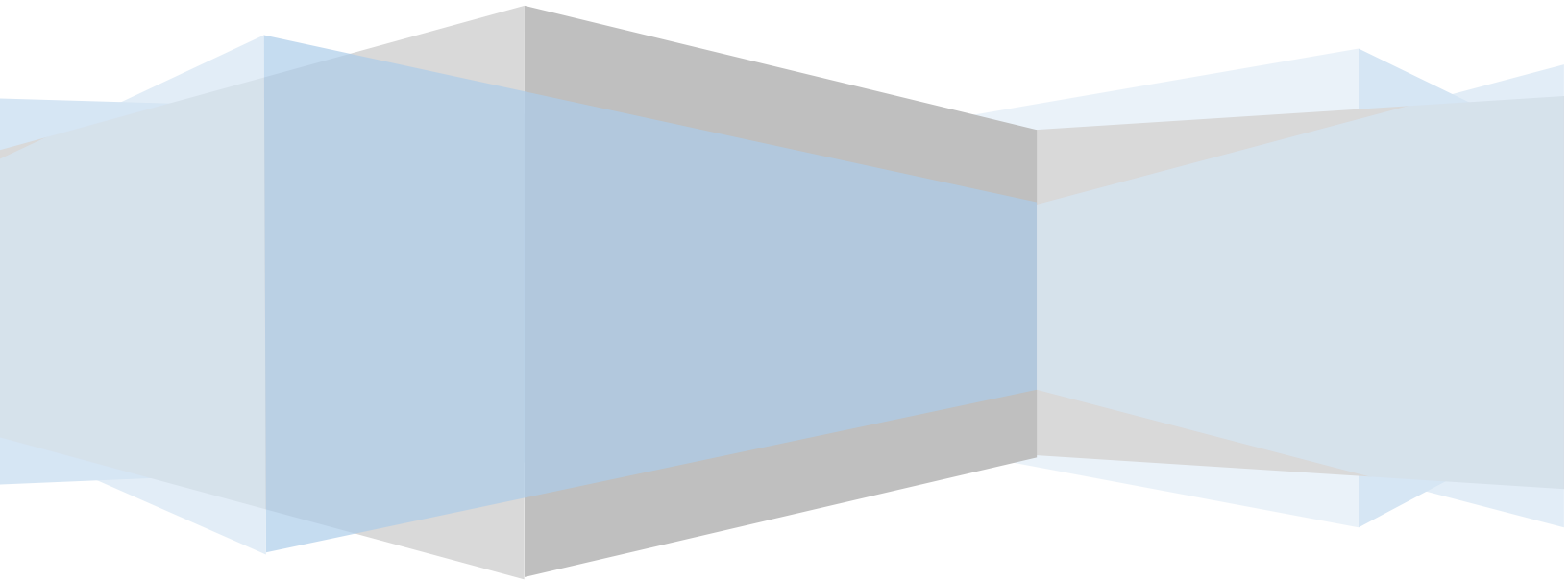


# POST OPERATIONS ANALYSIS REPORT

December, 2021

CENTRAL COMMAND CENTER, C-ATFM, DELHI







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## A. Executive Summary

Air Traffic Movement at Indian metro Airports showed a slight dip towards the end of December owing to sudden surge in Covid-19 infections across India after seeing continuous rise in the last few months.

The coronavirus induced suspension of scheduled commercial international passenger flights has been extended till 31<sup>st</sup> Jan'22. But special international flights have been operating under the Vande Bharat Mission since May 2020 and under bilateral "air bubble" arrangements with selected countries since July 2020.

Under an air bubble pact between two countries, special international flights can be operated by their airlines between their territories.

Eight(8)ATFM measures were applied in the month of December'21 due to Demand Capacity imbalance at Delhi and Kolkata Airport.

