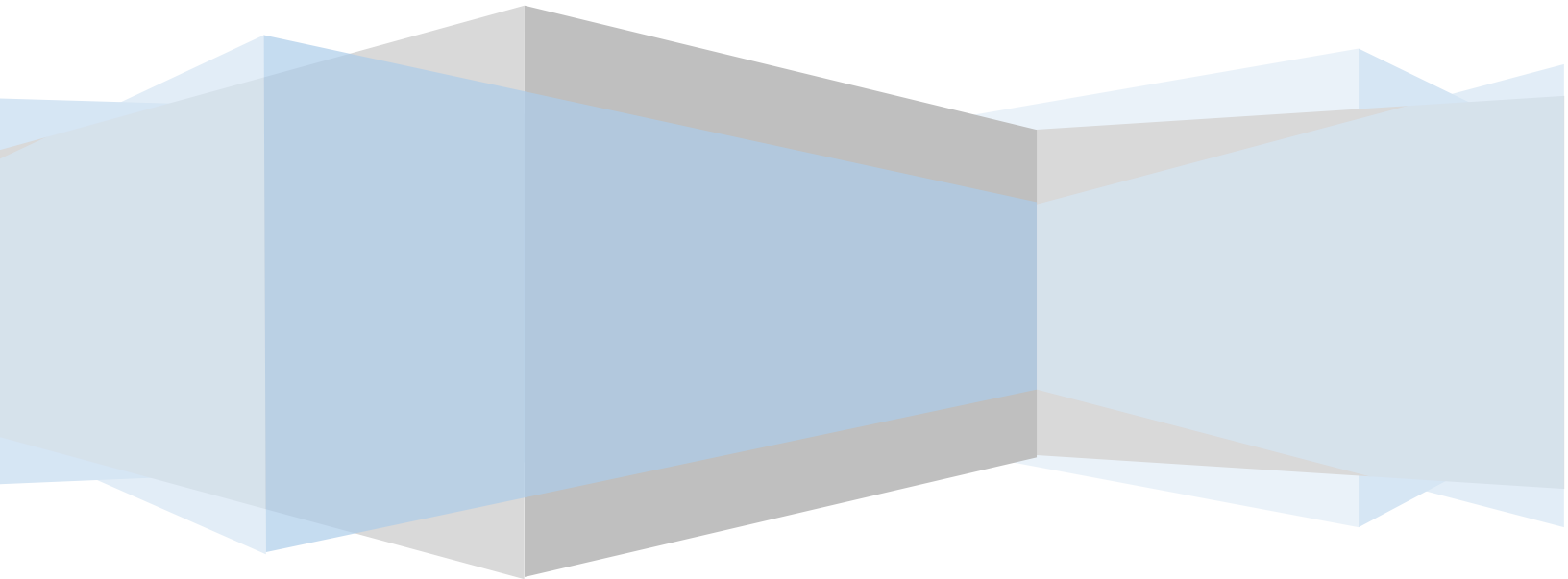


POST OPERATIONS ANALYSIS REPORT

November, 2020

CENTRAL COMMAND CENTER, C-ATFM, DELHI







Contents

A. Executive Summary	4
B. Traffic Analysis	4
I. Daily ATMs at six major airports	5
II. Comparison of total ATMs (YoY) and Month wise	6
III. Air-Traffic Growth (Post COVID Lockdown period)	8
IV. Flight Operations – Airport wise	8
V. Flight Operations – Airline wise (Post COVID lockdown period)	9
C. ATFM Post Operations – CDM Analysis.....	10
I. Introduction	10
II. ATFM Measures Overview.....	11
III. Overall Compliance.....	12
IV. CTOT Compliance rate – Airport wise	14
V. CTOT Compliance rate – Airline wise	15
VI. Air Delay during the CDM Scenario period	16
D. Glossary	17



List of Figures

Figure 1: Daily ATMs at six major airports - Nov'20	5
Figure 2: Percentage Traffic Variation (YoY)	6
Figure 3: Month wise ATMs at six major airports	7
Figure 4: Traffic Growth - Post Covid	8
Figure 5: Busiest Airports in India - Nov'20.....	8
Figure 6: Flight Movements – Airline wise.....	9
Figure 7: ATFM Measures - Nov'20	10
Figure 8: Affected Flight Statistics – Nov'20	11
Figure 9: Overall Compliance – Nov'20	12
Figure 10: ATFM Compliance – Month wise	13
Figure 11: Airlines Overall Compliance - Nov'20.....	15
Figure 12: Cumulative Air Delay during CDM period.....	16



A. Executive Summary

Government of India has now allowed domestic airlines to ramp up their operations to 80 per cent of pre-Covid approved capacity from the existing 70 per cent stipulation. This will help airlines in adding more flights on existing as well as new sectors as flight operations inch towards normalcy. Upon resumption of flights in May, the airlines were allowed to operate not more than 33 per cent of their pre-COVID domestic flights. On June 26, this was increased to 45 per cent and on September 2, it was further increased to 60 per cent. On November 11, it was increased to 70 per cent.

The scheduled international flight movements however remain suspended till 1829 UTC of 31st December'20. (NOTAM G1183 replacing NOTAM G0915/20).

Even though India has extended its embargo on international flights till 31st December'20, special international passenger flights have been operating in India under the Vande Bharat Mission since May and under bilateral air bubble arrangements formed between India and other countries since July. Air bubbles or travel corridors are systems established between two countries that perceive each other to be safe and allow carriers of both the countries to fly passengers either way without any restrictions. Government is also implementing "air bubble" agreements with countries in order to mitigate a host of quarantine and Covid-19 testing rules at arrival destinations.

