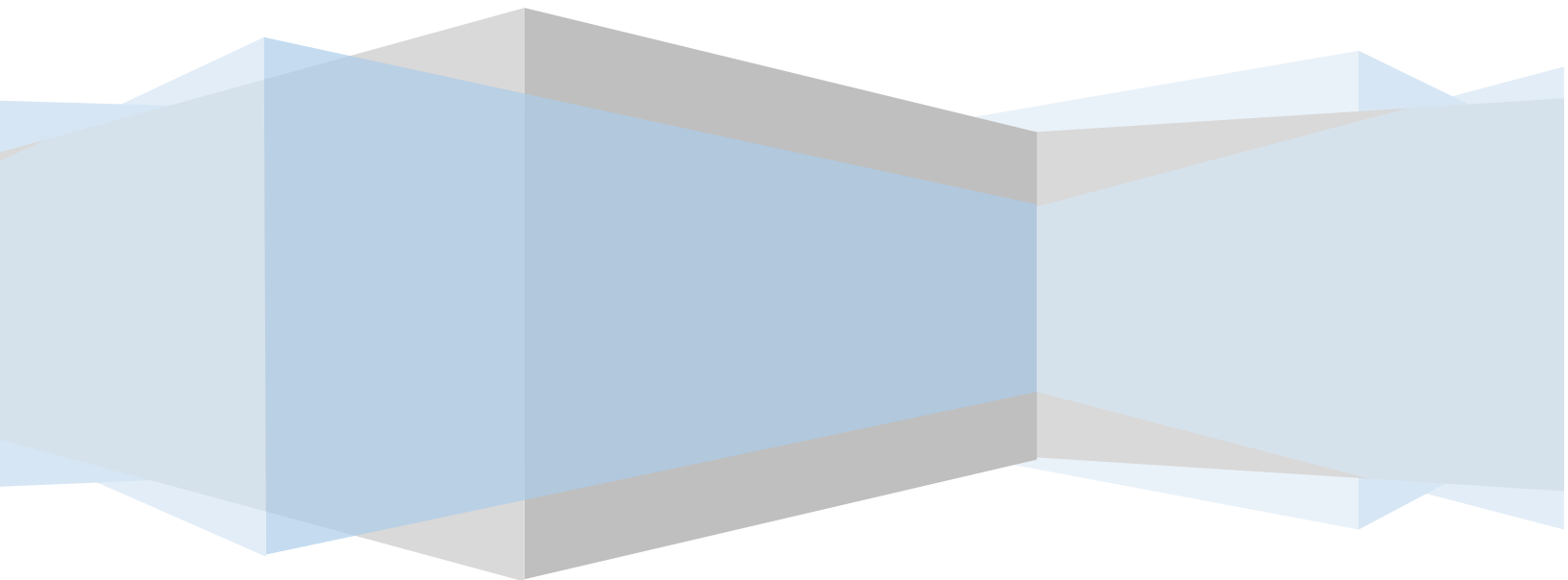


POST OPERATIONS ANALYSIS REPORT

May, 2022

CENTRAL COMMAND CENTER, C-ATFM, DELHI







Contents

A. Executive Summary	4
B. Traffic Analysis	5
I. Air Traffic Movement at Major Airports in India	5
II. Comparison of total ATMs (YoY) and Monthwise	8
III. Flight Operations – Airlinewise	9
C. ATFM Post Operations – CDM Analysis.....	10
I. Introduction	10
II. ATFM Measures Overview.....	11
III. Overall Compliance	12
IV. CTOT Compliance rate – Airportwise	14
V. Reason For Non Compliance.....	16
VI. CTOT Compliance rate – Airlinewise	17
VII. Air Delay during the CDM Scenario period	18
VIII. Tangible Benefits due to ATFM Measures	19
D. Glossary	21
Annexure-1.....	22
Pre-Monsoon RWY Maintenance- Mumbai(2022)	22
Annexure-2.....	31
Missing ‘DEP’ Messages.....	31



List of Figures

Figure 1: Traffic Growth Post 1 st COVID wave	4
Figure 2: Average Daily Movements(April'22 vs May'22)	5
Figure 3: Air Traffic Movement for Delhi –May 2022	6
Figure 4: Air Traffic Movement for Mumbai - May 2022.....	6
Figure 5: Air Traffic Movement for Bengaluru - May 2022.....	7
Figure 6: Air Traffic Movement for Hyderabad - May 2022	7
Figure 7: Traffic Variation (YoY)	8
Figure 8: Flight Movements –Airlinewise	9
Figure 9: ATFM Measures –May'22.....	10
Figure 10: Affected Flight Statistics –May'22.....	11
Figure 11: Overall Compliance – May'22	12
Figure 12: ATFM Compliance(Monthwise)	13
Figure 13: Reason for Non-Compliance as provided by FMPs.....	16
Figure 14: Airlines Overall Compliance –May'22.....	17
Figure 15: Air Delay distribution during the CDM period.....	18
Figure 16: Affected Flight Statistics – Mumbai CDM May'22.....	24
Figure 17: Overall Compliance Mumbai CDM– May'22.....	25
Figure 18: Airlines Overall Compliance Mumbai CDM–May'22	27
Figure 19: Air Delay distribution during the Mumbai CDM period.....	28



A. Executive Summary

Domestic air traffic is estimated to have logged a 5 % growth in May 2022 as compared to April '22.

The international air traffic in May'22 saw an increase of 14% as compared to April 2022 levels resulting from government's decision to resume scheduled commercial international passenger flights to and from India in March'22.

All Six Metro Airports saw an increase in the daily average air traffic movement as compared to the previous month. On average, the Indian Airports in the ATFCM area saw 3786 IFR flights per day. The peak day was on 20th May'22 (4030 IFR flights). Friday's were the busiest days throughout this month with an average of 3922 flights per day.

Four (4)ATFM measure were applied this month. During other observed periods of congestion few flights were cherry picked and delayed. Compliance of such flights is not considered in this report. ATFM measures initiated due to bad weather in Delhi on 20th May'22 , 23rd May'22 and 30th May'22 had to be supplemented with further ground stop programs due to deterioration of weather and are not considered in this report.

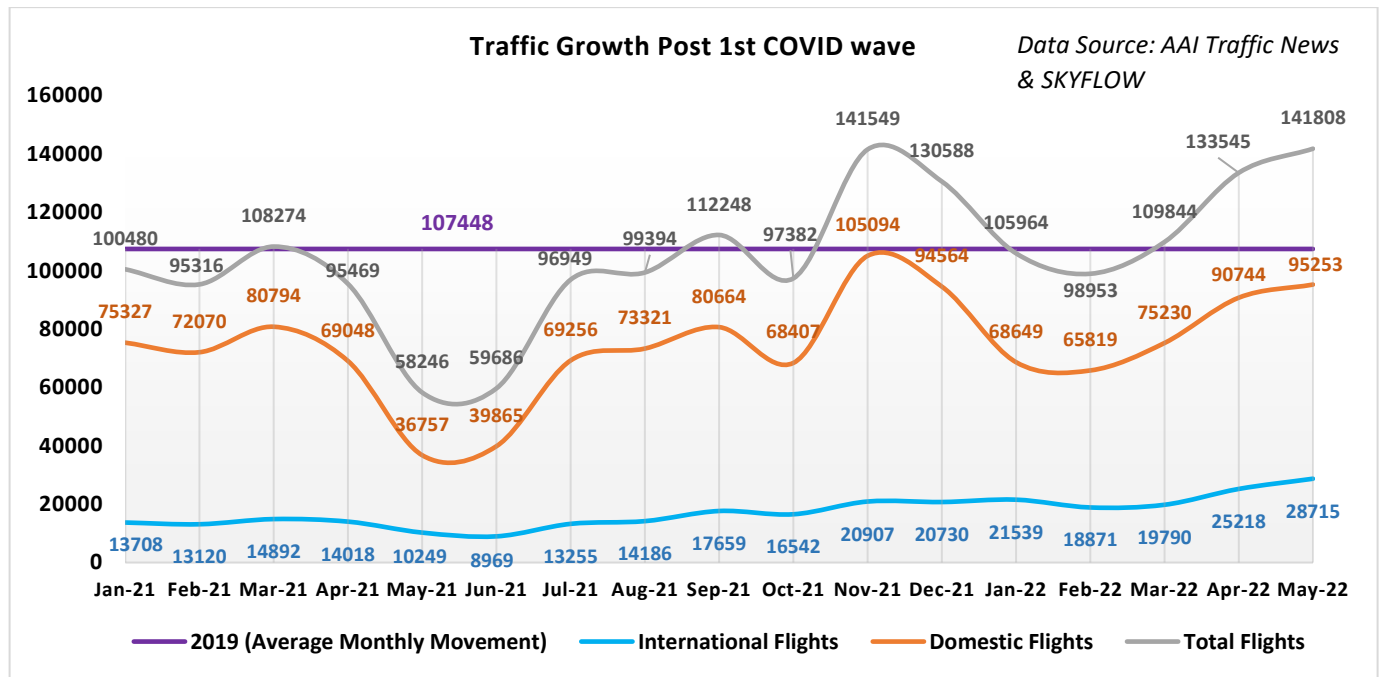


Figure 1: Traffic Growth Post 1st COVID wave

The graph above depicts the Domestic and international Air traffic in Indian ATFCM Area during the last 17 months (Jan' 2021 to May'2022). The traffic demand is visibly impacted by the Covid-19 infections through out the period.

