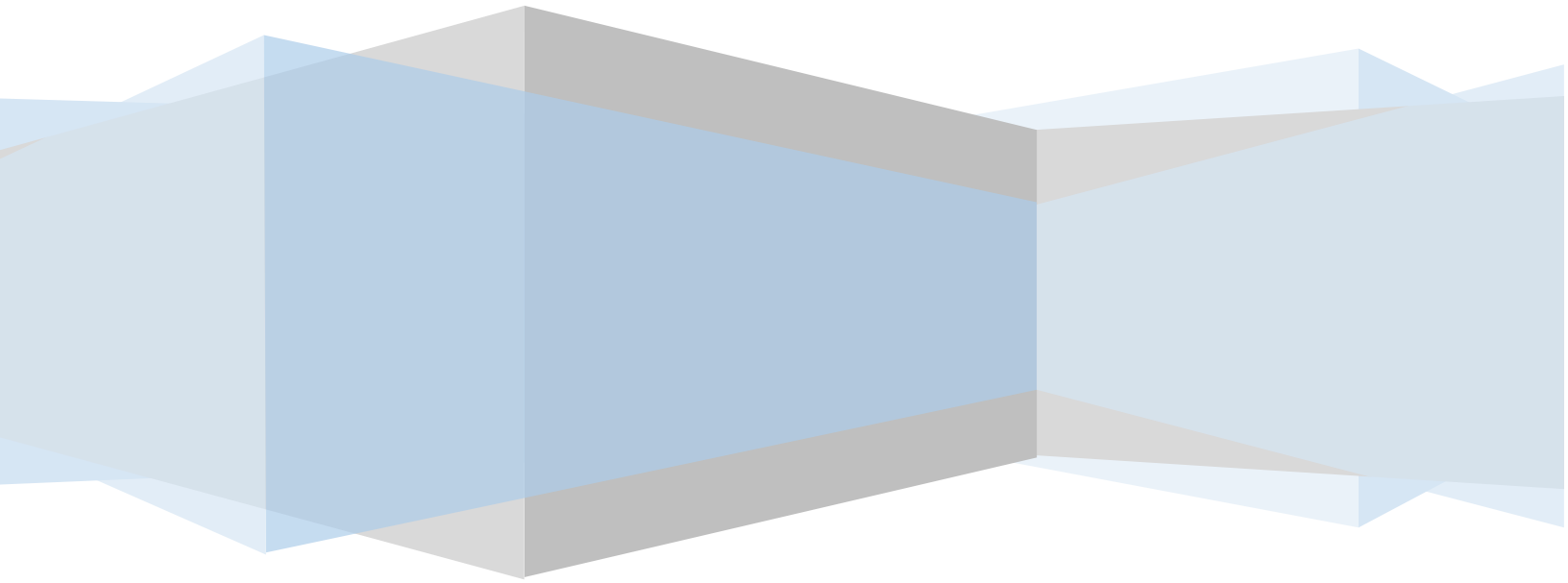
POST OPERATIONS ANALYSIS REPORT

November, 2021

CENTRAL COMMAND CENTER, C-ATFM, DELHI



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A. Executive Summary

Air Traffic Movements continue to increase at Indian metro Airports even though fears of Omicron variant of Covid-19 cases has increased restrictions and introduced more checks for travelers from high risk countries.

India had announced to resume international flights from Dec 15, 2021, but then decided to defer it due to rising Omicron cases across the world.
The coronavirus induced suspension of scheduled international passenger flights has been extended till 14thDecember ’21. 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.

Three(3)ATFM measures were applied in the month of November ’21 due to Demand Capacity imbalance at Delhi Airport.

