

पोस्ट ऑपरेशन विश्लेषण रिपोर्ट

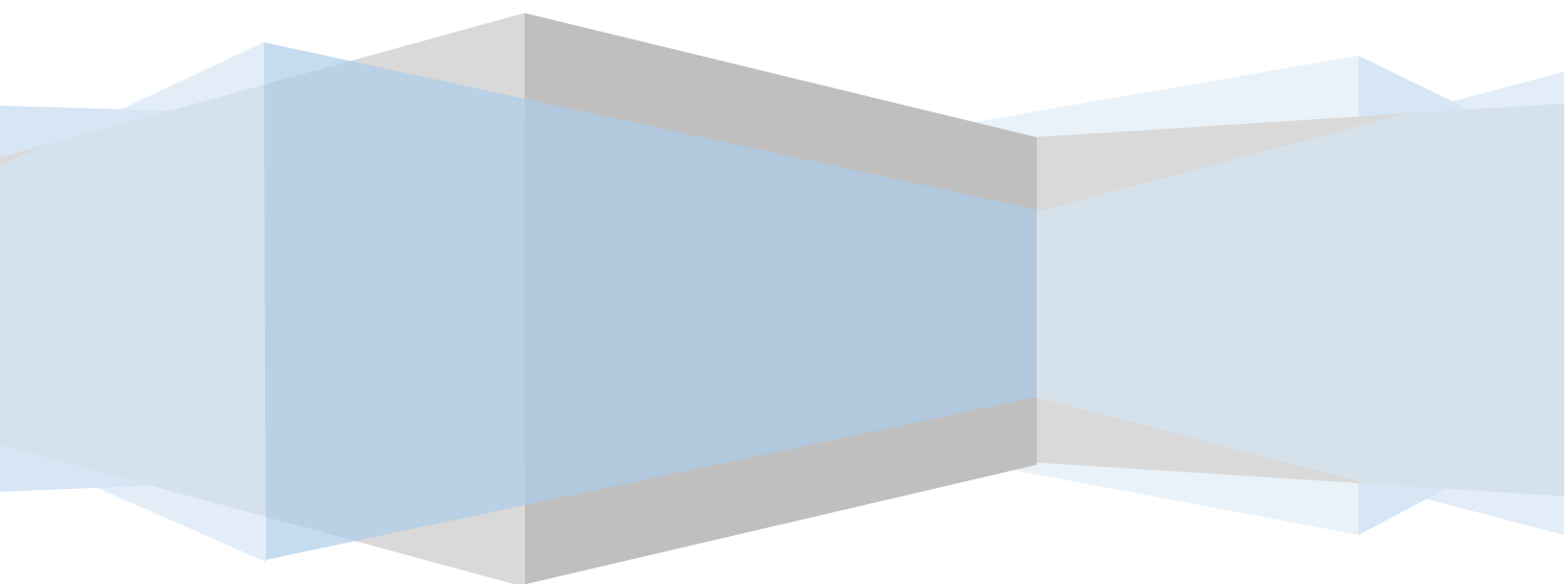
अगस्त, 2025

सेंट्रल कमांड सेंटर, सी ए टी एफ एम, दिल्ली

POST OPERATIONS ANALYSIS REPORT

August, 2025

CENTRAL COMMAND CENTER, C-ATFM, DELHI





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A. कार्यकारी सारांश/Executive Summary

Average Domestic air traffic (31 days) has recorded an increase of 0.6% whereas the average international air traffic has increased by 0.35 % in the month of August 2025 as compared to July '25.

On average, the Indian Airports in the ATFCM area saw 4567 IFR flights per day in the month of August 2025. The peak days were on 08th August 2025 (4758 IFR flights). Thursday's were the busiest days throughout this month with an average of 4633 IFR flights per day.

Total Twenty Two (22) ATFM measures were applied this month during periods of congestion at Chennai and Mumbai Airport.

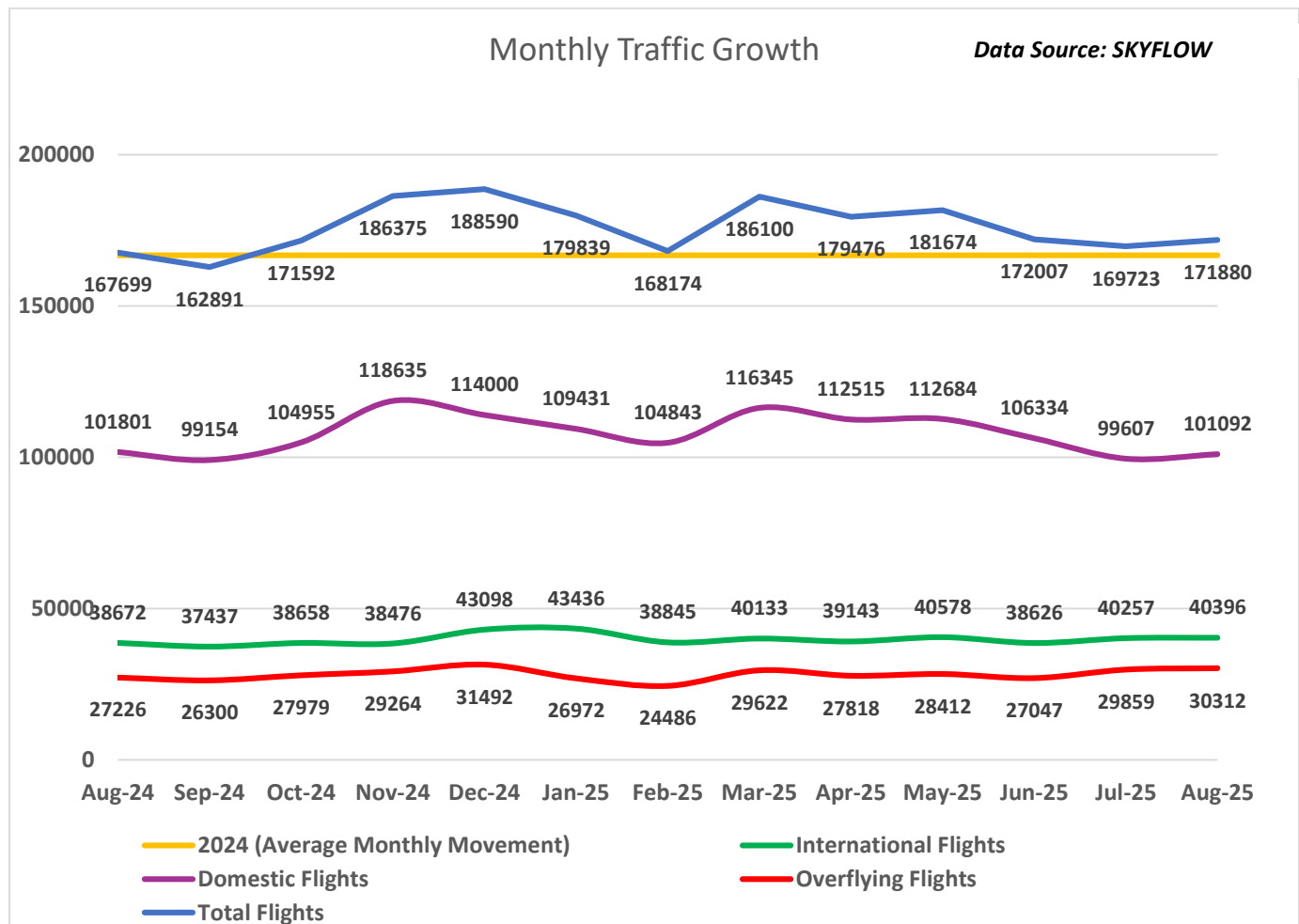


Figure 1: Monthly Traffic Growth

The graph above depicts the Domestic, International and Overflying Air traffic in Indian ATFCM Area during the last 13 months (Aug'24 to Aug'25).