## Traffic Analysis

### I. Air Traffic Movement at Major Airports in India

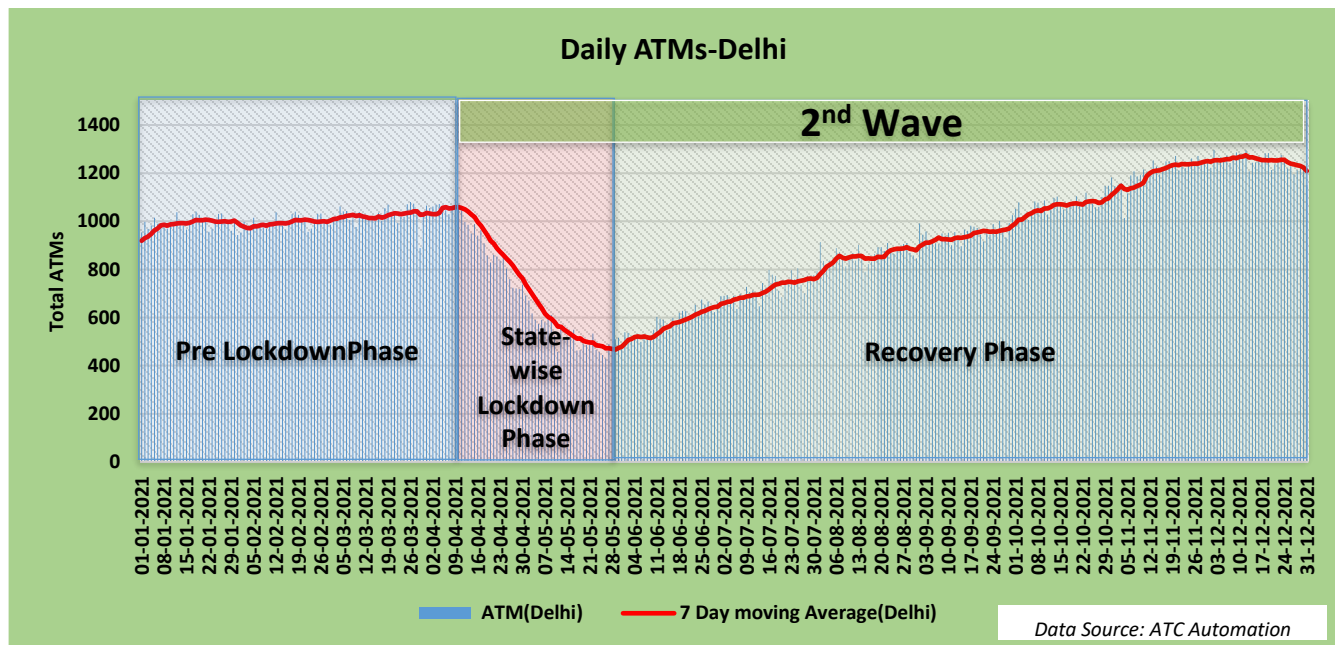


Figure 1: Air Traffic Movement-Delhi

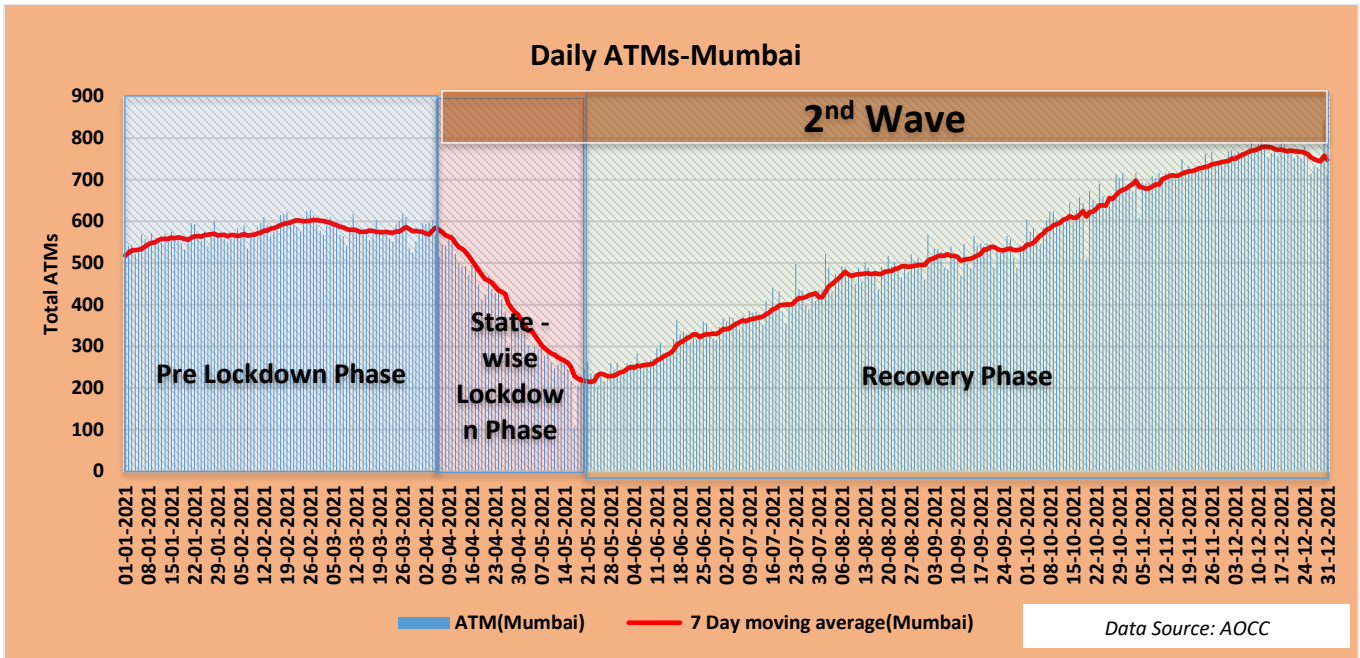


Figure 2: Air Traffic Movement– Mumbai

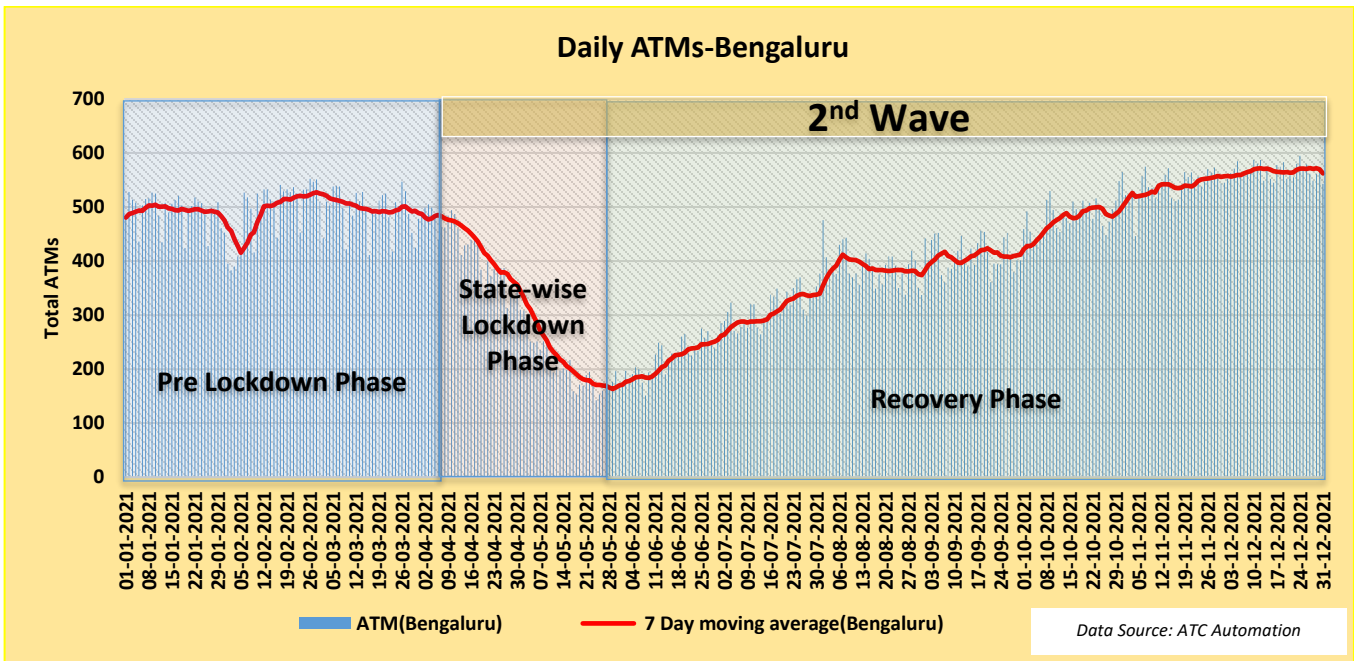


Figure 3: Air Traffic Movement–Bengaluru

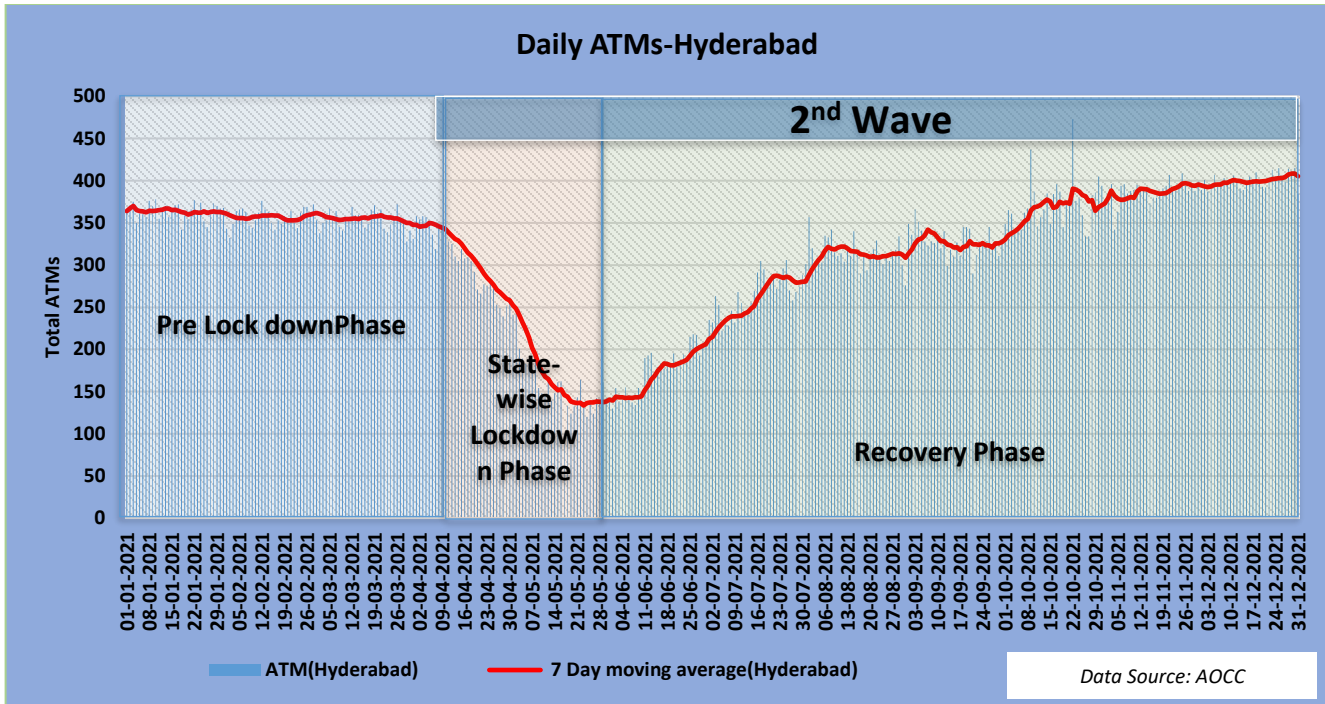


Figure 4: Air Traffic Movement –Hyderabad

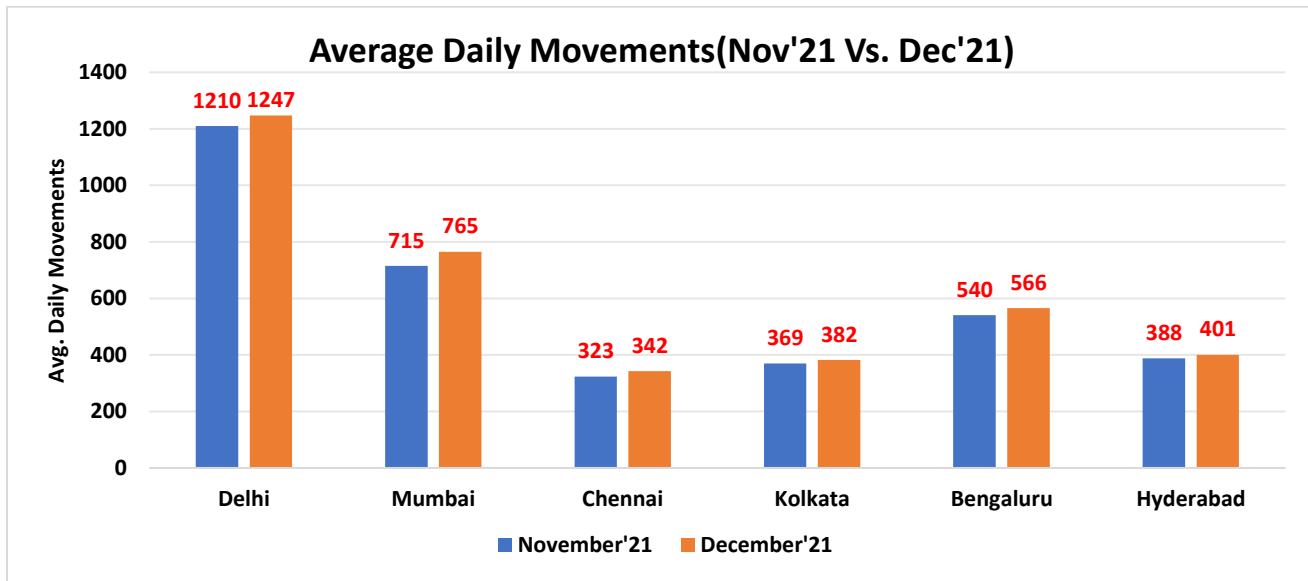


Figure 5: Average Daily Movements at Six Metro Airports

It is evident from the above chart that **Average Daily movement** at all the Metro Airports has increased in December'21 as compared to the previous month but by a very small margin as compared to previous months which saw a steep rise.



## 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 December'21. Air Traffic movement is also plotted Airline wise for the month for the major Scheduled Operators.

The graph below depicts the total ATMs in the month of December for the year 2019,2020 and 2021 for six major airports and the percentage change in comparison to the total ATMs in December'19.

