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Sixteenth Meeting of the Asia/Pacific Air Traffic Flow Management and Airport Collaborative Decision-Making Steering Group (ATFM & A-CDM/SG/16)

Bangkok, Thailand, 06 – 10 April 2026

Agenda Item 4a: Review of Current ATFM Operations and Problem Areas

BOBCAT ATFM OPERATIONAL UPDATES

(Presented by Thailand)

SUMMARY

This paper presents post-operations analysis of the BOBCAT operations following the resumption of the service on 4 September 2025, with the system parameters – including aircraft spacing and flight level allocation – configured based on the current Afghanistan Contingency Arrangement. The analysis covers traffic demand and delay impact assessment, ATFM measure (CTOT) compliance, and effectiveness analysis based on achievable flight levels by BOBCAT traffic for the period of 4 September 2025 – 28 February 2026. This paper also includes a study on the compliance to potential 2- and 5-minute CTO windows. In addition, this paper also examines the impact of the political tension in the Middle East on BOBCAT traffic demand since the beginning of March 2026.

1. INTRODUCTION

1.1 The meeting is invited to recall the Bay of Bengal Cooperative ATFM (BOBCAT) operations, an international ATFM procedure to support the management of westbound nighttime traffic flow through the Afghanistan airspace (Kabul FIR), in operation since 2007. The service, provided by AEROTHAI (Thailand), was suspended in September 2021 following the cessation of en-route air traffic control service by Kabul Area Control Center (Kabul ACC).

1.2 Despite the contingency procedure still being in effect, airspace users have, over the past year, elected to route their nighttime westbound flights from South/Southeast Asia to Europe through Kabul FIR again, especially considering the efforts by Afghanistan ATS authorities to provide additional flight levels under the contingency arrangement to enhance airspace capacity.

1.3 At the SAIOSEACG/4 (March 2025) and the ATFM/SG/15 (April 2025) meetings, discussions on the reactivation of BOBCAT operations were conducted, culminating in an agreement to reactivate operations starting from 4 September 2025. Coordinated AIP publication by relevant States in July 2025 helped to ensure relevant information was made available to stakeholders in an organized and timely manner.

1.4 The BOBCAT system configuration with respect to aircraft spacing and flight level allocation through Kabul FIR is based on the current Afghanistan ATM contingency arrangement and relevant NOTAMs¹.

1.5 In keeping with the tradition of reporting BOBCAT post-operations analysis at relevant forums, Thailand has resumed conducting this analysis based on data collected by the BOBCAT system along with Traffic Sample Data (TSD) provided by relevant States. This paper provides such operational analysis for the period of 4 September 2025 – 28 February 2026.

1.6 In addition to the routine analysis, Thailand has assessed the impact of ongoing Middle East political tensions on traffic demand over Kabul FIR and the consequent impact on ATFM delays for BOBCAT flights. That information is also provided in this paper.

2. DISCUSSION

BOBCAT Traffic Demand Analysis

2.1 The meeting is invited to note the level of traffic demand based on the number of BOBCAT slot requests for the period between 4 September 2025 and 28 February 2026 as shown in **Figure 1**.

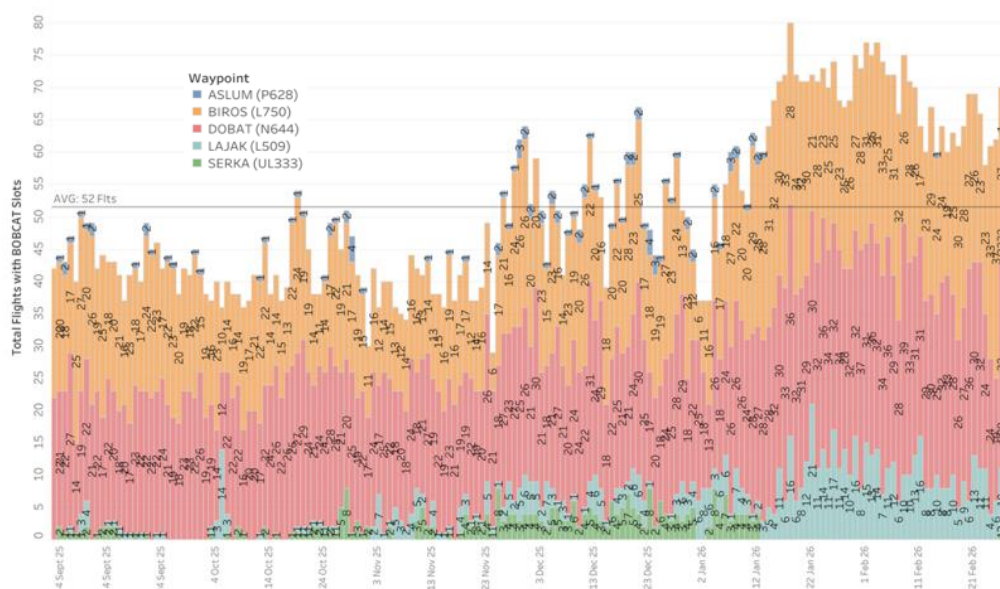


Figure 1 : BOBCAT Traffic Demand from Slot Request: 4 Sep 2025 - 28 Feb 2026

2.2 BOBCAT traffic demand during this 178-day period totalled 9,180 flights, averaging 52 flights/night. It should be noted that BOBCAT traffic demand increased significantly since late November 2025, with a peak of 80 flights/night observed on 18 January 2026. This significant increase in traffic demand was observed following the publication of the EASA Conflict Zone Information Bulletin (CZIB) on 16 January 2026 advising aircraft operators to avoid operating within Tehran FIR at all altitudes².

