

a) research the flights identified as having possible GNSS interference that originated from the United States; and

b) analyze ADS-C data to identify possible GNSS interference observed in New York oceanic airspace (KZWY).

2. Discussion

2.1 Based on the additional information provided by ISAVIA in follow up to WP/11, there was observed to be a significant percentage (20.7%) of identified flights originating from US airports. Additional research was conducted on two of the aircraft IDs identified most frequently with possible interference impacts on ADS-C and/or ADS-B: UAL944 (12 occurrences), operating from KORD to EDDF, and AIC174 (27 occurrences) operating from KSFO to VIDP.

2.2 After consulting with various FAA experts, and given the information available, it was unable to be concluded whether interference had occurred after departure from United States airports. Rather, the consensus was that the interference had occurred on the previous inbound flight. Both aircraft had flown through suspected high interference areas during previous flights and maintained the effect after arrival and then subsequent departure.

2.3 In order to identify and assess potential GNSS interference in KZWY, ADS-C data from January 2023 to July 2024 was collected and analyzed. The analysis process identified all flights in which there were 10 or more ADS-C reports with a Figure of Merit (FOM) less than or equal to 2. The value of 2 was selected due to the fact that the Advanced Technologies & Oceanic Procedures (ATOP) ground system requires a FOM of 3 or higher to allow PBCS-enabled separation standards.

2.4 Figure 1 provides an excerpt from RTCA DO-258A, *Interoperability Requirements for ATS Applications Using ARINC 622 Data Communications (FANS 1/A Interop Standard)*, explaining the accuracy associated with each FOM value. Further consideration may be needed for which FOM values should be used to identify potential GNSS interference.

Figure of Merit Level	**Accuracy of Position Determination (within 95% Probability)**	**Reason Navigation Accuracy Value Was Chosen**
0	Complete loss of navigational capabilities	Inability to determine position within 30 nautical miles is considered total loss of navigation.
1	< 30 nautical miles	Consistent with INS on long flight without updates.
2	< 15 nautical miles	Consistent with INS on intermediate length flight without updates.
3	< 8 nautical miles	Consistent with INS on short length flight and beyond 50 nautical miles from VOR.
4	< 4 nautical miles	Consistent with VOR accuracies at 50 or less nautical miles and with GPS worldwide.
5	< 1 nautical mile	Consistent with RHO-RHO applications of ground-based DME, RNAV using multiple DME or GPS position updates.
6	< 0.25 nautical mile	Consistent with RNAV with GPS.
7	< 0.05 nautical mile	Consistent with augmented GPS accuracies.

Figure 1. Definition of ADS-C FOM values

2.5 Figure 2 shows the count of flights identified by month, demonstrating a notable increase in the second quarter of 2024. There was 1 specific aircraft filtered from the data due to FOM=0 being observed for every ADS-C report from every flight in the sample period (123 flights total). This aircraft was reported separately to the operator for corrective action.