B. यातायात विश्लेषण/Traffic Analysis

I. भारत के प्रमुख हवाई अड्डों पर हवाई यातायात गतिविधि /Air Traffic Movement at Major Airports in India

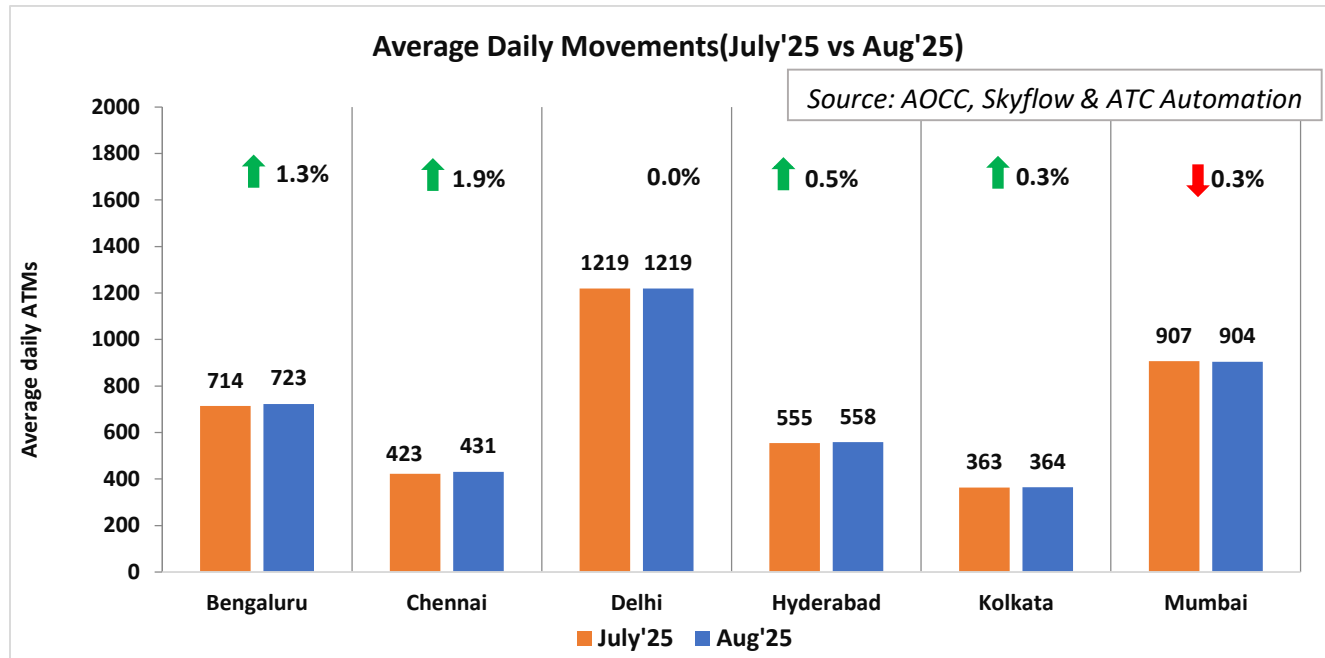


Figure 2: Average Daily Movements (July'25 vs Aug'25)

The above chart depicts the percentage change in average daily ATMs at six major Airports in August 2025 as compared to the previous month July 2025.

Airports\Year	Avg. Daily ATMs (YoY) for six major airports				
	Aug'21	Aug'22	Aug'23	Aug'24	Aug'25
Bengaluru	389	548	634	716	723
Chennai	230	349	397	416	431
Delhi	863	1179	1253	1328	1219
Hyderabad	314	415	461	531	558
Kolkata	249	361	382	399	364
Mumbai	474	769	919	939	904



Air Traffic Movement for each day in August 2025 is plotted for Delhi, Mumbai, Bengaluru and Hyderabad Airport along with the percentage change w.r.t. Avg. Daily Movements for the same month.