ATFM measures were applied four times for Bengaluru Airport in the month of November'20 due to scheduled Runway maintenance. The average CTOT compliance rate was observed to be 80% and 59% of arrivals received an air delay of 10 minutes or less during the period when ATFM measures were in force.

B. Traffic Analysis

Experts have pointed out to the containment of Covid19 spread as one of the key factors in recovery of domestic flights. "The recovery in domestic passenger traffic is contingent on the following five factors – containment of the spread of Covid-19, which in turn is dependent on the development of a vaccine and its wide availability, willingness of consumers to undertake leisure travel, recovery in macroeconomic growth, which in turn impacts consumer sentiments and ability to travel, Central and various state government-mandated travel restrictions and quarantine norms, and recovery in business travel".

The total number of ATMs at Indian Airports in **Nov'20 (during Covid pandemic) w.r.t. Dec'19(Pre -Covid) is 57.4%.**

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 and all other aircraft movements at four major Indian Airports namely Delhi, Mumbai, Bengaluru and Hyderabad is plotted for each day of the month of Nov'20. The data used is the movement data received from Delhi, Mumbai, Bengaluru and Hyderabad Airport. Airline movement is also plotted for the month for major Scheduled Operators.



I. Daily ATMs at six major airports

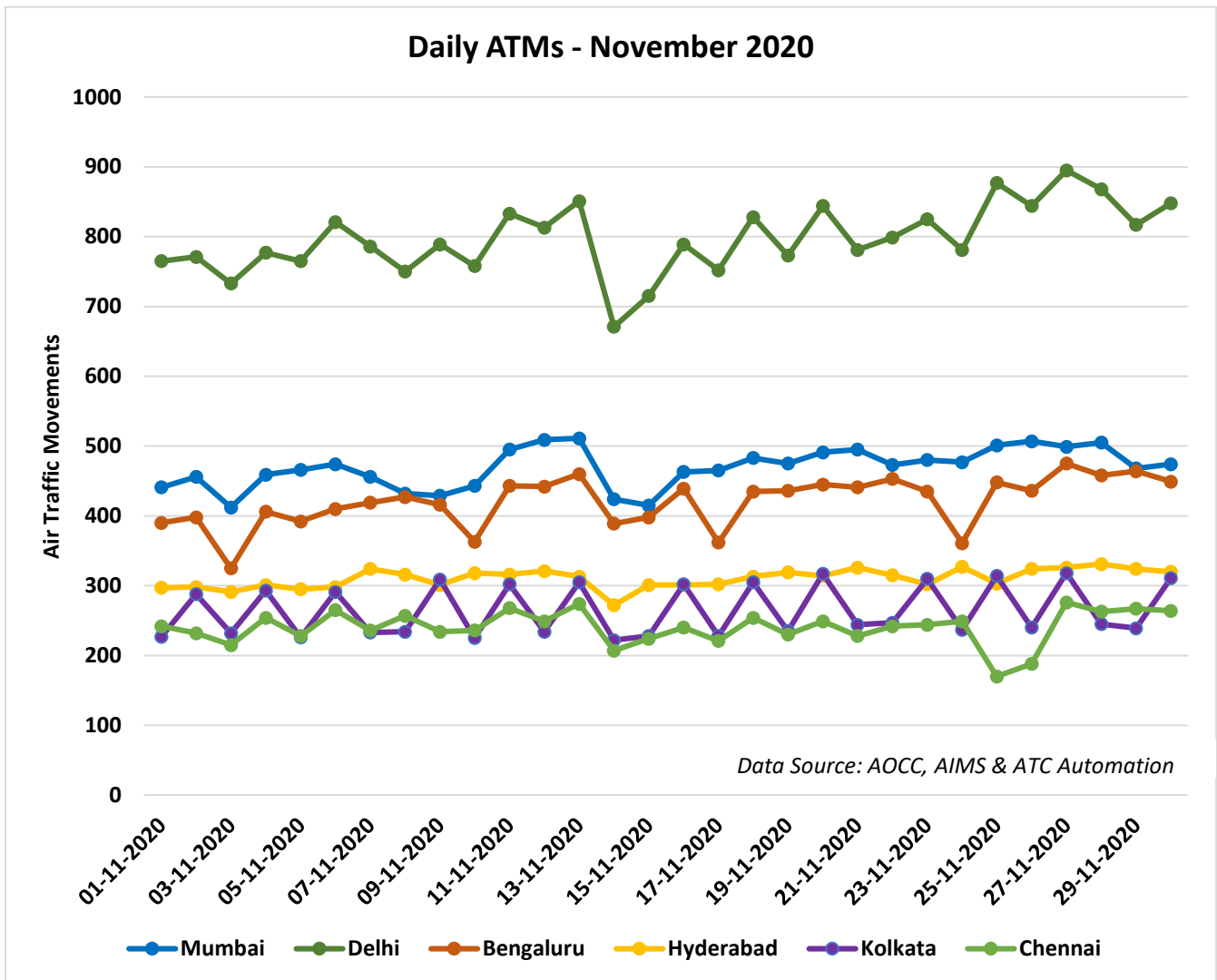


Figure 1: Daily ATMs at six major airports - Nov'20



II. Comparison of total ATMs (YoY) and Month wise

The graph below depicts the change in total ATMs in the month of Nov'20 in comparison to the total ATMs in Nov'19 for six major Airports in India. The traffic handled at Bengaluru in Nov'20 is 57.9% less than the traffic handled in Nov'19 whereas the traffic handled in Mumbai, Delhi, Hyderabad, Kolkata and Chennai are 47.7%, 43.1%, 43.6%, 47.4% and 51.5% less than the traffic handled in Nov'19 respectively.