B. Traffic Analysis

I. Air Traffic Movement at Major Airports in India

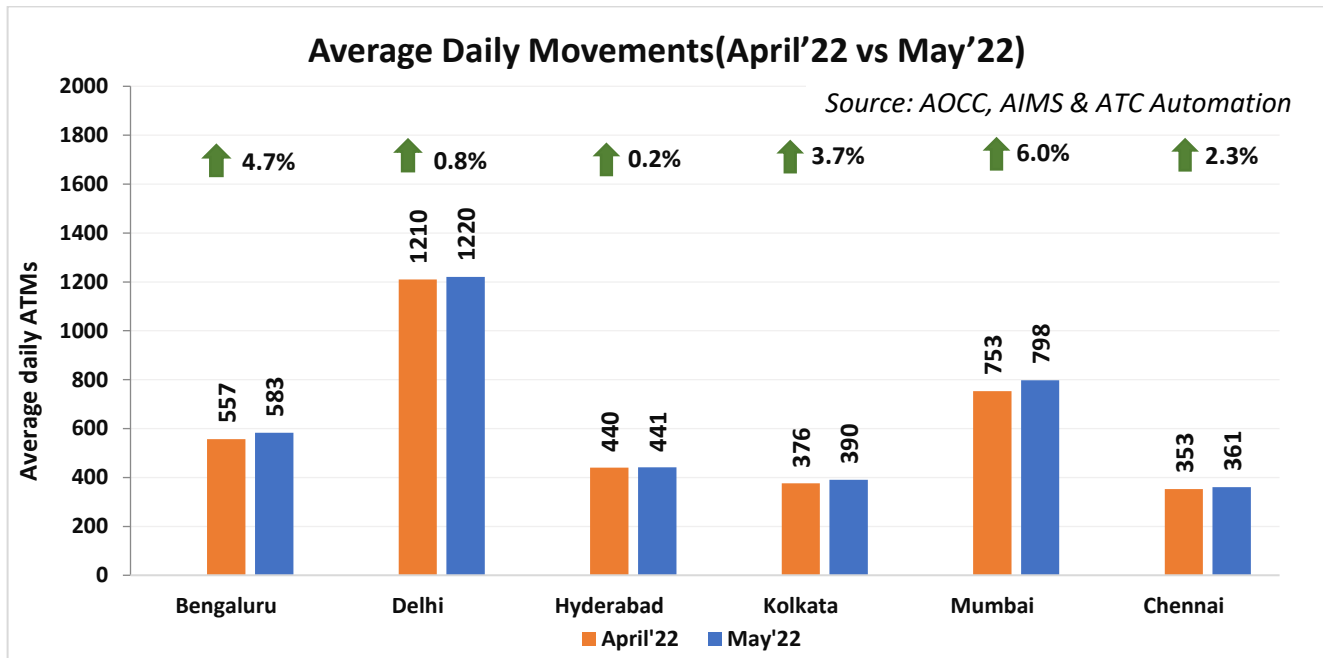


Figure 2: Average Daily Movements(April'22 vs May'22)

The above chart depicts the percentage increase in average daily ATMs at six major Airports in India in May'22 as compared to the previous month.

Airports\Year	Avg. Daily ATMs (YoY) for six major airports			
	May'19	May'20	May'21	May'22
Bengaluru	634	50	204	583
Delhi	1230	132	528	1220
Hyderabad	503	27	157	441
Kolkata	425	26	143	390
Mumbai	790	60	252	798
Chennai	457	37	141	361

Major Airports - Bengaluru ,Delhi, Hyderabad, Kolkata, Mumbai and Chennai recorded average daily movements 92%,99%, 88,92%, 92%,101% and 79% respectively of May 2019 levels.



Air Traffic Movement for each day in May'22 is plotted for Delhi, Mumbai, Bengaluru and Hyderabad Airport along with the percentage change w.r.t. Avg. Daily Movement for the same month.

