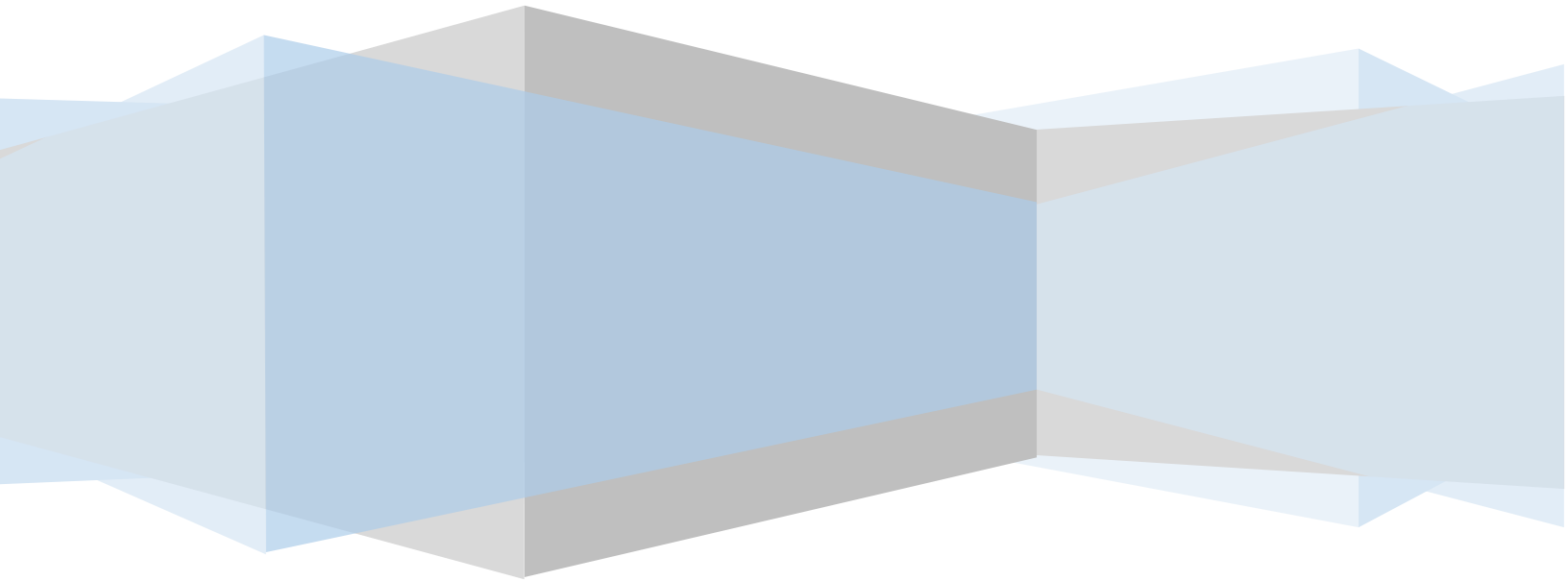


**ANNUAL REPORT**  
**ATFM OPERATIONS**  
**(Jan 2020 to Dec 2020)**

**CENTRAL COMMAND CENTER, C-ATFM, DELHI**







# Contents

<b>A. Executive Summary .....</b>	<b>4</b>
<b>B. Traffic Analysis .....</b>	<b>5</b>
<b>I. Impact of COVID-19 on three major airports.....</b>	<b>6</b>
<b>II. Comparison of total ATMs (YoY) and Month wise .....</b>	<b>7</b>
<b>III. Air-Traffic Growth (Post COVID Lockdown period) .....</b>	<b>9</b>
<b>IV. Flight Operations – Airport wise .....</b>	<b>10</b>
<b>V. Flight Operations – Airline wise (Post COVID lockdown period) .....</b>	<b>10</b>
<b>VI. Traffic Flow Between India and The Rest Of The World.....</b>	<b>11</b>
<b>C. ATFM Post Operations – CDM Analysis.....</b>	<b>12</b>
<b>I. Introduction .....</b>	<b>12</b>
<b>II. ATFM Measures Overview.....</b>	<b>13</b>
<b>III. Overall Compliance .....</b>	<b>14</b>
<b>IV. CTOT Compliance rate – Airport wise .....</b>	<b>16</b>
<b>V. CTOT Compliance rate – Airline wise .....</b>	<b>17</b>
<b>VI. Air Delay during the CDM Scenario period .....</b>	<b>18</b>
<b>D. Glossary .....</b>	<b>19</b>



## List of Figures

Figure 1: COVID-19 Impact on 3 Major Airports .....	6
Figure 2: Percentage Traffic Variation (YoY) .....	7
Figure 3: Month wise ATMs at six major airports .....	8
Figure 4: Traffic Growth - Post Covid .....	9
Figure 5: Busiest Airports in India - Dec'20 .....	10
Figure 6: Flight Movements – Airline wise.....	10
Figure 7: International Traffic Flow – Region wise (Dec'20).....	11
Figure 8: ATFM Measures - 2020 .....	12
Figure 9: Affected Flight Statistics .....	13
Figure 10: Overall Compliance.....	14
Figure 11: ATFM Compliance – Month wise .....	15
Figure 12: Airlines Overall Compliance .....	17
Figure 13: Cumulative Air Delay during CDM period.....	18



## A. Executive Summary

Amidst reports of Covid-19 spreading across the world in Jan'20, domestic flight operations in India continued at its normal pace whereas a dip was observed in the international flight operations. January, February and March Months witnessed 12,19 and 15 number of ATFM measures respectively applied for Demand Capacity imbalance arising due to various reasons in Delhi, Mumbai and Bengaluru Airport.

India witnessed a plummet in total Air Traffic amidst Covid-19 pandemic in last week of March'20 when Government of India in its initiative to prevent further spread of Covid-19 virus, applied a total ban on operations of all domestic & international commercial flight operations to and from India. Only flights engaged in Cargo, humanitarian aids, medical supplies and relief purposes were allowed to operate with prior approval of DGCA.

Schedule domestic flights were suspended on March 25, 2020 due to the pandemic. They were allowed to resume two months later on May 25 in a phased manner beginning with one-third (33%) of their pre-Covid capacity. When the winter schedule for domestic flights was approved, airlines were allowed to operate 60% domestic flights which was later revised to 80 per cent of pre-Covid approved capacity from the existing stipulation.

The scheduled international flight movements remain suspended till 1829 UTC of 31st January'20. (NOTAM G1365 replacing NOTAM G1183/20). However, special international passenger flights have been operating in India under the Vande Bharat Mission since May and under air bubble arrangements formed with around 24 countries since July'20. Under a bilateral air bubble arrangement, airlines of the two countries can operate flights between their territories with certain restrictions. India had also suspended all passenger flights connecting India and U.K. from December 23 to January 7 as a new variant of coronavirus emerged in the UK. Flight operations have now been resumed partially with U.K. from January 8, 2021.