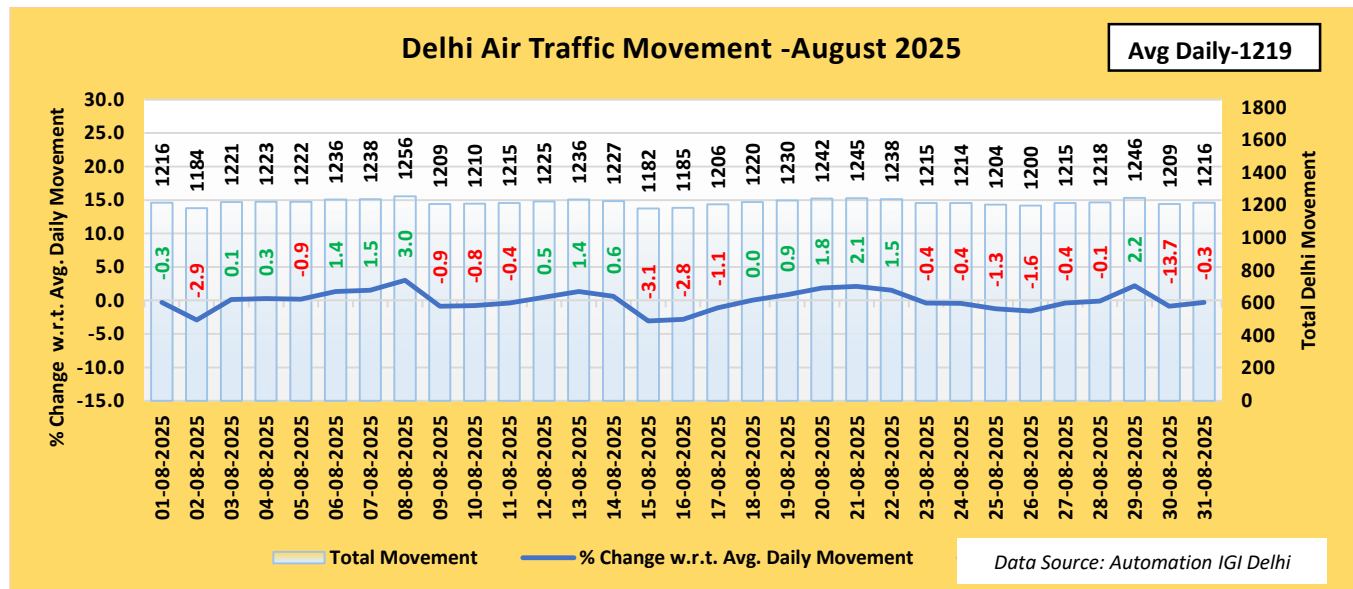


Figure 3: Air Traffic Movement for Delhi –Aug'25

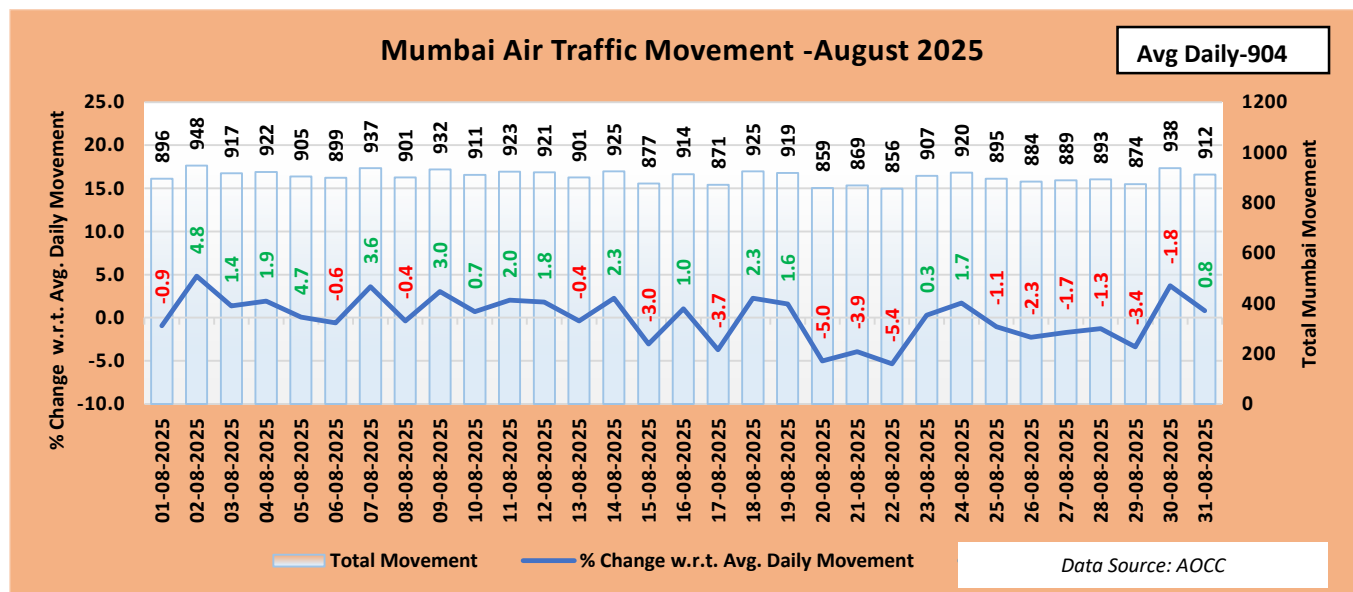


Figure 4: Air Traffic Movement for Mumbai – Aug'25

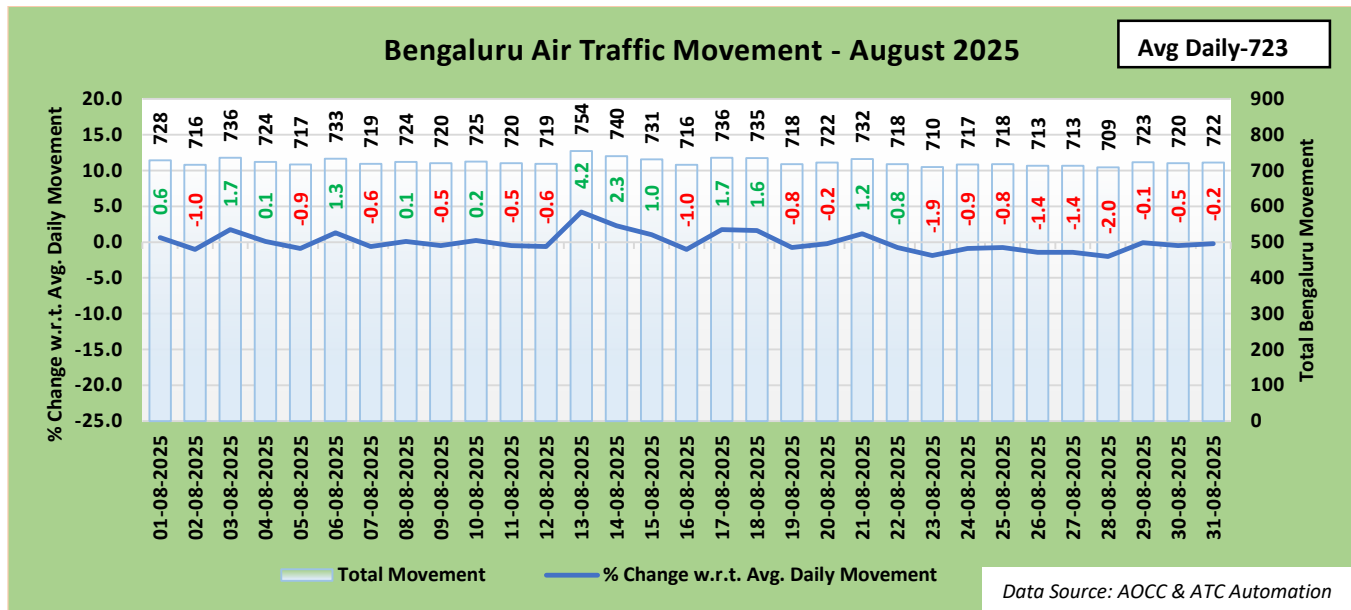


Figure 5: Air Traffic Movement for Bengaluru – Aug'25

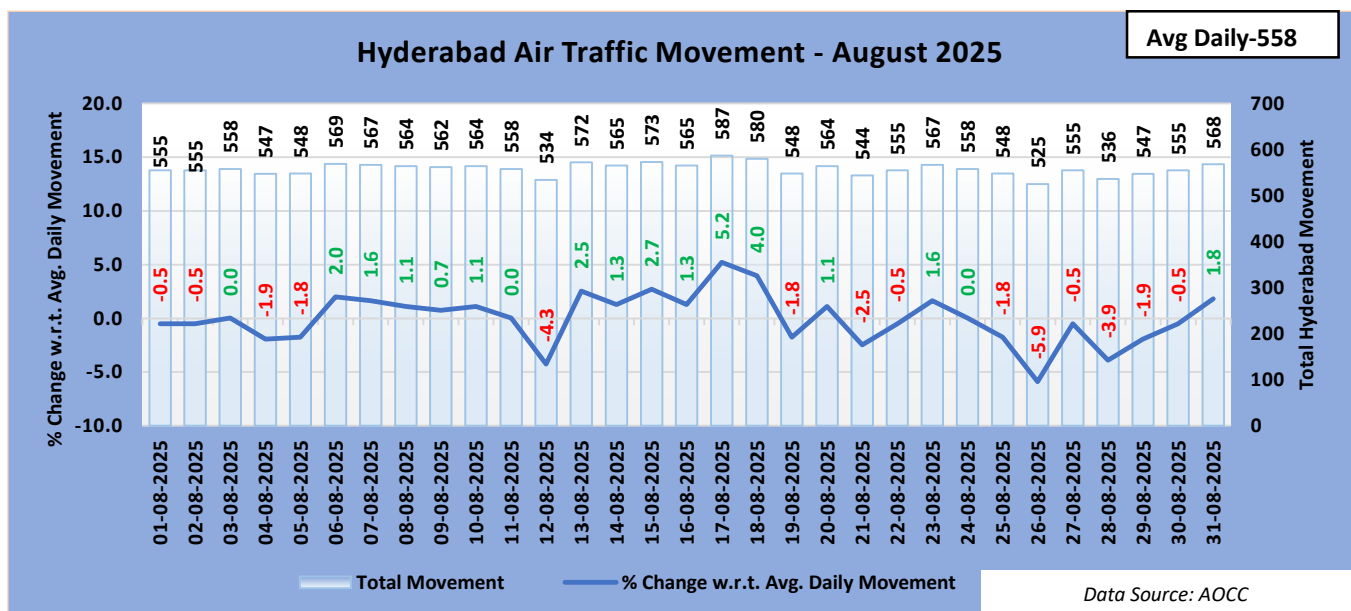


Figure 6: Air Traffic Movement for Hyderabad – Aug'25

It can be concluded from the above charts that the ATM at Delhi, Mumbai, Bengaluru and Hyderabad exceeds the average daily movement for 15 days, 16 days, 12 days and 17 days respectively in the month of August 2025.

II. एटीएम की वार्षिक व मासिक तुलना/Comparison of total ATMs (YoY) and Monthwise

The total Air traffic movement(ATMs) including Passenger and other flights such as Cargo flights, International scheduled, International non-scheduled, Domestic scheduled, Domestic non-scheduled, Air taxi & commercial business flights at six major Indian Airports namely Delhi, Mumbai, Bengaluru, Hyderabad, Kolkata and Chennai is plotted for the month of August for two consecutive years 2024 and 2025 respectively. Air Traffic movement is also plotted Airline wise for the last six months for the major Scheduled Operators.

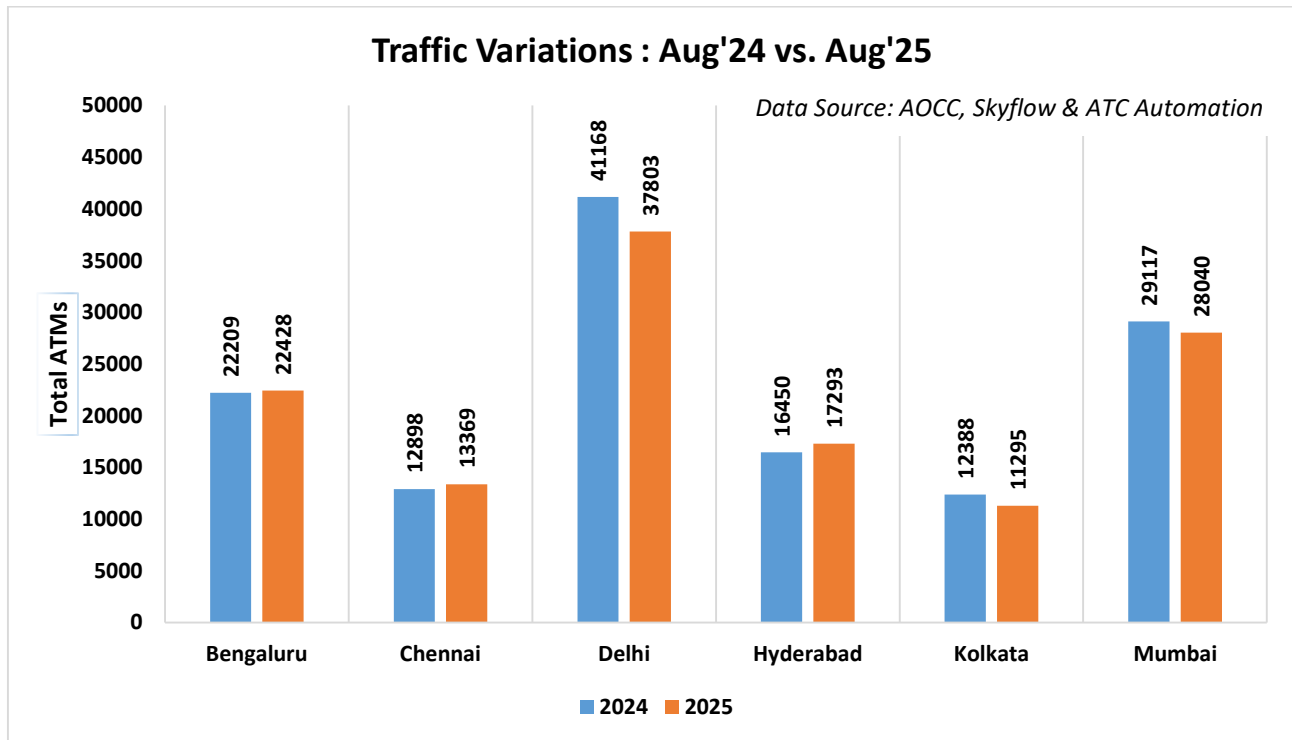


Figure 7: Traffic Variation (YoY)