¹ Kabul FIR ATM Contingency Plan is accessible [here](#), and active NOTAMs for Kabul FIR is accessible [here](#).

² The EASA Conflict Zone Information Bulletins (CZIB) published on 16 January 2026 can be accessed [here](#).

2.3 Based on the daily traffic distribution categorised by entry waypoints (ASLUM, BIROS, DOBAT, LAJAK, and SERKA) as shown in **Figure 1**, the distribution of entry waypoints remained relatively consistent, with significant traffic volume utilising DOBAT (via N644) and BIROS (via L750) as their entry waypoints into Kabul FIR, linking Pakistan airspace with Turkmenistan airspace through Afghanistan airspace. It is also apparent that the use of ASLUM (via P628) and SERKA (via UL633), which would route traffic into Tehran FIR, ceased from mid-January onward, consistent with the EASA CZIB mentioned previously.

2.4 In terms of departure aerodromes contributing to BOBCAT traffic, 24 aerodromes supplied traffic during the analysis period as shown in **Figure 2**. Bangkok-Suvarnabhumi International Airport (VTBS), Singapore Changi International Airport (WSSS), Indira Gandhi International Airport (VIDP), and Taoyuan International Airport (RCTP) were the primary contributors, averaging 6 – 15 BOBCAT departures/night.

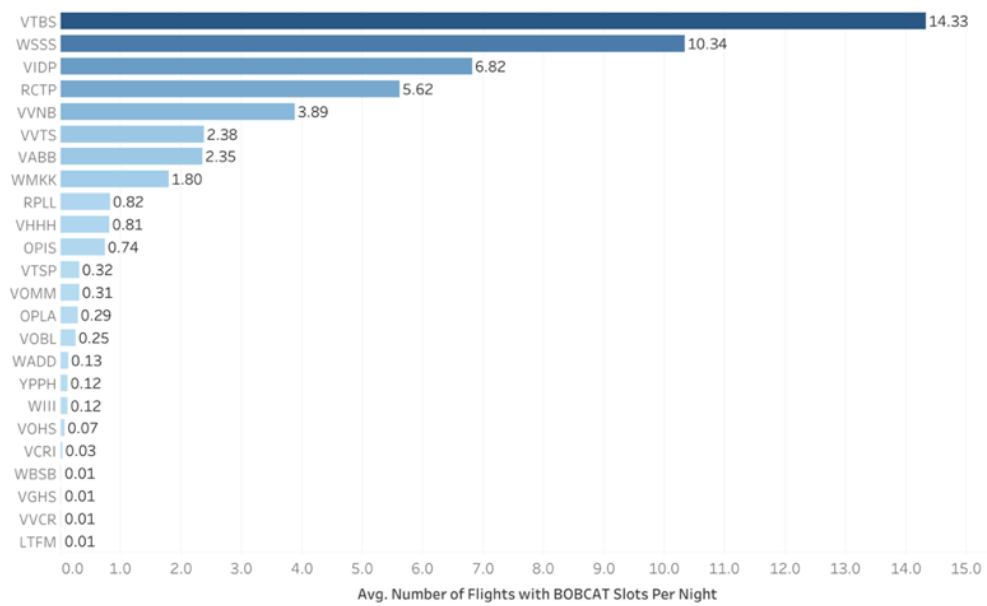


Figure 2 : Average Daily BOBCAT Slot Allocation by Departure Aerodrome: 4 Sep 2025 - 28 Feb 2026

2.5 In terms of airspace users, 29 airlines participated in BOBCAT operations between 4 September 2025 – 28 February 2026. Thai Airways (THA/TG) constituted the largest share of BOBCAT flights at 21.0% (averaging 11 flights/night), followed by Singapore Airlines (SIA/SQ) at 11.1% (averaging 6 flights/night) and Vietnam Airlines (HVN/VN) at 10.1% (averaging 6 flights/night), as illustrated in **Figure 3**.

| | | | | | |
|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------|
| THA 21.0% (11 flts/night) | DLH 9.5% (5 flts/night) | BAW 6.7% (4 flts/night) | THY 6.2% (4 flts/night) | EVA 5.3% (3 flts/night) | |
| SIA 11.1% (6 flts/night) | CAL 5.3% (3 flts/night) | SWR 4.6% (3 flts/night) | AUA 1.4% (1) | MAS 1.3% (1) | ACA 1.3% (1) |
| HVN 10.1% (6 flts/night) | KLM 4.8% (3 flts/night) | AFR 4.2% (3 flts/night) | CFG 1.3% (1) | FIN | |
| | | | AHY 1.2% (1) | VIR | |
| | | | QFA | | |

Figure 3 : BOBCAT Slot Allocation by Airlines: 4 Sep 2025 - 28 Feb 2026

ATFM Delay Analysis

2.6 ATFM delay is a figure of merit providing insight into the degree of demand-capacity imbalance. In BOBCAT operations, ATFM delay is defined as the difference between the Estimated Take-Off Time (ETOT) derived from the Estimated Off-Block Time (EOBT) provided by the airline, and the initial departure slot time (Calculated Take-Off Time: CTOT) assigned by the BOBCAT system. The meeting is invited to note the analysis of average daily ATFM delay assigned by the BOBCAT system due to Kabul FIR capacity shortfall as shown in **Figure 4**, which displays the daily average ATFM delay per flight (red line) against the number of flights (blue bars).