During the new normal, CCC had to adapt to the virtual world. Around 264 officers at various Flow Management Positions(FMPs) were trained through online classes. CCC Specialist training was imparted to newly posted officers and refresher training was conducted for existing officers. The pandemic period was used productively for reviewing and updating ATFM documents such as AIP supplement, ATMC, Common Business rules and Atech ATFM manuals. New Reports on Traffic Analysis is prepared Daily and Weekly and shared with all stakeholders.



## Introduction

Air Traffic Flow Management is being implemented in phased manner in India. The operational structure comprises of Central Command Centre (CCC) established in Delhi, at the helm of affairs, supported by Flow Management positions (FMPs) at designated Air Traffic Control Towers, Approach and Area Control Centers. The Phase-I implementation involved activation of 36 Flow Management positions in different ATS units including 8 joint civil –military Airports and application of Ground Delay Program (GDP) and Ground Stop Program (GSt) to regulate traffic (resolve Demand Capacity imbalance) at constrained Airport.

Regular ATFM Operations commenced in India from 27<sup>th</sup> April'2017.

Phase –II implementation process includes the integration of ATFM and Airport CDM of 4 major and 8 satellite Airports to increase the operation efficiency and situation awareness of all the stakeholders. Airport CDM of 4 Major Airports- Mumbai, Kolkata, Chennai and Delhi Airport is already integrated with the ATFM system. Phase-II also includes addressing the demand capacity imbalance in Airspace through Airspace Flow Program such as Miles/Minutes in trail, Sequencing Programs (Arrival, Departure, En-route), Fix Balancing, Re-routing etc.

Since the Airspace Flow Program requires proactive participation of FMPs and Air traffic controllers it has been decided to use in trail and Sequencing programs initially so as not to overwhelm all concerned and gain enough expertise to smoothly undertake other Airspace Flow Programs. A meeting to this effect with all concerned stakeholders including the ATS in charges, Airlines, Regulator, Military Cell and Airport Operator has already been conducted. An in-house training on Phase –II System functionality has already been conducted for CCC officers. The internal testing of arrival sequencing Program was carried out in coordination with Bengaluru ATC (21<sup>st</sup> Sep'20 to 1<sup>st</sup> Oct'20).

FMP and ATC training on Airspace flow programs is in pipeline followed by one-month of trial operations. Post successful trials after addressing and mitigating any shortcomings observed, we propose to go fully operational with Airspace flow programs on identified hotspots.

## 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 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 three major Indian Airports namely Delhi, Mumbai and Bengaluru is plotted for each week of the year from 1<sup>st</sup> Feb'20 to 1<sup>st</sup> Jan'21. The data used is the movement data received from Delhi, Mumbai and Bengaluru Airport.

I. Impact of COVID-19 on three major airports

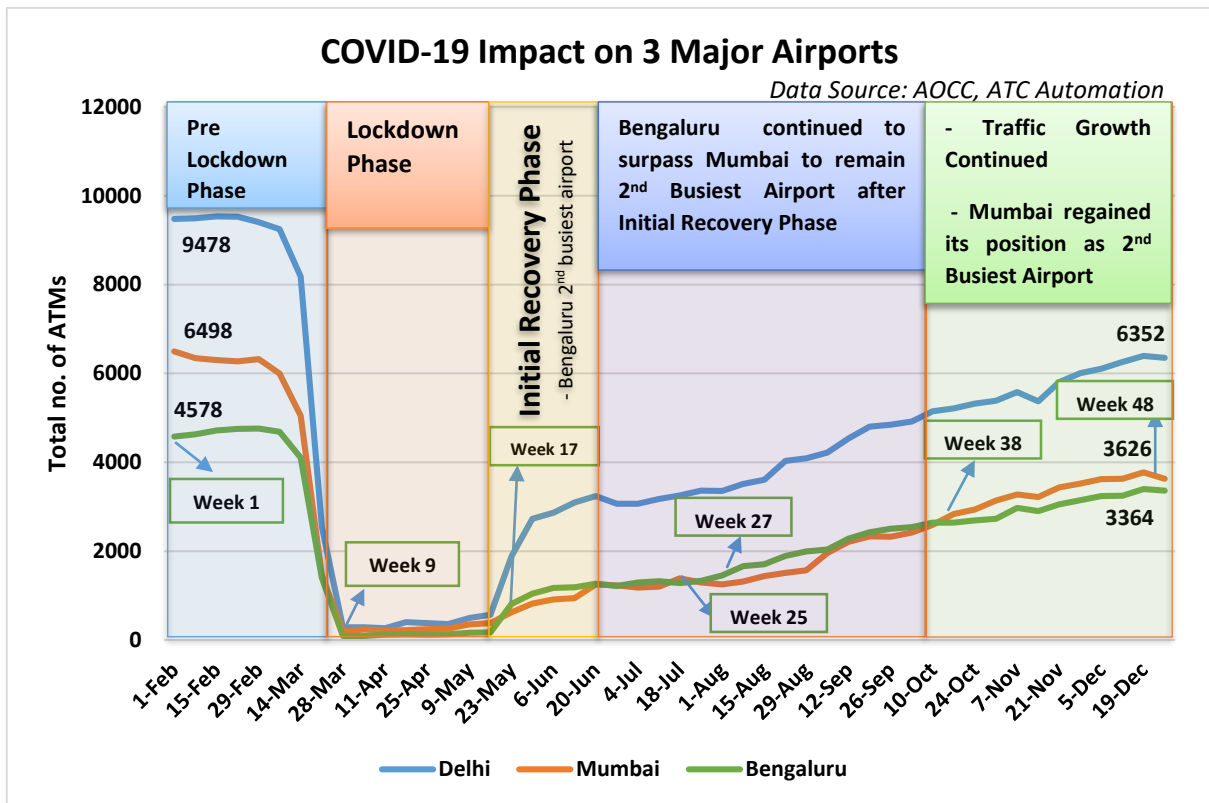


Figure 1: COVID-19 Impact on 3 Major Airports

The above graph also tracks the impact of COVID-19 on these three major airports of India. Government of India imposed nationwide lockdown on 24.03.2020 and consequently the air traffic movements dropped below 98% of 2019 levels in week 9 (28.03.2020-03.04.2020).

Gradually the restrictions were eased for scheduled domestic traffic and air traffic showed marginal improvement in week 17 (23.05.2020-29.05.2020) reaching more than 10% of the 2019 levels. It is interesting to note that Bengaluru surpassed Mumbai in terms of ATMs to become the 2<sup>nd</sup> busiest airport in India. This was owing to the fact that Maharashtra was more severely affected by COVID-19 as compared to other states.

Week 25 (18.07.2020-24.07.2020) signified the recovery peak for Mumbai so far with a slight increase in ATMs leading it to surpass Bengaluru. Lockdown in Maharashtra was extended till August 31<sup>st</sup> to contain the spread of COVID-19 leading to a drop in traffic for Mumbai in week 27 (01.08.2020-07.08.2020) whereas the traffic for Bengaluru and Delhi exhibited an upward trend. Bengaluru continued to be the 2<sup>nd</sup> busiest airport.

