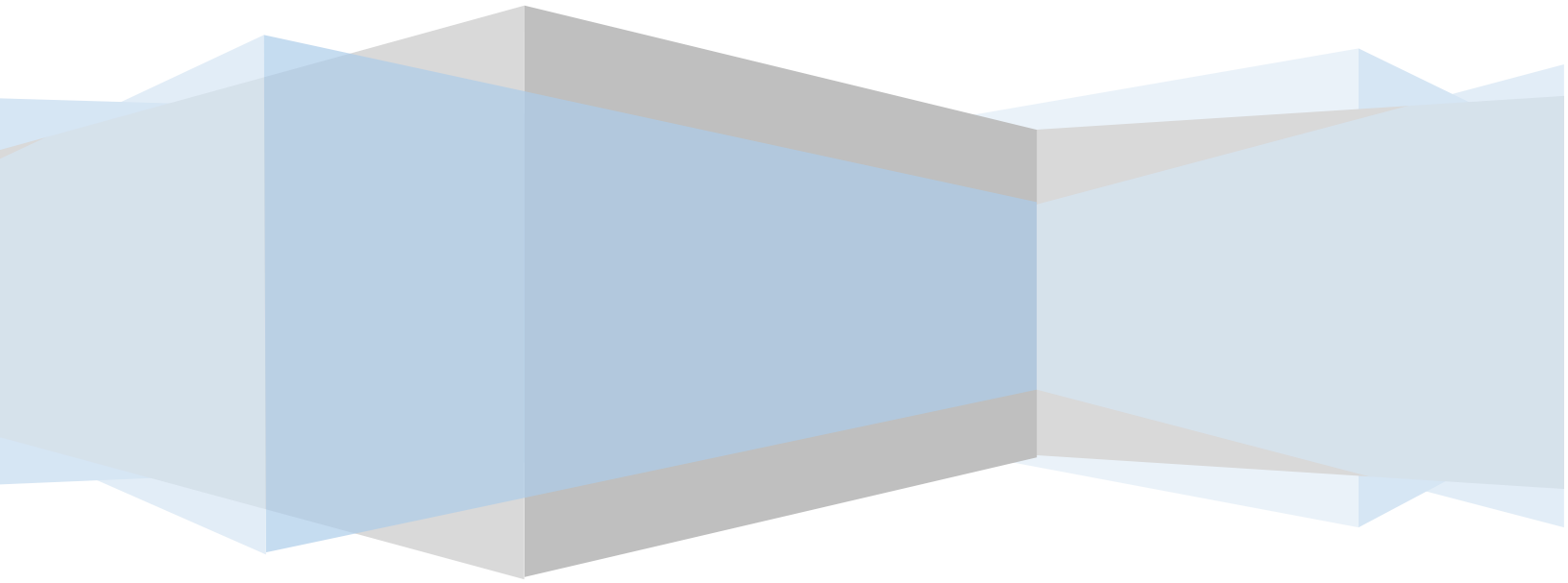
POST OPERATIONS ANALYSIS REPORT

September, 2020

CENTRAL COMMAND CENTER, C-ATFM, DELHI



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A. Executive Summary

Domestic flight operations resumed in graded manner from 1830 UTC of 24th May'20. Government of India has now allowed airlines to operate up to 45 percent of their summer schedule whereas the scheduled international flight movements remain suspended till 1829 UTC of 31st October'20. (NOTAM G0804 replacing NOTAM G0666/20)

Even though India has extended its embargo on international flights till 31st October'20, "air bubbles" or "air bridges" have become the only medium through which commercial international travel has resumed since mid-July. India now has air bubble arrangements with 15 countries including the US, UK, Germany, France, Afghanistan, Bahrain, Bhutan, Kenya, Canada, Iraq, Japan, Maldives, Nigeria, Qatar, and UAE. In order to mitigate a host of quarantine and Covid-10 testing rules in arrival destinations, governments are implementing "air bubble" agreements between countries. 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

B. Traffic Analysis

Domestic flight services have resumed in India on May 25, after about two months of suspension due to the coronavirus disease (COVID-19)-necessitated nationwide lockdown. Experts believe the unpredictability of lockdowns imposed by state governments and differing quarantine rules are also making consumers averse to travel. The flow of travel is primarily unidirectional and limited to largely essential travel.

The total number of ATMs at Indian Airports in **Sep'20 (during Covid pandemic) w.r.t. Dec'19(Pre -Covid) is 43.9%.**

The total Air traffic movements including Passenger and Combination 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 Sep'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 four major airports