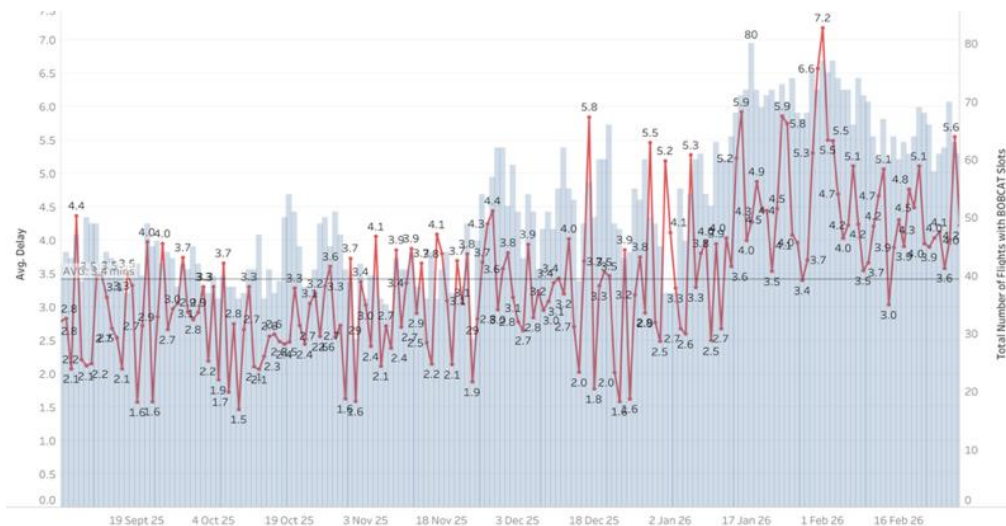


Figure 4 : Daily Average ATFM Delay: 4 Sep 2025 - 28 Feb 2026

2.7 The average ATFM delay for the period was 3.6 minutes per flight, with a total delay of 29,387 minutes over the 178-day period. Peaks in ATFM delays, such as the spike to a daily average of 7.2 minutes on 1 February 2026 and 6.6 minutes on 31 January 2026, generally correlate with specific operational constraints or demand surges. It should also be noted that ATFM delays tend to be higher when specific waypoints and flight levels are requested beyond their available capacity.

2.8 To provide further granularity, **Figure 5** illustrates the distribution of ATFM delays by entry waypoint, helping to identify whether specific routes (e.g., L509 via LAJAK or N644 via DOBAT) experience disproportionate delays compared to others. The results show variability, with SERKA (UL333) experiencing isolated spikes in average delay of up to 6.0 minutes on some days.

2.9 On high-density waypoints, BIROS (L750) shows an average ATFM delay of 3.1 minutes per night, with occasional peaks reaching 7.6 minutes per night. Similarly, DOBAT (N644) shows an average ATFM delay of 4.0 minutes per night, with occasional peaks reaching 9.2 minutes, correlating with traffic surges of up to 75 flights on 30 January 2026.

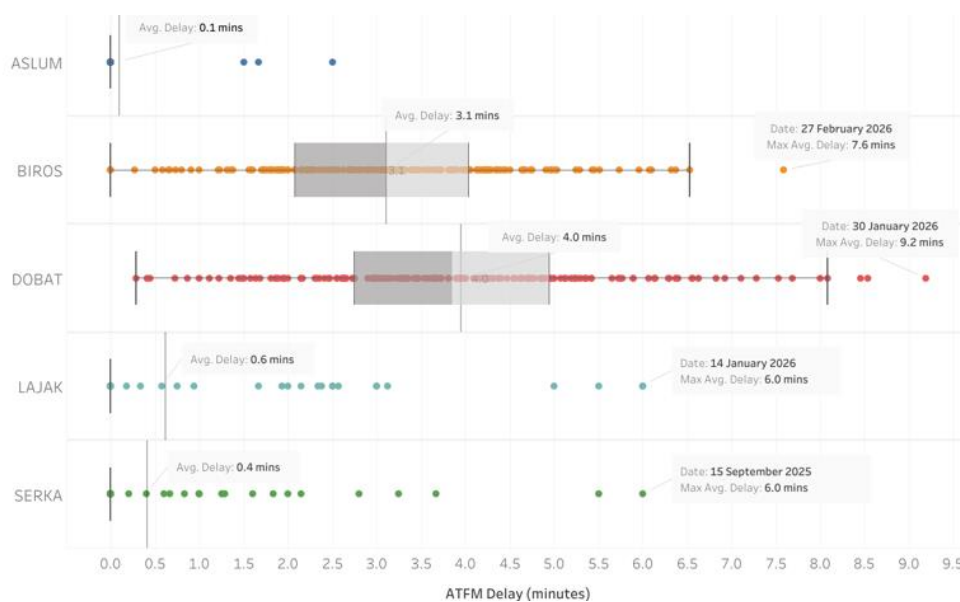


Figure 5 : Distribution of ATFM Delay by Entry Waypoints: 4 Sep 2025 - 28 Feb 2026

2.10 Assuming that ATFM delays assigned by the BOBCAT system translate to equivalent reductions in airborne delay for BOBCAT flights, operations over the 178-day period resulted in an initial estimate of **approximately 3,350 tons of fuel savings and approximately 10,586 tons of CO₂ emissions reduction.**

Addressing of ATS Movement Messages

2.11 The meeting is reminded that ATS movement messages should continue to be forwarded to the Bangkok ATFM Unit via AFTN address VTBBZDZX. Missing ATS movement messages, in particular departure messages (DEP), will impact the accuracy of post-operations analysis, and States/Administrations are requested to ensure proper transmission.

