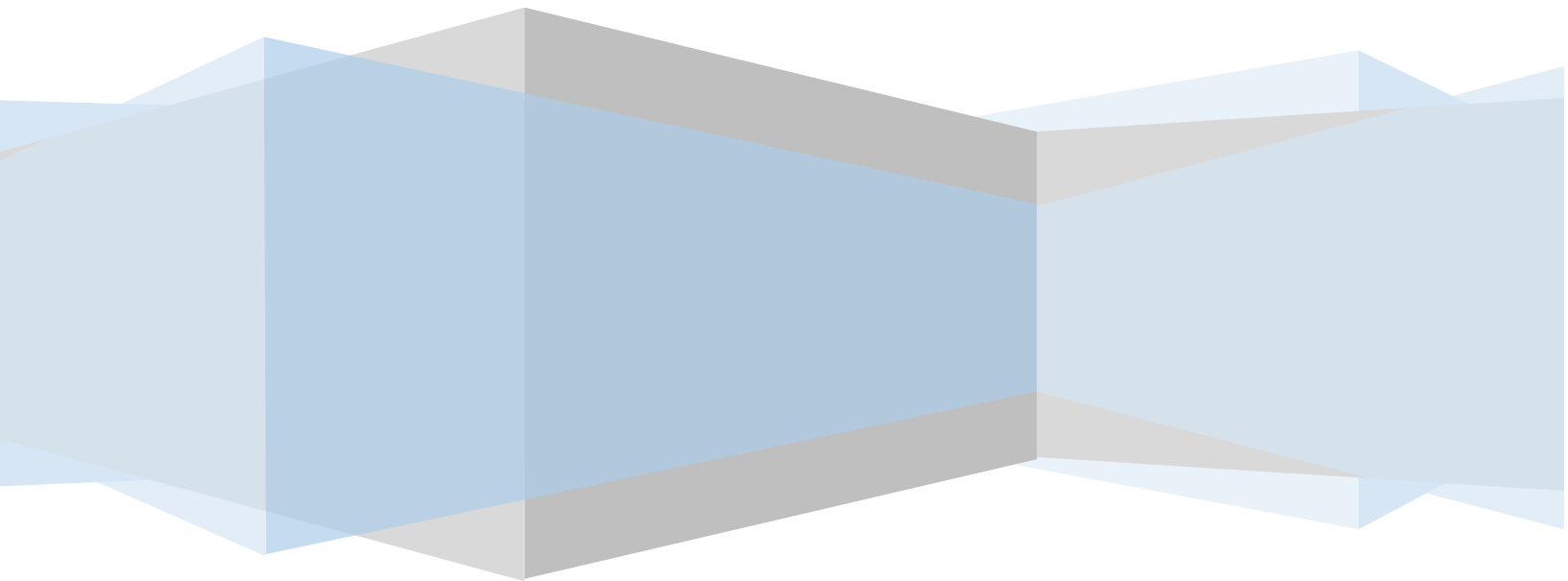


POST OPERATIONS ANALYSIS REPORT

March, 2021

CENTRAL COMMAND CENTER, C-ATFM, DELHI







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A. Executive Summary

International Commercial scheduled flights continue to remain suspended in India till 1829 UTC of 30th April'21(NOTAM G0279/21). However, special international flights have been permitted since May last year under the Vande Bharat Mission and under air bubble arrangements formed with many Countries since July'20. Under a bilateral air bubble arrangement, airlines of the two countries can operate flights between their territories with certain restrictions.

Domestic flight operations resumed on 24th May'20 and has shown continuous recovery. Experts believe that the governments's vaccination drive and pragmatic innovations across the the travel industry has contributed in building public confidence in leisure travel.

Total four (4) number of times ATFM measures were applied to resolve Demand Capacity imbalance in March'21. Ground delay measures were applied in Bengaluru to cater to traffic congestion after the Scheduled Runway Maintenance work was completed. The average CTOT Compliance has been 90 percent this month.

Traffic Analysis

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 six major Indian Airports namely Delhi, Mumbai, Bengaluru, Hyderabad, Kolkata and Chennai is plotted for each day of the month of March'21.

The data used is the movement data received from Delhi, Mumbai, Bengaluru and Hyderabad Airport. AIMS (Airport Information Management System) data is used for Kolkata and Chennai Airport. Air Traffic movement is also plotted Airline wise for the month for the major Scheduled Operators.



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

The graph below depicts the change in total ATMs in the month of Mar'21 in comparison to the total ATMs in Mar'20 for six major Airports in India.