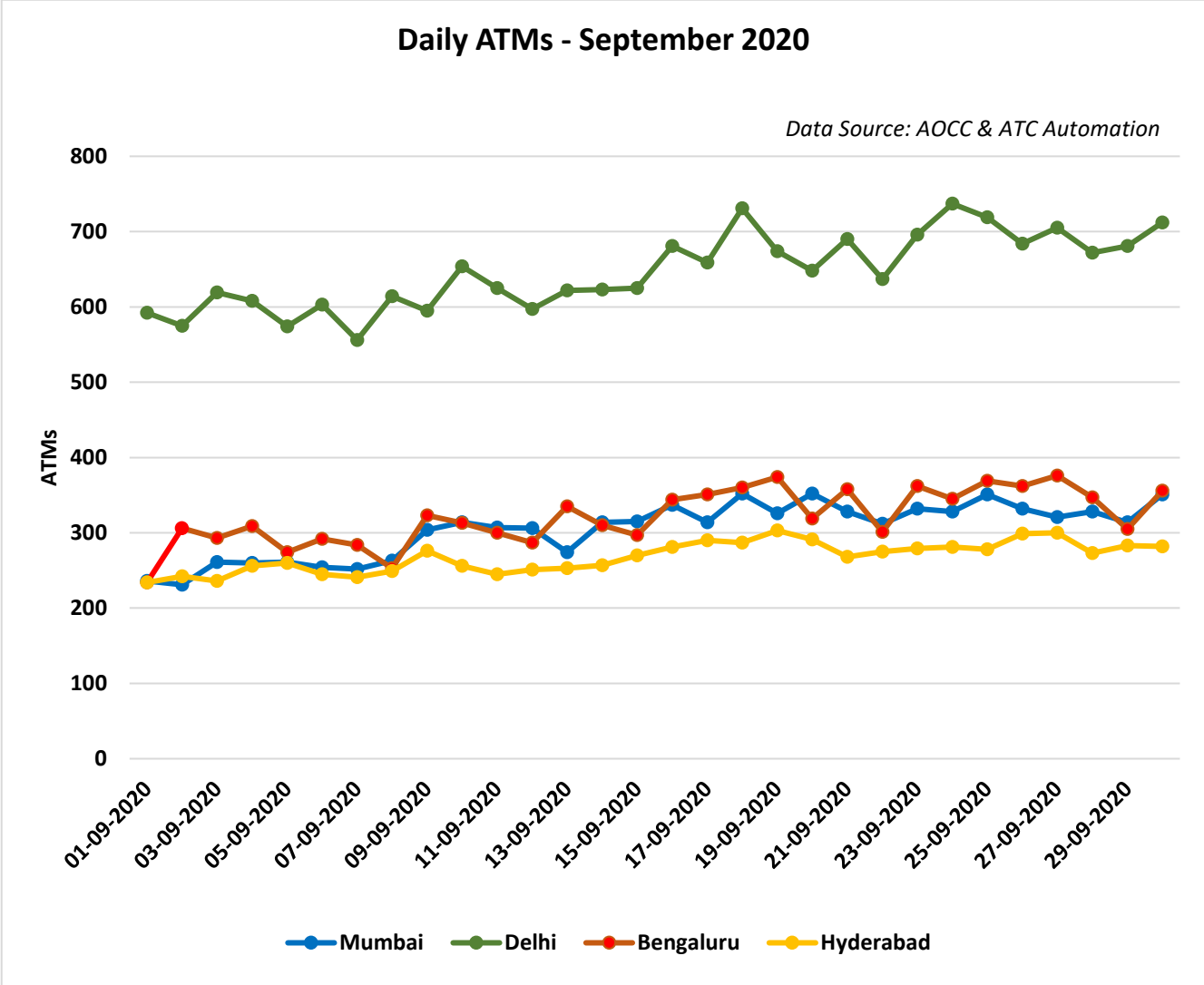

Figure 1: Daily ATMs at four major airports - Sep'20

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

The graph below depicts the change in total ATMs in the month of Sep'20 in comparison to the total ATMs in Sep'19 for four major Airports in India. The traffic handled at Mumbai in Sep'20 is 65.3% less than the traffic handled in Sep'19 whereas the traffic handled in Delhi, Bengaluru and Hyderabad are 51% ,48% 46% less than the traffic handled in Sep'19 respectively.

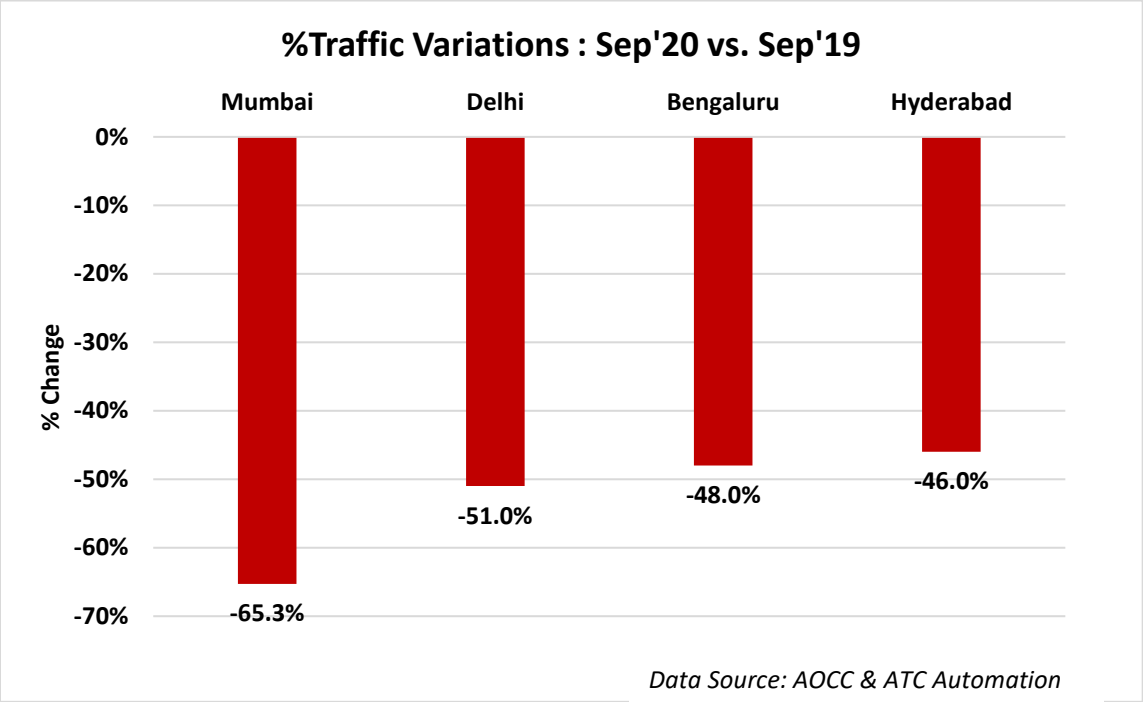

Figure 2: Percentage Traffic Variation (YoY)