2.12 **Figure 6** shows the analysis of non-receipt of DEP messages for BOBCAT traffic during the analysis period, with the numbers on the left-hand side graph indicating the number of BOBCAT departures with missing DEP messages. While most major aerodromes showed low rates of missing

DEP messages, several aerodromes with significant BOBCAT traffic – including Islamabad International Airport (OPIS), Allama Iqbal International Airport (OPLA), Noi Bai International Airport (VVNB), and Kuala Lumpur International Airport (WMKK) – showed significant percentages of non-receipt. Missing DEP messages may result in inaccuracies in the analysis and reduced data visibility for BOBCAT flights from those departure aerodromes.

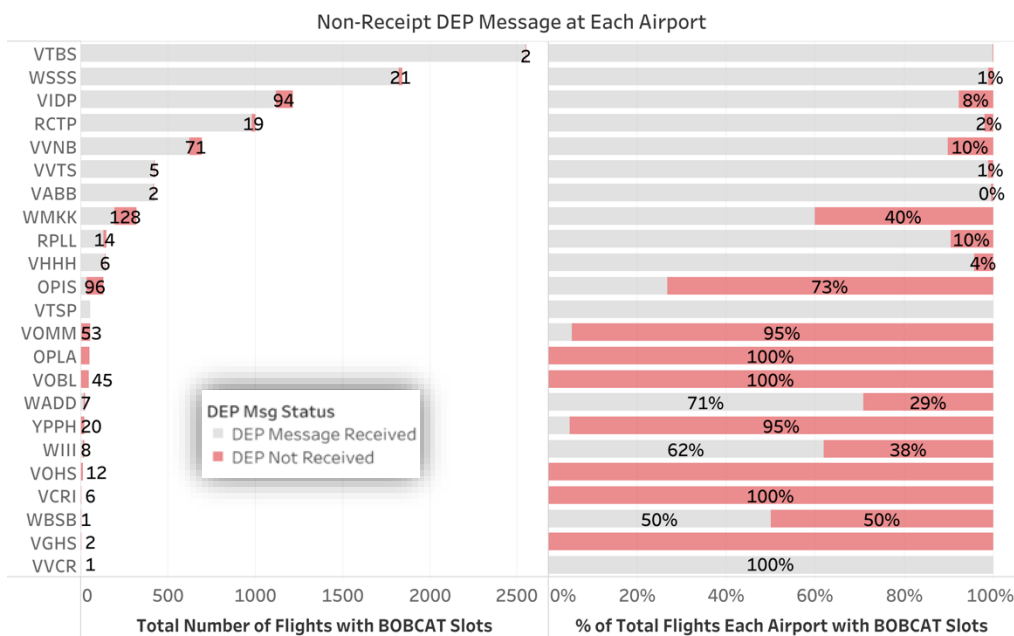


Figure 6 : Non-Receipt of DEP Messages: 4 Sep 2025 - 28 Feb 2026

CTOT Compliance Assessment

2.13 The basis of BOBCAT operations is the allocation of departure ATFM slots in the form of Calculated Take-Off Times (CTOTs) corresponding to entry slots into Kabul FIR. Successful operation hinges on high CTOT compliance being facilitated by departure aerodromes, and compliance is therefore also being monitored. Figure 7 summarizes BOBCAT CTOT compliance rates in the context of departure (DEP) messages received for major aerodromes in the Asia/Pacific region during the analysis period, showing that CTOT compliance performance varies among aerodromes and that there is room for improvement.

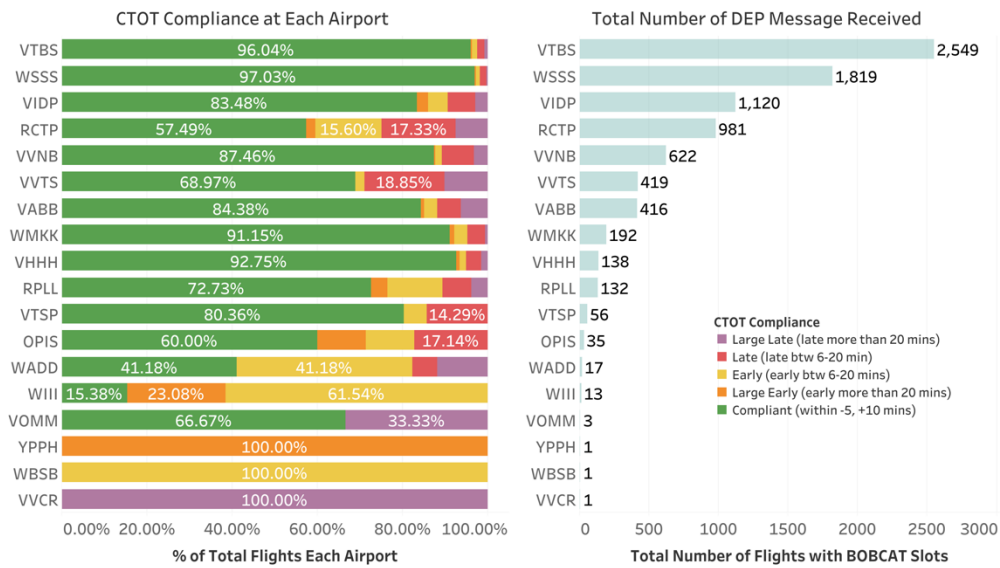


Figure 7 : BOBCAT CTOT Compliance at Major Aerodromes: 4 Sep 2025 - 28 Feb 2026

Traffic Sample Data and Post-Operational Analysis of Kabul FIR Entries

2.14 To conduct post-operations analysis focusing on actual entry times and flight levels achieved at Kabul FIR, Traffic Sample Data (TSD) were agreed to be provided by relevant States on the week starting with the third Sunday of each month. For this round of analysis, Pakistan supplied TSD for the following periods:

- 4 – 27 September 2025 (includes the first weeks of BOBCAT reactivation),
- 21 – 27 October 2025,
- 16 – 22 November 2025,
- 14 – 20 December 2025,
- 11 – 17 January 2026, and
- 15 – 21 February 2026

Flight Level and Entry Time Compliance

2.15 Based on the analysis of TSD supplied by Pakistan, a high percentage of flights were able to enter Kabul FIR at the same or higher flight levels as those assigned by the BOBCAT system. **Figure 8** illustrates a daily comparison of actual flight levels at Kabul FIR entry versus those assigned as part of BOBCAT slots during the study period, showing that approximately 92% of flights achieved the same or higher flight levels than those allocated overall.