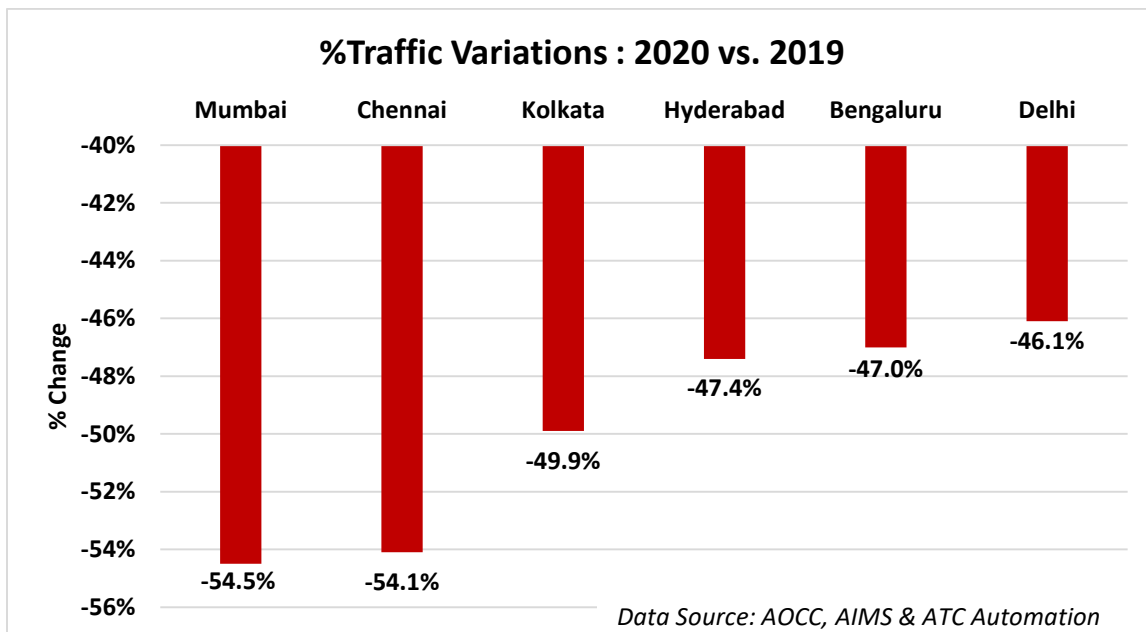


Unlock 5.0 came into effect from October 1<sup>st</sup>, 2020. This combined with the eased restrictions led to an increase in ATMs at Mumbai and it regained its position as 2<sup>nd</sup> busiest airport in India in week 38 (17.10.2020-23.10.2020). This week witnessed traffic at Delhi, Mumbai and Bengaluru reaching 51.5%, 40.4% and 54.7% respectively of the 2019 levels.

In week 48 (26.12.2020-01.01.2021) the traffic at Delhi, Mumbai and Bengaluru has reached 59.8%, 51.5% and 64.9% respectively of the pre-COVID levels.

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

The graph below depicts the change in total ATMs in 2020 in comparison to the total ATMs in 2019 for six major Airports in India.



**Figure 2: Percentage Traffic Variation (YoY)**

Total ATMs (YoY) for six major airports		
Airports\Year	2020	2019
Mumbai	140550	309151
Chennai	79538	173516
Kolkata	84483	168555
Hyderabad	98009	186529
Bengaluru	124153	234172
Delhi	253755	471291

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



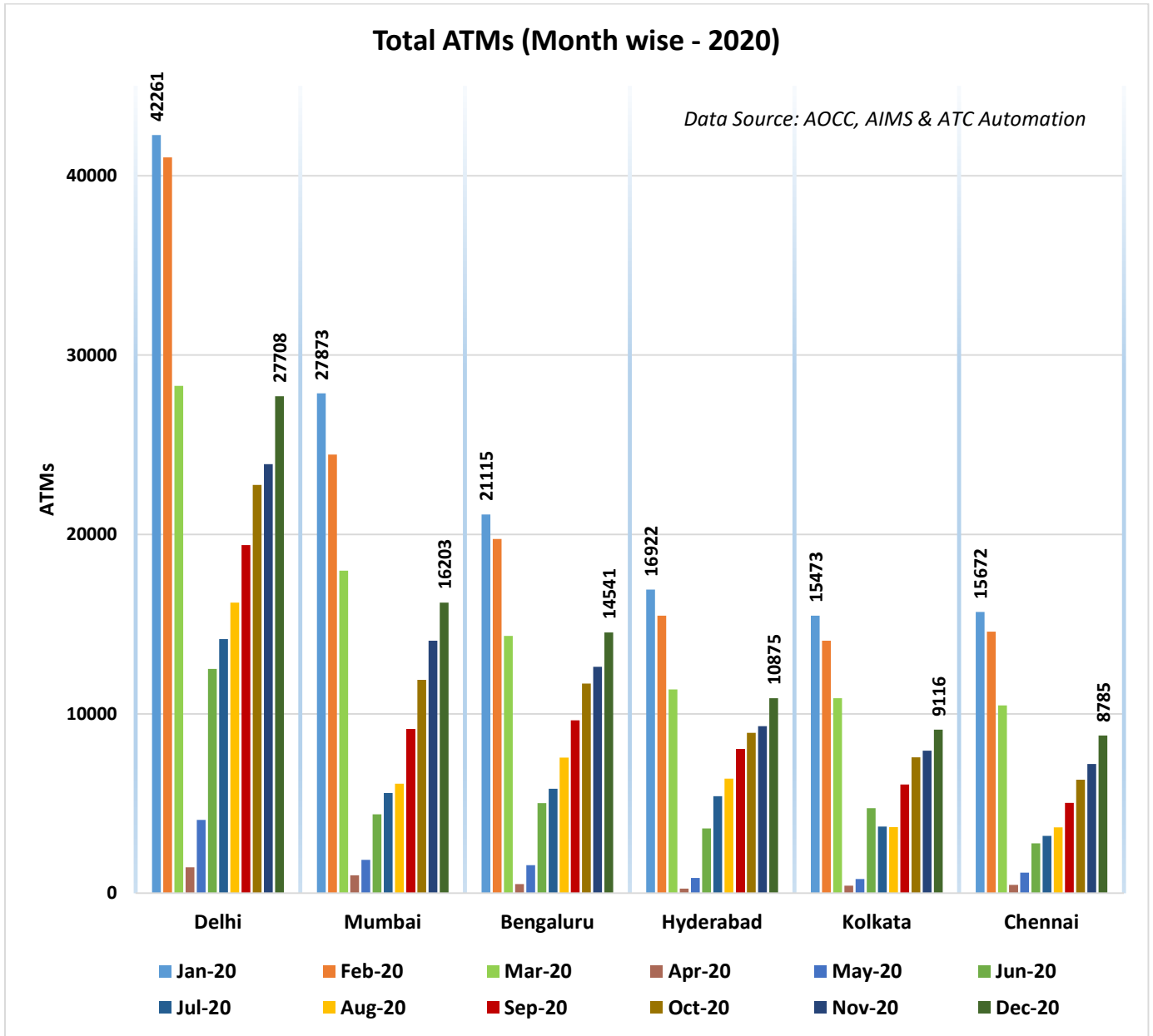


Figure 3: Month wise ATMs at six major airports



### 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 recovery to Precovid levels as per the data available with ATFM (Average monthly Air traffic movement for the year 2019) is by Feb'21 by an optimistic estimate and by April'21 by a conservative estimate.