III. उड़ान संचालन - एयरलाइन अनुसार /Flight Operations – Airlinewise

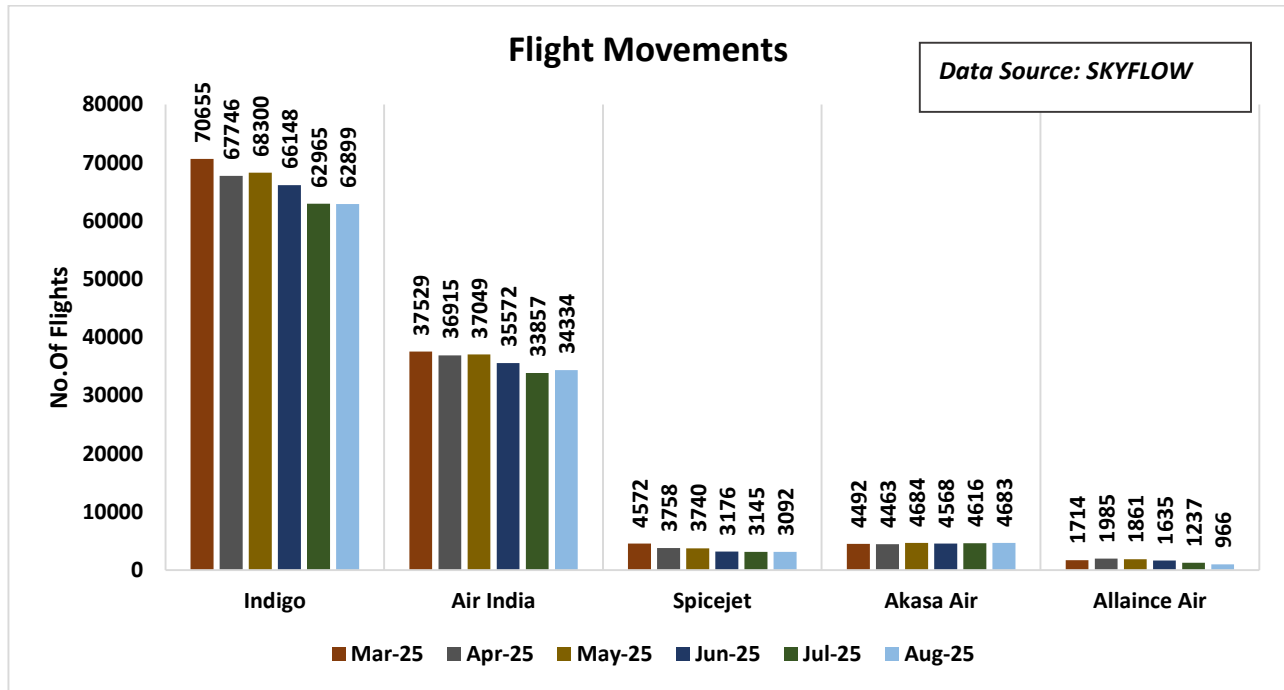


Figure 8: Flight Movements –Airlinewise

Inference:

1. Air India and Akasa Air airlines have recorded an increase whereas Indigo, Spicejet and Alliance Air have recorded a decrease in the monthly average(31 days) Flight movement in Aug'25 as compared to July'25.

C. सी.एटीएफएम पोस्ट ऑपरेशन - सीडीएम विश्लेषण

ATFM Post Operations – CDM Analysis

I. परिचय/Introduction

Analysis Period 1st – 31st August 25

Back Ground During the above mentioned period, **Nine (09)** ATFM measures were applied for **Chennai Airport**, **Thirteen (13)** ATFM measures were applied for **Mumbai Airport** due to the following reasons as illustrated in the bar chart below:–

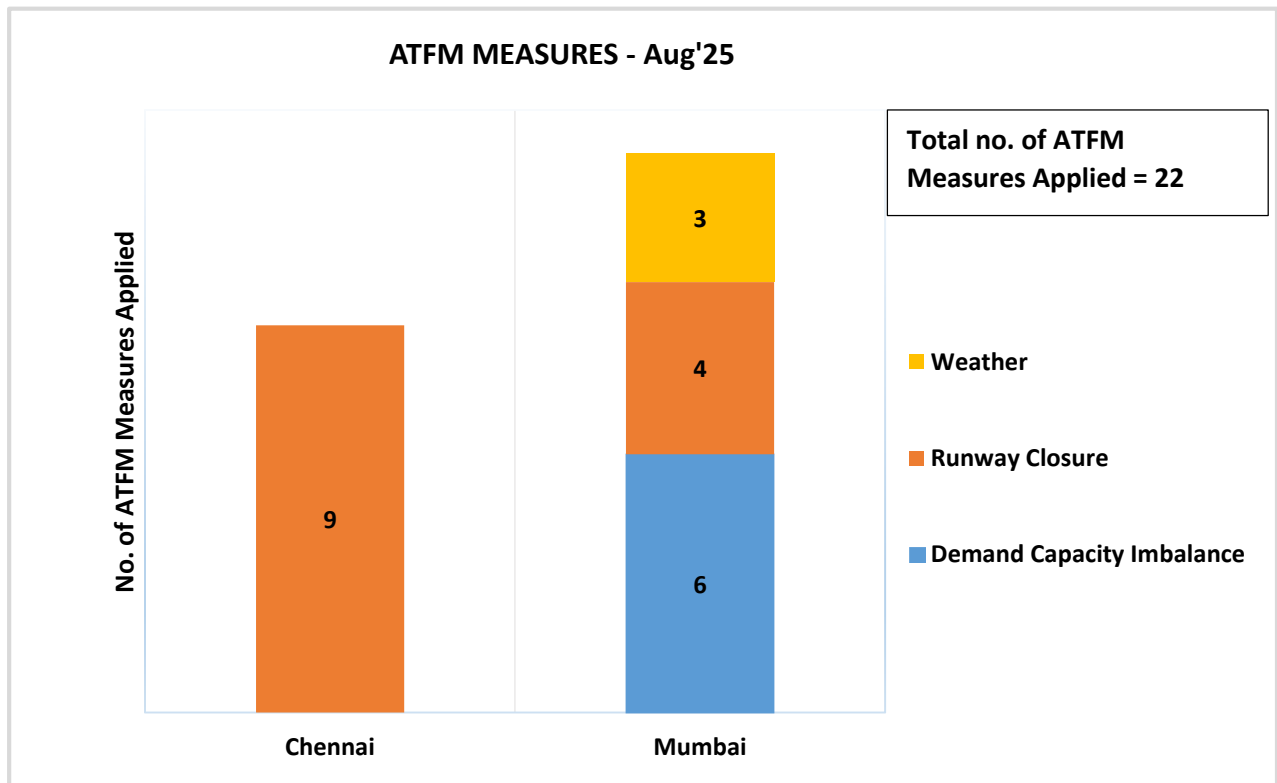


Figure 9: ATFM Measures –Aug'25

II. एटीएफएम मेजर्स का अवलोकन/ATFM Measures Overview

Constrained Airport	Chennai	Mumbai
Number of ATFM measures applied	9	13
Average ATFM Ground delay(in min) due to measures*	29.3	29.7
Maximum ATFM Ground delay(in min) due to measures	50	85
% Compliance	97.4	99.0

Note: * *Average ATFM Delay* = $\frac{\text{Total ATFM Delay}}{\text{Total Domestic Arrivals}}$

Total Arrivals	1036
Total International Arrivals(exempted)	269
Total affected flights in scenario (Domestic Arrivals)	767
Total Domestic Arrivals with zero ATFM delay	35
Total Domestic Arrivals with ATFM delay	732