2.16 For a more aggregated view, **Figure 9** shows a monthly comparison of the same metric, indicating that between 85% and 94% of flights were able to achieve the same or higher flight levels than those allocated upon entering Kabul FIR.

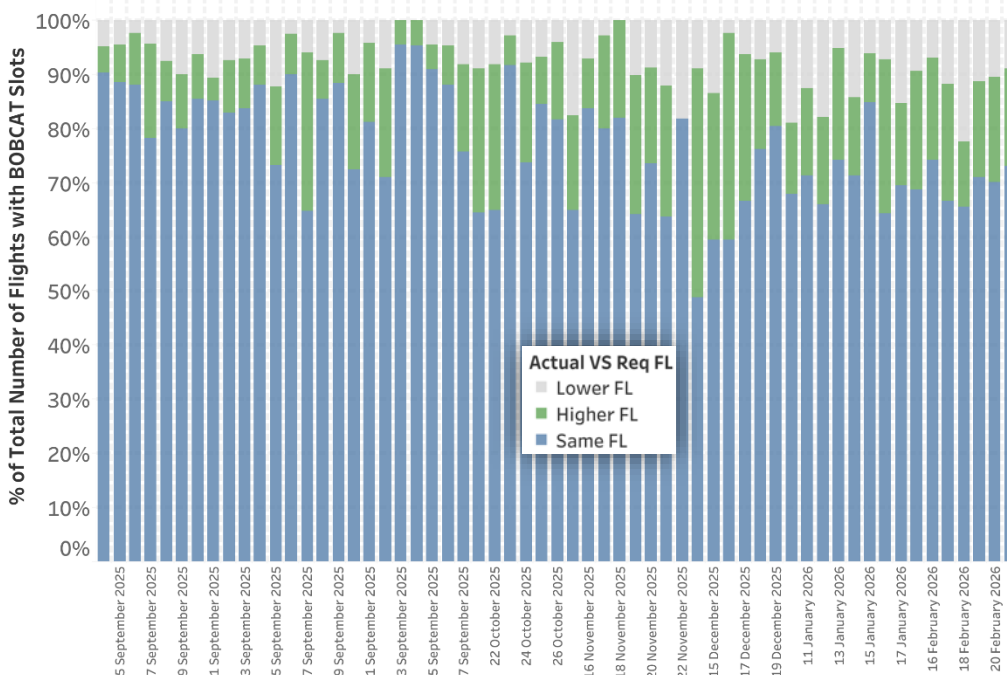


Figure 8 : Comparison of Flight Levels Achieved vs Flight Levels Allocated: 4 Sep 2025 - 21 Feb 2026

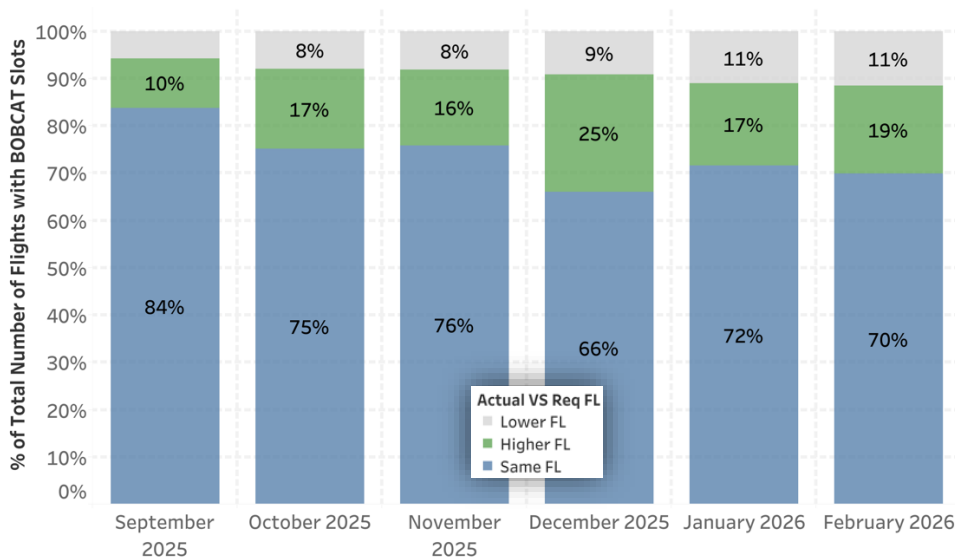


Figure 9 : Overall Monthly Flight Levels Achieved vs Flight Levels Allocated: 4 Sep 2025 - 21 Feb 2026

Causes for Lower Flight Levels at Kabul FIR Entries

2.17 During the analysis period, while 92% of flights were able to enter Kabul FIR at or above their allocated flight levels, 8% of flights (232 flights) in the TSD provided by Pakistan crossed into Kabul FIR at flight levels lower than those assigned. An analysis of the reasons why these flights were unable to achieve their allocated flight levels was conducted, with results shown in **Figure 10**.