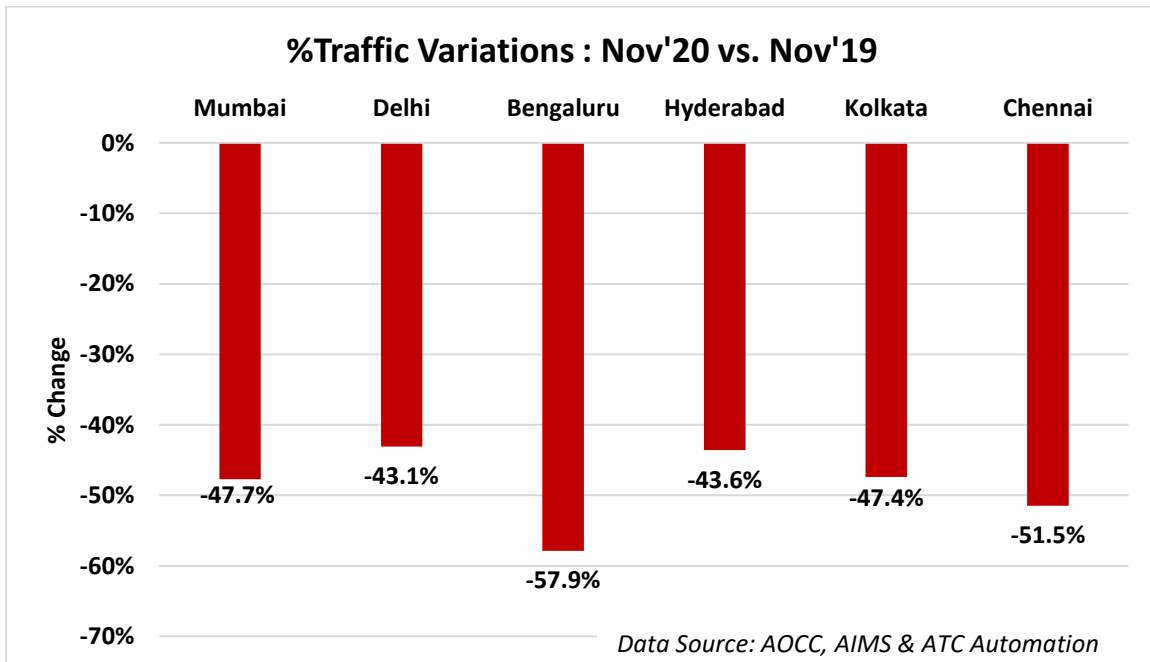


Figure 2: Percentage Traffic Variation (YoY)

Total ATMs (YoY) for six major airports		
Airports\Year	Nov'20	Nov'19
Mumbai	14078	26946
Delhi	23919	42072
Bengaluru	12615	19919
Hyderabad	9309	16517
Kolkata	7941	15120
Chennai	7206	14847



The graph below presents the month wise air traffic movement in the year 2020, at six major Airports.