Total ATMs (YoY) for four major airports		
Airports\Year	**Sep'19**	**Sep'20**
Mumbai	26346	9130
Delhi	39907	19408
Bengaluru	18525	9639
Hyderabad	14804	8041

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

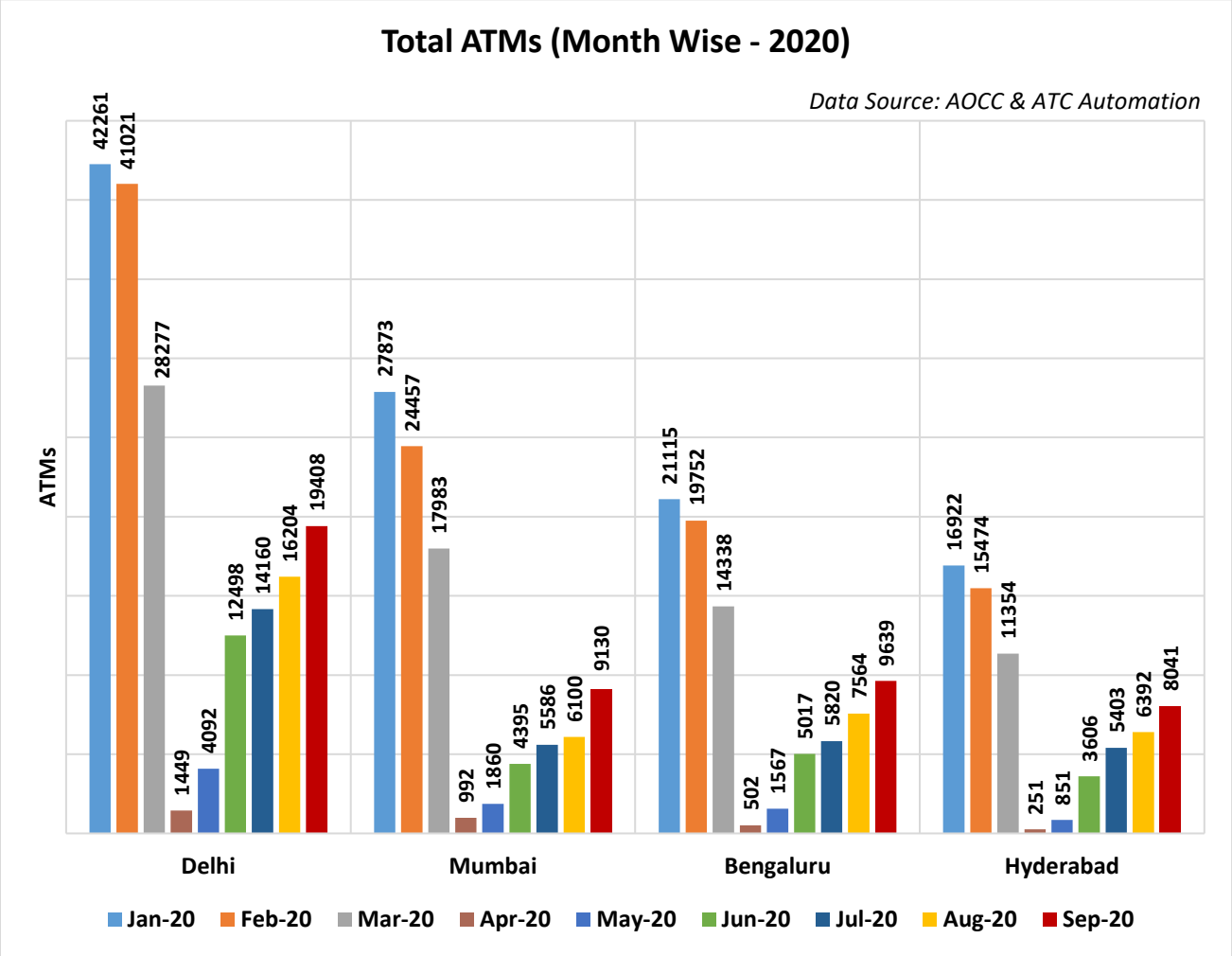

Figure 3: Monthwise ATMs at four major airports

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 September, with a sequential growth over August by 35%.