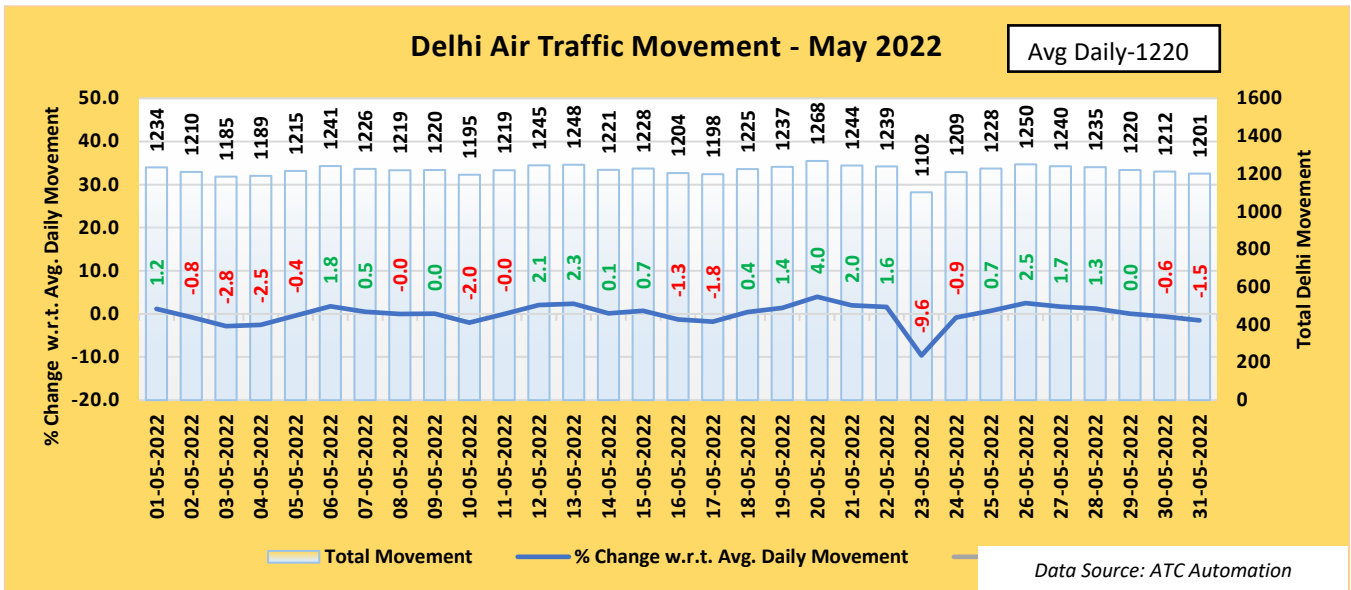


Figure 3: Air Traffic Movement for Delhi –May 2022

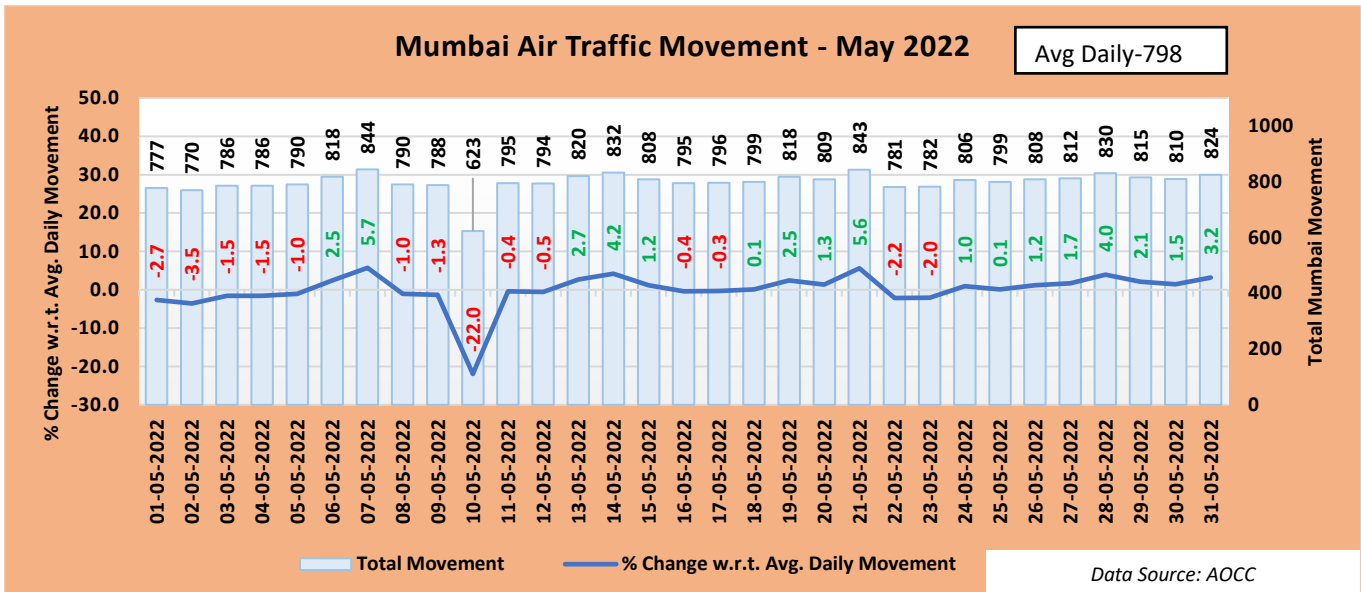


Figure 4: Air Traffic Movement for Mumbai - May 2022

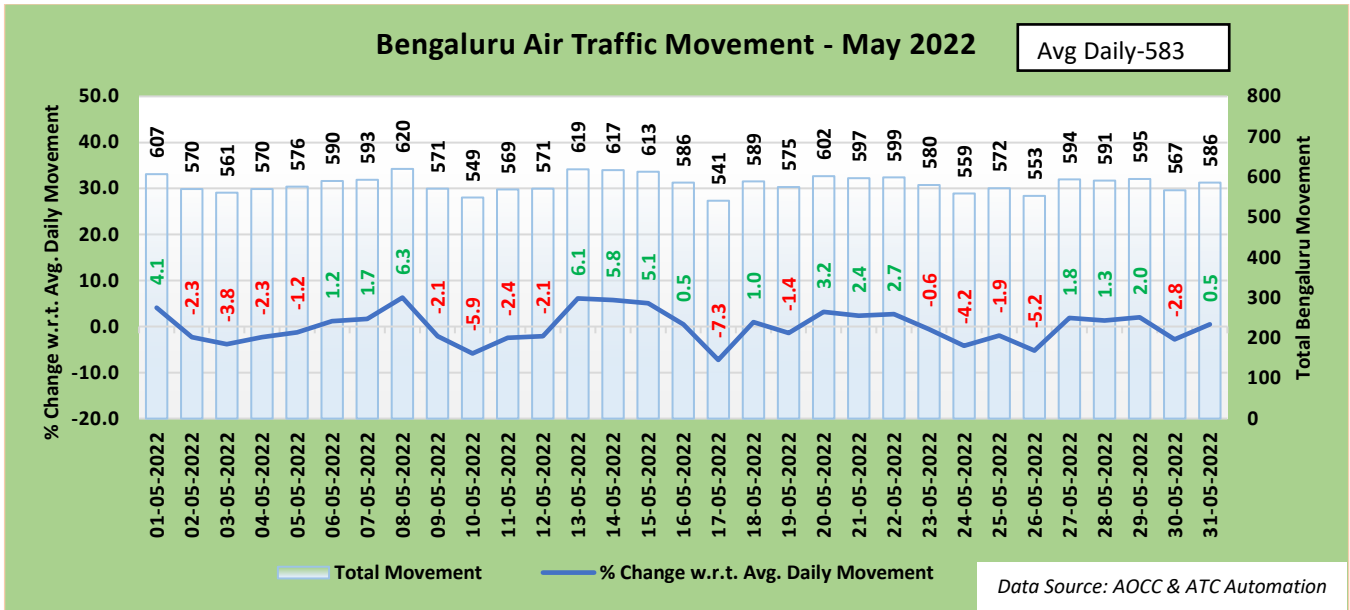


Figure 5: Air Traffic Movement for Bengaluru - May 2022

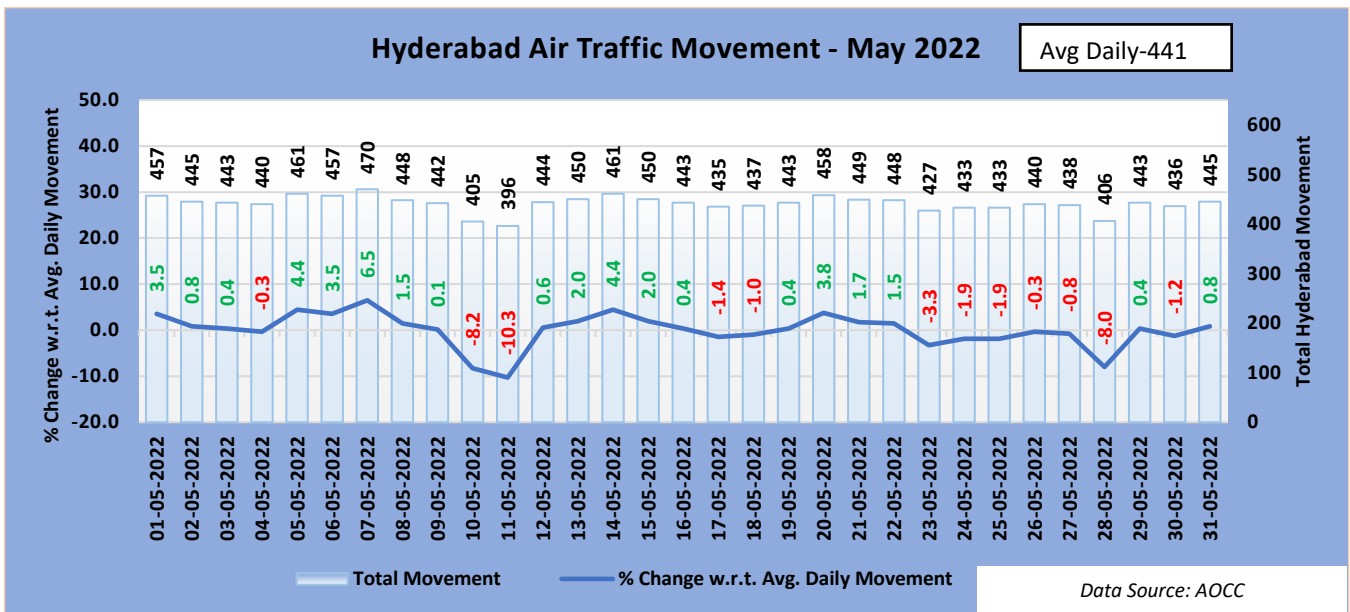


Figure 6: Air Traffic Movement for Hyderabad - May 2022

It is evident from the above charts that on 31st May '22 the ATMs at Mumbai, Bengaluru and Hyderabad saw a marginal increase of 3.2% , 0.5 % and 0.8% respectively as compared to the average daily movement for the



month of May'22 whereas Delhi on the same day witnessed a decrease of 1.5 % w.r.t. average daily movement captured for the month.

II. Comparison of total ATMs (YoY) and Monthwise

The total Air traffic movement including Passenger and Combination of other flights i.e. All-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 May for two consecutive years. Air Traffic movement is also plotted Airline wise for the last six months for the major Scheduled Operators.

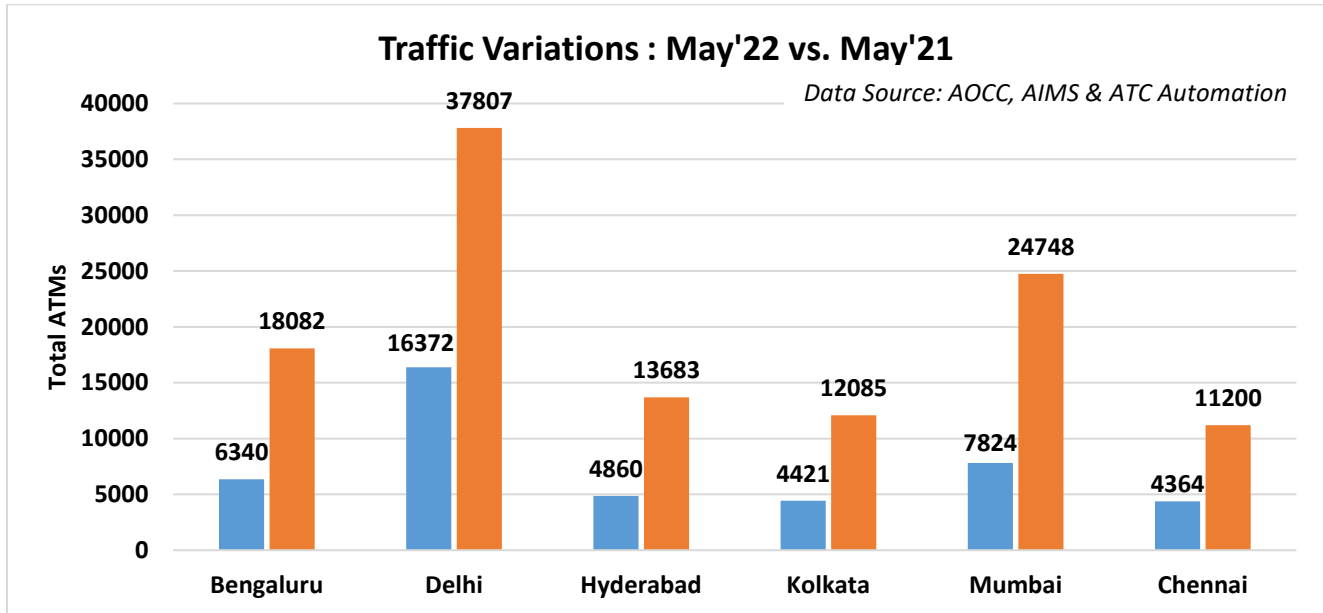


Figure 7: Traffic Variation (YoY)

Airports\Year	Total ATMs (YoY) for six major airports	
	May'22	May'21
Bengaluru	18082	6340
Delhi	37807	16372
Hyderabad	13683	4860
Kolkata	12085	4421
Mumbai	24748	7824
Chennai	11200	4364