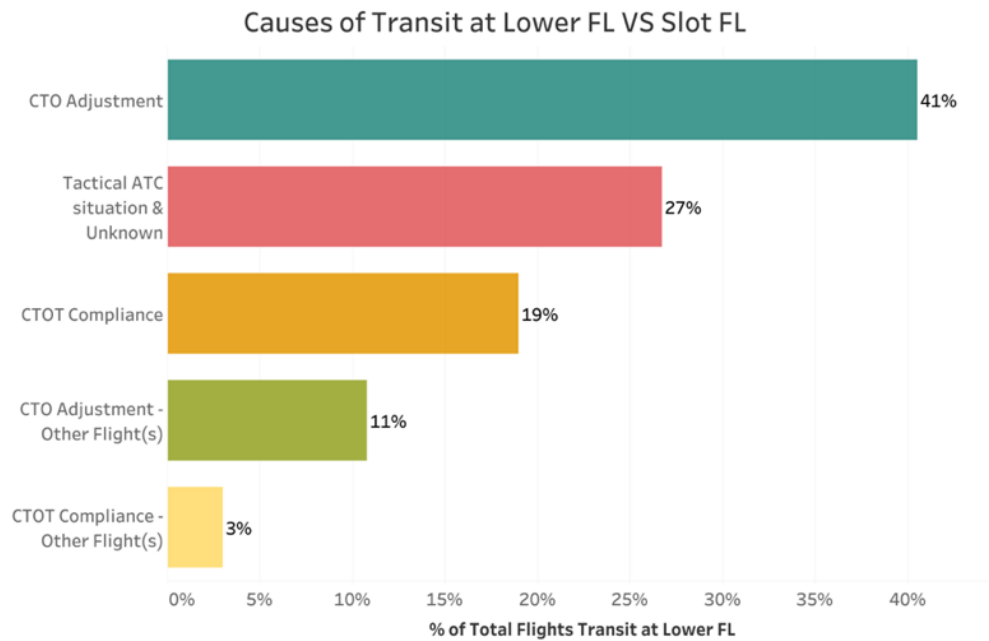


Figure 10 : Causes of Transit at Lower FL VS Slot FL: 4 Sep 2025 - 21 Feb 2026

2.18 From the chart, the leading factor contributing to flights entering Kabul FIR below their allocated flight levels was compliance with the assigned Calculated Time Over (CTO) at the entry waypoint (41%). This is marked as *CTO Adjustment*, indicating that these flights needed to adjust their flight times after departure to enter Kabul FIR at the allocated CTO. Tactical ATC intervention and other unknown operational factors constituted the next largest factor at 27%, followed by CTOT non-compliance at 19%. Additionally, some flights lost their Kabul FIR entry flight level slots due to other flights' CTO non-compliance (11%) or CTOT non-compliance (3%).

2.19 To enhance flight level achievement and regional network efficiency, stakeholders are urged to ensure that departures occur strictly within the prescribed CTOT window [-5, +10 minutes] and that entries into Kabul FIR are aligned as closely as possible with the allocated CTO. Such adherence is critical for individual flights to secure their allocated vertical profiles and to prevent systemic disruptions to other flights.

2.20 Tactical ATC intervention and other unknown operational factors should continue to be monitored to ensure operational safety while supporting airspace users in optimizing their fuel consumption when transiting Kabul FIR.

CTO Window Impact Study

2.21 A study was conducted to analyse the impact of different CTO window configurations on flight compliance using the TSD provided. **Figure 11** shows the distribution of Actual Time Over (ATO) versus Calculated Time Over (CTO) at Kabul FIR entry waypoints achieved by the flights.

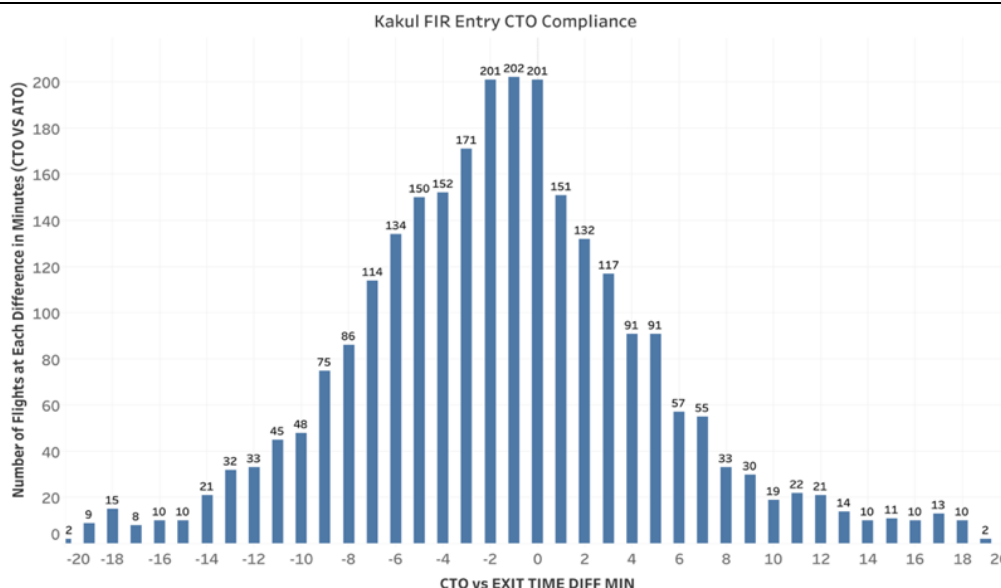


Figure 11: Distribution of ATO vs CTO: 4 Sep 2025 - 21 Feb 2026

2.22 Analysis of the distribution illustrates the number and percentage of flights that would fall within specific CTO compliance windows based on the achieved ATO at Kabul FIR entries, as summarized in **Table 1**.