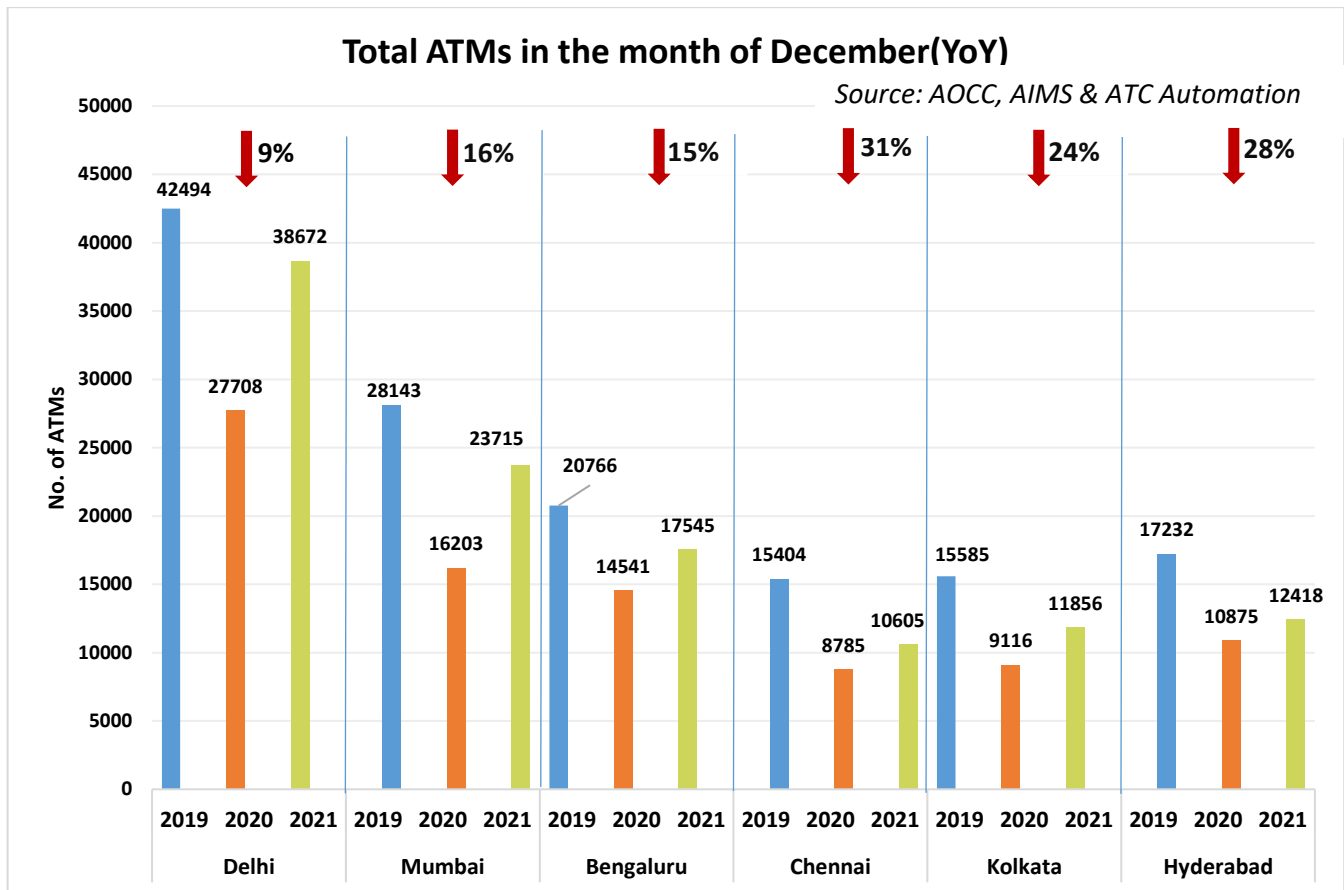


Figure 6: Total ATMs in December & Percentage Traffic Variation





### III. Flight Operations – Airlinewise

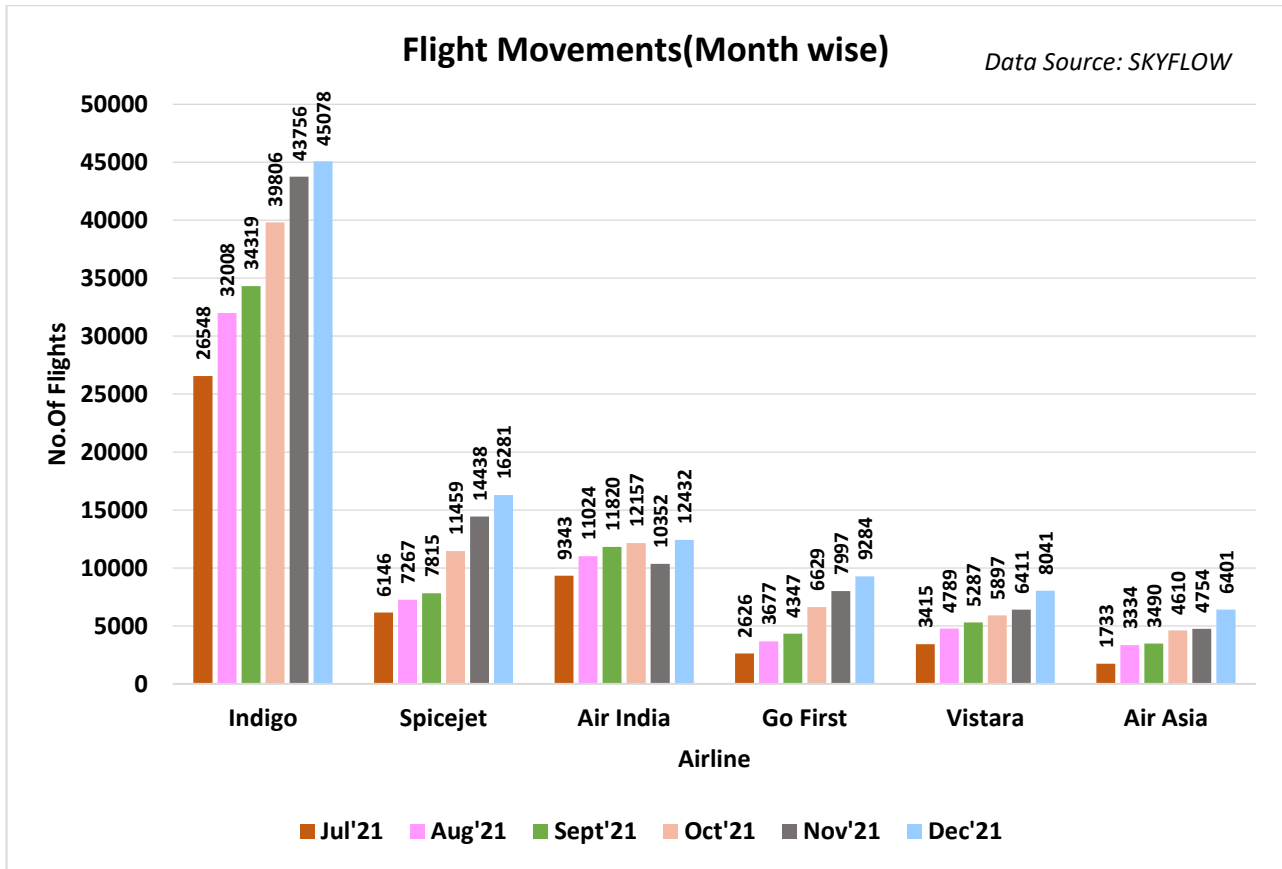


Figure 7: Flight Movements –Airlinewise



## B. ATFM Post Operations – CDM Analysis

### I. Introduction

**Analysis Period** 1<sup>st</sup> – 31<sup>st</sup> December'21

**Back Ground** During the above mentioned period, **Eight(8)** ATFM measures were applied for **Delhi and Kolkata Airport** due to the following reason as illustrated in the bar chart below:-