III. Flight Operations – Airlinewise

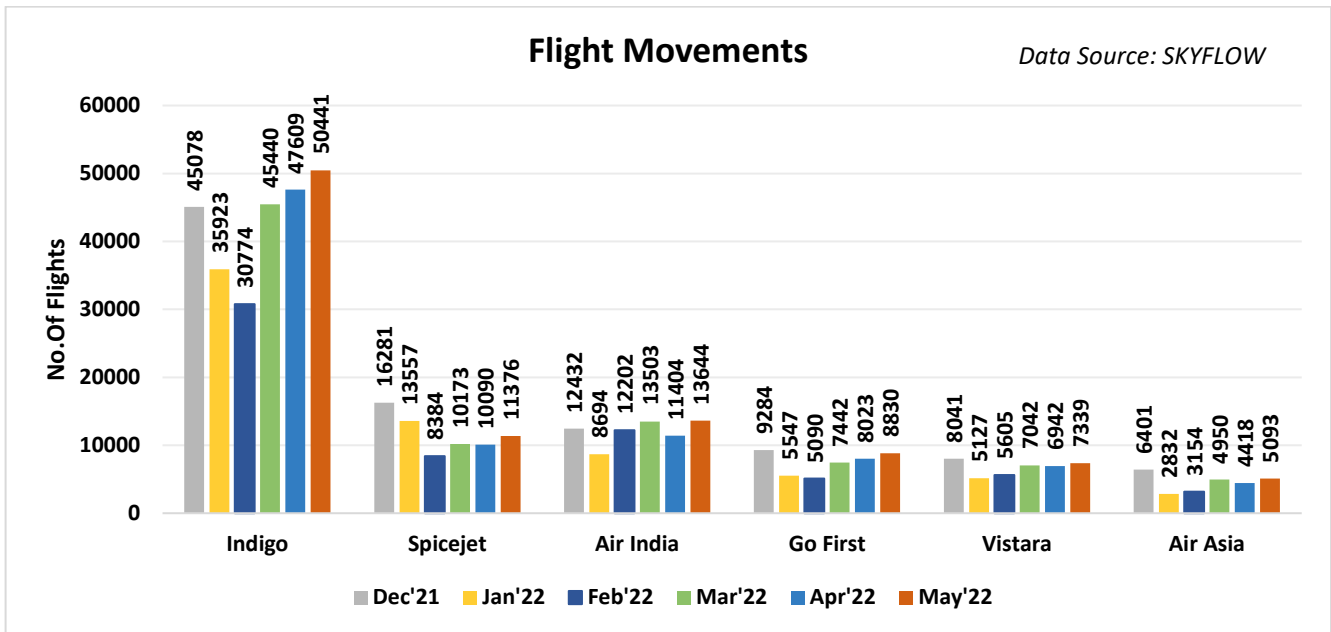


Figure 8: Flight Movements –Airlinewise



C. ATFM Post Operations – CDM Analysis

I. Introduction

Analysis Period 1st – 31st May'22

Back Ground During the above mentioned period, **three(3)** ATFM measures were applied for **Delhi Airport** and **one(1)** ATFM measure was applied for **Mumbai Airport** due to the following reason as illustrated in the bar chart below:–

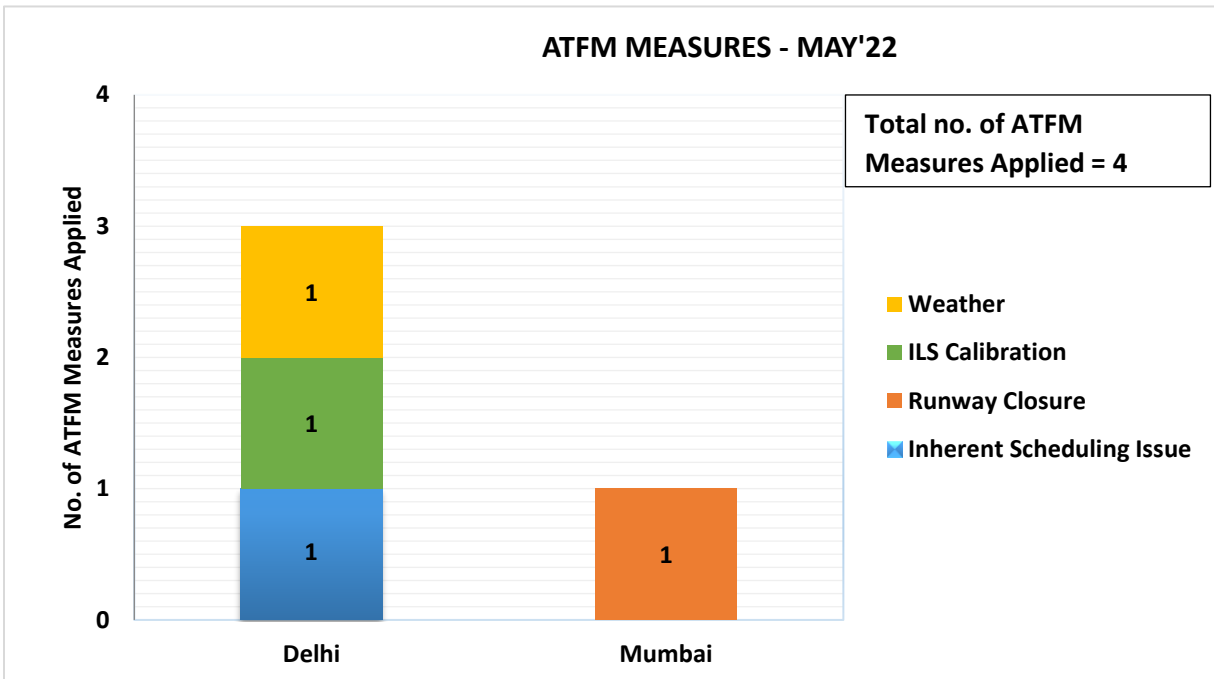


Figure 9: ATFM Measures –May'22

II. ATFM Measures Overview

Constrained Airport	Delhi Airport	Mumbai Airport
Number of ATFM measures applied	3	1
Average ATFM Ground delay due to measures*	13 Min	38 Min
Maximum ATFM Ground delay due to measures	34 Min	55 Min
% Compliance	79	88

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

Total Arrivals	270
Total International Arrivals(Exempted)	40
Total affected flights in scenario (Domestic Arrivals)	230
Total Domestic Arrivals with zero ATFM delay	20
Total Domestic Arrivals with ATFM delay	210

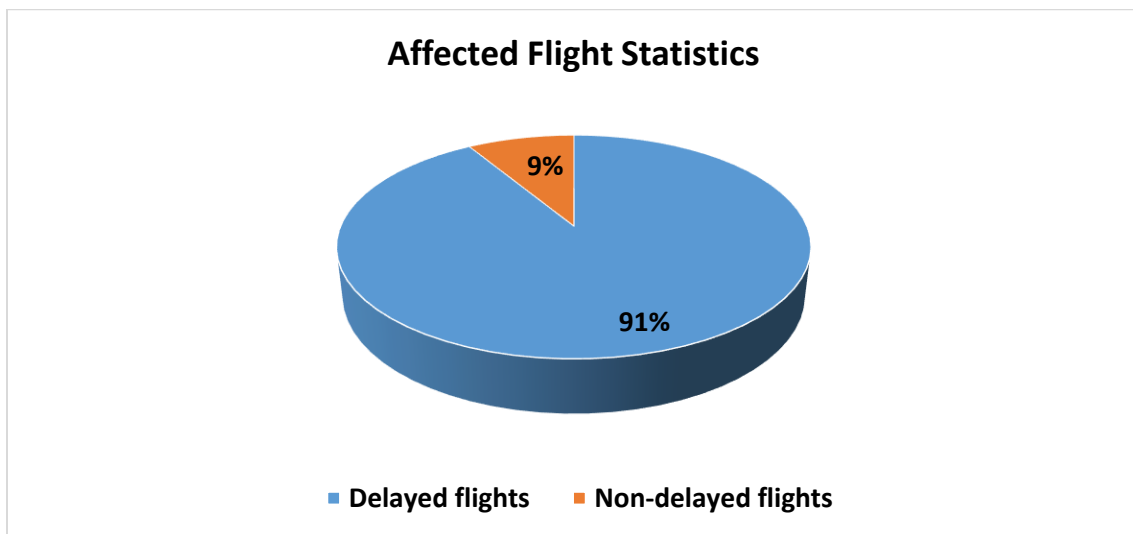


Figure 10: Affected Flight Statistics –May'22



III. Overall Compliance

Total arrivals	270
Domestic arrivals	230
Flights with complete data (ATOT)	225
Flights with incomplete data	0
Flights Not Operated	5
Compliant*	183
Non-Compliant	42

*Total No. of Revised CTOTs issued = 42 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)