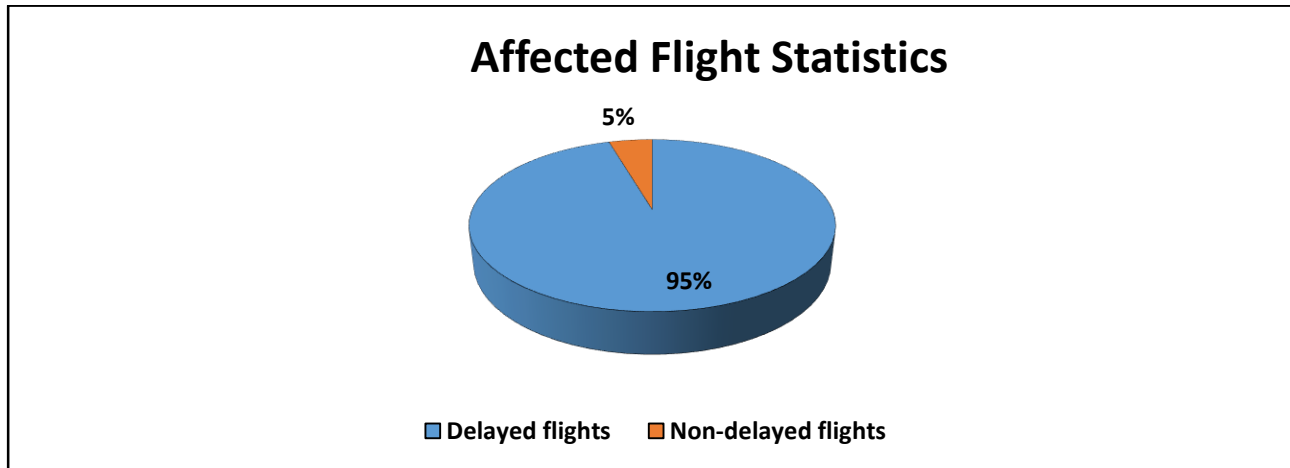


Figure 10: Affected Flight Statistics –Aug'25

III. समग्र अनुपालन/Overall Compliance

Total arrivals	1036
Domestic arrivals	767
Flights with complete data (ATOT)	747
Flights with incomplete data	7
Flights Not Operated	13
Compliant*	737
Non-Compliant	10

*Total No. of Revised CTOTs issued = 240 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)

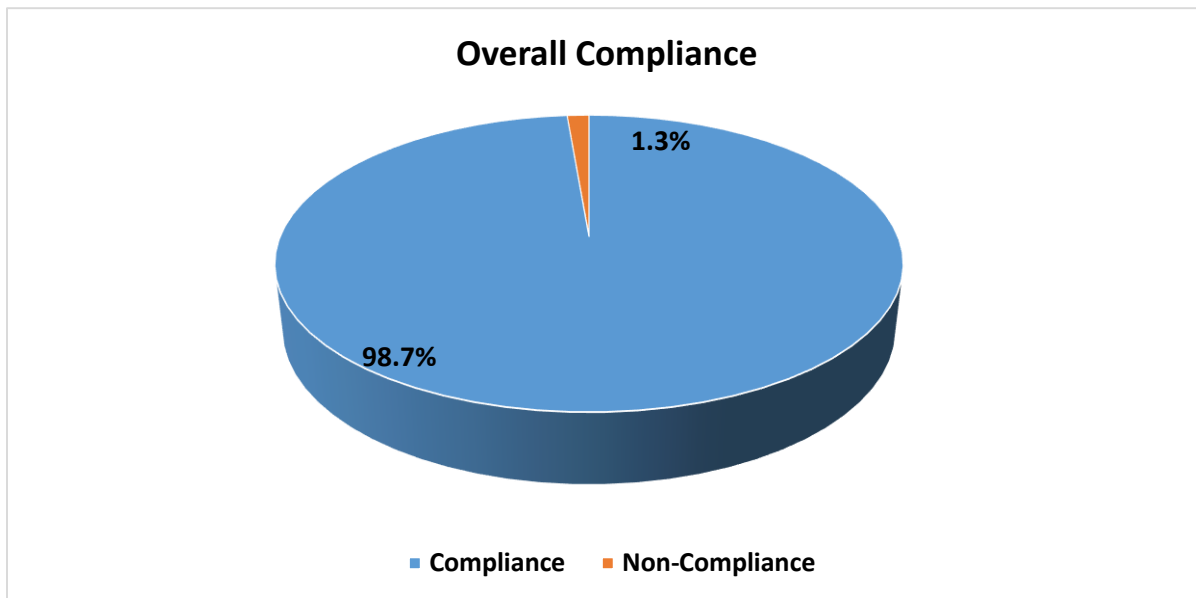


Figure 11: Overall Compliance – Aug'25

NOTE: Flights with required data (i.e. ATOT) are only considered for compliance measurement

Out of the total domestic arrivals with complete data in the CDM scenario, 98.7% arrivals are compliant for the month of August 2025.

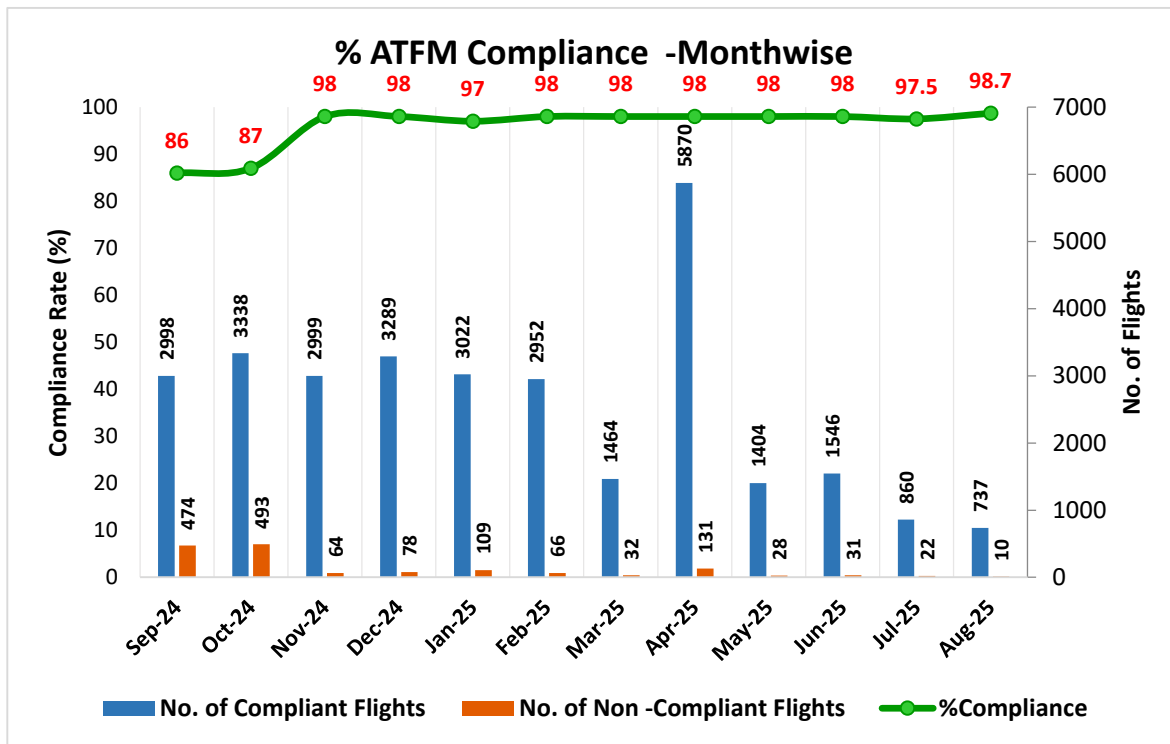


Figure 12: Compliance(Monthwise)

Inference

1. Out of the total arrivals captured(1036 flights) during the CDM scenario for the constrained Airports, 74.0% of flights i.e. domestic arrivals(767 flights) were candidates for ground delay(participating).
2. Out of these Domestic Arrivals(767), 95.4% (732 flights) are assigned ATFM ground delay.
3. Out of the total arrivals captured(1036 flights) to the constrained Airport during the ATFM scenario, 70.7% of flights(732 flights) were assigned ATFM Ground Delay.