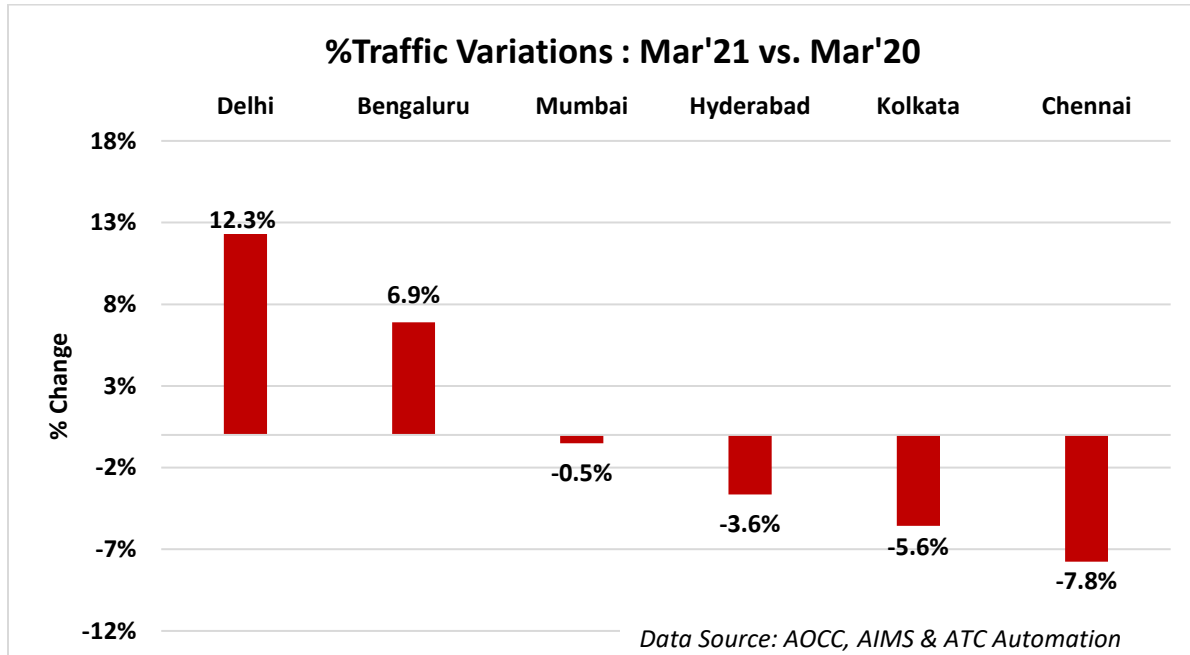


Figure 1: Percentage Traffic Variation (YoY)

Delhi and Bengaluru Airports are observed to be on a higher pace to recovery, Mumbai is marginally below the March'20 movements baseline whereas Hyderabad, Kolkata and Chennai Airport are still below the March'20 movements baseline.

Total ATMs (YoY) for six major airports		
Airports\Year	March'21	March'20
Delhi	31767	28277
Bengaluru	15328	14338
Mumbai	17888	17983
Hyderabad	10940	11354
Kolkata	10265	10870
Chennai	9651	10464



The graphs below depict the percentage change in ATMs month wise taking Jan'20(Pre -Covid) as the reference value for the six metro Airports.