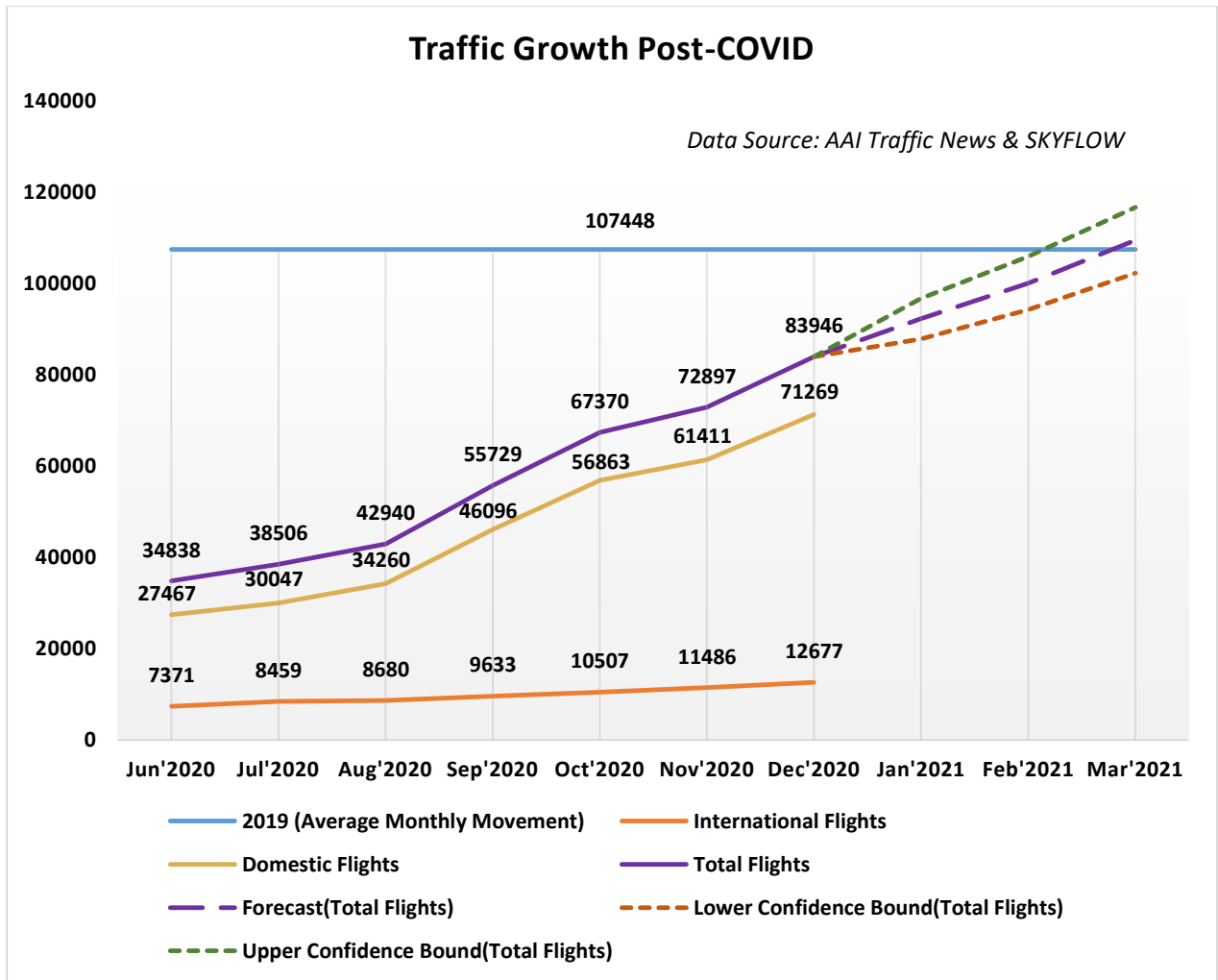


Figure 4: Traffic Growth - Post Covid



#### IV. Flight Operations – Airport wise

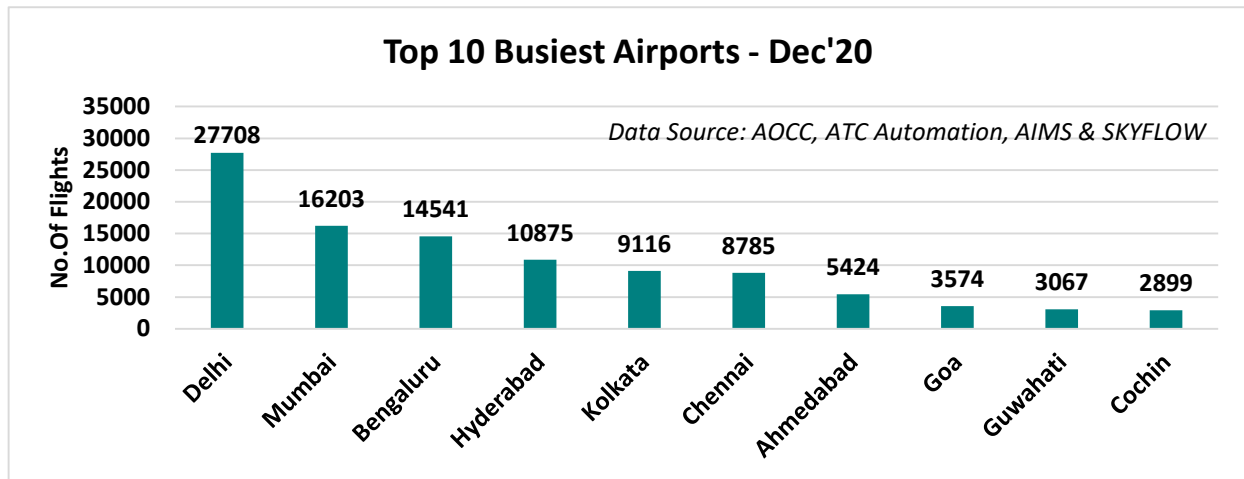


Figure 5: Busiest Airports in India - Dec'20

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

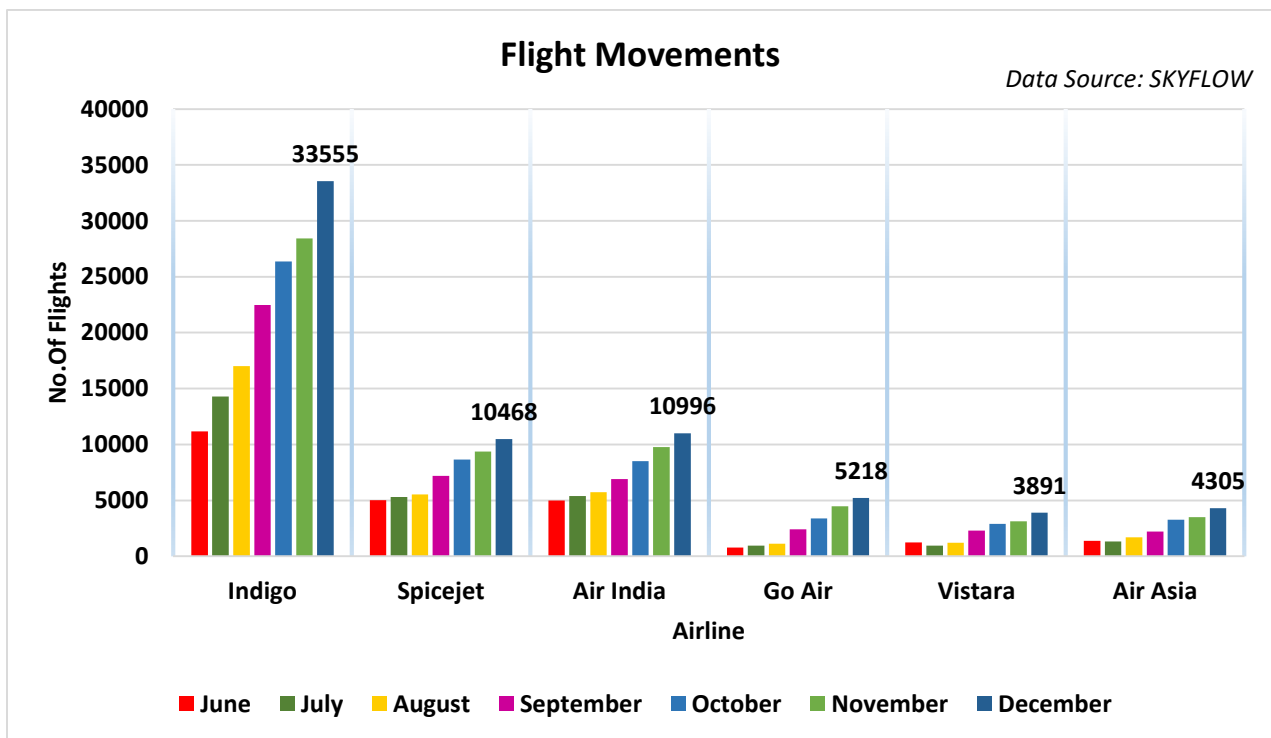
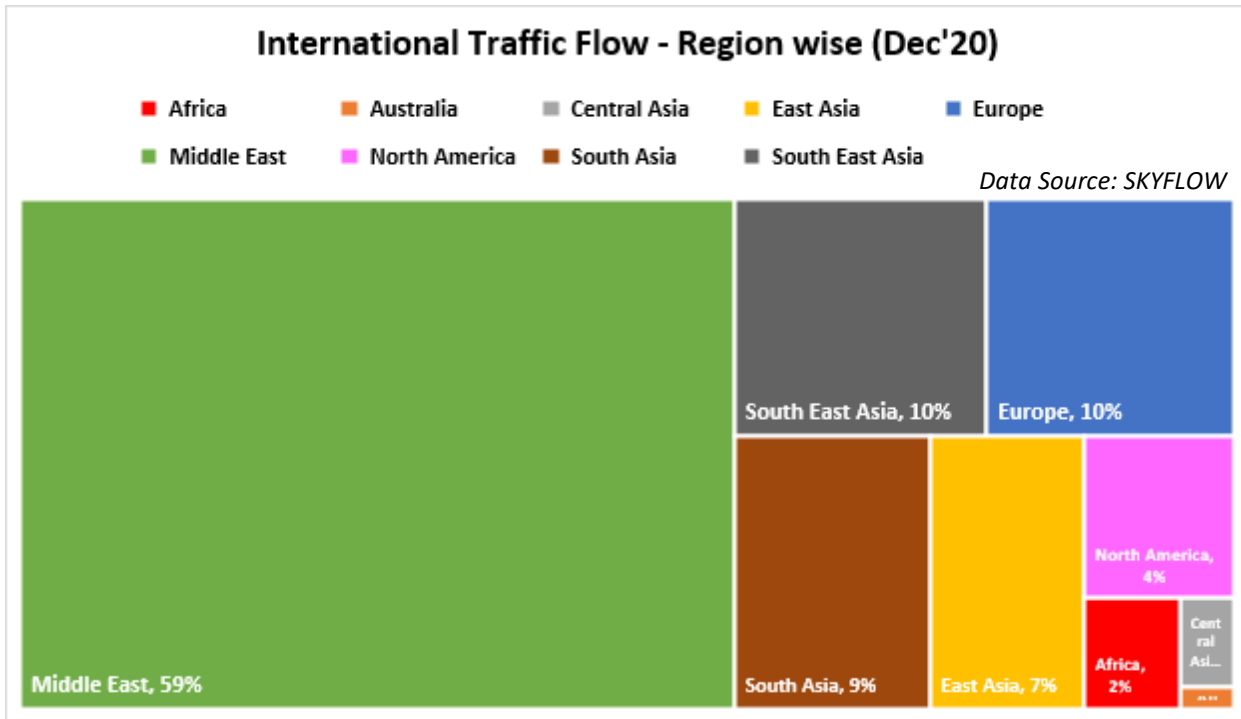


Figure 6: Flight Movements – Airline wise

VI. Traffic Flow Between India and The Rest Of The World



**Figure 7: International Traffic Flow – Region wise (Dec'20)**

**Note:** Since Scheduled International Flight operations to/from India remain suspended till 31<sup>st</sup> Jan'21, all the flights depicted above are flights operating under “Vande Bharat Mission”, Travel Bubble Agreements and Cargo flights for the month of Dec'20.