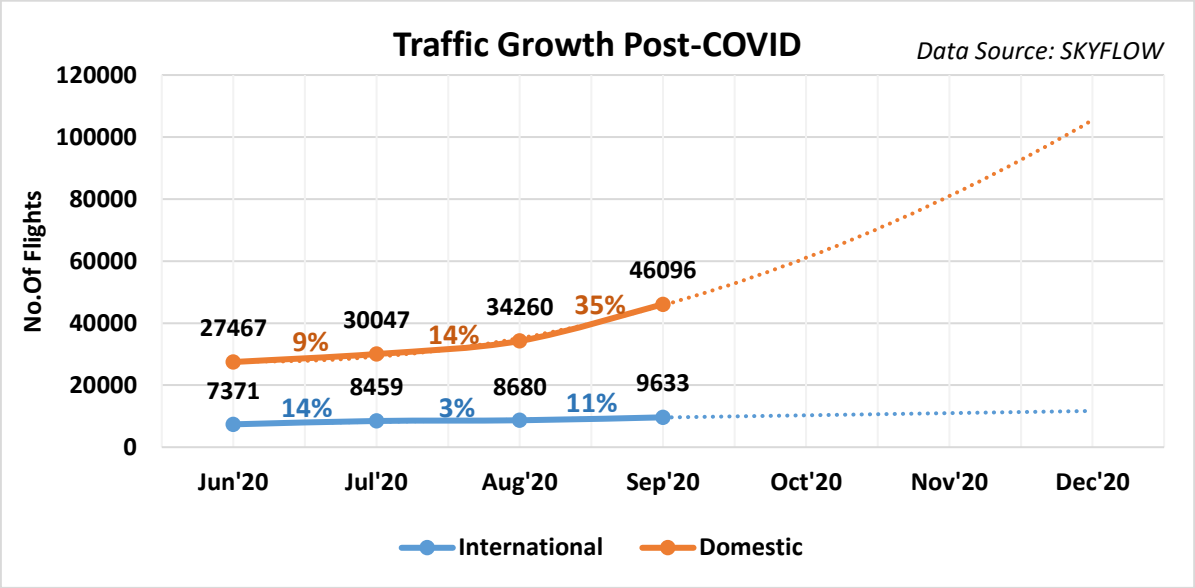

Figure 4: Traffic Growth - Post Covid

IV. Flight Operations – Airport wise

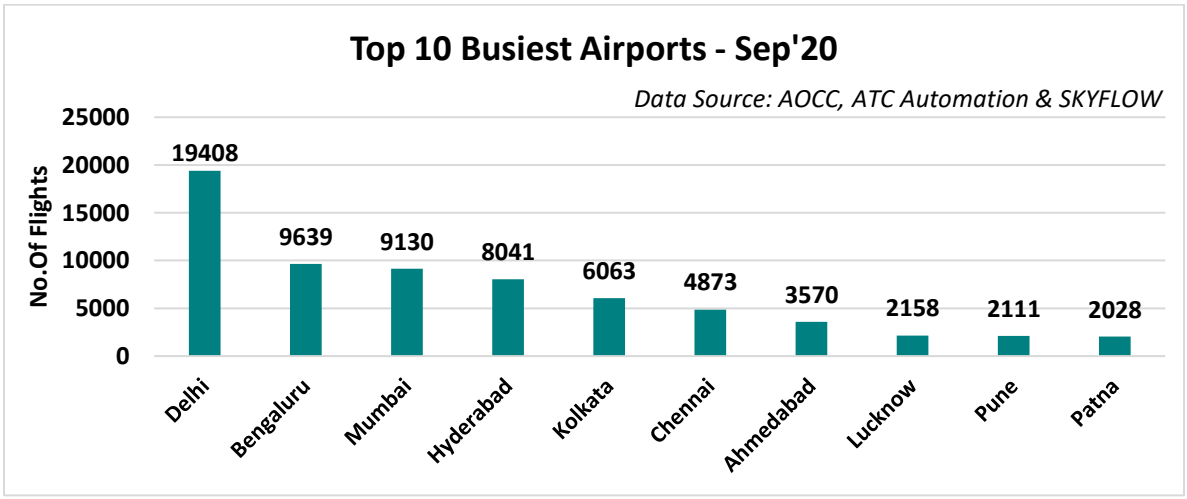

Figure 5: Busiest Airports in India - Sep'20

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

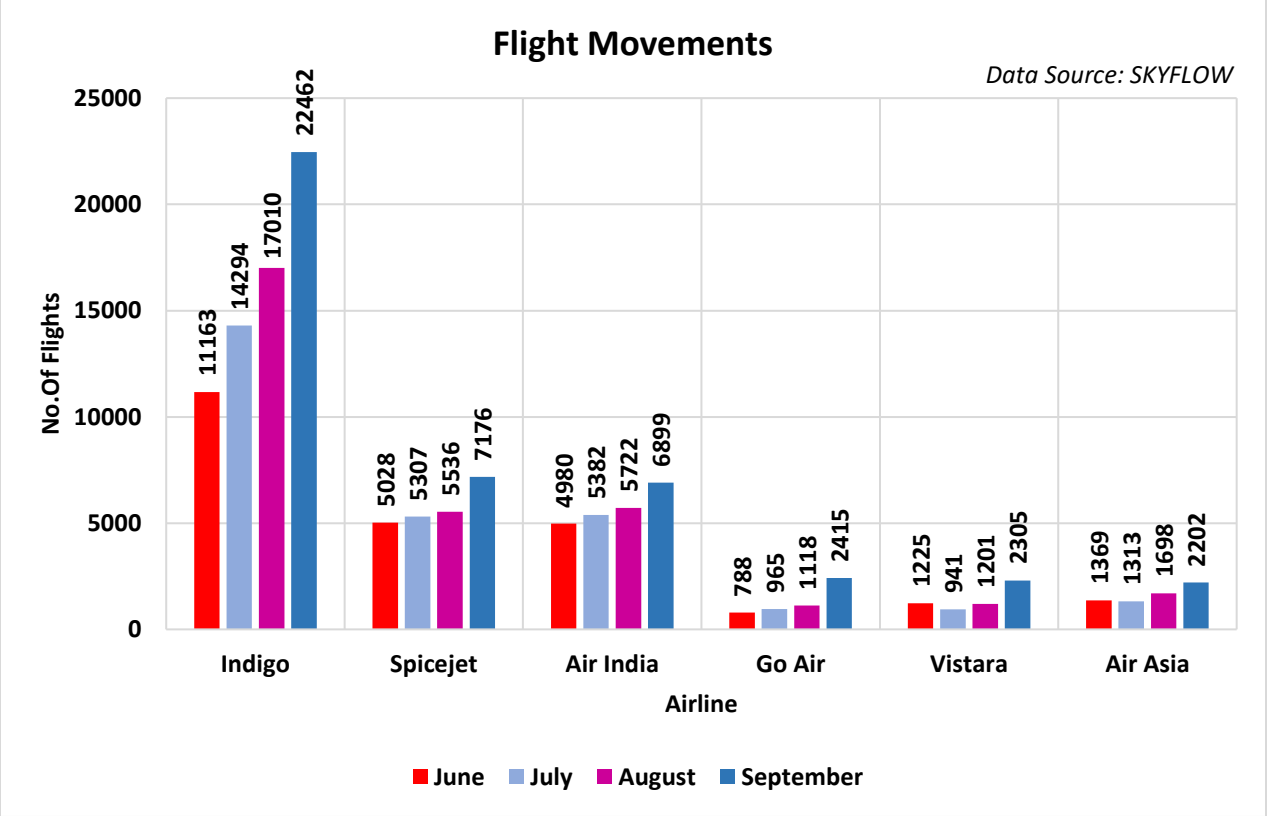

Figure 6: Flight Movements – Airline wise

C. ATFM Post Operations – CDM Analysis

I. Introduction

Analysis Period 1st – 30th September'20