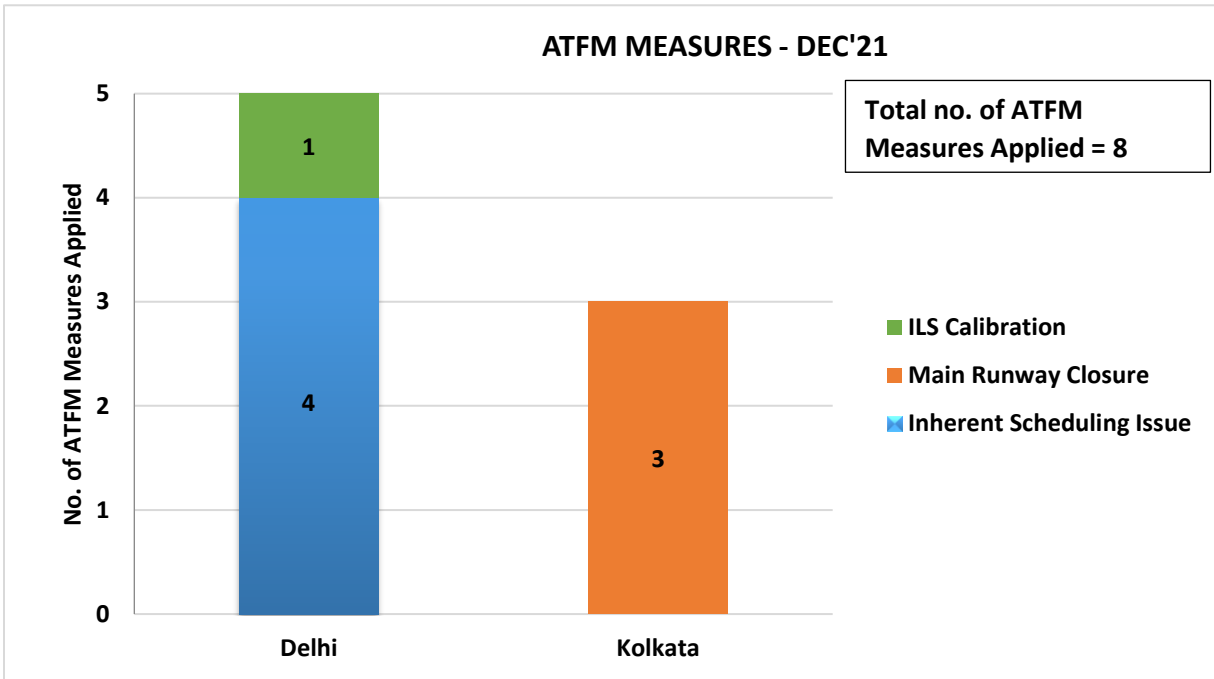


Figure 8: ATFM Measures –Dec'21



## II. ATFM Measures Overview

	Delhi Airport	Kolkata Airport
Number of ATFM measures applied	5	3
Average ATFM Ground delay due to measures*	12 Min	12 Min
Maximum ATFM Ground delay due to measures	38 Min	38 Min
% Compliance	58	85

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

Total Arrivals	525
Total International Arrivals(Exempted)	55
Total affected flights in scenario (Domestic Arrivals)	470
Total Domestic Arrivals with zero ATFM delay	66
Total Domestic Arrivals with ATFM delay	404

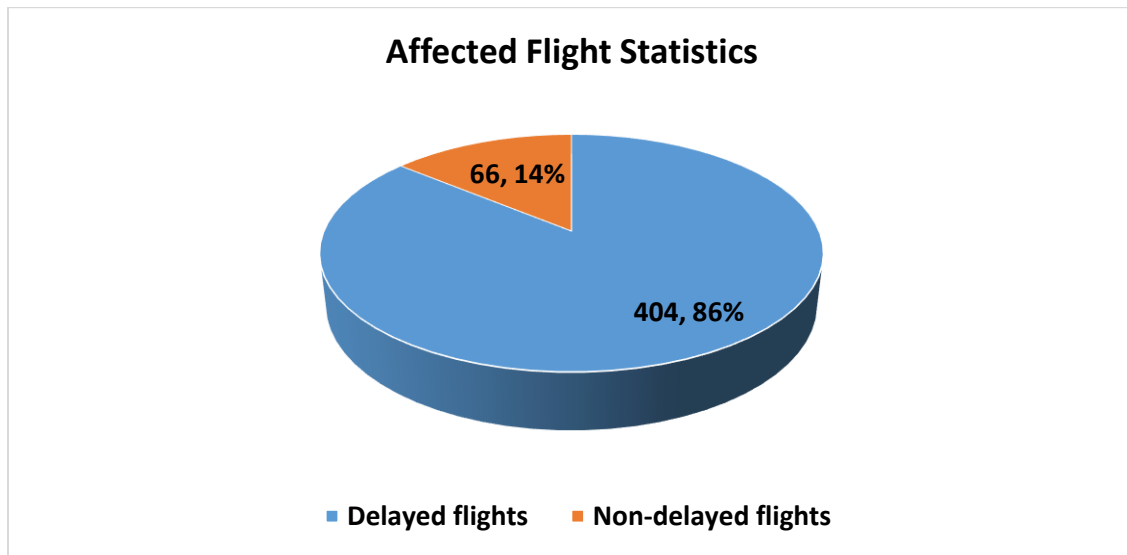


Figure 9: Affected Flight Statistics –Dec'21



### III. Overall Compliance

<b>Total arrivals</b>	525
<b>Domestic arrivals</b>	470
<b>Flights with complete data (ATOT)</b>	461
<b>Flights with incomplete data</b>	4
<b>Flights Not Operated</b>	5
<b>Compliant*</b>	291
<b>Non-Compliant</b>	170

\*Total No. of Revised CTOTs issued = 44 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)