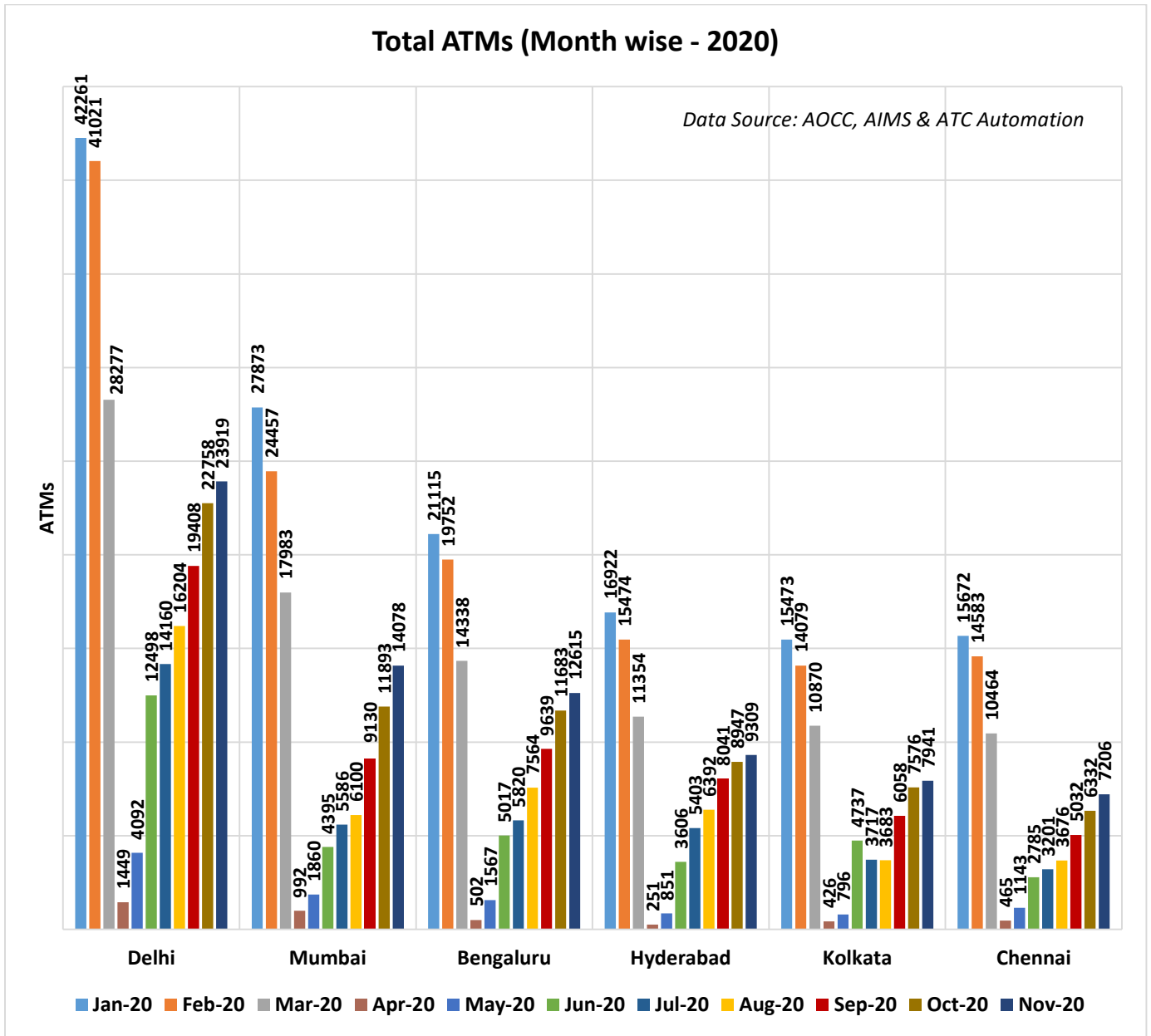


Figure 3: Month wise ATMs at six major airports



III. Air-Traffic Growth (Post COVID Lockdown period)

The graph below plots the percentage change per month in Air traffic (domestic and international) post Covid Lockdown and resumption of flight operations from May'20. The Indian aviation industry witnessed continued recovery in domestic passenger traffic in November, with a steady growth over October by 8%.