Back Ground During the above mentioned period, ATFM measures were applied **thrice(3) for Bengaluru Airport** due to the following reasons as illustrated in the bar chart below:–

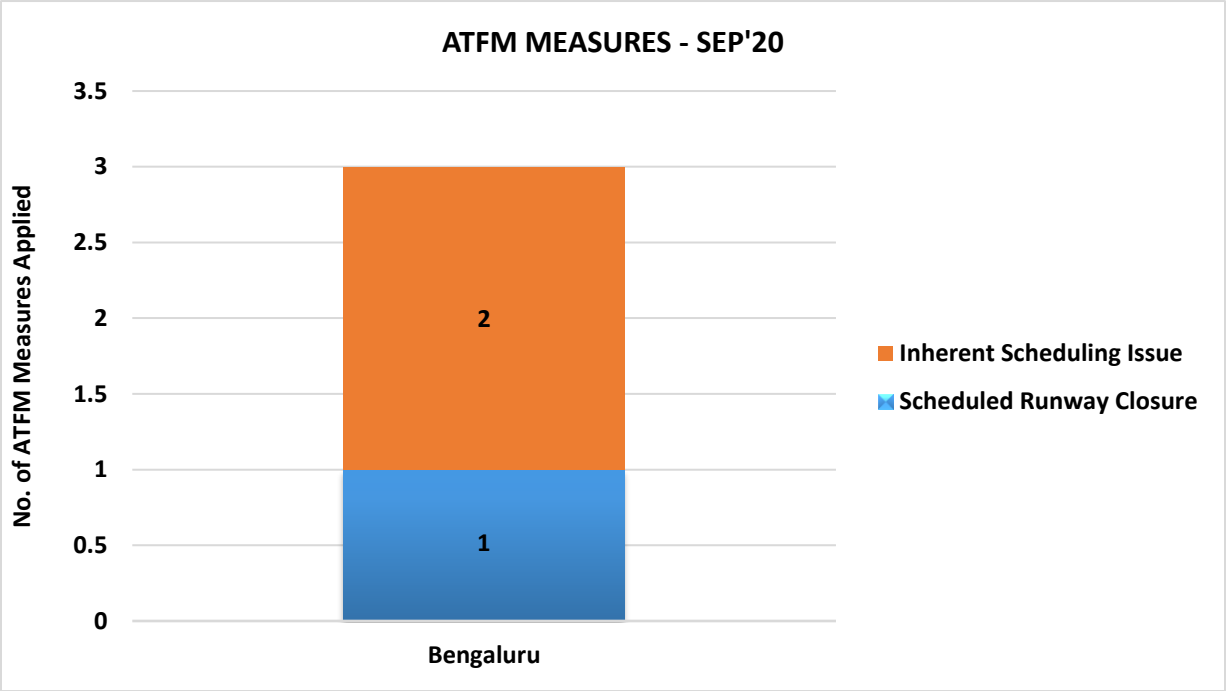

Figure 7: ATFM Measures - Sep'20

II. ATFM Measures Overview

	Bengaluru Airport
Number of ATFM measures applied	3
Average ATFM Ground delay due to measures	9 min
Maximum ATFM Ground delay due to measures	30 min
% Compliance	67

Total affected flights in scenario (Domestic Arrivals)	53
Total Domestic Arrivals with zero ATFM delay	16
Total Domestic Arrivals with ATFM delay	37