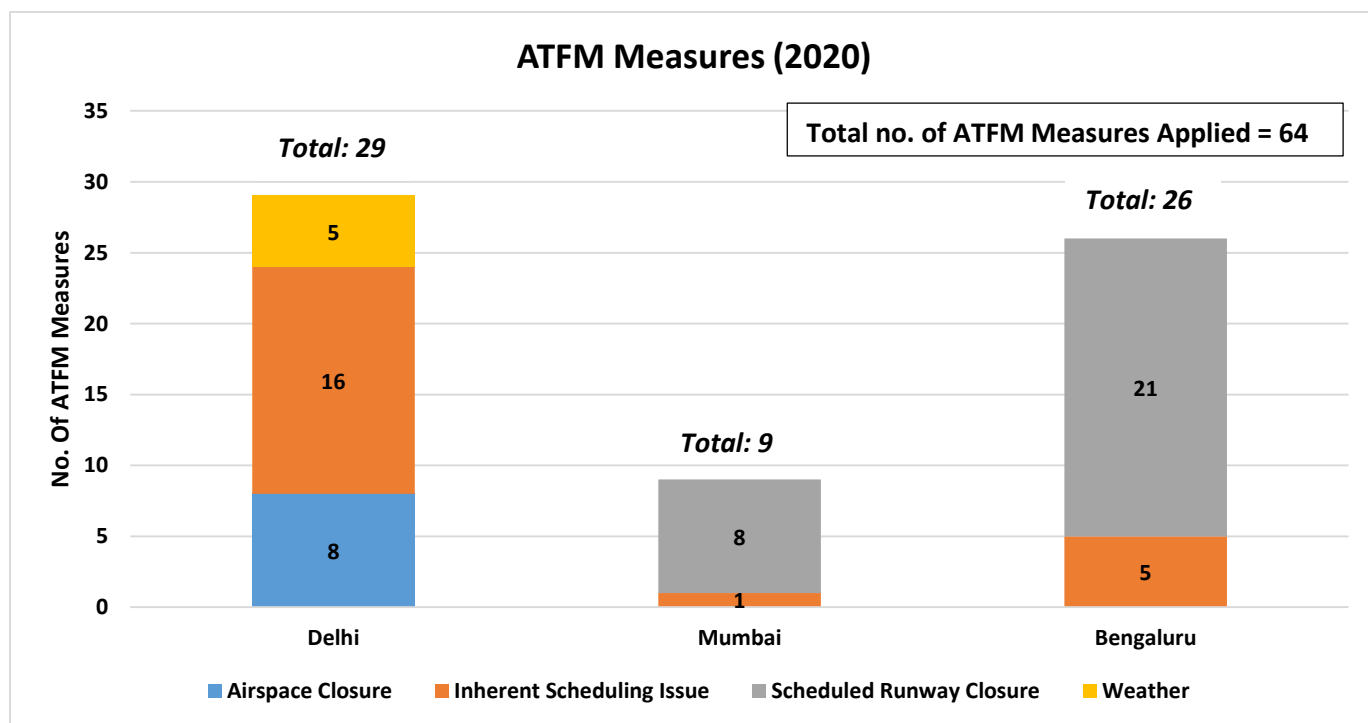


## C. ATFM Post Operations – CDM Analysis

### I. Introduction

**Analysis Period** 1<sup>st</sup> January'20 – 31<sup>st</sup> December'20

**Back Ground** During the above mentioned period, ATFM measures were applied **twenty nine (29) times for Delhi Airport, nine (9) times for Mumbai Airport and twenty six (26) times for Bengaluru Airport** due to the following reasons as illustrated in the bar chart below:-



**Figure 8: ATFM Measures - 2020**

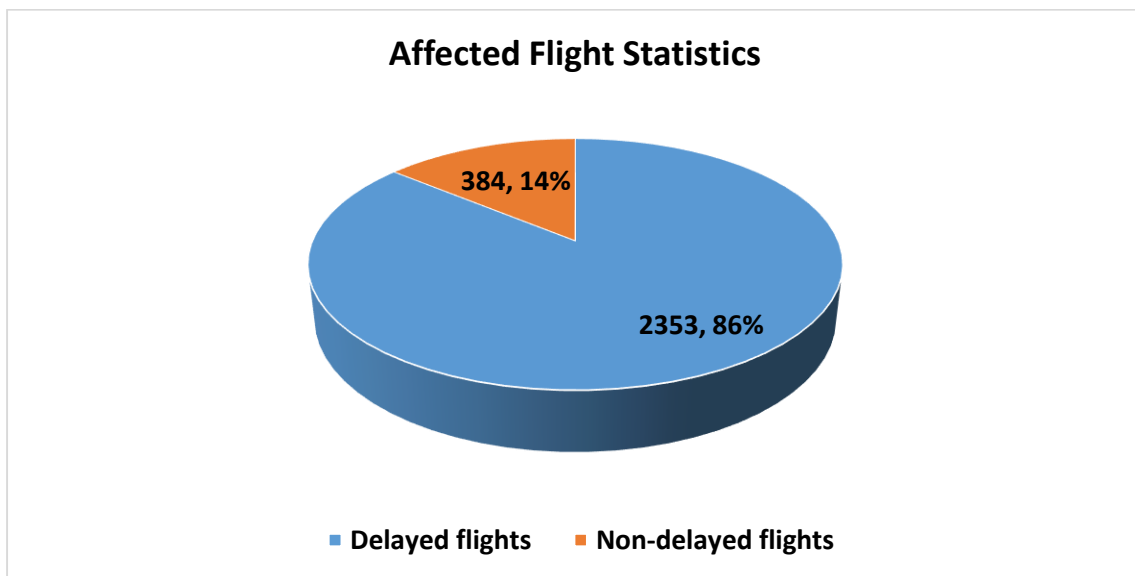


## II. ATFM Measures Overview

	Delhi	Mumbai	Bengaluru
Number of ATFM measures applied	29	9	26
Average ATFM Ground delay due to measures	18 min	11 min	14 min
Maximum ATFM Ground delay due to measures	106 min	36 min	42 min
% Compliance	62%	63%	75%

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

Total affected flights in scenario (Domestic Arrivals)	2737
Total Domestic Arrivals with zero ATFM delay	384
Total Domestic Arrivals with ATFM delay	2353