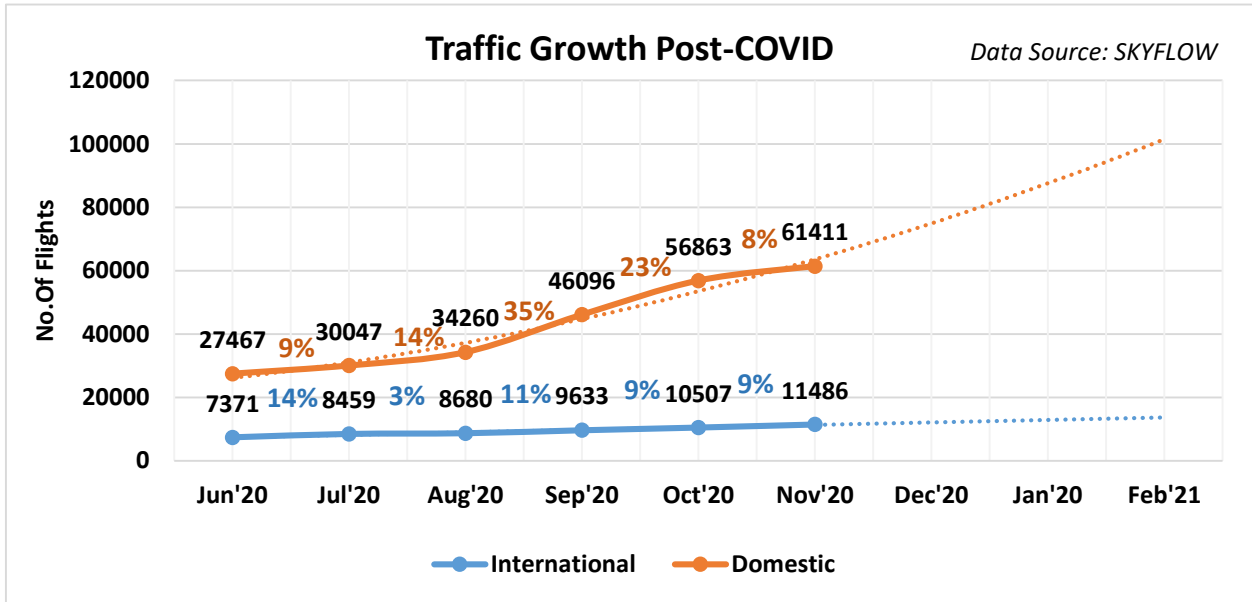


Figure 4: Traffic Growth - Post Covid

IV. Flight Operations – Airport wise

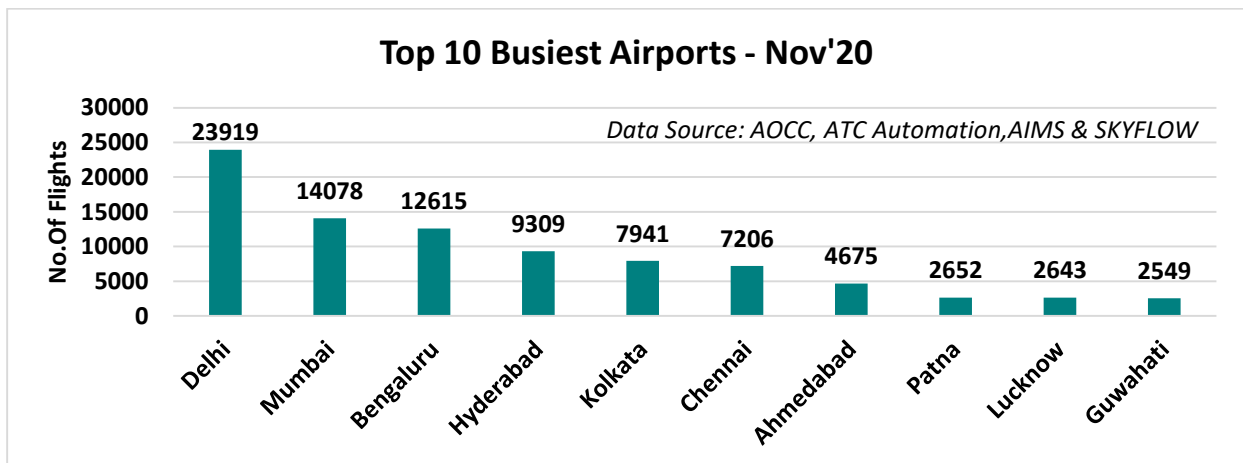


Figure 5: Busiest Airports in India - Nov'20



V. Flight Operations – Airline wise (Post COVID lockdown period)

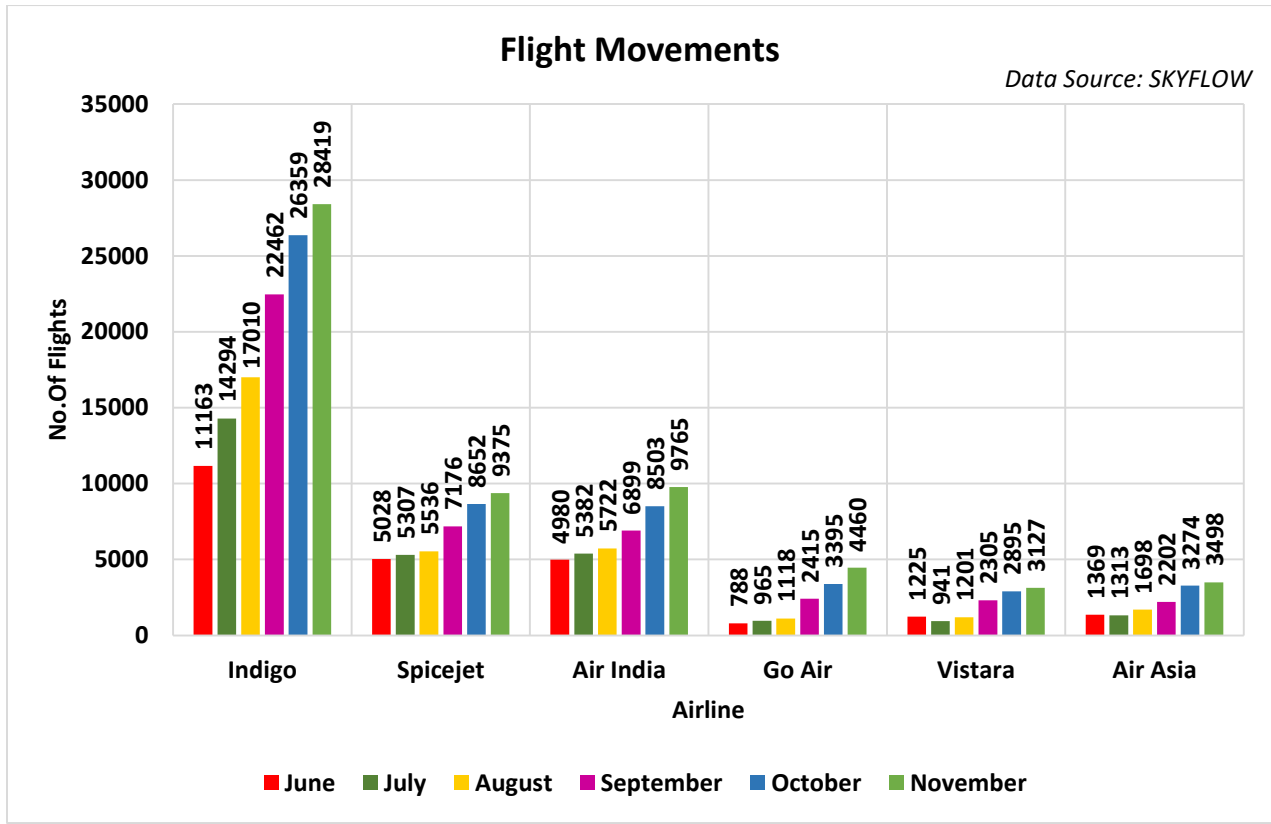


Figure 6: Flight Movements – Airline wise



C. ATFM Post Operations – CDM Analysis

I. Introduction

Analysis Period 1st – 30th November'20

Back Ground During the above mentioned period, ATFM measures were applied **four(4) times for Bengaluru Airport** due to the following reasons as illustrated in the bar chart below:–