| CTO Window | Flight Count | Percentage of Total Flights (1,887 flights) |
|---------------------------------------|--------------|---|
| No CTO Window (Current Configuration) | 210 | 7.69 % |
| 2-minute CTO Window (0, +2 min) | 484 | 18.52 % |
| 5-minute CTO Window (0, +5 min) | 783 | 29.95 % |

Table 1 : Flight Distribution for CTO Window Options

2.23 The table indicates that only about 8% of flights with BOBCAT slots were able to comply with no CTO window. Widening the window to 2 minutes could increase the number of compliant flights to approximately 19%, while a 5-minute window could capture approximately 30% of flights.

2.24 It should be noted that the current configuration of the BOBCAT system assumes that flights will enter Kabul FIR exactly at their allocated CTOs and therefore does not incorporate built-in extra spacing in the slot allocation algorithm, i.e., entry slots are assigned exactly as per the spacing prescribed in the Kabul FIR ATM Contingency Plan. Any discussion on widening the CTO compliance window should therefore take into consideration the impact on the BOBCAT system's spacing algorithm and consequent ATFM delays being assigned.

Summary of the Routine Post-Operations Analysis

2.25 The reactivation of BOBCAT operations since 4 September 2025 has been successful, with good support from relevant States/Administrations and airspace users. The operation has proven effective in balancing traffic demand with available airspace capacity during the peak nighttime period in Kabul FIR, with flights achieving the same or higher flight levels when transiting the airspace.

2.26 BOBCAT post-operations analysis will continue to be conducted with the support of Traffic Sample Data provided by relevant States, with results reported at relevant regional forums accordingly.

Addendum: Impact of Middle East Political Tension in March 2026

2.27 The meeting is invited to note that political tension in the Middle East region has been heightening since late 2025, with increasing regional instability observed in November – December 2025, followed by a brief closure of Tehran FIR in January 2026. Beginning on 28 February 2026 and continued into early March 2026, the political tension escalated to its highest levels, resulting in full airspace closure of up to 9 FIRs in the region. This undoubtedly impacts the availability of ATS routes for flights between South/Southeast Asia and Europe, not least nighttime westbound flights normally captured in BOBCAT operations. To assess the impact on BOBCAT flight operations, Thailand conducted an initial assessment of BOBCAT traffic demand, focusing on a comparison of demand levels and associated ATFM delays between the periods before and after the full-scale airspace closures.

2.28 It was expected that the closure of Tehran FIR starting in March 2026 would result in higher levels of traffic demand through Kabul FIR during BOBCAT operating hours. This was confirmed through a comparison of BOBCAT slot allocation between 2 – 15 February 2026 (before the airspace closure) and 2 – 15 March 2026 (after the airspace closure), particularly during the second week of each period. **Figure 12** shows approximately 6.2% increase in allocated BOBCAT slots from the February period to the March period, with an all-time high of 84 slots allocated on Sunday 15 March 2026.

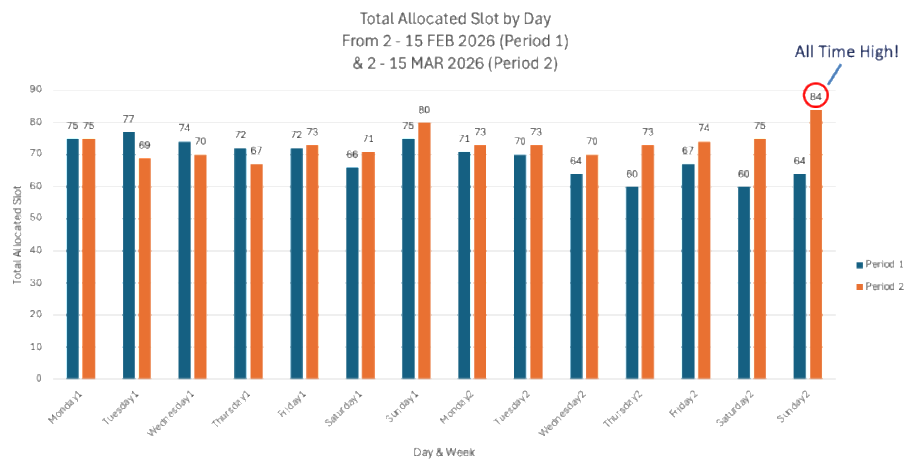


Figure 12 : Comparison of BOBCAT Slots in Feb and Mar 2026

2.29 Examining the traffic demand in greater detail, **Figure 13** shows the breakdown of allocated BOBCAT slots by requested Kabul FIR entry waypoints and flight levels. The analysis shows an increase in traffic demand via BIROS (L750) across almost all flight levels, and an increase in traffic demand via DOBAT (N644) and LAJAK (L759-M875) for the most common flight levels (FL340, FL360, FL380). The absence of traffic via ASLUM (P628) during the March analysis period is consistent with P628 routing aircraft into the closed Tehran FIR.