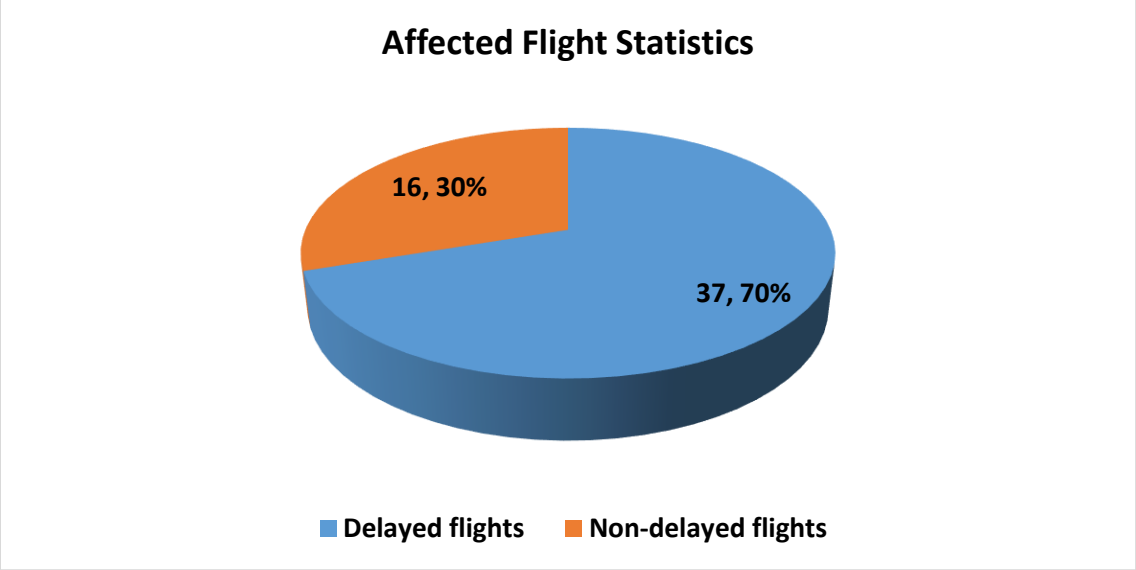

Figure 8: Affected Flight Statistics – Sep'20

III. Overall Compliance

Total Arrivals	55
Domestic arrivals	53
Flights with complete data (ATOT)	52
Flights with incomplete data	0
Flights Not Operated	1
Compliant*	35
Non-Compliant	17

Total No. of Revised CTOTs issued = 4 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)