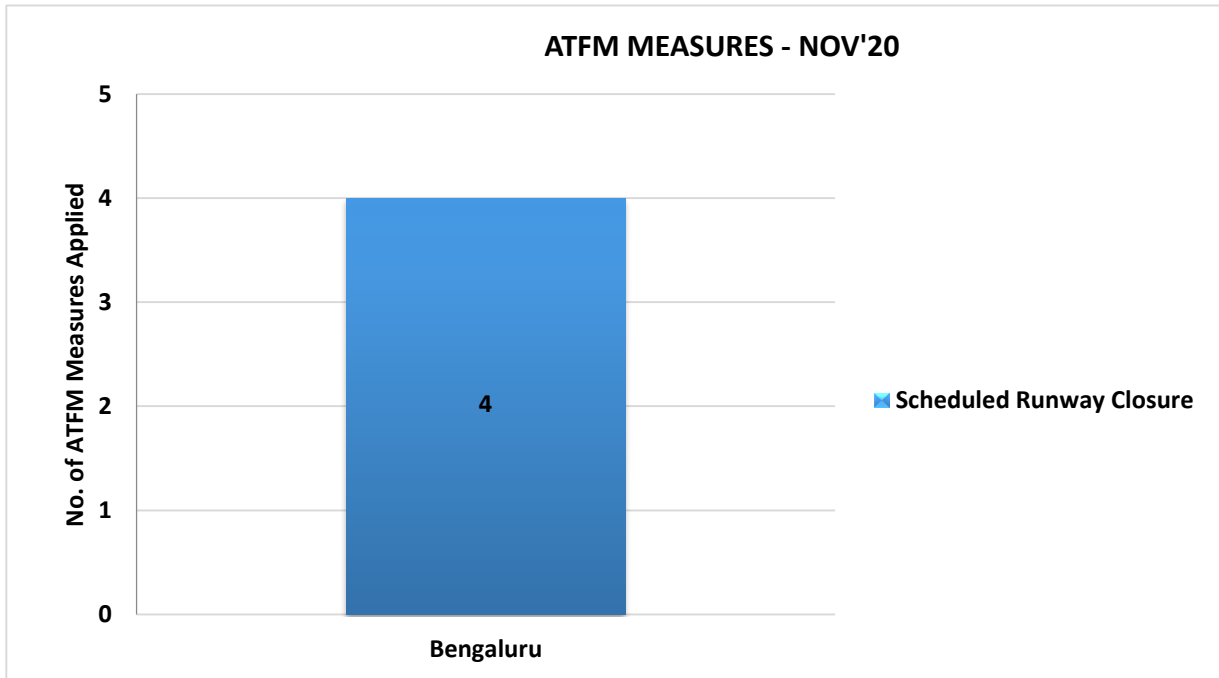


Figure 7: ATFM Measures - Nov'20



II. ATFM Measures Overview

	Bengaluru Airport
Number of ATFM measures applied	4
Average ATFM Ground delay due to measures	17 min
Maximum ATFM Ground delay due to measures	40 min
% Compliance	80

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

Total affected flights in scenario (Domestic Arrivals)	66
Total Domestic Arrivals with zero ATFM delay	10
Total Domestic Arrivals with ATFM delay	56

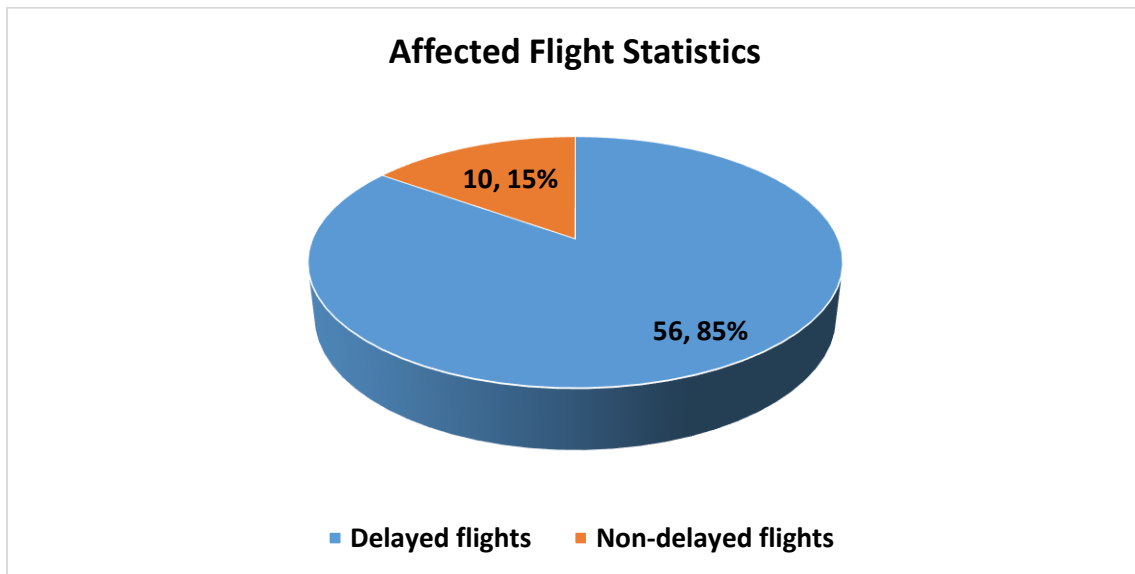


Figure 8: Affected Flight Statistics – Nov'20



III. Overall Compliance

Total Arrivals	66
Domestic arrivals	66
Flights with complete data (ATOT)	66
Flights with incomplete data	0
Flights Not Operated	0
Compliant*	53
Non-Compliant	13

Total No. of Revised CTOTs issued = 5 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)