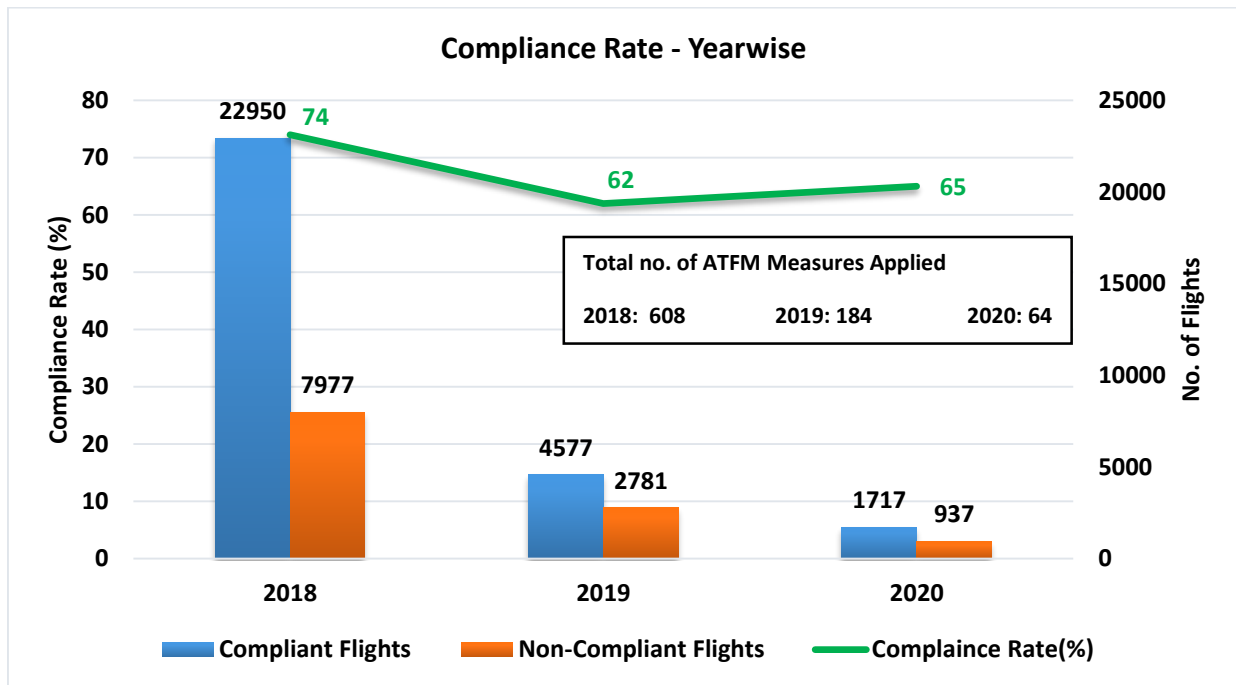
**Figure 9: Affected Flight Statistics**



### III. Overall Compliance

<b>Total Arrivals</b>	3366
<b>Domestic arrivals</b>	2737
<b>Flights with complete data (ATOT)</b>	2654
<b>Flights with incomplete data</b>	19
<b>Flights Not Operated</b>	64
<b>Compliant*</b>	1717
<b>Non-Compliant</b>	937

Total No. of Revised CTOTs issued = 254 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)



**Figure 10: Overall Compliance**

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

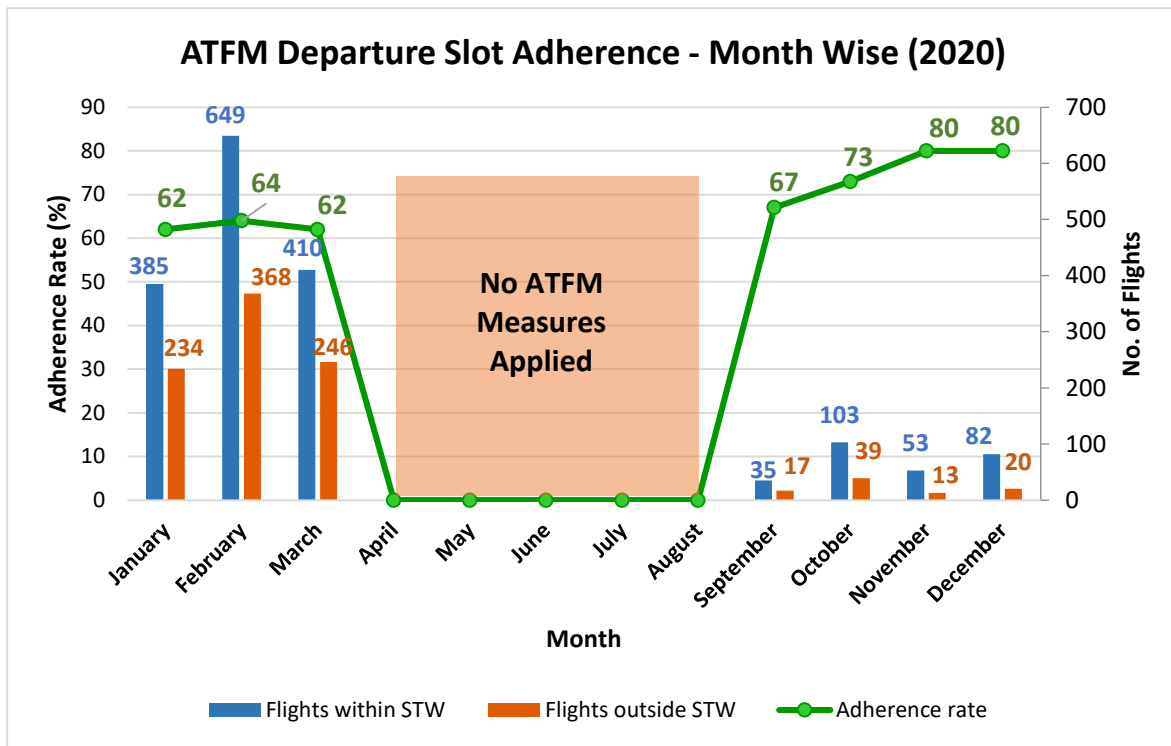


Figure 11: ATFM Compliance – Month wise

### Inference

1. Out of the total arrivals captured for the constrained Airports during the CDM scenario , 81% of flights i.e. Domestic arrivals, are participating.
2. Out of these Domestic Arrivals, 86% of arrivals are assigned ATFM ground delay & 14% of flights are without any ATFM ground delay.
3. Out of the total arrivals captured to the constrained Airport during the ATFM scenario, 70% of flights are assigned ATFM Ground Delay.





## IV. CTOT Compliance rate – Airport wise

MUMBAI FIR	2019 (68%)*	2020 (66%)*	
Mumbai	65	65	
Ahmedabad**	71	60	
Pune	53	58	
Indore	82	94	
Bhopal	77	81	
KOLKATA FIR	(67%)*	(70%)*	
Kolkata	68	68	
Patna	70	68	
Guwahati	63	69	
Varanasi	58	66	
Bagdogra	60	63	
DELHI FIR	(52%)*	(51%)*	
Delhi	53	77	
Chandigarh	50	45	
Lucknow	61	55	
Srinagar	41	49	
Jaipur**	68	56	
CHENNAI FIR	(64%)*	(68%)*	
Hyderabad	62	80	
Bengaluru**	72	59	
Chennai	75	75	
Goa	46	77	
Cochin	74	66	