Traffic Analysis

I. Air Traffic Movement at Major Airports in India

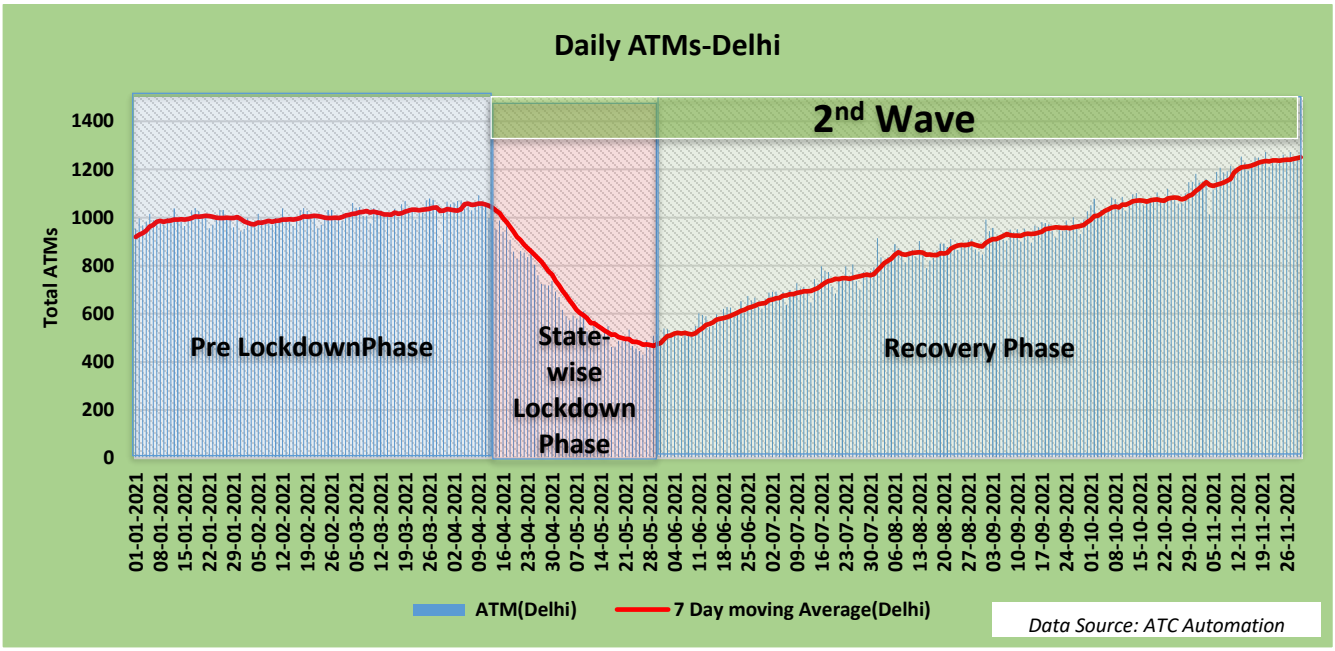

Figure 1: Air Traffic Movement-Delhi

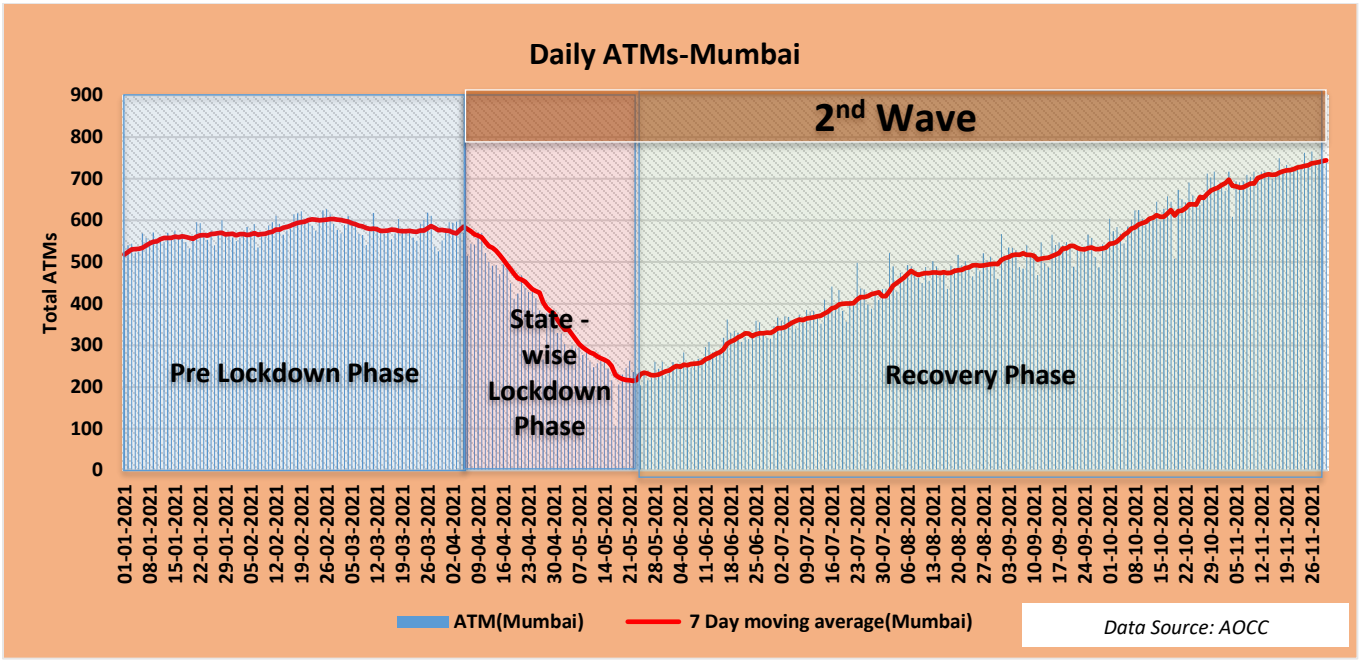

Figure 2: Air Traffic Movement– Mumbai

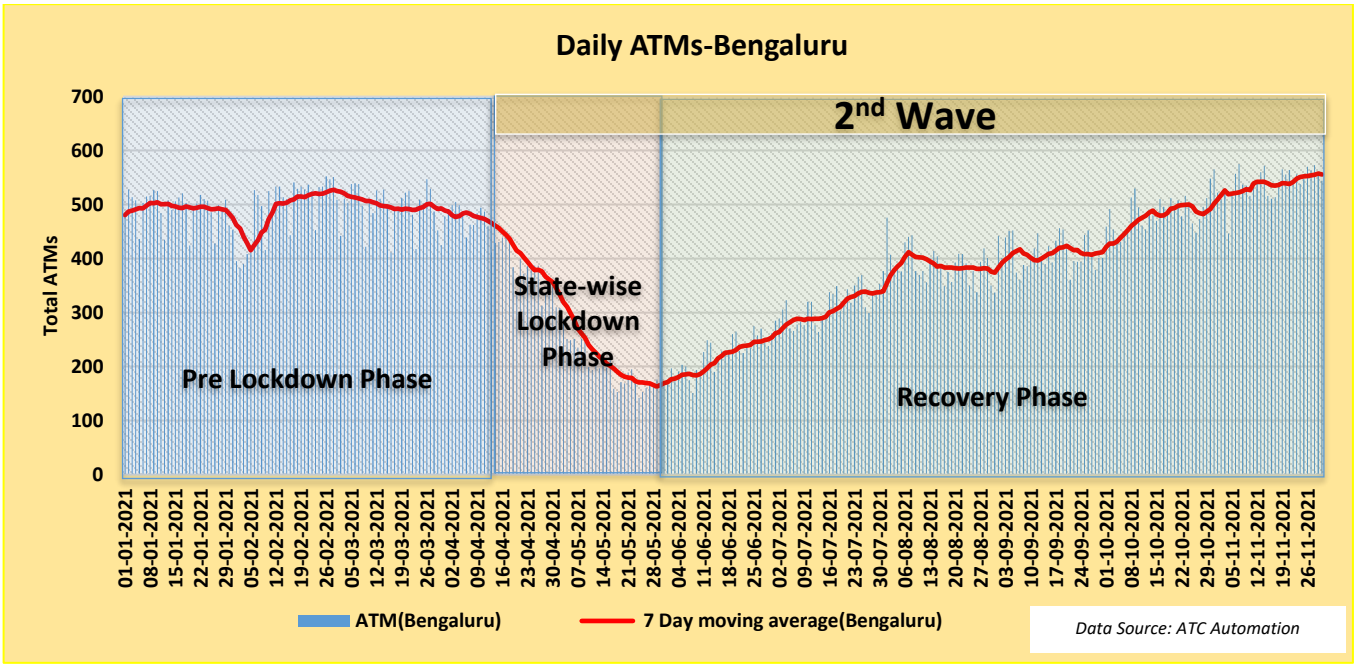