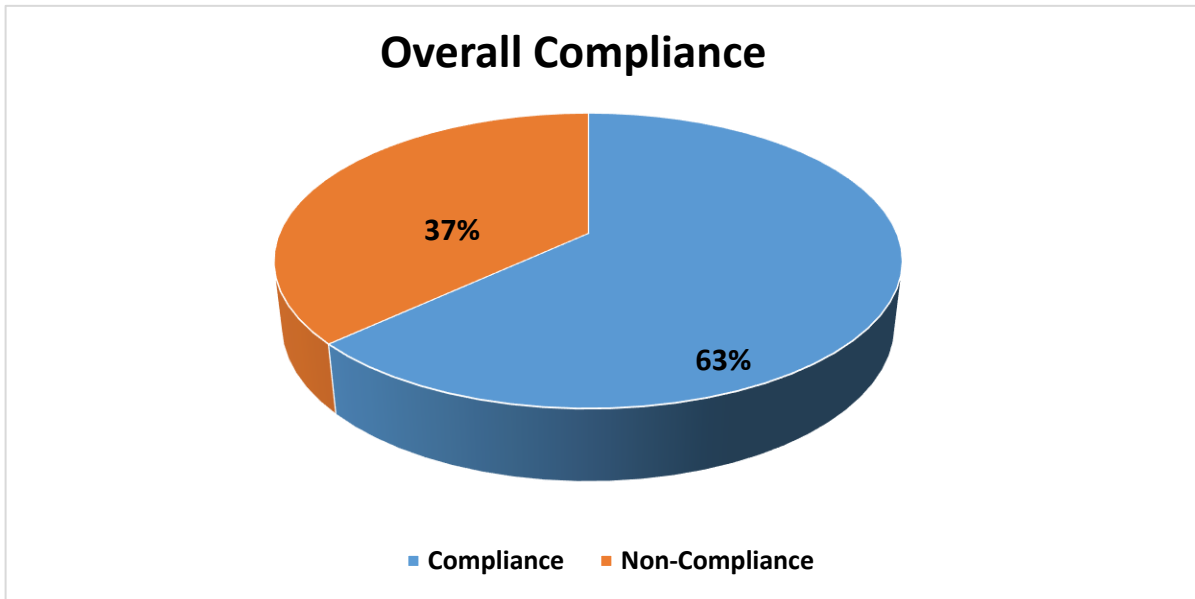


Figure 10: Overall Compliance – Dec’21

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

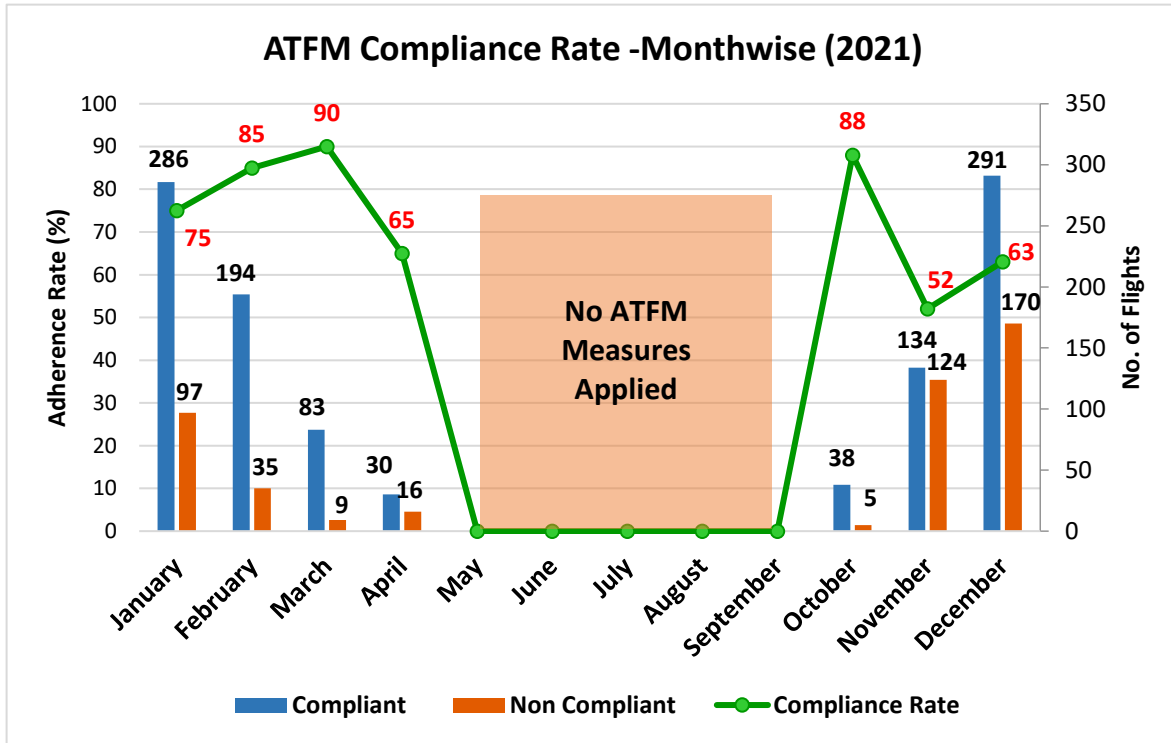


Figure 11: ATFM Compliance-Monthwise

**Inference**

1. Out of the total arrivals captured for the constrained Airports during the CDM scenario, 89% of flights i.e. Domestic arrivals, are participating.
2. Out of these Domestic Arrivals, 86% of arrivals are assigned ATFM ground delay.
3. Out of the total arrivals captured to the constrained Airport during the ATFM scenario, 77% of flights are assigned ATFM Ground Delay.



## IV. CTOT Compliance rate – Airportwise

MUMBAI FIR (69%)*	Compliant	Non Compliant	%Compliant
<b>Pune</b>	<b>4</b>	<b>4</b>	<b>50</b>
Mumbai	21	12	64
Bhopal	6	1	85
Jabalpur	6	1	85
Kandla	1	0	100
Aurangabad	1	0	100
Indore	2	0	100
Udaipur	12	2	85
<b>Vadodra</b>	<b>1</b>	<b>3</b>	<b>25</b>
Rajkot	1	0	100
Shirdi	4	0	100
<b>Surat</b>	<b>0</b>	<b>4</b>	<b>0</b>
Nagpur	2	1	67
Ahmedabad	6	2	75
<b>KOLKATA FIR (75%)*</b>			
<b>Varanasi</b>	<b>5</b>	<b>4</b>	<b>55</b>
Agartala	4	2	67
Kolkata	11	3	78
Bagdogra	23	4	85
<b>Gorakhpur</b>	<b>3</b>	<b>3</b>	<b>50</b>
Guwahati	13	4	76
<b>Chakeri</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>Jharsuguda</b>	<b>0</b>	<b>1</b>	<b>0</b>
Jorhat	3	0	100
<b>Prayagraj</b>	<b>2</b>	<b>2</b>	<b>50</b>
Bhubhaneshwar	9	3	75
Darbangha	5	1	83
Gaya	2	0	100
Dibrugarh	6	0	100
<b>Durgapur</b>	<b>1</b>	<b>1</b>	<b>50</b>
Dimapur	4	1	80
<b>Raipur</b>	<b>2</b>	<b>2</b>	<b>50</b>
<b>Silchar</b>	<b>3</b>	<b>2</b>	<b>60</b>
Lengpui	5	0	100
Pakyong	2	1	67
Imphal	6	0	100
Rupsi	1	0	100
Patna	12	3	80
<b>Ranchi</b>	<b>6</b>	<b>4</b>	<b>60</b>