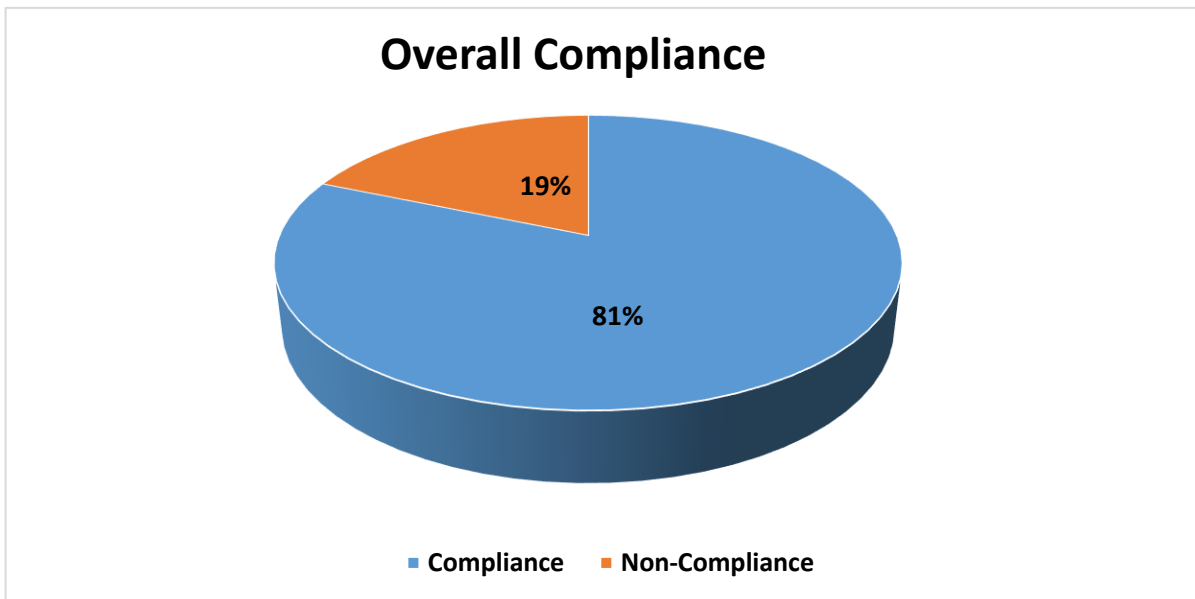


Figure 11: Overall Compliance – May'22

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

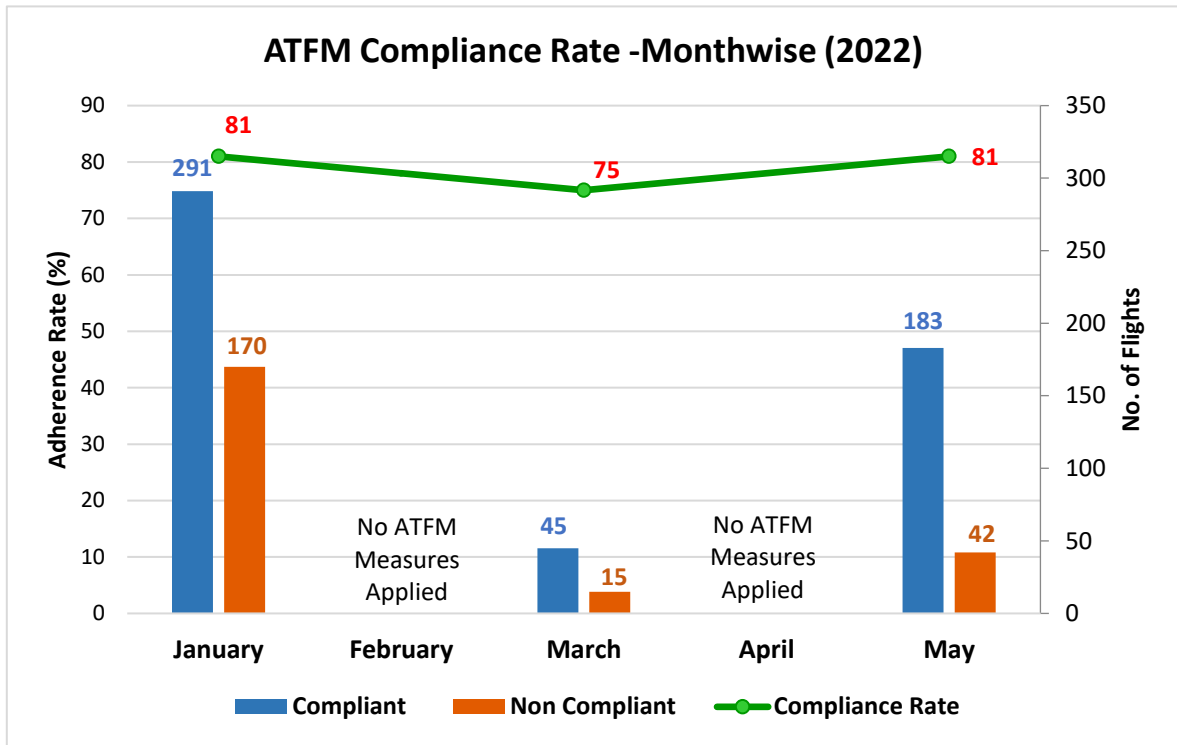


Figure 12: ATFM Compliance(Monthwise)

Inference

1. Out of the total arrivals captured for the constrained Airports during the CDM scenario, 85% of flights i.e. Domestic arrivals, are participating.
2. Out of these Domestic Arrivals, 91% of arrivals are assigned ATFM ground delay.
3. Out of the total arrivals captured to the constrained Airport during the ATFM scenario, 78% of flights are assigned ATFM Ground Delay.



IV. CTOT Compliance rate – Airportwise

MUMBAI FIR (85%)*	Compliant	Non Compliant	%Compliant
Pune	7	2	78
Ahmedabad	9	2	82
Mumbai	17	2	89
Bhopal	3	0	100
Jabalpur	1	0	100
Indore	4	0	100
Vadodra	3	1	75
Rajkot	1	0	100
Aurangabad	2	0	100
Udaipur	1	1	50
Nagpur	3	1	75
Surat	6	1	86
KOLKATA FIR (82%)*			
Varanasi	2	0	100
Kolkata	7	6	54
Ranchi	5	0	100
Bagdogra	1	1	50
Prayagraj	1	0	100
Guwahati	4	1	80
Agartala	1	0	100
Bhubhaneshwar	3	0	100
Darbangha	1	0	100
Raipur	4	0	100
Patna	7	0	100
DELHI FIR (69%)*			
Chandigarh	5	2	71
Dehradun	4	2	67
Amritsar	2	2	50
Delhi	7	2	78
Leh	1	1	50
Gaggal	0	1	0
Jammu	2	1	67
Jaipur	3	1	75
Lucknow	5	2	71
Srinagar	9	3	75



CHENNAI FIR (88%)*	Compliant	Non Compliant	%Compliant
Goa	3	1	75
Bengaluru	15	2	88
Chennai	11	1	92
Vijayawada	0	1	0
Coimbatore	1	0	100
Calicut	0	1	0
Begumpet	1	0	100
Mangaluru	1	1	50
Nanded	1	0	100
Trivandrum	2	0	100
Cochin	4	0	100
Shamshabad	11	0	100
Vishakhapatnam	2	0	100

*FIR wise compliance rate

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



V. Reason For Non Compliance



Figure 13: Reason for Non-Compliance as provided by FMPs

Inference

1. CTOT was received late at the place of departure and by that time the flight had already initiated a pushback/startup is the biggest factor identified by FMP as a reason for Non- Compliance this month.
2. Airline Operational Reason is identified as another important contributing factor for Non-Compliance by the FMP.
3. Congestion and ATC operational reason at the place of departure is also identified as a contributing factor for Non compliance.



VI. CTOT Compliance rate – Airlinewise

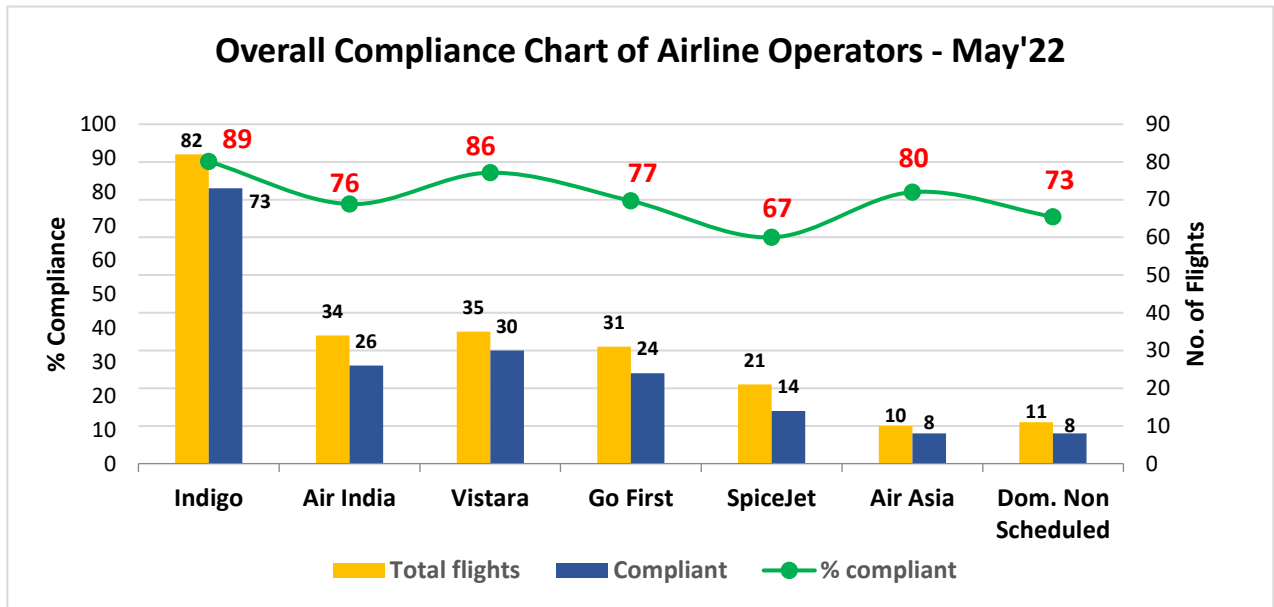


Figure 14: Airlines Overall Compliance –May’22

Inference

1. Out of the total domestic arrivals with complete data in the CDM scenario, 81% arrivals are compliant.
2. Delhi region has the lowest compliance rate of 69% whereas Chennai region have the highest compliance rate of 88%.
3. Vistara and Indigo Airlines have a CTOT Compliance better than the average recorded compliance for the month of May’22.