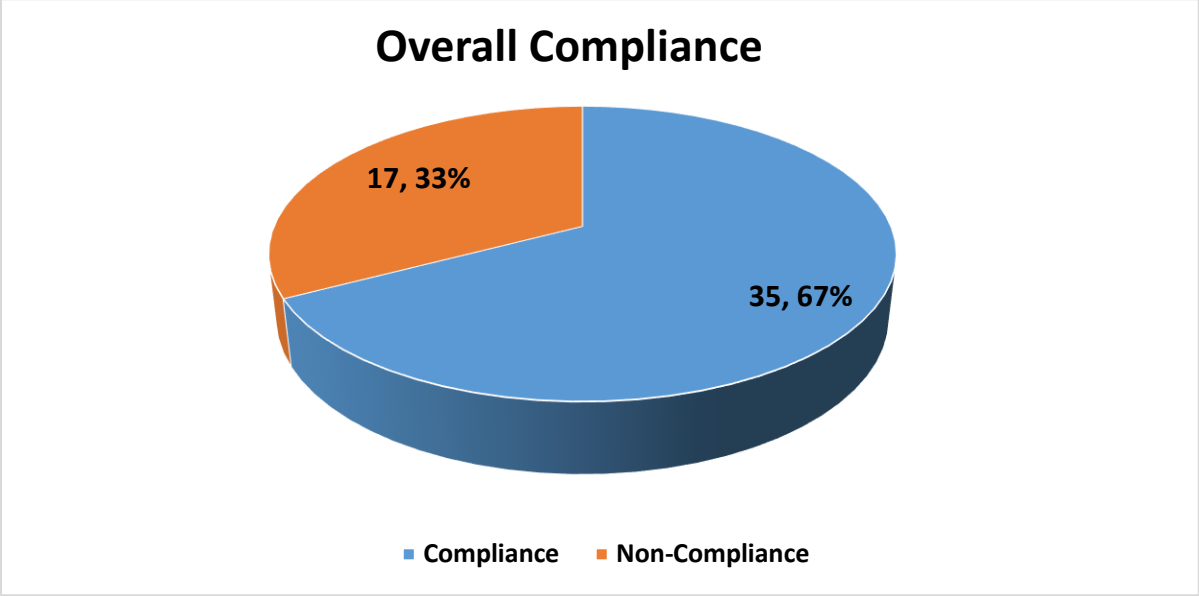

Figure 9: Overall Compliance – Sep'20

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

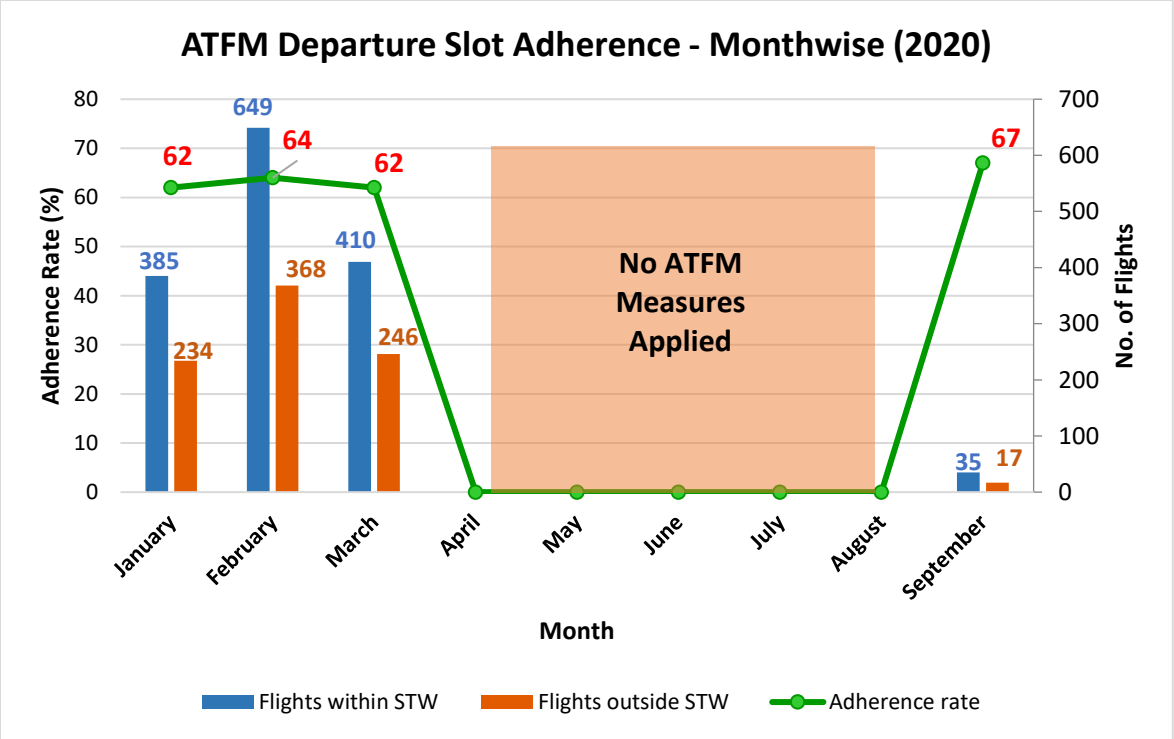

Figure 10: ATFM Compliance – Month wise

Inference

1. Out of the total arrivals captured for the constrained Airports during the CDM scenario , 96% of flights i.e. Domestic arrivals, are participating.

2. Out of these Domestic Arrivals,70% of arrivals are assigned ATFM ground delay & 30% of flights are without any ATFM ground delay.

3. Out of the total arrivals captured at the constrained Airport during the ATFM scenario, 67% of flights are assigned ATFM Ground Delay.

IV. CTOT Compliance rate - Airport wise

MUMBAI FMP (75%)*	Compliant	Non Compliant	%Compliant
Ahmedabad	2	0	100
Kolhapur	0	1	0
Mumbai	2	0	100
Pune	1	1	50
Surat	1	0	100
KOLKATA FMP (87%)*			
Bhubaneshwar	3	0	100
Guwahati	2	0	100
Kolkata	2	2	50
Patna	1	0	100
Varanasi	3	0	100
DELHI FMP (50%)*			
Delhi	3	3	50
Jaipur	2	0	100
Lucknow	1	3	25
CHENNAI FMP (56%)*			
Chennai	2	0	100
Cochin	2	0	100
Hyderabad	1	2	33
Madurai	3	0	100
Trichy	0	2	0

**FIR wise compliance rate*

V. CTOT Compliance rate of Airline Wise

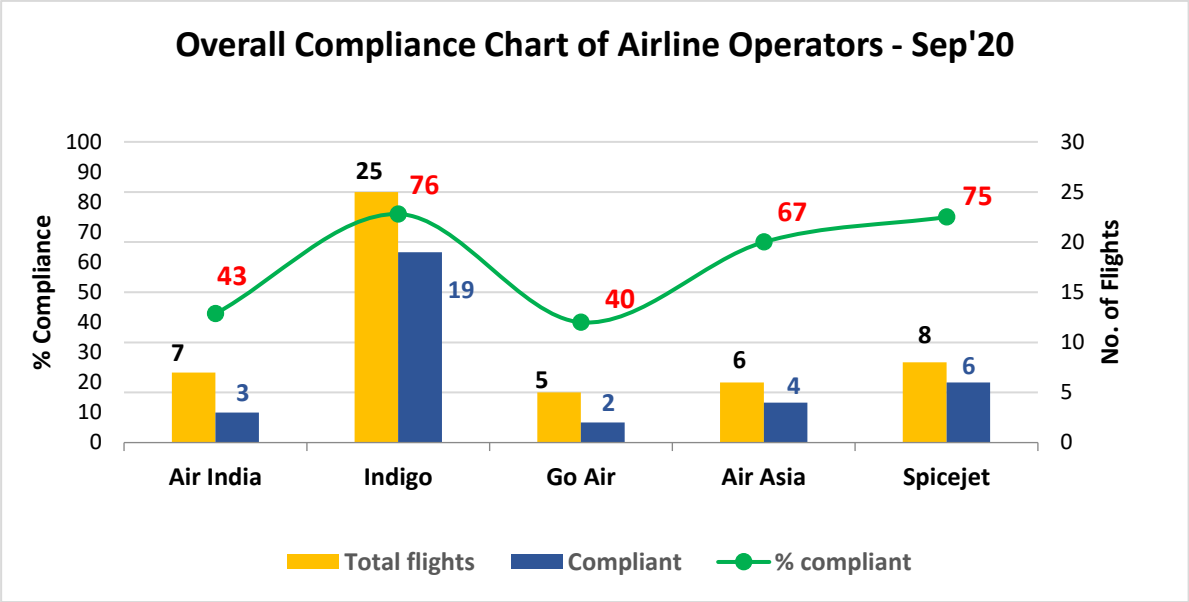

Figure 11: Airlines Overall Compliance - Sep'20

Inference

1. Out of the total domestic arrivals with complete data in the CDM scenario, 67% arrivals are compliant.
2. Kolkata region has the highest compliance rate of 87% whereas Delhi region has the lowest compliance rate of 50%.
3. Indigo and Spicejet have a compliance rate above the average recorded 67% compliance.