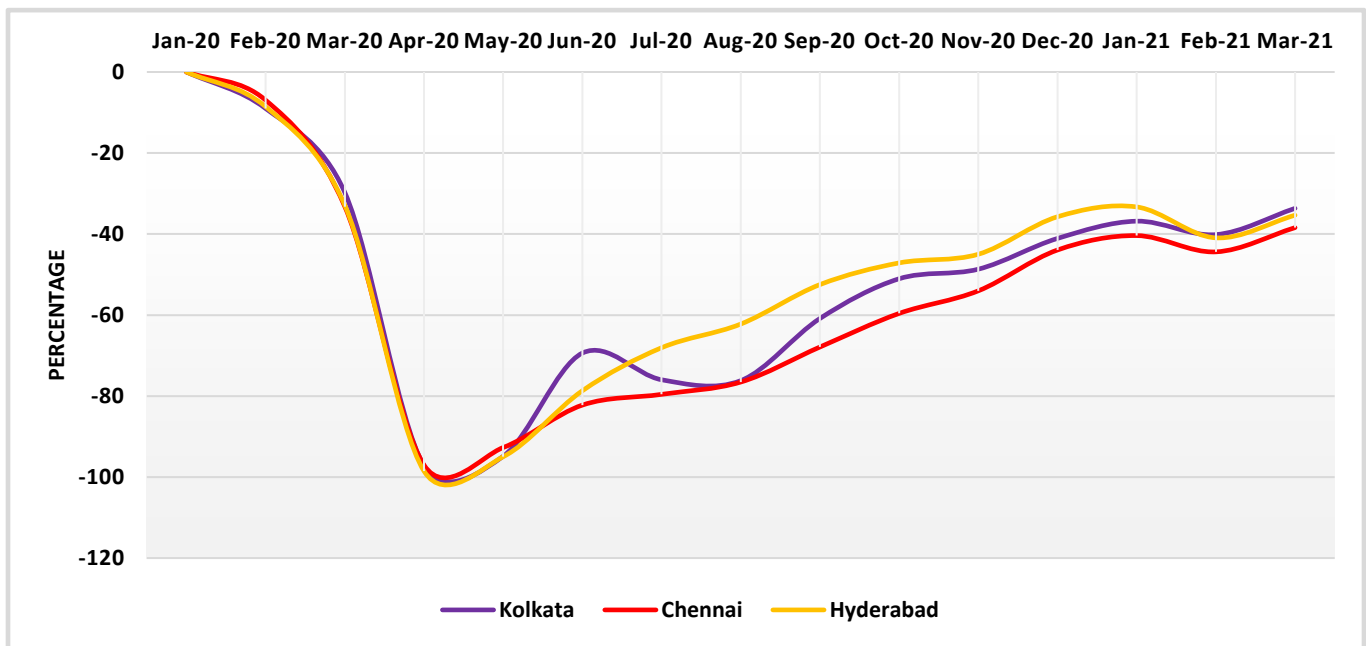
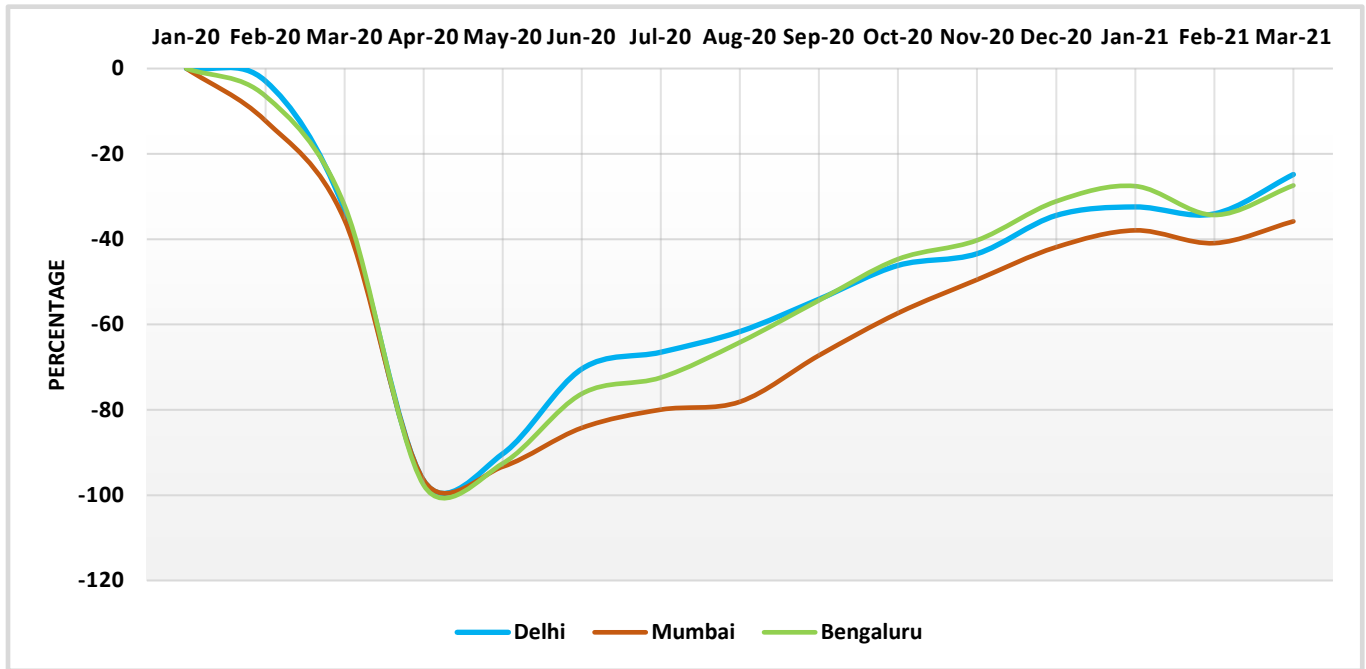