VII. Air Delay during the CDM Scenario period

Average Air Delay to domestic arrivals* within the CDM Scenario period for Delhi is 3 minutes and for Mumbai is 5 minutes.

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

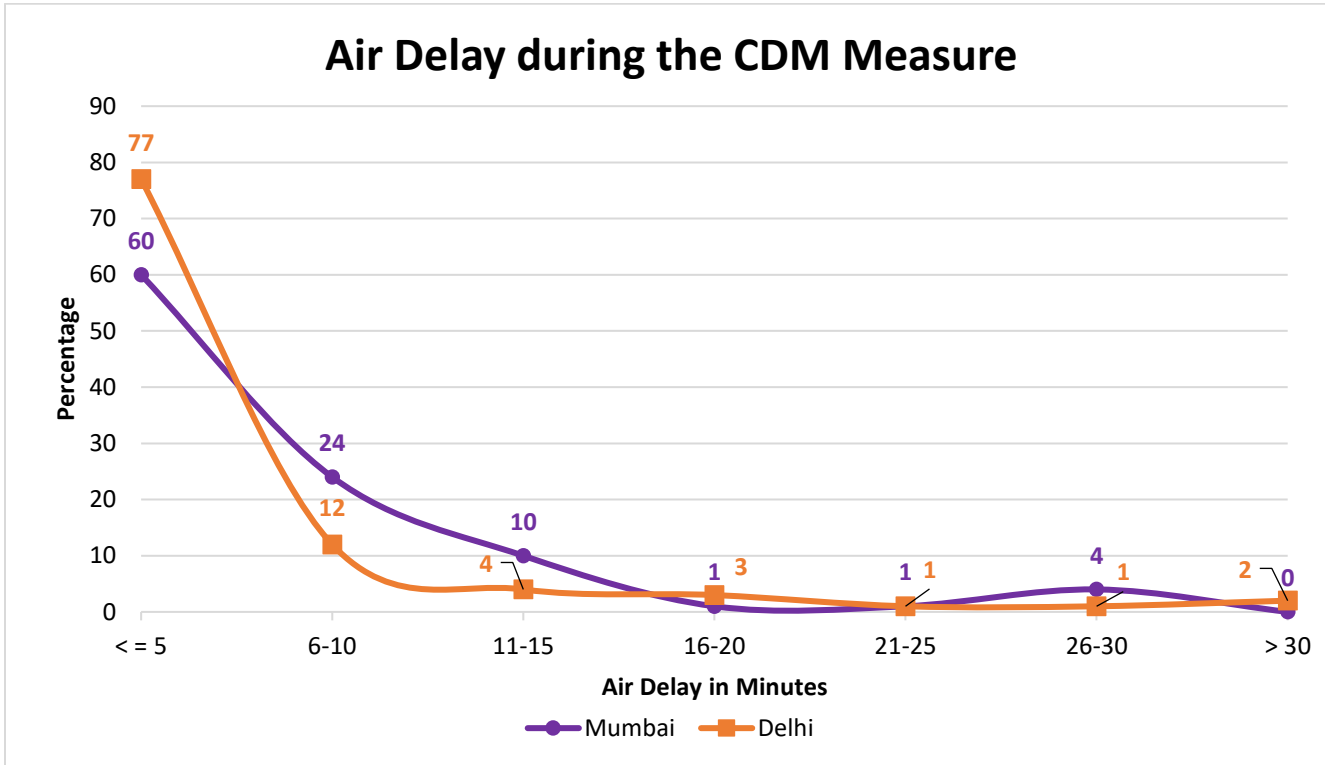


Figure 15: Air Delay distribution during the CDM period

Inference

1. 89% of domestic arriving flights to Delhi had an Air delay of equal to or less than 10 minutes during the CDM period.
2. 84% of domestic arriving flights to Mumbai had an Air delay of equal to or less than 10 minutes during the CDM period.



VIII. 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 for domestic flights (flight distance less than 1500 nm) and B777 for international flights (flight distance more than 5000nm):

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.



Reduction in Air delay due to ATFM measures= = 3511 min

Fuel Saving Calculation:

Total Fuel saved during the ATFM Measure: **192582.26 Kgs**

Total reduction in CO₂ emission : 3.16(KgCO₂/kg fuel)*192582.26 Kgs= 608559.9 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. 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>	$\frac{\text{Total monthly ATFM delay (in minutes)}}{\text{Total Domestic Arrivals}}$
<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
Air delay statistics	<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> $\text{Average Air Delay} = \frac{\text{Total Air Delay to domestic arrivals (with values greater than zero)}}{\text{Total Domestic Arrivals}}$ <p>CLDT: Calculated Landing Time CTOT: Calculated Take off Time ALDT: Actual Landing Time ATOT: Actual Take off Time</p>



Annexure-1

Pre-Monsoon RWY Maintenance- Mumbai(2022)

**A. Introduction:**

Due to the Pre-Monsoon Runway Maintenance, Mumbai Runway Intersection was closed as specified vide NOTAM no. A0574/22.

(A0574/22 NOTAMN

Q) VABF/QMRLC/IV/NBO/A/000/999/

A) VABB B) 2205100530 C) 2205101130

E) RWY 09/27 AND RWY 14/32 NOT AVBL FOR LDG/TKOF

DUE PRE-MONSOON PREVENTIVE MAINT OF INT OF RWY)

No prior coordination was effected with Central Command Centre(CCC) by MIAL AOCC or Mumbai ATC regarding the closure.

The NOTAM was received in the SKYFLOW system on 22nd April'22.

It was observed through the SKYFLOW system that 12 flights were planning to arrive in Mumbai before 1130 UTC. ATFM measures were applied from 1100-1400 UTC to regulate air traffic post the availability of Runway.

Mumbai WSO informed that the Runway handover after the maintenance may be delayed by 15 minutes. Ground Stop Program was applied to push domestic arrivals to arrive at Mumbai later than 1145 UTC. Ground delay measures were further applied to regulate the bunching observed.

Mumbai WSO was apprised by CCC to proactively coordinate with MIAL for the handover of Runway as close as possible to the published availability time as the first seven estimated landing at Mumbai happened to be international flights(international flights are beyond the ambit of ATFM measures) and a delay in runway availability would have entailed holding for these flights.

Both Runways 09/27 and 14/32 were available for landing and takeoff at 1118 UTC. First flight, VT1865 (Dehradun departure-ATFM Non-Compliant) landed at 1126 UTC and first departure, Sej2901(Destination-Rajkot) took off at 1125 UTC.



B. ATFM Post Operations – CDM Analysis

Analysis Period : 10th May'22 - 1100 UTC to 1400 UTC

I. ATFM Measures Overview

Constrained Airport	Mumbai Airport
Number of ATFM measures applied	1
Average ATFM Ground delay due to measures*	38 Min
Maximum ATFM Ground delay due to measures	55 Min
% Compliance	88

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

Total Arrivals	65
Total International Arrivals(Exempted)	13
Total affected flights in scenario (Domestic Arrivals)	52
Total Domestic Arrivals with zero ATFM delay	0
Total Domestic Arrivals with ATFM delay	52

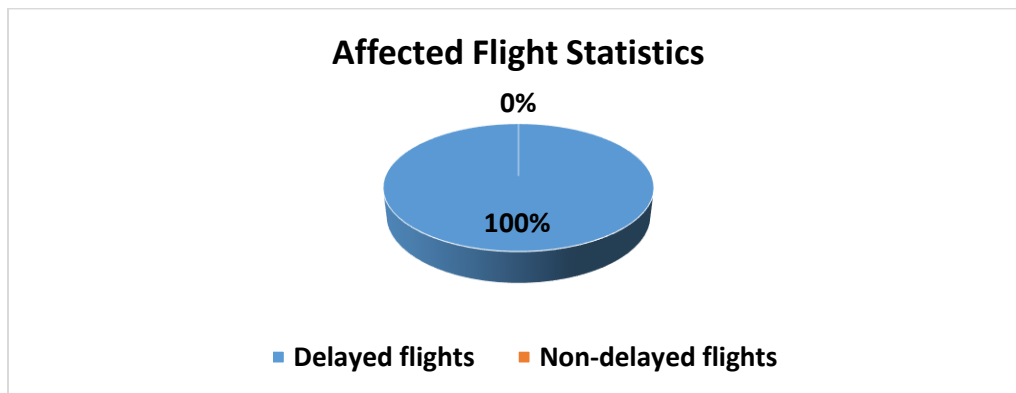


Figure 16: Affected Flight Statistics – Mumbai CDM May'22



II. Overall Compliance

Domestic arrivals	52
Flights with complete data (ATOT)	52
Flights with incomplete data	0
Flights Not Operated	0
Compliant*	46
Non-Compliant	6