<b>DELHI FIR (39%)*</b>			
Chandigarh	3	6	33
Delhi	1	3	25
Hindon	1	0	100
Gwalior	0	1	0
Gaggal	1	1	50
Bikaner	0	1	0
Jodhpur	2	3	40
Hisar	0	1	0
Pathankot	0	1	0
Jammu	9	6	60
Leh	1	3	25
Kishangarh	2	0	100
Jaisalmer	0	2	0
Jaipur	5	3	62
Lucknow	1	6	14
Srinagar	6	18	25
Dehradun	7	5	58
Amritsar	2	5	28
<b>CHENNAI FIR (62%)*</b>			
Goa	6	11	35
Bangalore	19	4	82
Vijayawada	0	1	0
Coimbatore	1	0	100
Cochin	5	0	100
Calicut	0	1	0
Chennai	9	4	69
Madurai	1	0	100
Shamshabad	8	8	50
Port Blair	4	2	67
Trivandrum	1	1	50
Tirupati	1	0	100
Vishakhapatnam	1	1	50

\*FIR wise compliance rate

Note: This list contains only the airports with flights to Constrained Airport and affected by ATFM measures.



## V. Reason For Non Compliance

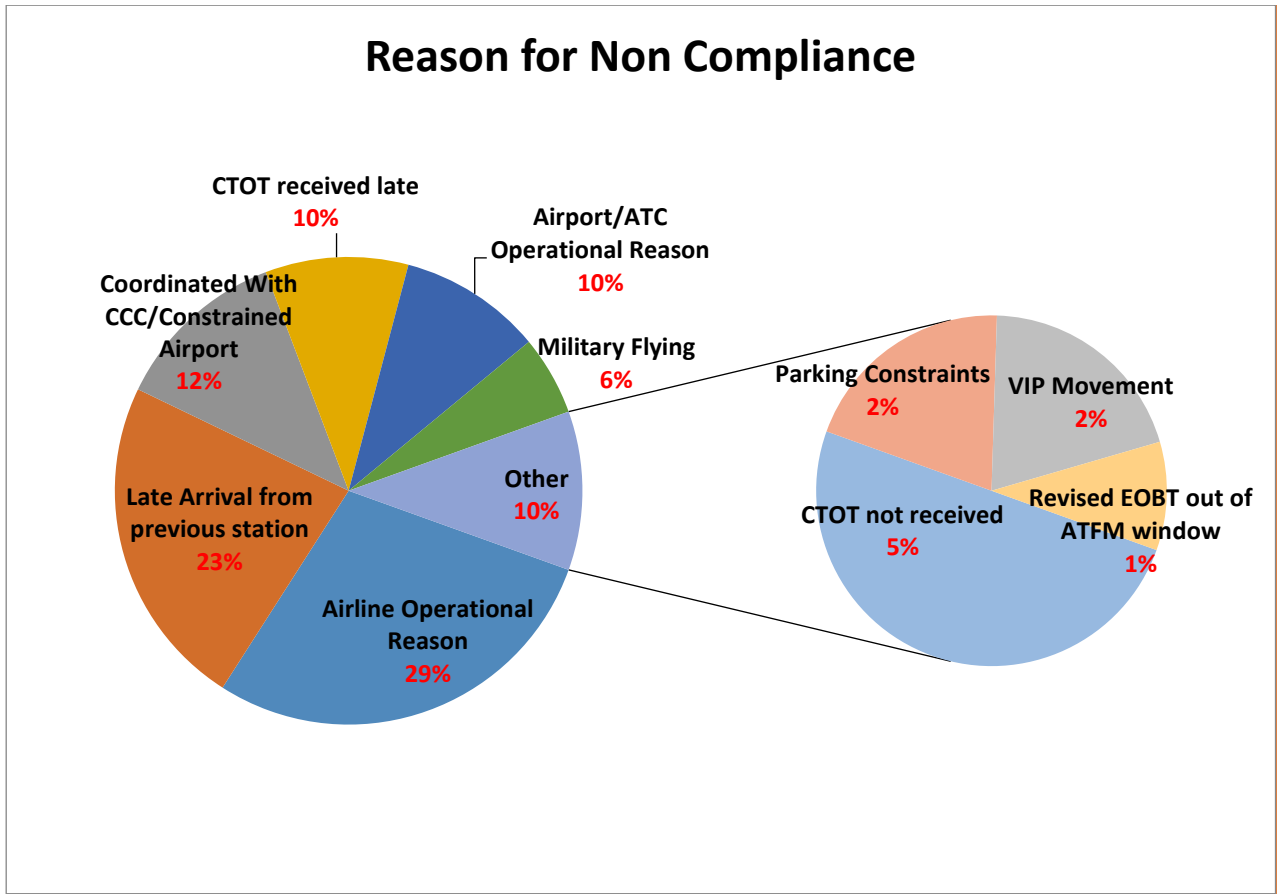


Figure 12: Reason for Non-Compliance as provided by FMPs

### Inference

1. Airline Operational Reason is one of the biggest factor identified by FMPs as a reason for Non-Compliance from their station.
2. Absence of Updated demand in SKYFLOW is the 2<sup>nd</sup> contributing factor cited by FMPs as the reason for Non-Compliance.(Flights are allocated a CTOT based on earlier shared EOBT but there late arrival and hence subsequent late estimated off block time is not captured in SKYFLOW)