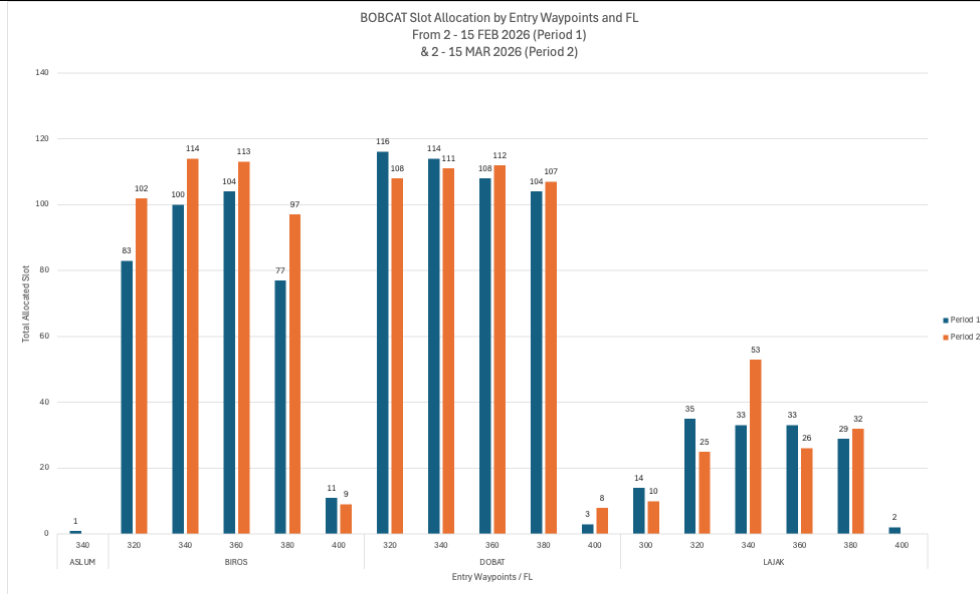


Figure 13 : Comparison of BOBCAT Slots in Feb and Mar 2026 by Waypoints & FL

2.30 Consequent to the increase in traffic demand, it was also expected that ATFM delays allocated by the BOBCAT system would increase. This was confirmed through average ATFM delay analysis for the same February and March periods, as shown in **Figure 14**, which shows a general increase in average ATFM delays experienced by BOBCAT flights during the March period (2 – 15 March 2026). Of particular note was the peak average ATFM delay on Tuesday 10 March 2026, with 7 flights receiving more than 20 minutes of ATFM delay and 1 flight receiving 45 minutes.

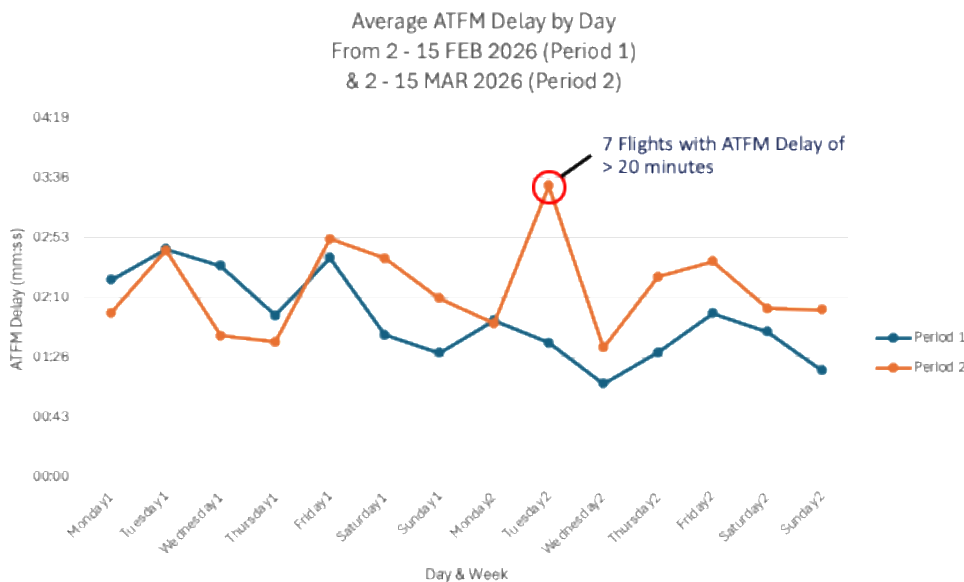


Figure 14 : Comparison of ATFM Delays in Feb and March 2026

2.31 This initial assessment confirms that heightened political tension in the Middle East has been impacting flight operations through the region. The meeting is invited to note the increasing level of traffic demand over Kabul FIR, particularly on ATS routes routing traffic around Tehran FIR (L750, N644, and L509-M875). Considering this, airspace users are recommended to also include alternate

Kabul FIR entry waypoints and flight levels, and to configure their Maximum Acceptable Delay (MAD) parameters appropriately, in their slot requests to reduce the possibility of slots not being allocated.

2.32 Meanwhile, Thailand will continue to monitor the situation in the region and its impact on BOBCAT operations. Initial assessment of AEROTHAI engineers indicate no significant server loads, with expectations that the system is technically able to support much higher number of slots. Thailand remains committed to providing the BOBCAT service to support safe and efficient flight operations, particularly given the important role Kabul FIR plays in connecting flights between South/Southeast Asia and Europe during this period of heightened tension.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) review CTOT compliance performance, particularly at aerodromes with lower percentages of compliant departures;
- c) discuss the concept of a CTO compliance window and its impact on BOBCAT spacing parameters;
- d) share issues or challenges relating to BOBCAT operations;
- e) acknowledge the impact of increasing traffic demand and associated ATFM delays over Kabul FIR consequent to the heightened Middle East political tension;
- f) invite airspace users to include alternate Kabul FIR entry waypoints and flexible MAD parameters to help reduce the impact of increased traffic demand; and
- g) discuss any other relevant matters as appropriate.