*Total No. of Revised CTOTs issued = 9 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)

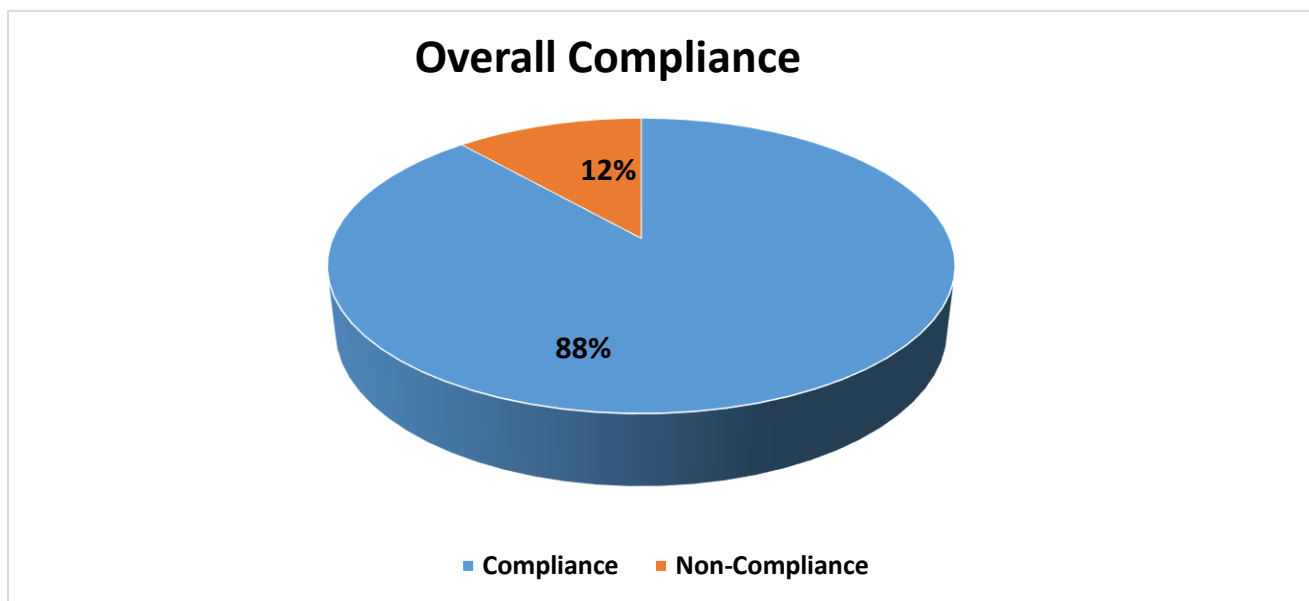


Figure 17: Overall Compliance Mumbai CDM– May'22

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



III. CTOT Compliance rate – Airportwise

*FIR wise compliance rate

MUMBAI FIR (100%)*	Compliant	Non Compliant	%Compliant
Ahmedabad	1	0	100
Jabalpur	1	0	100
Aurangabad	1	0	100
Indore	1	0	100
Vadodara	1	0	100
Nagpur	2	0	100
Surat	2	0	100
KOLKATA FIR (82%)*			
Varanasi	1	0	100
Kolkata	2	0	100
Bagdogra	1	1	50
Ranchi	1	0	100
Guwahati	0	1	0
Prayagraj	1	0	100
Darbangha	1	0	100
Raipur	1	0	100
Patna	1	0	100
DELHI FIR (83%)*			
Amritsar	1	0	100
Chandigarh	2	0	100
Dehradun	1	1	50
Delhi	7	2	77
Lucknow	1	0	100
Srinagar	3	0	100
CHENNAI FIR (93%)*			
Goa	1	0	100
Bengaluru	3	0	100
Coimbatore	1	0	100
Shamshabad	1	0	100
Hyderabad	1	1	50
Mangalore	1	1	50
Chennai	3	0	100
Trivandrum	1	0	100
Nanded	1	0	100

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



IV. CTOT Compliance rate – Airlinewise

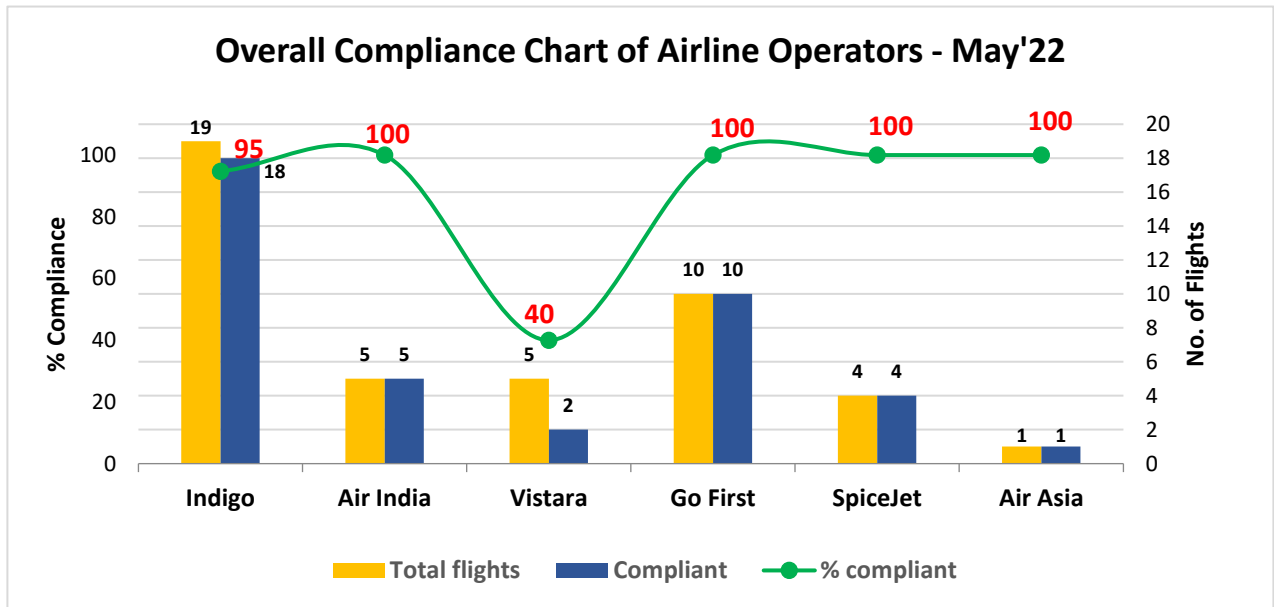


Figure 18: Airlines Overall Compliance Mumbai CDM–May'22

Inference

4. Out of the total domestic arrivals with complete data in the CDM scenario, 88% arrivals are CTOT compliant.
5. Kolkata region has the lowest CTOT compliance rate of 82% whereas Mumbai region have the highest compliance rate of 100%.
6. Vistara Airline has the lowest CTOT compliance rate of 40% whereas all other major Airlines have a CTOT compliance rate better than the average recorded CTOT compliance of 88%.



V. Air Delay during the CDM Scenario period

Average Air Delay to domestic arrivals* within the CDM Scenario period for Mumbai is 5 minutes.