Figure 2: Percentage Traffic Variation



II. Flight Operations – Airline wise

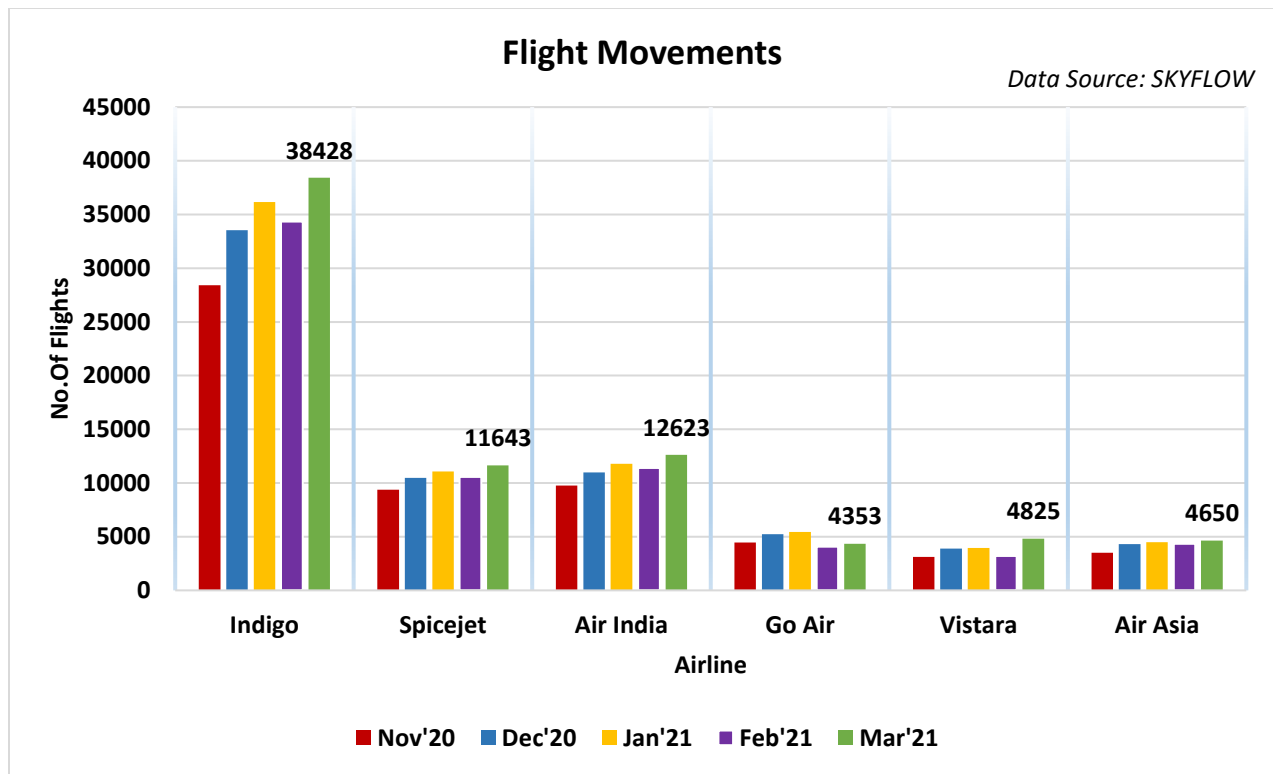


Figure 3: Flight Movements – Airline wise



B. ATFM Post Operations – CDM Analysis

I. Introduction

Analysis Period 1st – 31st March'21

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:–

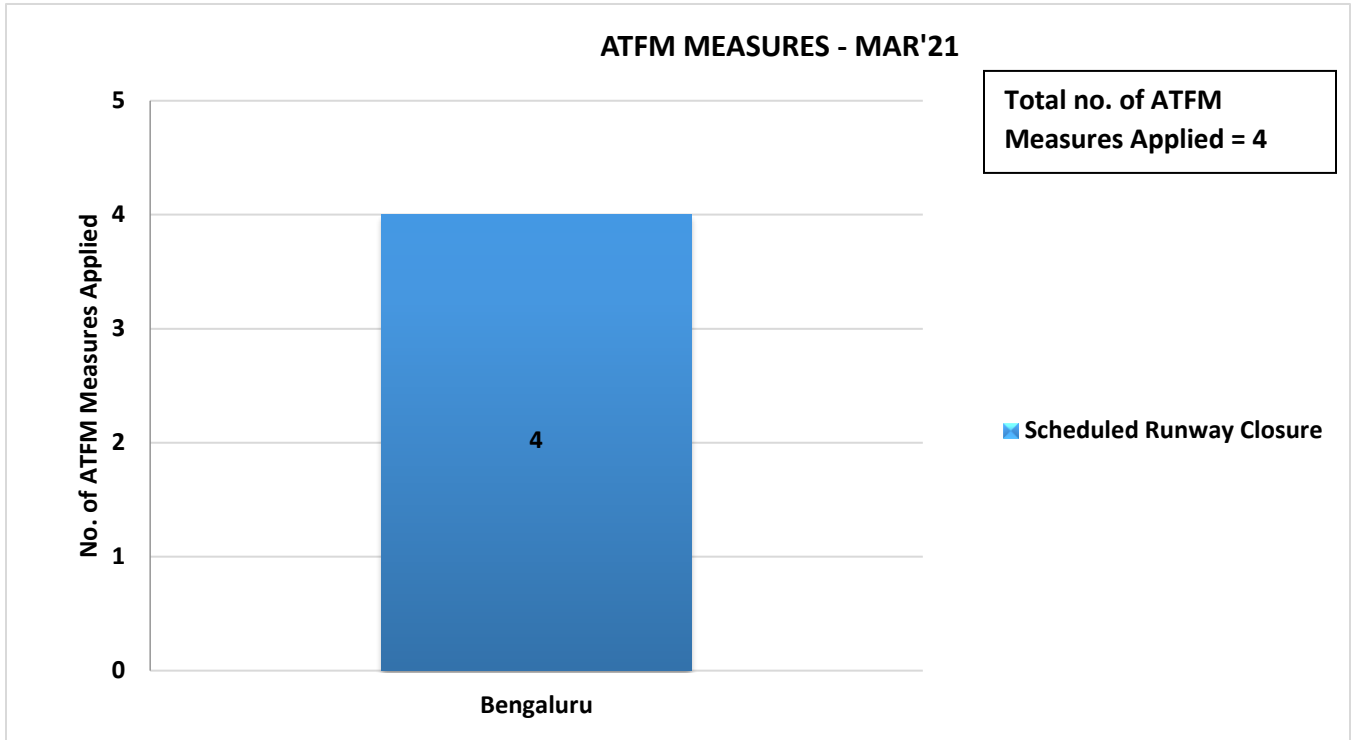


Figure 4: ATFM Measures – Mar'21



II. ATFM Measures Overview

	Bengaluru Airport
Number of ATFM measures applied	4
Average ATFM Ground delay due to measures	26 min
Maximum ATFM Ground delay due to measures	45 min
% Compliance	90

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

Total Arrivals	104
Total International Arrivals(Exempted)	11
Total affected flights in scenario (Domestic Arrivals)	93
Total Domestic Arrivals with zero ATFM delay	0
Total Domestic Arrivals with ATFM delay	93