## VI. CTOT Compliance rate – Airlinewise

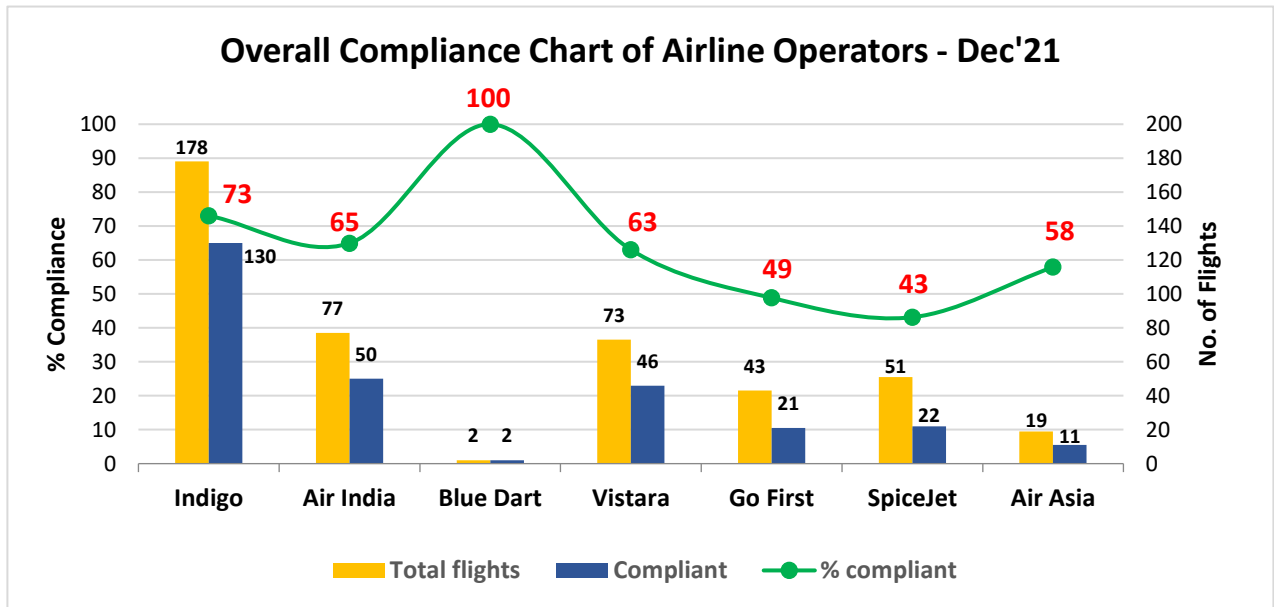


Figure 13: Airlines Overall Compliance –Dec’21

### Inference

1. Out of the total domestic arrivals with complete data in the CDM scenario, 63% arrivals are compliant.
2. Delhi region has the lowest compliance rate of 39% whereas Kolkata region has highest compliance rate of 75%.
3. Air India, Indigo and Blue Dart Airlines have a CTOT Compliance better than the average recorded compliance for the month of Dec’21.

## VII. Air Delay during the CDM Scenario period

**Average Air Delay to domestic arrivals\* within the CDM Scenario period for Delhi and Kolkata is 5 minutes and 7 minutes respectively.**

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

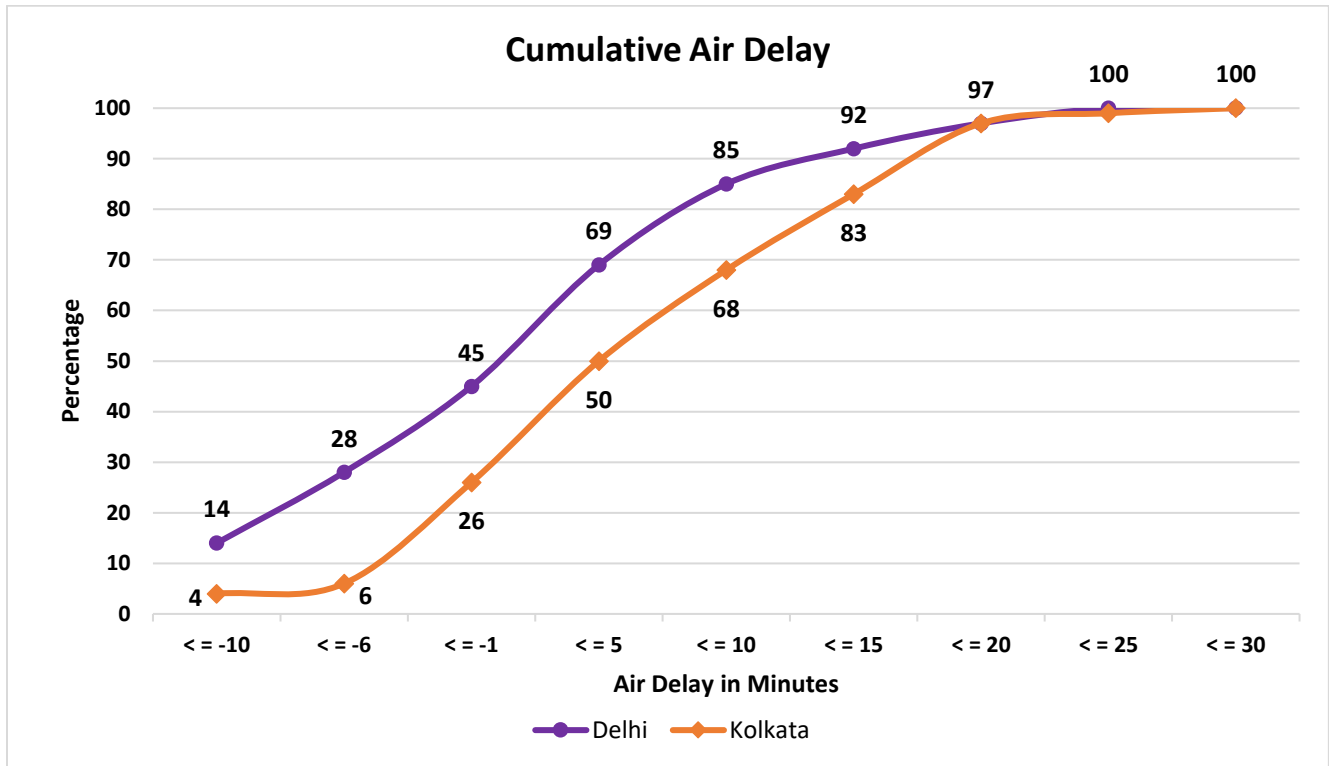


Figure 14: Cumulative Air Delay during CDM period

### Inference

1. 92% of arriving flights to Delhi had an Air delay of equal to or less than 15 minutes during the CDM period.
2. 83% of arriving flights to Kolkata had an Air delay of equal to or less than 15 minutes during the CDM period.



## C. 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>