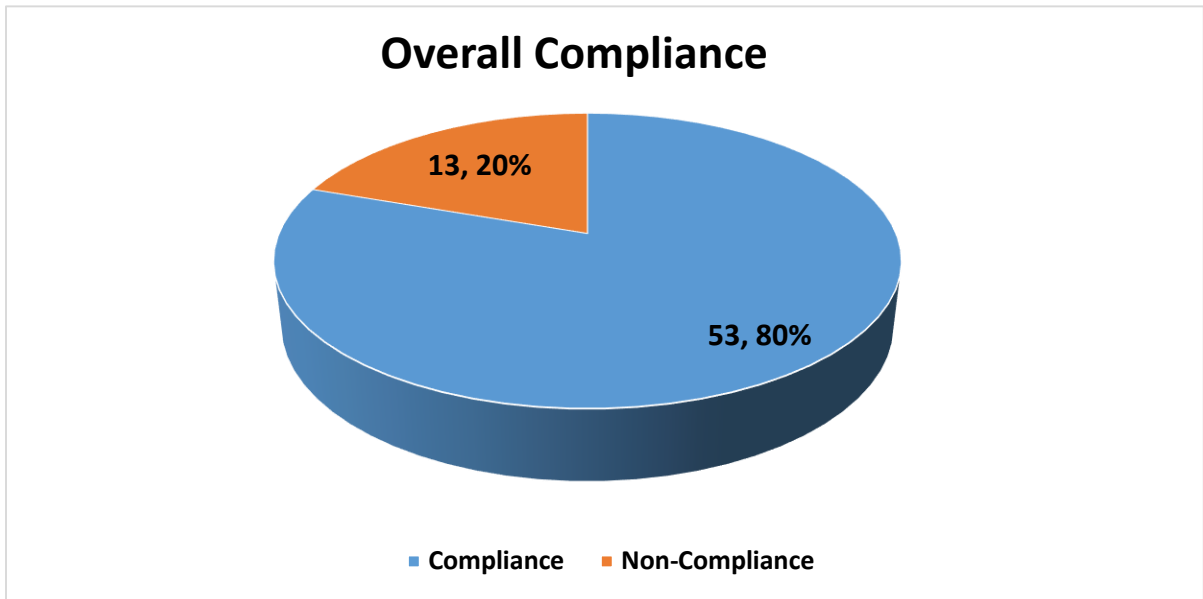


Figure 9: Overall Compliance – Nov'20

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

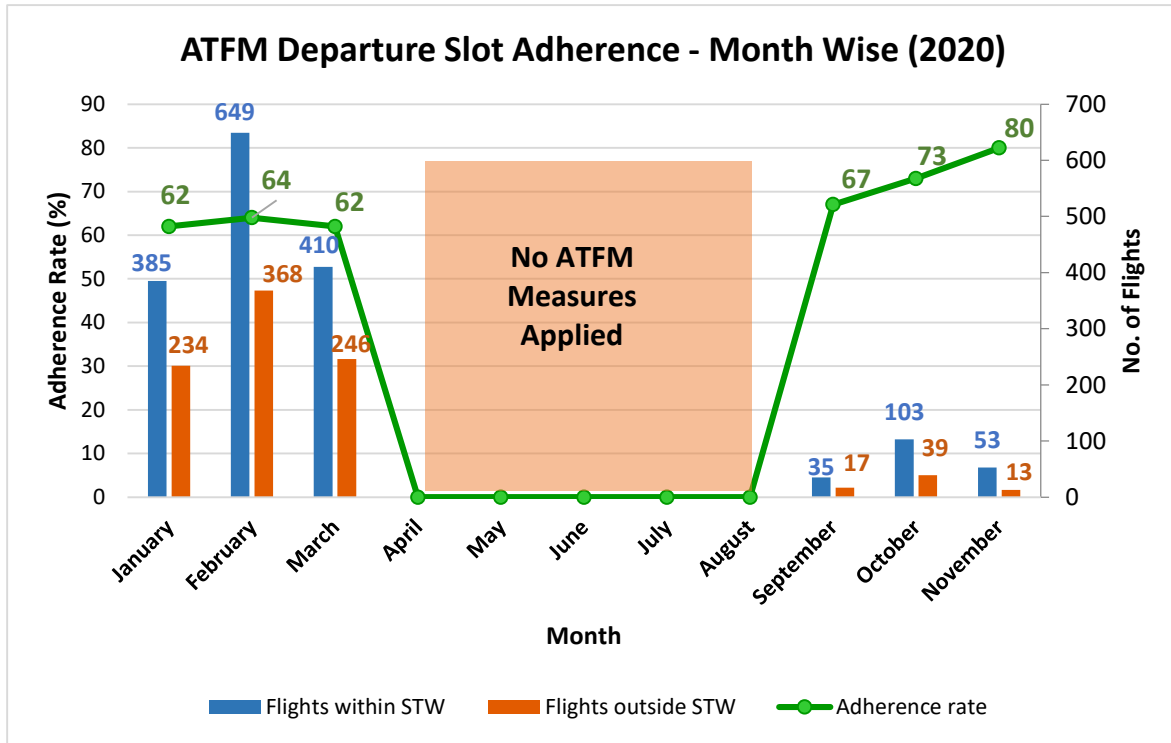


Figure 10: ATFM Compliance – Month wise

Inference

1. Out of the total arrivals captured for the constrained Airports during the CDM scenario , 100% of flights i.e. Domestic arrivals, are participating.
2. Out of these Domestic Arrivals, 85% of arrivals are assigned ATFM ground delay & 15% of flights are without any ATFM ground delay.
3. Out of the total arrivals captured to the constrained Airport during the ATFM scenario, 85% of flights are assigned ATFM Ground Delay.



IV. CTOT Compliance rate – Airport wise

MUMBAI FMP (90%)*	Compliant	Non Compliant	%Compliant
Kolhapur	2	1	67
Bhopal	3	0	100
Pune	2	0	100
Surat	2	0	100
KOLKATA FMP (78%)*			
Bagdogra	2	0	100
Guwahati	3	1	75
Kolkata	6	4	60
Allahabad	3	0	100
Varanasi	4	0	100
DELHI FMP (92%)*			
Delhi	6	1	86
Chandigarh	2	0	100
Jaipur	1	0	100
Lucknow	2	0	100
CHENNAI FMP (71%)*			
Chennai	2	1	67
Rajahmundry	1	0	100
Hyderabad	9	0	100
Belgaum	1	2	33
Madurai	2	1	67