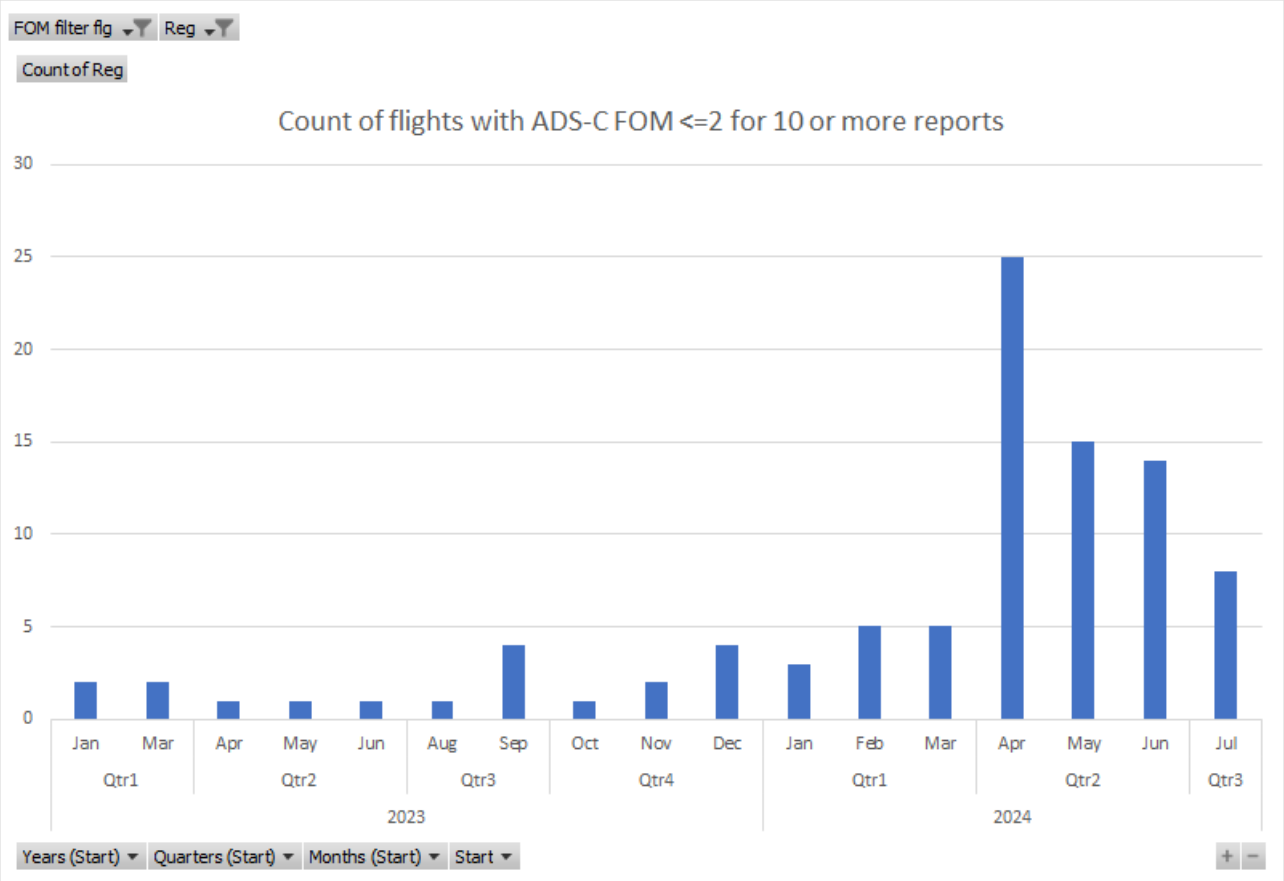

Figure 2. KZWY flights observed between January 2023 and July 2024 having 10 or more ADS-C reports with FOM less than or equal to 2

2.6 Further analysis was conducted on the 2024 data, drilling down by city pair (origin and destination) and operator/aircraft type. Table 1 shows the number of flights observed during January to July of 2024 meeting the analysis criteria (ADS-C FOM <=2 for 10 or more reports).

Table 1. Flights with potential GNSS interference by city pair and operator/aircraft type

City Pair	*ETD A35K*	*ETD A388*	*IGA A319*	*IGA B737*	*JBU A320*	*JBU A321*	*QTR A359*	*QTR A35K*	*QTR B77L*	*QTR B77W*	*UAE A388*	*UAL B772*	*XGN GLF4*	*Total*
OTHH/ KMIA								42	7	1				50
OTHH/ KJFK							3	2		4				9
OTHH/ KIAD										4				4
KJFK/ OMDB											4			4
OTHH/ KBOS							4							4
OMDB/ KJFK											3			3
OTHH/ KDFW								2						2
OMDB/ KIAD											2			2
TGPY/ KTEB													1	1
OMAA/ KORD	1													1

City Pair	ETD A35K	ETD A388	IGA A319	IGA B737	JBU A320	JBU A321	QTR A359	QTR A35K	QTR B77L	QTR B77W	UAE A388	UAL B772	XGN GLF4	Total
KJFK/ MDSD						1								1
KMCO/ EINN			1											1
OMDB/ KEWR												1		1
KOPF/ TXKF				1										1
TXKF/ KFRG													1	1
MDSD/ KEWR					1									1
OMAA/ KJFK		1												1
Grand Total	**1**	**1**	**1**	**1**	**1**	**1**	**7**	**46**	**7**	**9**	**9**	**1**	**2**	**87**

2.7 It is observed that 80% of the identified flights were associated with Qatar Airlines (QTR) flights originating in Doha, Qatar (OTHH) with destinations in the United States.