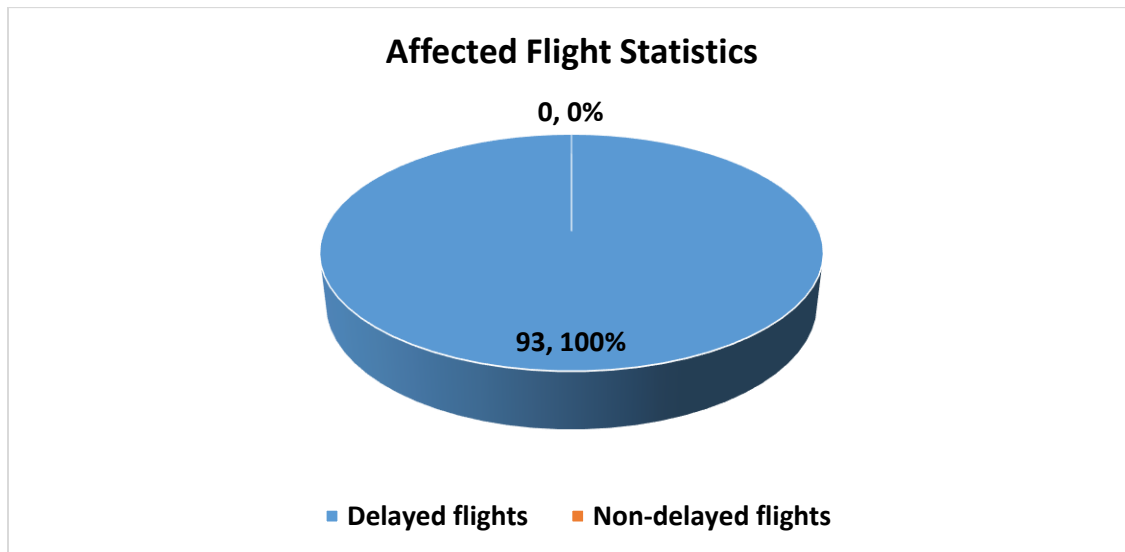


Figure 5: Affected Flight Statistics – Mar’21



III. Overall Compliance

Domestic arrivals	93
Flights with complete data (ATOT)	92
Flights with incomplete data	0
Flights Not Operated	1
Compliant*	83
Non-Compliant	9

Total No. of Revised CTOTs issued = 2 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)