*FIR wise compliance rate



V. CTOT Compliance rate – Airline wise

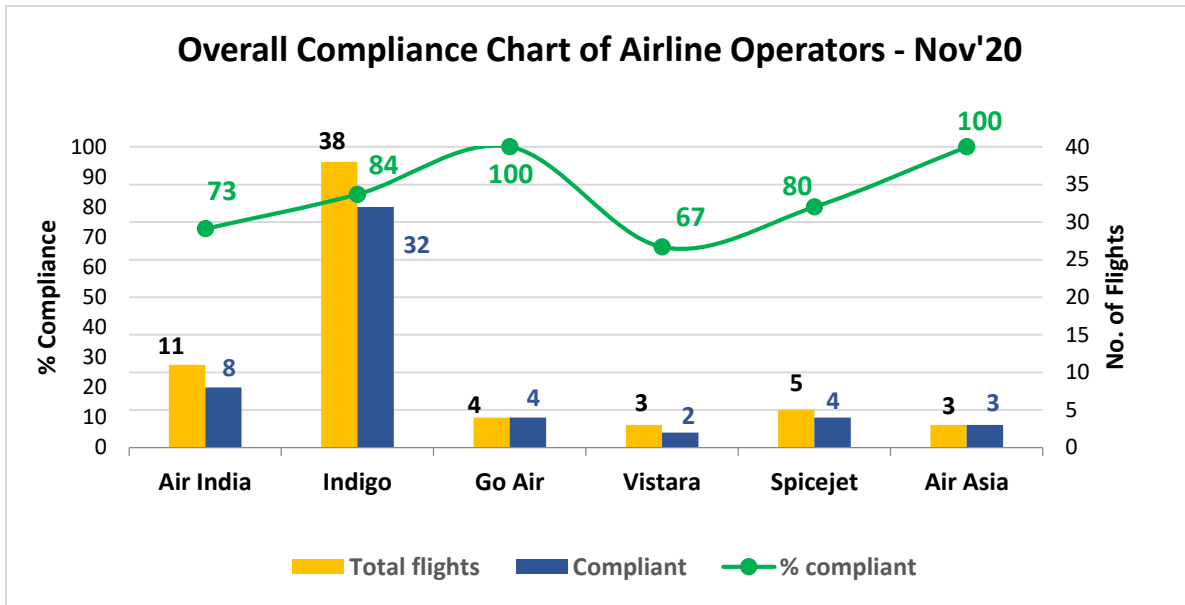


Figure 11: Airlines Overall Compliance - Nov'20

Inference

1. Out of the total domestic arrivals with complete data in the CDM scenario, 80% arrivals are compliant.
2. Delhi region has the highest compliance rate of 92% whereas Chennai region has the lowest compliance rate of 71%.
3. Air Asia, Indigo and GoAir have a compliance rate above the average recorded 80% compliance.



VI. Air Delay during the CDM Scenario period

Average Air Delay to domestic arrivals* within the CDM Scenario period for Bengaluru is 14 minutes

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

Distribution of difference between AET & filed EET

AET-EET min (time band)		<= -10	-9 to -6	-5 to -1	0 to 5	6 to 10	11 to 15	16 to 20	21 to 25	26 to 30	>30
Bengaluru	Flt. Count	1	2	9	14	12	6	9	5	3	3
	% flight	2	3	14	22	18	9	14	8	5	5

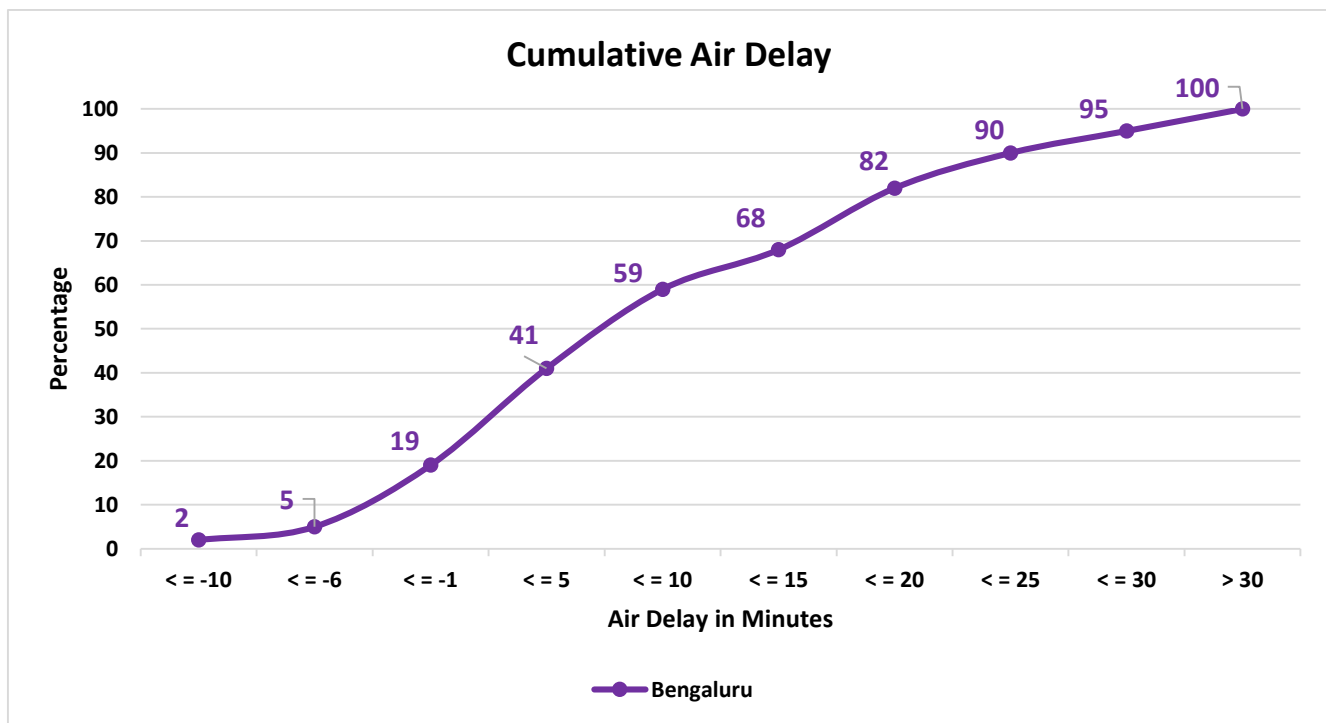


Figure 12: Cumulative Air Delay during CDM period

Inference

- 59% of arriving flights to Bengaluru had an Air delay of equal to or less than 10 minutes during the CDM period.



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>