2.8 Focusing the analysis to all of the data link flights during January to July 2024 operating through KZWY and originating in OTHH, it is observed that there were 494 total flights. There were 32 American Airlines (AAL) flights with a destination of Philadelphia, and the rest were QTR flights. Figure 3 shows the comparison of total connected data links flights for each operator and the percentage with a low FOM value observed.

2.9 It is noted that the AAL flights did not have any issues, while the QTR flights had up to 45% affected by FOM issues during the 7 month analysis period. However, while the number of QTR flights originating in OTHH has nearly doubled in June and July, the percentage of flights with FOM issues has decreased.

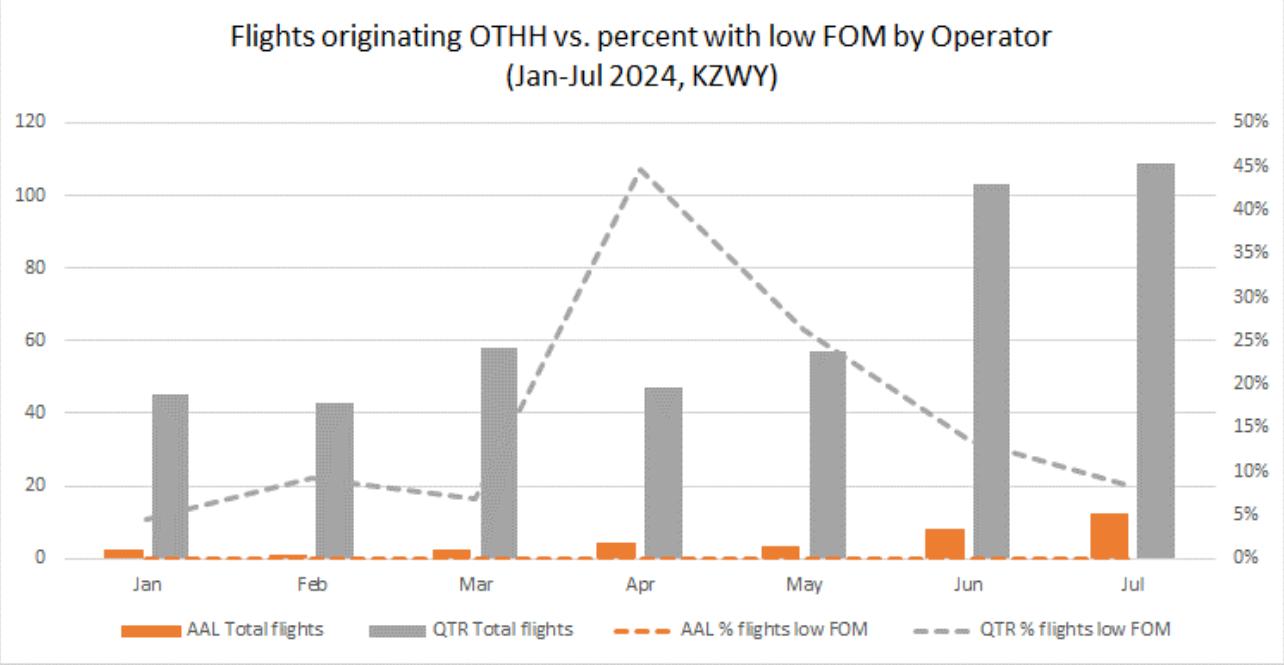

Figure 3. Further analysis of KZWY flights originating in OTHH

2.10 For next steps, further investigation is needed on the routes being used for the affected flights. In addition, discussion is needed to determine if refinements are needed for the logic used to identify flights operating in KZWY that have potentially been affected by GNSS interference. Discussion items include other types of data that can be analyzed, development of a plan for monitoring these issues, and coordinating with the appropriate parties to understand and limit the effects to the extent possible.

2.11 The FAA TIG team has also initiated coordination with other relevant stakeholders in the FAA to ensure that impacts in the oceanic airspace are being considered in the larger efforts to investigate and mitigate/resolve GNSS interference issues.

3. Action by the Meeting

3.1 The NAT TIG is invited to note the information provided.

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