VI. Air Delay during the CDM Scenario period

Average Air Delay to domestic arrivals* within the CDM Scenario period for Bengaluru is 7 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	4	2	8	7	20	6	3	0	2	0
	% flight	8	4	15	13	38	12	6	0	4	0

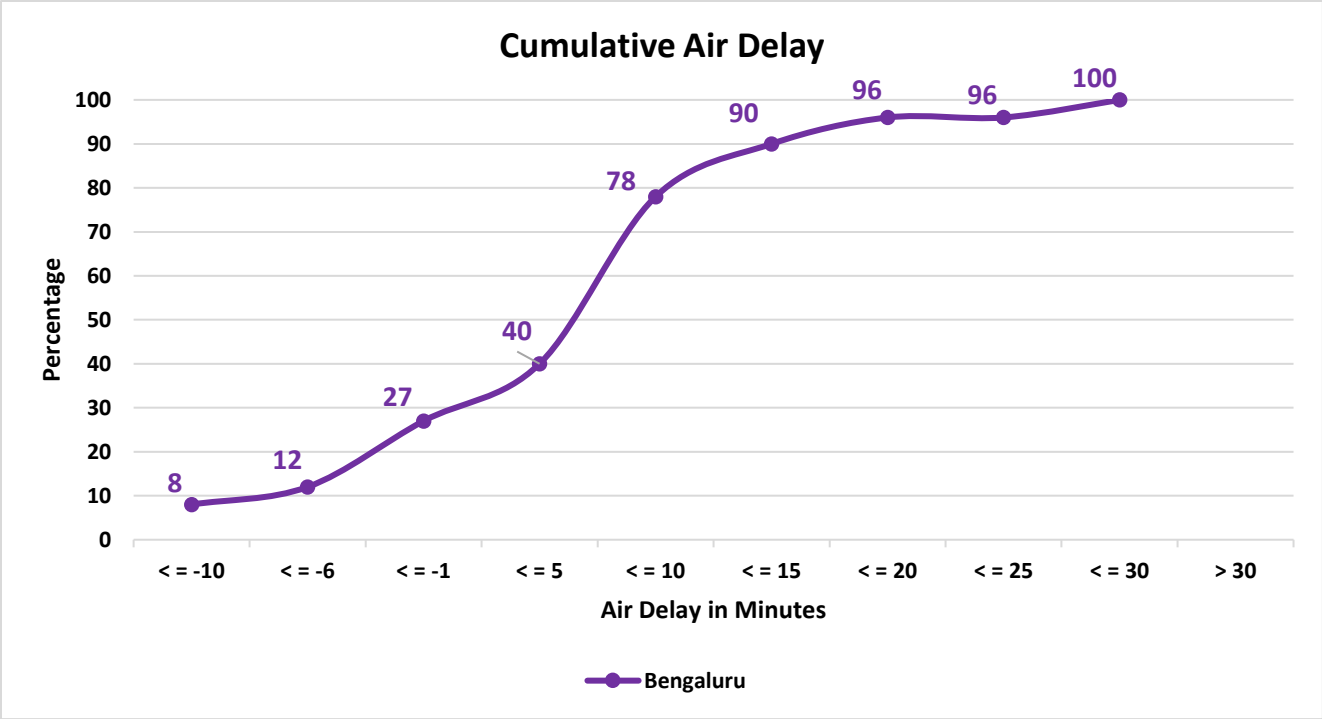

Figure 12: Cumulative Air Delay during CDM period

Inference

1. 78% of flights for Bengaluru had an Air delay of equal to or less than 10 minutes during the CDM period.

D. Glossary

ATFM Parameters	**Definition**
Affected Flight statistics	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)
Average ATFM delay	$\frac{\boldsymbol{Total\ monthly\ ATFM\ delay\ (in\ minutes)}}{\boldsymbol{Total\ Domestic\ Arrivals}}$
Maximum ATFM delay	Maximum ATFM delay (in minutes) assigned in the month
Overall compliance rate	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
CTOT Compliance rate of Airline operators	An overview of CTOT compliance rate of various Airline operators
CTOT Compliance rate of Airports within different Regions	An overview of CTOT compliance rate of Airports within 4 FIRs
Air delay statistics	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** Average Air Delay is calculated as: $\boldsymbol{Average\ Air\ Delay} = \frac{\boldsymbol{Total\ Air\ Delay\ to\ domestic\ arrivals\ (with\ values\ greater\ than\ zero)}}{\boldsymbol{Total\ Domestic\ Arrivals}}$ *CLDT: Calculated Landing Time* *CTOT: Calculated Take off Time* *ALDT: Actual Landing Time* *ATOT: Actual Take off Time*