IV. सीटीओटी अनुपालन दर –एयरपोर्टवाइज/CTOT Compliance rate – Airportwise

MUMBAI FIR (98%)*	Compliant	Non Compliant	% Compliant
Ahmedabad	34	0	100%
Aurangabad	1	0	100%
Mumbai	20	0	100%
Vadodara	1	0	100%
Bhopal	11	0	100%
Diu	3	0	100%
Hirasar, rajkot	5	0	100%
Indore	8	0	100%
Jabalpur	4	0	100%
Jalgaon	3	0	100%
Jamnagar	7	0	100%
Kandla	4	0	100%
Kolhapur	1	0	100%
Nagpur	11	1	92%
Pune	1	1	50%
Surat	1	0	100%
Udaipur	8	0	100%
KOLKATA FIR (100%)*	Compliant	Non Compliant	% Compliant
Prayagraj	1	0	100%
Ayodhya	3	0	100%
Siliguri	16	0	100%
Varanasi	17	0	100%
Bhubaneswar	13	0	100%
Kolkata	33	0	100%
Chakeri	1	0	100%
Darbhangha	2	0	100%
Deoghar	2	0	100%
Gorakhpur	3	0	100%
Guwahati	13	0	100%
Jharsuguda	2	0	100%
Patna	7	0	100%



Ranchi	3	0	100%
Raipur	8	0	100%
DELHI FIR (98%)*	Compliant	Non Compliant	% Compliant
Amritsar	6	0	100%
Adampur	2	0	100%
Bareilly	1	0	100%
Chandigarh	11	0	100%
Dehradun	2	0	100%
Delhi	106	2	98%
Hindon	1	1	50%
Gwalior	2	0	100%
Jodhpur	2	0	100%
Jaipur	22	0	100%
Leh	1	1	50%
Lucknow	14	0	100%
Srinagar	7	0	100%
CHENNAI FIR (99%)*	Compliant	Non Compliant	% Compliant
Hal Bangalore	2	0	100%
Bangalore	68	2	97%
Vijayawada	14	0	100%
Coimbatore	19	0	100%
Kochi	27	1	96%
MOPA Goa	15	0	100%
Goa	38	0	100%
Hubli	1	0	100%
Shamsabad, Hyderabad	41	1	98%
Begumpet Hyderabad	1	0	100%
Kannur	4	0	100%
Madurai	18	0	100%
Mangalore	5	0	100%
Chennai	25	0	100%
Port Blair	9	0	100%
Rajahmundry	2	0	100%
Shivamogga	1	0	100%
Tuticorin	11	0	100%
Tiruchirappally	4	0	100%



Thiruvananthapuram	8	0	100%
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**FIR wise compliance rate (decimals rounded off to nearest integer value).*

Note: The above list contains only those airports which had flights to the Constrained Airport and are affected by ATFM measures.

Airports with % compliance less than the average compliance(98.7%) for the month are highlighted in red.

V. सीटीओटी अनुपालन दर- एयरलाइनवाइज़/CTOT Compliance rate – Airlinewise

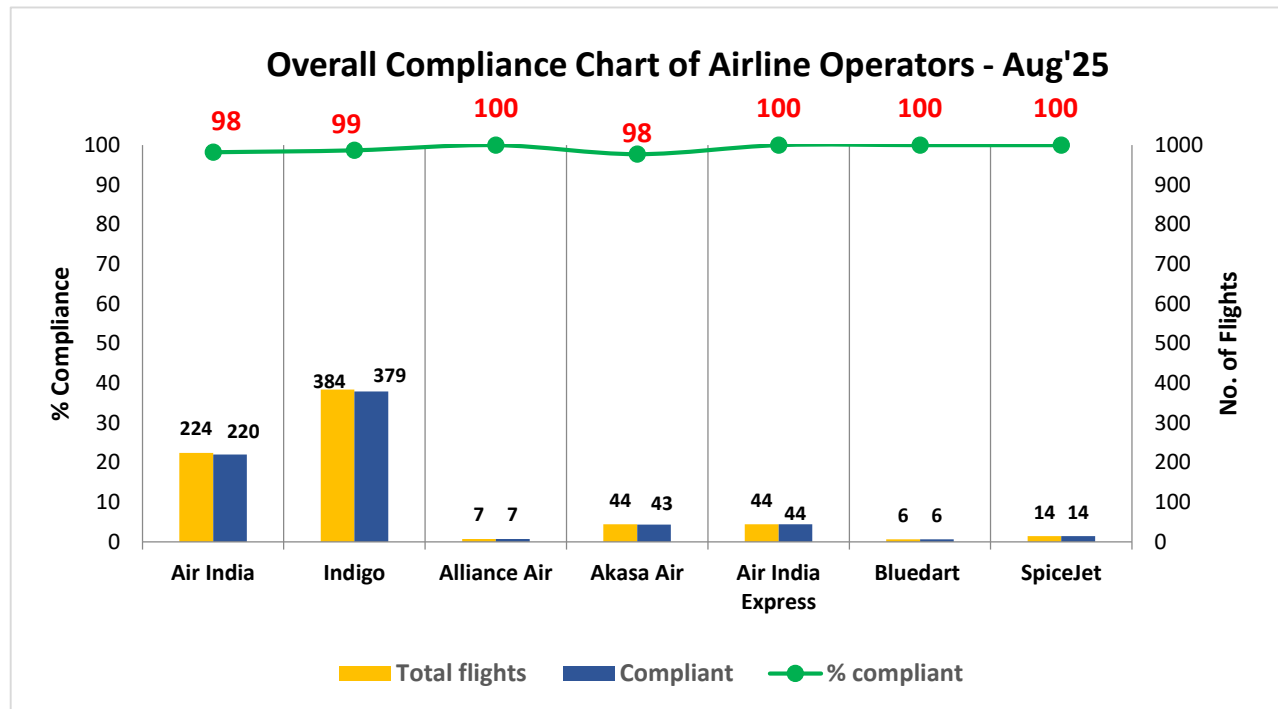


Figure 13: Airline wise Compliance –Aug'25

Inference

1. Kolkata region record the highest compliance of 100% whereas Delhi and Mumbai region has the lowest percentage compliance of 98%.
2. Indigo, Alliance Air, Air India Express, Spicejet and Blue Dart have a CTOT compliance higher than or equal to the average recorded compliance for the month of August'25.

VI. गैर-अनुपालन का कारण/Reason For Non Compliance

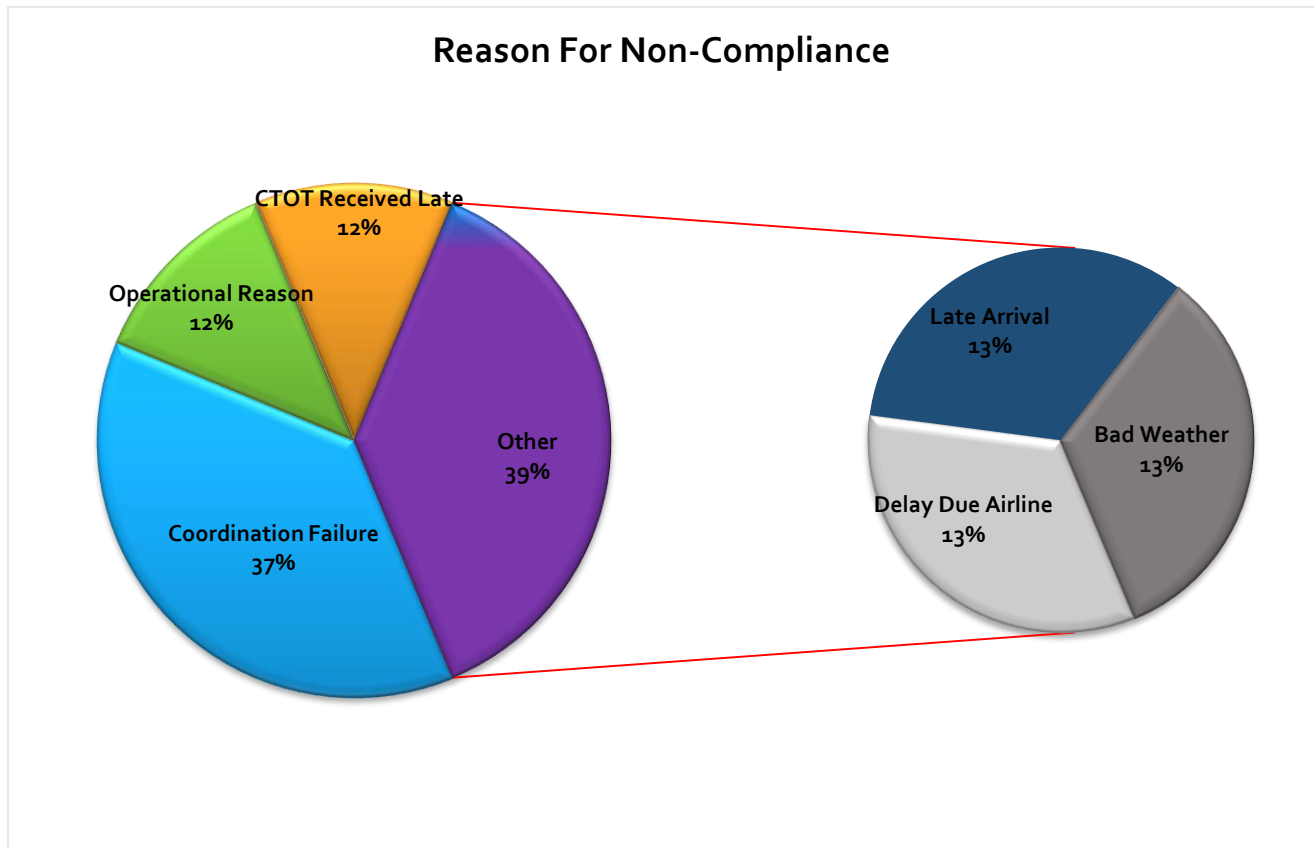


Figure 14: Reason for Non-Compliance as provided by FMPs

Inference:

1. 37 % of CTOT Non- Compliance was reported by concerned FMPs to be due to coordination failure between FMP and Station.
2. 12 % of the CTOT Non- compliance was due to operational reasons (due to Bird Activity on Runway, ATC handling emergency etc) and 12% due to late receipt of CTOTs and by the time the aircraft had already initiated pushed back or start up .
3. 13% each of the CTOT Non- compliance was due to late arrival from previous station.
4. 13 % of the CTOT Non- compliance was reported by concerned FMPs to be due airline delay & 13% of the CTOT Non- compliance due Bad Weather at the concerned stations.

VII.सीडीएम परिदृश्य अवधि के दौरान वायु विलंब/Air Delay during the CDM Scenario period

Average Air Delay to domestic arrivals* within the CDM Scenario period for Chennai and Mumbai was 11.5 and 15.8 minutes respectively.

**Note: Only calculated for domestic arrivals with both ATOT and ALDT information*

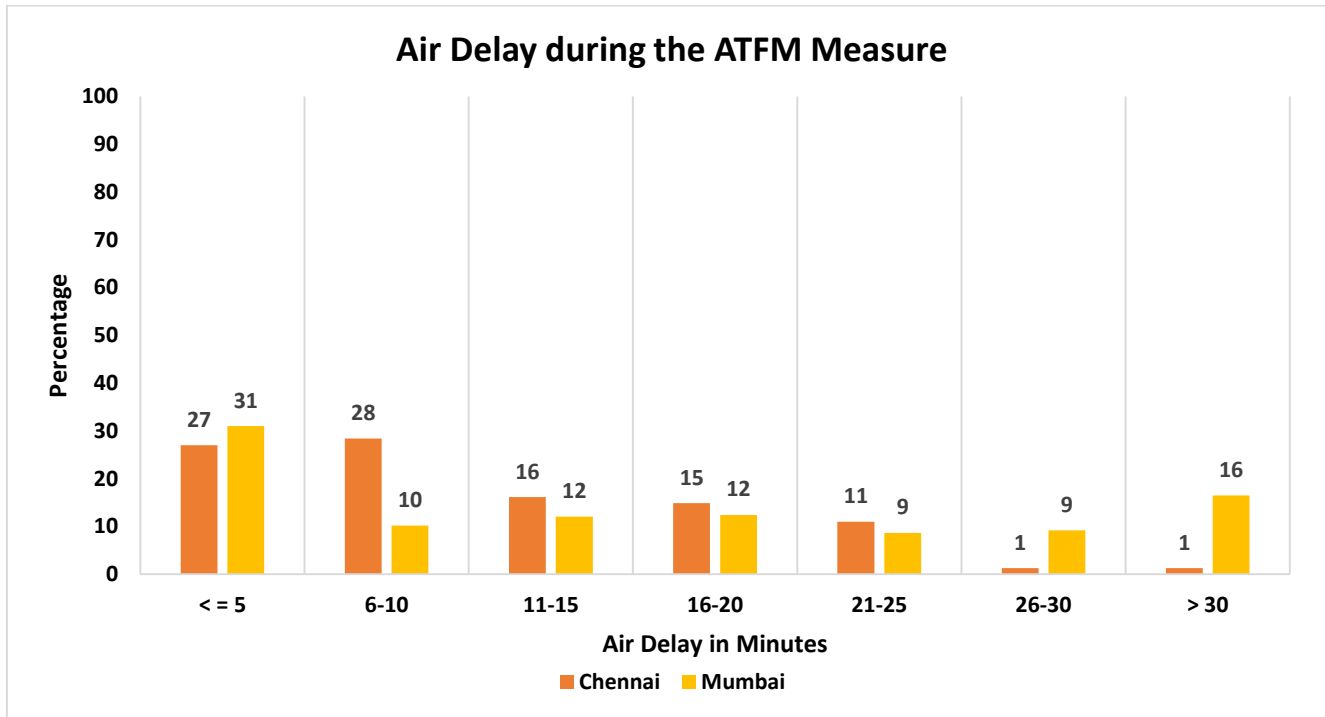


Figure 15: Air Delay distribution during the CDM period

Inference

1. 55% of domestic arriving flights to Chennai had an Air delay of equal to or less than 10 minutes during the CDM period.
2. 41% of domestic arriving flights to Mumbai had an Air delay of equal to or less than 10 minutes during the CDM period.

VIII. एटीएफएम उपायों के कारण मूर्त लाभ/Tangible Benefits due to ATFM Measures

A modest attempt is made to find out the tangible benefit of ATFM measures applied.

Assumptions:

- When ATFM measures are not in force, all flights take off at their ETOT where Estimated take off time(ETOT)= Estimated off block time(EOBT) + default taxi time
- All flights have an Estimated elapsed time(EET) as calculated by SKYFLOW using the Flight Plan information and Basic Aircraft data.

Methodology:

Air delay (with ATFM measures in force) is calculated during the period when ATFM measures are in force by summing the air delay for all the flights landing at constrained Airport.

i.e. **Total Air Delay = \sum (Actual Flying time – SKYFLOW calculated EET)**

Air delay (with no ATFM measures) is calculated as the sum of Air delay for all the flights during the above said period with no ATFM measures in place and the air delay for each flight is the difference in its ideal landing time and its ideal estimated landing time.

Total Air Delay (with no ATFM measures) = \sum (Ideal LDT - Ideal ELDT)

*Ideal LDT is taken by assuming every flight is landing at a specified interval based on the Arrival acceptance rate(AAR) defined,

*Ideal ELDT = ETOT + SKYFLOW calculated Flying time

Fuel Saving Calculation :

Great Circle Distance(GCD)* was calculated for all the arrivals during the ATFM Measure from the point of origin to destination. Assuming Airbus 320 as reference aircraft for flights (flight distance equal to or less than 3000 nm) and B777 for international flights (flight distance more than 3000nm):

Fuel consumption (Kgs / nm) for each affected flight in the scenario was then calculated using the Reference document: ICAO Carbon emissions calculator methodology, version10, Appendix C: ICAO Fuel Consumption Table.

The Fuel consumed per minute(Kg/min) was calculated for each affected flight.



Total Air Delay(with ATFM Measures)= 13563 mins

Total Air Delay (with no ATFM measures) = 21879 mins

Reduction in Air delay due to ATFM measures= (21879-13563) = **8316 mins**

Fuel Saving Calculation:

Total Fuel saved during the ATFM Measure: **4,24,358.12 Kg**

Total reduction in CO₂ emission : 3.16(KgCO₂/kg fuel)* 4,24,358.12 Kg = 13,40,971.65 Kg

**GCD (Great Circle Distance): The distance between origin and destination airports is derived from latitude and longitude coordinates originally obtained from ICAO Location Indicators database.*

3.16 = constant representing the number of tonnes of CO₂ produced by burning a tonne of aviation fuel.