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

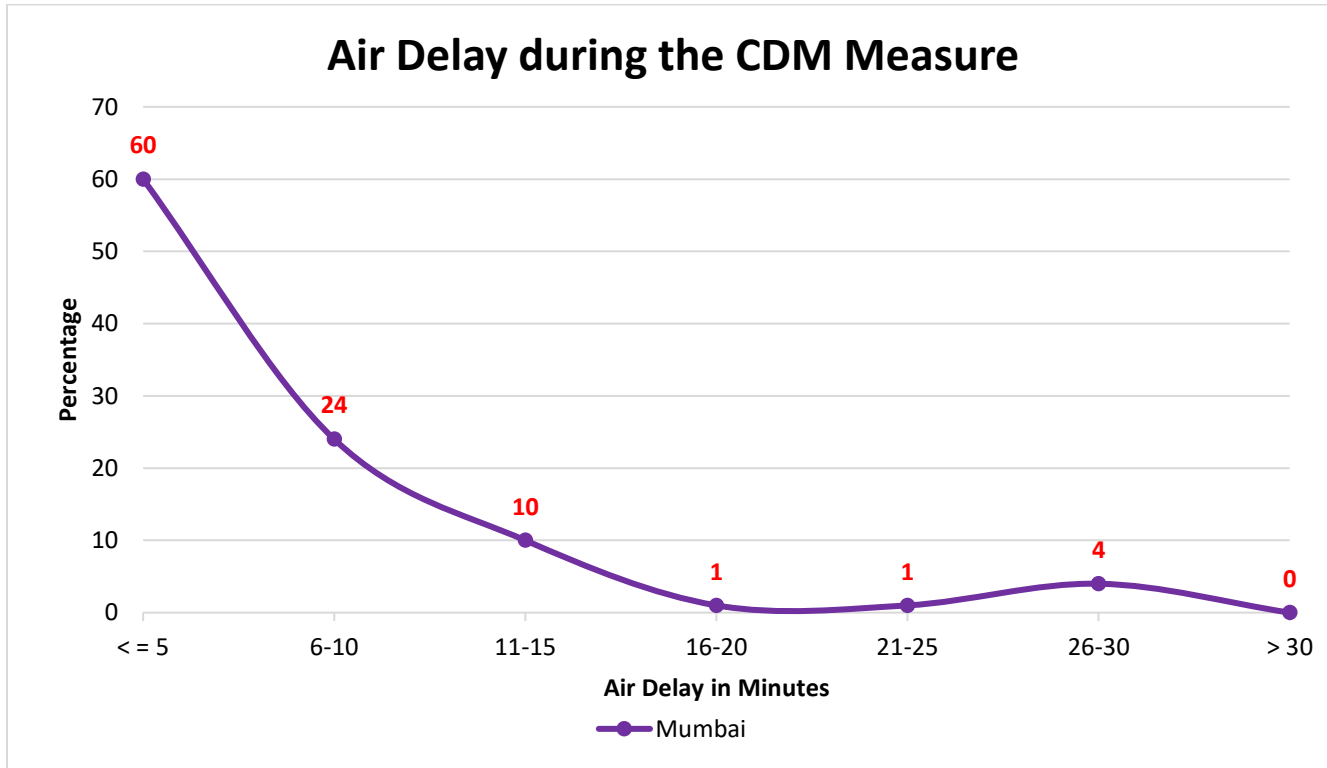


Figure 19: Air Delay distribution during the Mumbai CDM period

Inference

- 3. 84% of arriving flights to Mumbai had an Air delay of equal to or less than 10 minutes during the CDM period.



VI. Tangible Benefits due to ATFM Measures

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

A study was conducted to calculate Fuel Saving due to ATFM measures on 10th May'22 (1100-1400 UTC) due to the reduction in Air delay by the application of Ground Delay measures.

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.
- Landings at CSMI Airport take place every 130 seconds, considering an Airport acceptance rate(AAR) of 27 on primary Runway configuration.

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 Mumbai 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 Mumbai with alternate spacing interval of 2 minutes.

*Ideal ELDT = ETOT + SKYFLOW calculated Flying time

Fuel Saving Calculation during the CDM Period 10.05.2022 (1100 UTC to 1400 UTC):

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 for domestic flights (flight distance less than 1500 nm) and B777 for international flights (flight distance more than 5000nm):

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) = 34 min

Total Air delay (with no ATFM measures) = 1016 min

Total amount of Air delay reduced due to ATFM measures= 1016-34= 982 min

Fuel Saving Calculation:

Total Fuel saved during the ATFM Measure: **58,593.20 Kgs**

Total reduction in CO₂ emission : **3.16(KgCO₂/kg fuel)* 58,593.20 Kgs= 1,85,154.50 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.

VII. Lessons Learnt:

- A more proactive and concrete coordination between Mumbai ATC and CCC regarding the availability of Runway would have resulted in less Ground delay to Airlines.
- Capacity once lost due to late planning of arrivals cannot be regained due to SKYFLOW(ATFM system) limitation.



Annexure-2

Missing 'DEP' Messages



Missing 'DEP' Messages

I. **Introduction:** A study has been conducted since 1st November 2021 to compare the 'FPL' and 'DEP' messages received at C-ATFM system(VIDPCTFM). The study is based on evaluation of ATS messages received at CATFM SKYFLOW System and analyzing the 'DEP' messages received for the active flight plans received. List of international flights to/from India for which 'DEP' message were not received at SKYFLOW system was also extracted.

II. **Description:**

ICAO Doc 4444 Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM) specifies in section 11.4.2.2.6 that a 'DEP' message shall be transmitted immediately after the Departure of an aircraft for which basic flight plan data have been previously distributed, unless otherwise prescribed on the basis of regional air navigation agreements. It further specifies in 11.4.2.2.6.2 that the **DEP message shall be transmitted by the ATS unit serving the Departure aerodrome to all recipients of basic flight plan data.**

The Air traffic flow Management system uses the "DEP" message received for activation of a Flight plan information. The strategic demand calculated based on the estimated time of Departure is updated in the tactical scenario by the "DEP" information and an updated demand is calculated for Air Traffic Flow Management (ATFM) processes.

AIP India in section ENR 1.10 subsection 4 clearly mentions the addressing requirements of filed Flight plan(FPL)and associated messages to ATFM unit on AFTN address VIDPCTFM ,in addition to concerned ATS units. Since all ATFN messages originating in India are also to addressed to VIDPCTFM, therefore it can be inferred that missing 'DEP' messages for any flight might mean that the message is either not transmitted correctly to all the intended recipients or not originated at all.

The 'FPL' and 'DEP' messages received at CATFM were categorized as follows:

- a) **Domestic**- Both departure and Destination aerodrome within Indian FIRs
- b) **International Arrival**- Departure aerodrome outside Indian FIRs and Destination aerodrome within Indian FIRs.
- c) **International Departure**- Departure aerodrome within Indian FIRs and Destination aerodrome outside Indian FIRs
- d) **Outside FIR**- Both departure and destination aerodrome outside Indian FIRs and the route does not cross any Indian FIR
- e) **Overflying**- Both departure and destination aerodrome outside Indian FIRs and but route crosses at least one Indian FIR

**III. Analysis:**

a) Total number of 'FPL' received by SKYFLOW system

Category	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	April 2022
Domestic	88968	95137	68512	66055	88049	88217
International Arrival	8997	10041	9754	8347	10826	11439
International Departure	8815	9945	9806	8700	11278	11463
Outside FIR	59	3664	5585	2378	83	84
Overflying	13438	11067	7906	9545	16066	15759
Grand Total	120277	129854	101563	95025	126302	126962

b) Total number of 'DEP' messages received for Flights with FPL in SKYFLOW system

Category	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	April 2022
Domestic	61324	65946	49935	49240	65852	66808
International Arrival	5733	6353	5958	5326	6641	7508
International Departure	6453	7415	8431	7983	10074	10552
Outside FIR	40	2381	3627	1593	44	49
Overflying	8952	7147	5144	6243	10311	10594
Grand Total	82502	89242	73095	70385	92922	95511

c) Total percentage of missing 'DEP' messages for flights with FPL in SKYFLOW system

Category	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	April 2022
Domestic	31.07	30.68	27.11	25.46	25.21	24%
International Arrival	36.28	36.73	38.92	36.19	38.66	34%
International Departure	26.80	25.44	14.02	8.24	10.68	8%
Outside FIR	32.20	35.02	35.06	33.01	46.99	42%
Overflying	33.38	35.42	34.94	34.59	35.82	33%

It is evident from the above table that the total percent of missing departure messages for international flights departing from India has seen a decline over the last 6 months.



Further analysis has been conducted for the international flights departing from Indian aerodromes since missing DEP messages from India has been identified as an ANS deficiency by ICAO regional office.

The breakup of the total ‘DEP’ not received for **international departures** originating from India for April 2022 and March 2022 has been provided in the following tables.

Airport	April-2022			March-2022		
	‘Dep’Not Rcvd	Total Intl FPL	Percentage	‘Dep’Not Rcvd	Total Intl FPL	Percentage
Ahemdabad	6	362	2%	11	278	4%
Mumbai	46	1975	2%	73	1862	4%
Nagpur	10	23	43%	2	18	10%
Pune (IAF)	1	43	2%	4	43	9%
Surat	7	11	64%	4	7	36%
Kolkata	3	521	1%	11	348	3%
Gaya	1	1	100%	2	0	100%
Agra (IAF)	1	1	100%	-	-	-
Amritsar	74	175	42%	115	48	71%
Chandigarh	39	39	100%	14	0	100%
Delhi (IGI)	60	2960	2%	155	2793	5%
Jaipur	38	88	43%	59	35	63%
Lucknow	10	200	5%	30	211	12%
Bengaluru	69	601	10%	70	661	10%
Coimbatore	6	44	12%	5	49	9%
Cochin	5	834	1%	55	870	6%
Calicut	10	597	2%	47	542	8%
Goa(Navy)	86	0	100%	58	0	100%
Shamshabad	73	674	10%	82	626	12%
Kannur	191	0	100%	190	0	100%
Madurai	54	0	100%	42	0	100%
Mangalore	2	152	1%	7	126	5%
Chennai	87	903	9%	96	949	9%
Portblair(Navy)	1	0	100%	-	-	-
Tiruchchirappalli	3	217	1%	5	214	2%
Thiruvananthapuram	5	375	1%	23	354	6%
Vishakhapatnam(Navy)	22	0	100%	15	0	100%
Srinagar(IAF)	-	-	-	4	0	100%

-X-