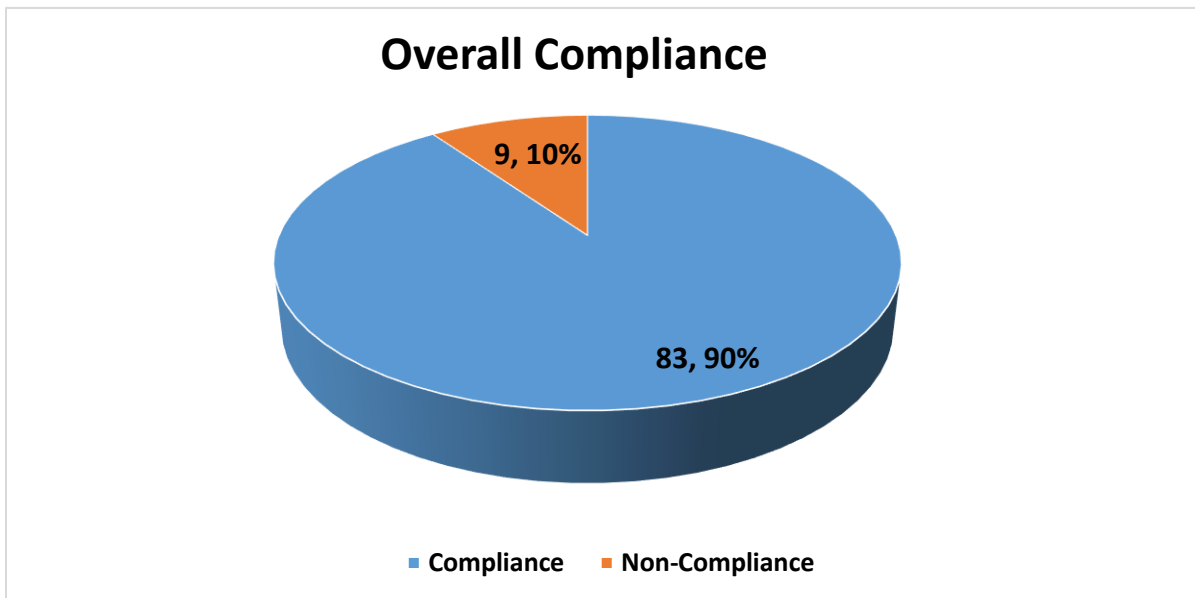


Figure 6: Overall Compliance – Mar’21

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

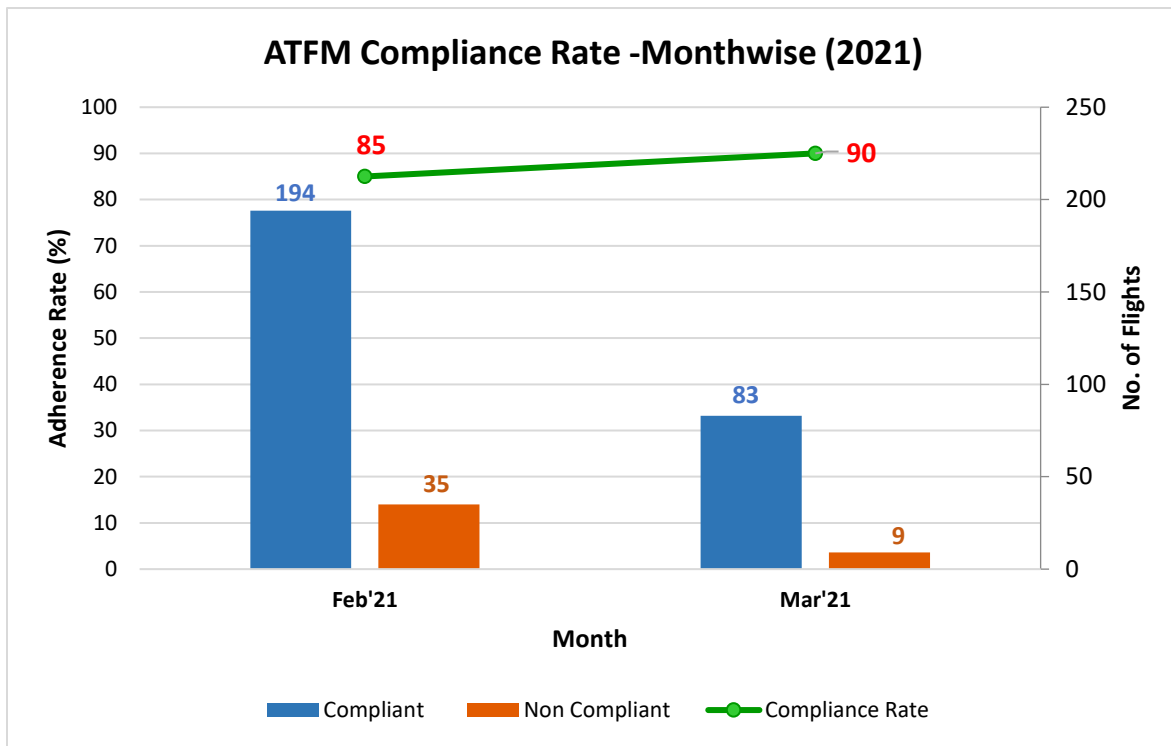


Figure 7: ATFM Compliance-Monthwise

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, 100% of arrivals are assigned ATFM ground delay.
3. Out of the total arrivals captured to the constrained Airport during the ATFM scenario, 89% of flights are assigned ATFM Ground Delay.



IV. CTOT Compliance rate – Airport wise

MUMBAI FIR (100%)*	Compliant	Non Compliant	%Compliant
Bhopal	4	0	100
KOLKATA FIR (91%)*			
Kolkata	13	0	100
Guwahati	4	0	100
Allahabad	3	0	100
Jharsuguda	3	1	75
Silchar	2	2	50
Patna	8	0	100
Bagdogra	3	1	75
Varanasi	4	0	100
DELHI FIR (79%)*			
Delhi	3	1	75
Jaipur	4	0	100
Lucknow	3	1	75
Chandigarh	1	1	50
CHENNAI FIR (93%)*			
Chennai	4	1	80
Belgaum	4	0	100
Hyderabad	8	0	100
Madurai	4	0	100
Mangalore	1	0	100
Vishakhapatnam	3	1	75
Cochin	4	0	100