\*FIR wise compliance rate

\*\* More than 10% reduction in Compliance rate



V. CTOT Compliance rate – Airline wise

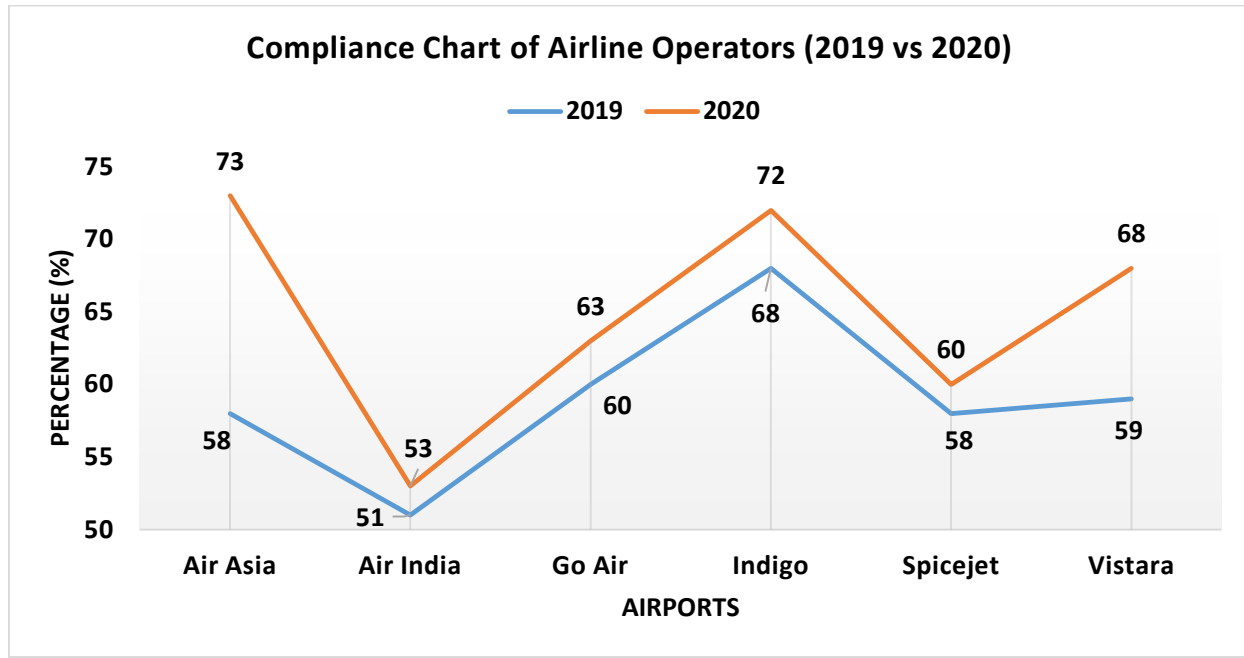


Figure 12: Airlines Overall Compliance

Inference

1. Out of the total domestic arrivals with complete data in the CDM scenario, 65% arrivals are compliant.
2. For the year 2020 Kolkata region has the highest compliance rate of 70% whereas Delhi region has the lowest compliance rate of 51%.
3. Indigo, Vistara and Air Asia have a compliance rate above the average recorded 65% compliance.
4. Compliance rate of all airlines has increased in year 2020 as compared to 2019.

## VI. Air Delay during the CDM Scenario period

Average Air Delay to domestic arrivals\* within the CDM Scenario period for Delhi, Mumbai and Bengaluru are 12 min, 9 min and 8 min respectively.

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

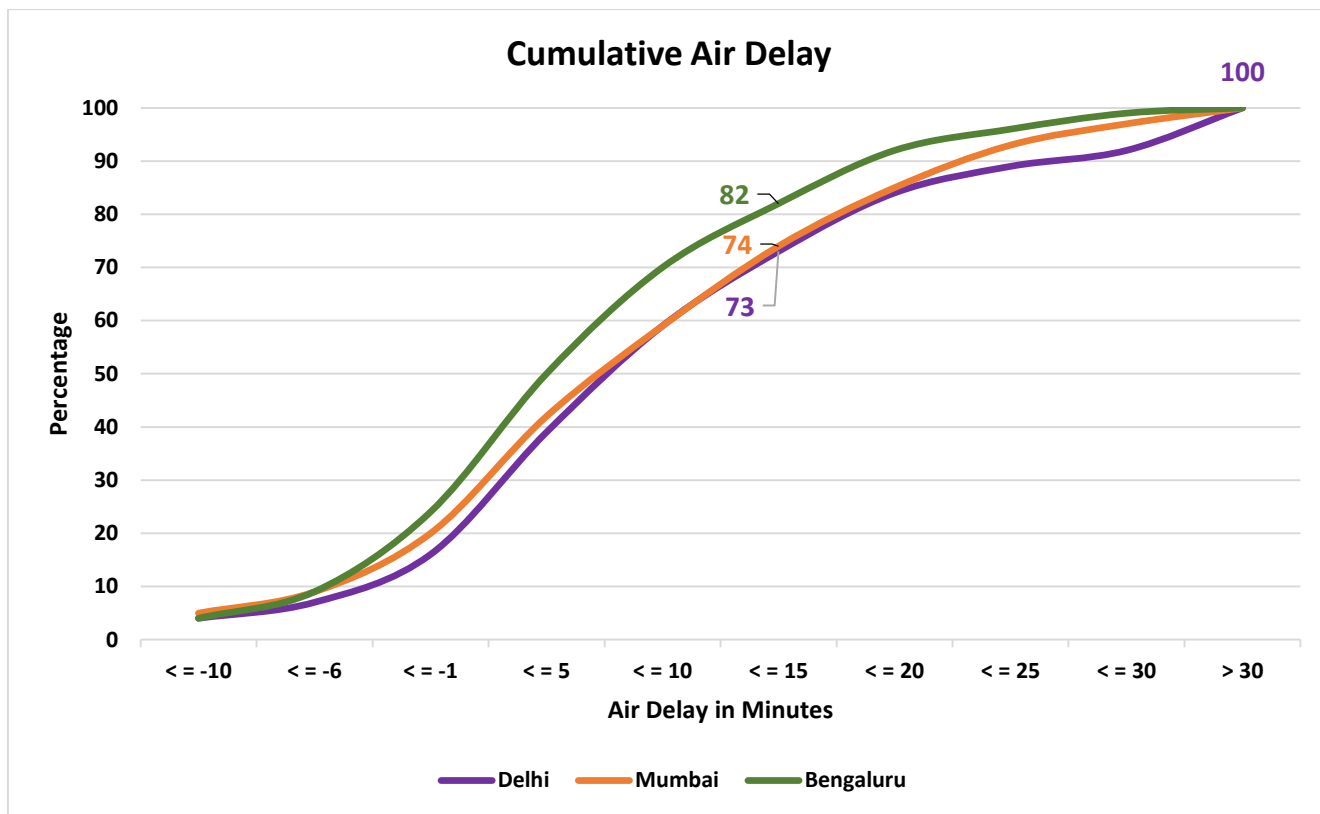


Figure 13: Cumulative Air Delay during CDM period

### Inference

1. 73% of arriving flights to Delhi had an Air delay of equal to or less than 15 minutes during the CDM period.
2. 74% of arriving flights to Mumbai had an Air delay of equal to or less than 15 minutes during the CDM period.
3. 82% of arriving flights to Bengaluru had an Air delay of equal to or less than 15 minutes during the CDM period.



## D. Glossary

<b>ATFM Parameters</b>	<b>Definition</b>
<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 &amp; 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). <b>Therefore, Air delay = AET-EET</b></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>