D. शब्दकोश/Glossary

ATFM Parameters	Definition
<i>Affected Flight statistics</i>	An insight of participating traffic in the scenario i.e. ratio of the domestic arrivals to the constrained airport affected by ATFM measures (assigned delay by the Ground Delay Program) to the domestic arrivals not affected by ATFM measures (not assigned any delay) within the CDM scenario.
ATFM Ground delay	ATFM ground delay defined as CTOT-ETOT (Calculated take off time – Estimated take off time)
<i>Average ATFM delay</i>	<i>$\frac{\text{Total monthly ATFM delay (in minutes)}}{\text{Total Domestic Arrivals}}$</i>
<i>Maximum ATFM delay</i>	Maximum ATFM delay (in minutes) assigned in the month
<i>Overall compliance rate</i>	Defined as monthly ATFM departure slot adherence rate of regulated flights. Flights having ATOT within the ATFM Slot Tolerance Window (STW) of minus 5 to plus 10 minutes of CTOTs, are considered as compliant flights
<i>CTOT Compliance rate of Airline operators</i>	An overview of CTOT compliance rate of various Airline operators
<i>CTOT Compliance rate of Airports within different Regions</i>	An overview of CTOT compliance rate of Airports within 4 FIRs
<i>Air delay statistics</i>	<p>Air delay defined as difference between AET & EET, where AET(actual elapsed time) can be obtained from (ALDT-ATOT) and estimated elapsed time(EET) can be obtained from FPL/RPL or (CLDT-CTOT). Therefore, Air delay = AET-EET</p> <p>Average Air Delay is calculated as:</p> <p><i>Average Air Delay</i> <i>$\frac{\text{Total Air Delay to domestic arrivals (with values greater than zero)}}{\text{Total Domestic Arrivals}}$</i></p> <p>CLDT: Calculated Landing Time CTOT: Calculated Take off Time ALDT: Actual Landing Time ATOT: Actual Take off Time</p>



Annexure-A

एयरलाइनों द्वारा सामान्य व्यावसायिक नियमों (सीबीआर) की उड़ान योजना आवश्यकताओं का अनुपालन - अगस्त 2025

Compliance by Airlines with Flight Planning Requirements of Common Business rules(CBR)- August 2025.



I. Introduction:

Accurate and timely input in respect of flight intent is paramount to the correct traffic demand projection and eventually effective ATFM implementation. FPLs remain the main source of tactical demand prediction for ATFM systems. Early filing of error free FPL helps in improving the lead time required for ATFM measures and reduces the number of unexpected flights(pop-up). This in turn helps in improving the accuracy of demand-capacity imbalance prediction and optimizes slot utilization.

AIP India, ENR 1.9 section 4 on Flight Planning in the context of ATFM recommends Flight Planning requirements for all Airline Operators –

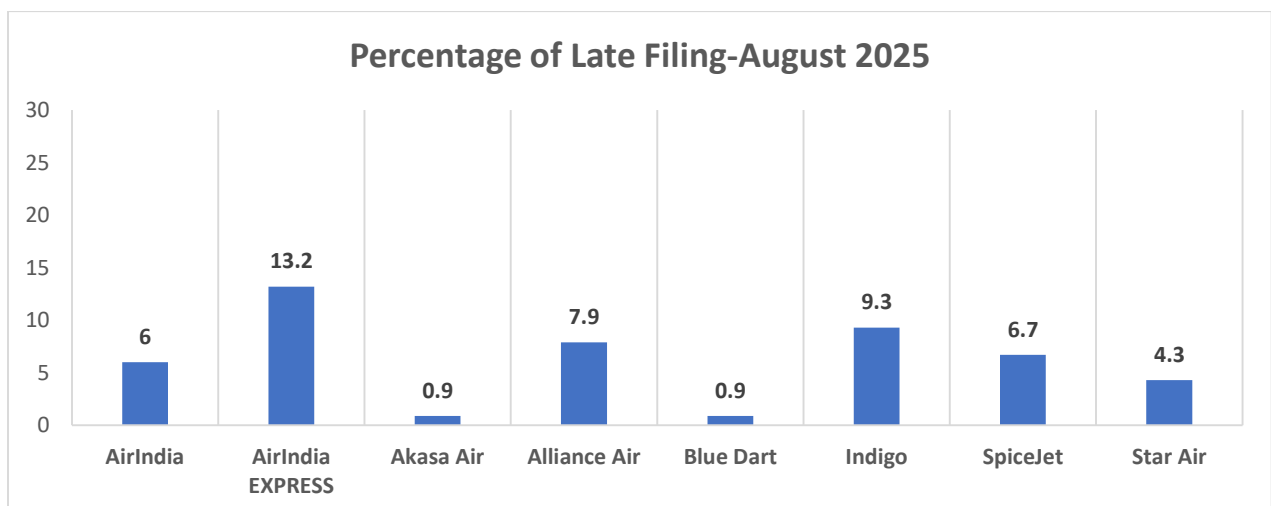
- a) Flight plans shall be submitted at least 3 hours before the estimated off block time (EOBT);
- b) The window for filing FPL is between 3 Hours and 120 Hours (Five days) before the EOBT. Earlier filing of FPL will give a realistic demand data to the CCC and hence the requirement of ATFM measures can be identified early for better planning. Late filing of a flight plan will lead to inaccuracies in predicting the demand and may lead to undesirable delay;”

II. Analysis

- A. An analysis has been conducted to find out the difference between the flight plan filing time and filed EOBT for all the FPLs received at ATFM system from 1st August 2025 to 31st August 2025.

The purpose of the analysis is to monitor the compliance with provisions of AIP India, section 4, ENR 1.9 regarding Flight Planning requirements in context of the ATFM.

This flight plan filing requirement has been reiterated through the recently agreed ATFM common business rules (CBR) document and is recognized as a metrics to be monitored regularly for any improvement.





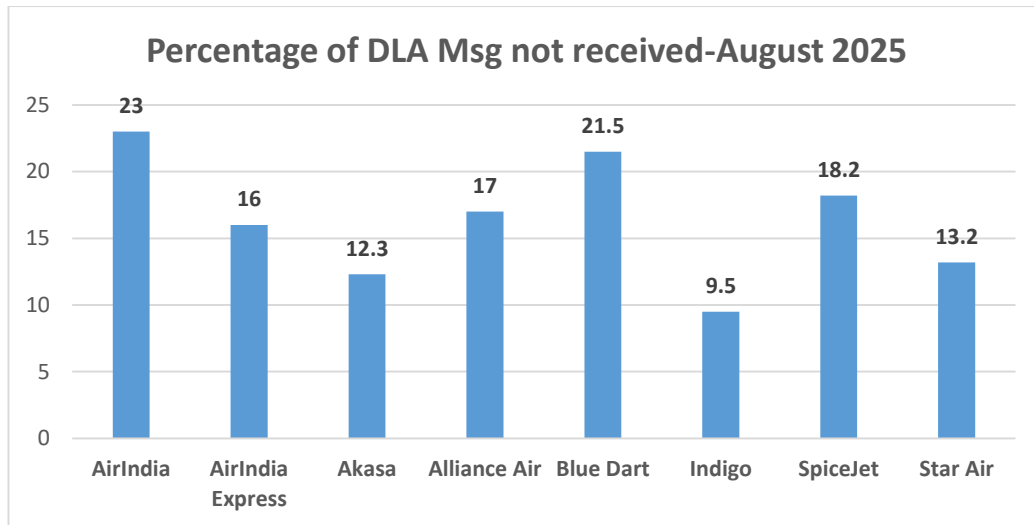
The table below lists number of filed flight plans (FPLs) with less than 3 Hours prior to EOBT:

Name of Airline	Late Filed FPL	Total No. Of FPL	% Delayed Filing
AirIndia	1202	19867	6
AirIndia EXPRESS	2058	15481	13.2
Akasa Air	45	4666	0.9
Alliance Air	84	1063	7.9
Blue Dart	6	657	0.9
Indigo	5893	63364	9.3
SpiceJet	225	3335	6.7
Star Air	57	1318	4.3
Total no. of FPLs for Scheduled Airlines	9570	109751	8.7

- B. For the analysis of non-receipt of DLA (Delay) messages for flight plans filed, the EOBT of FPL received has been compared with Actual Take off time (ATOT) received through DEP (Departure) messages. Thus, only those FPLs were considered for analysis for which DEP messages were available and no associated DLA messages was received.

The Table below lists number of flights for which no DLA message was received in August 2025. **{{EOBT of original FPL}- (ATOT received)} > 30 minutes)**

Name of Airline	DLA Message not received	Total No. of flights considered for analysis	% of flights for which no DLA message was received
AirIndia	3744	16240	23
AirIndia Express	1691	10537	16
Akasa	464	3771	12.3
Alliance Air	81	476	17
Blue Dart	114	529	21.5
Indigo	4821	50648	9.5
SpiceJet	347	1905	18.2
Star Air	69	521	13.2



- C. For analysis of non-receipt of CNL (cancel) messages for August 2025, annulled FPLs were considered for which no CNL/DEP/DLA messages were received. A FPL gets annulled in SKYFLOW system, if it doesn't get activated through Dep message /surveillance data/ manual activation by FMP within a defined system parameter.

The table below lists the number of Flights for which no CNL Msg. was received in August 2025:

Name of Airline	CNL message not received	No. of flights annulled
AirIndia	45	50
AirIndia Express	66	67
Akasa	11	11
Alliance Air	125	128
Blue Dart	3	3
Indigo	121	123
SpiceJet	44	44
Star Air	20	23

-End OF Report-