*FIR wise compliance rate



V. CTOT Compliance rate – Airline wise

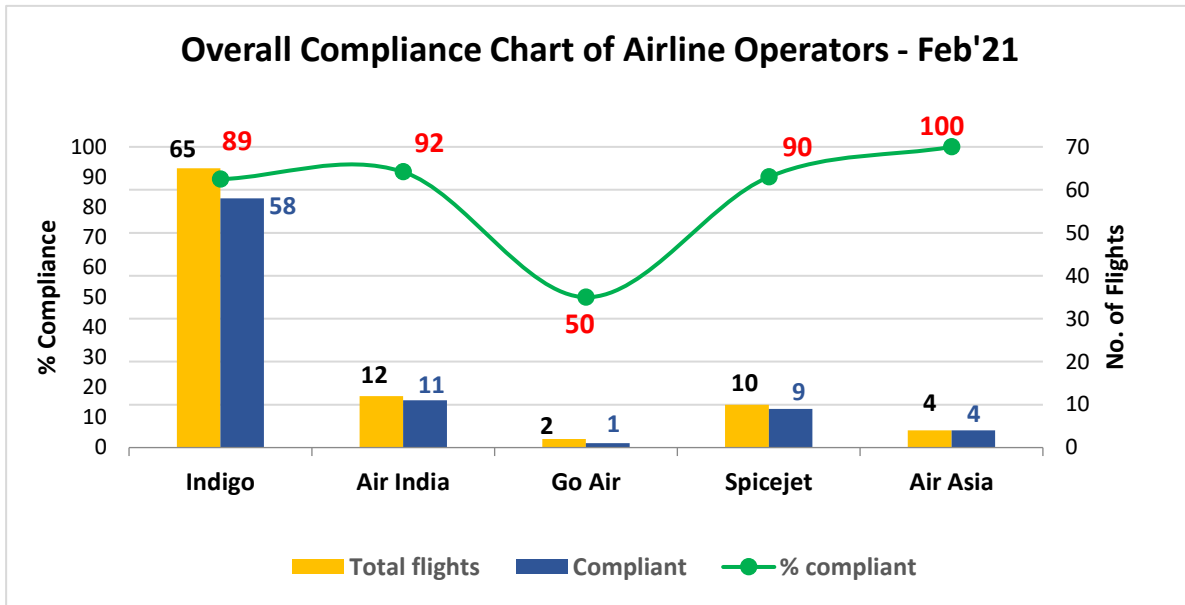


Figure 8: Airlines Overall Compliance – Mar'21

Inference

1. Out of the total domestic arrivals with complete data in the CDM scenario, 90% arrivals are compliant.
2. Mumbai region has the highest compliance rate of 100% whereas Delhi region has the lowest compliance rate of 79%.
3. Air India and Air Asia have a compliance rate above the average recorded 90% compliance.



VI. Air Delay during the CDM Scenario period

Average Air Delay to domestic arrivals* within the CDM Scenario period for Bengaluru is 9 minutes .

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

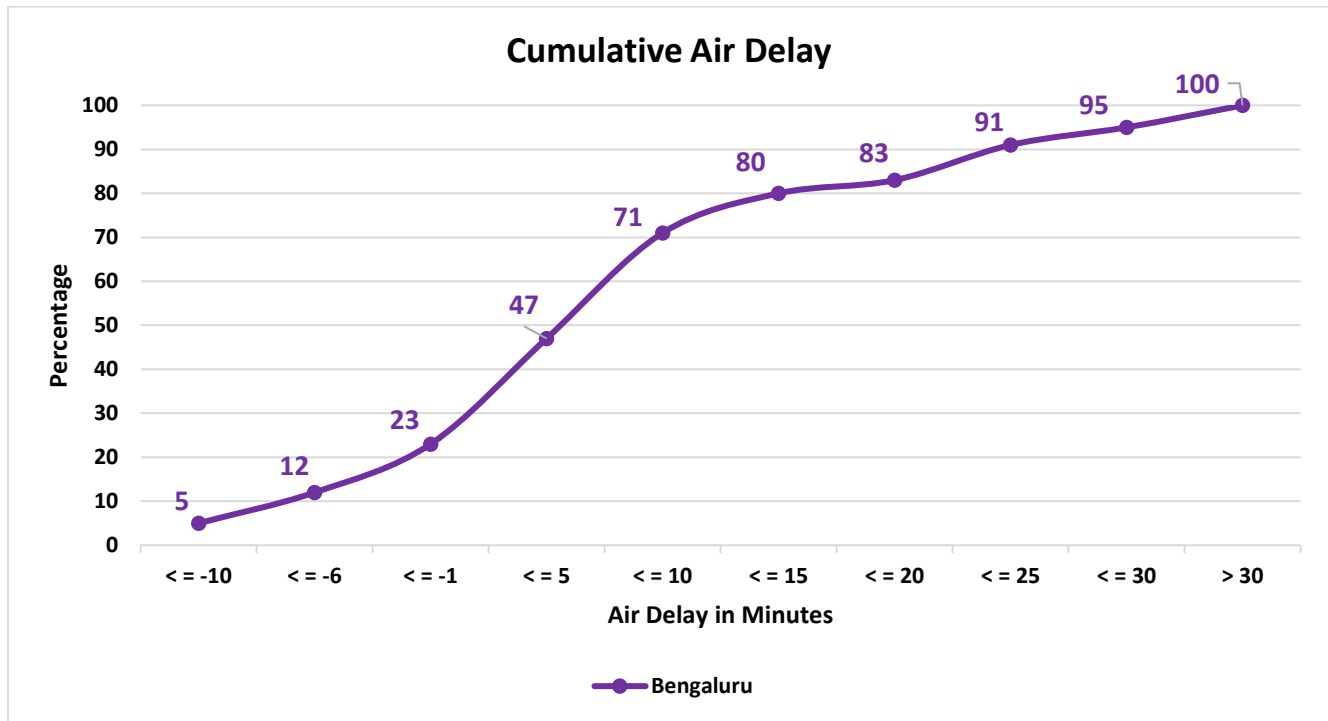


Figure 9: Cumulative Air Delay during CDM period

Inference

1. 71% of arriving flights to Bengaluru had an Air delay of equal to or less than 10 minutes during the CDM period.



C. 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>