Figure 3: Air Traffic Movement–Bengaluru

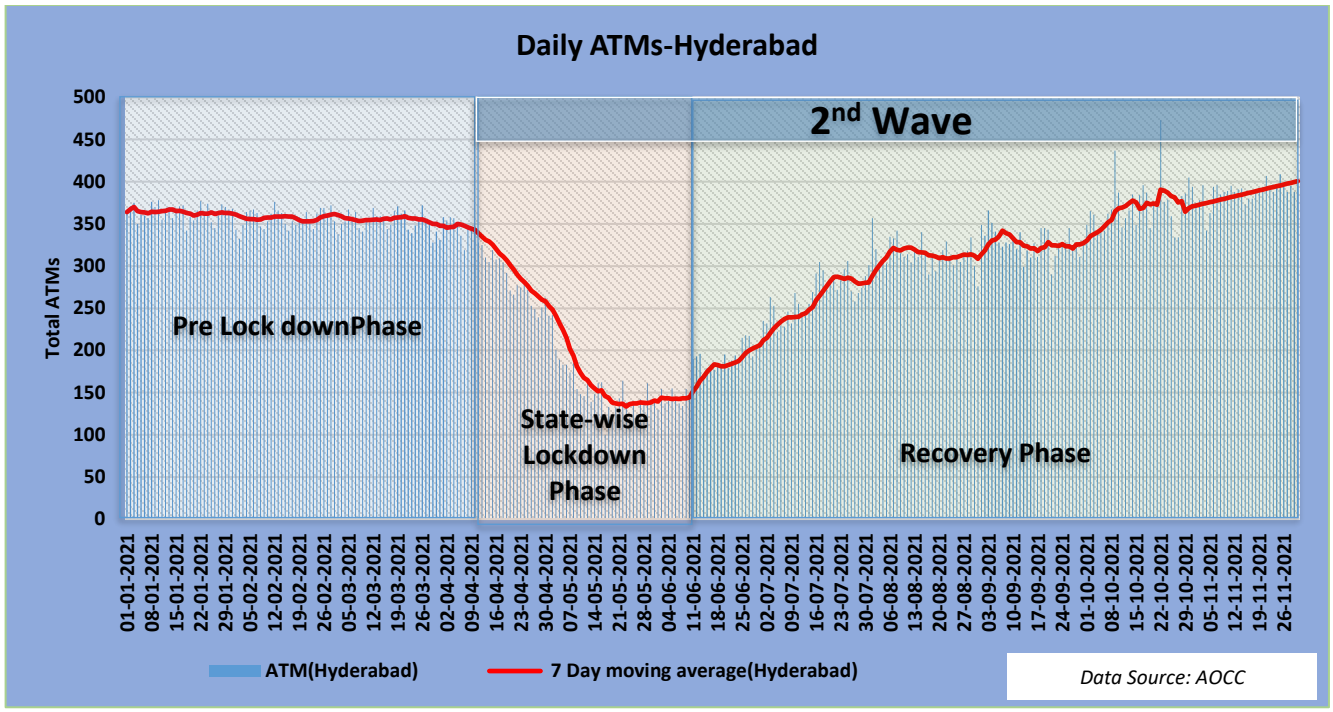

Figure 4: Air Traffic Movement –Hyderabad

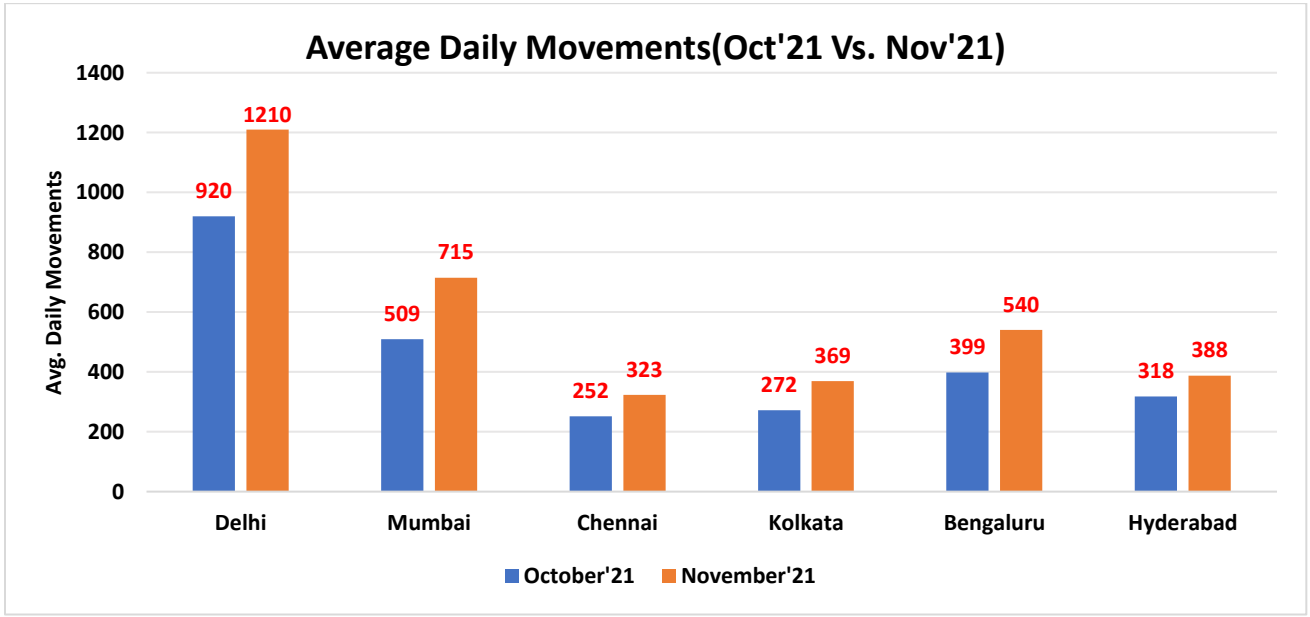

Figure 5: Average Daily Movements at Six Metro Airports

It is evident from the above chart that Average Daily movements has increased in November'21 as compared to the previous month.

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 November'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 November for the year 2019,2020 and 2021 for six major airports and the percentage change in comparison to the total ATMs in November'19.

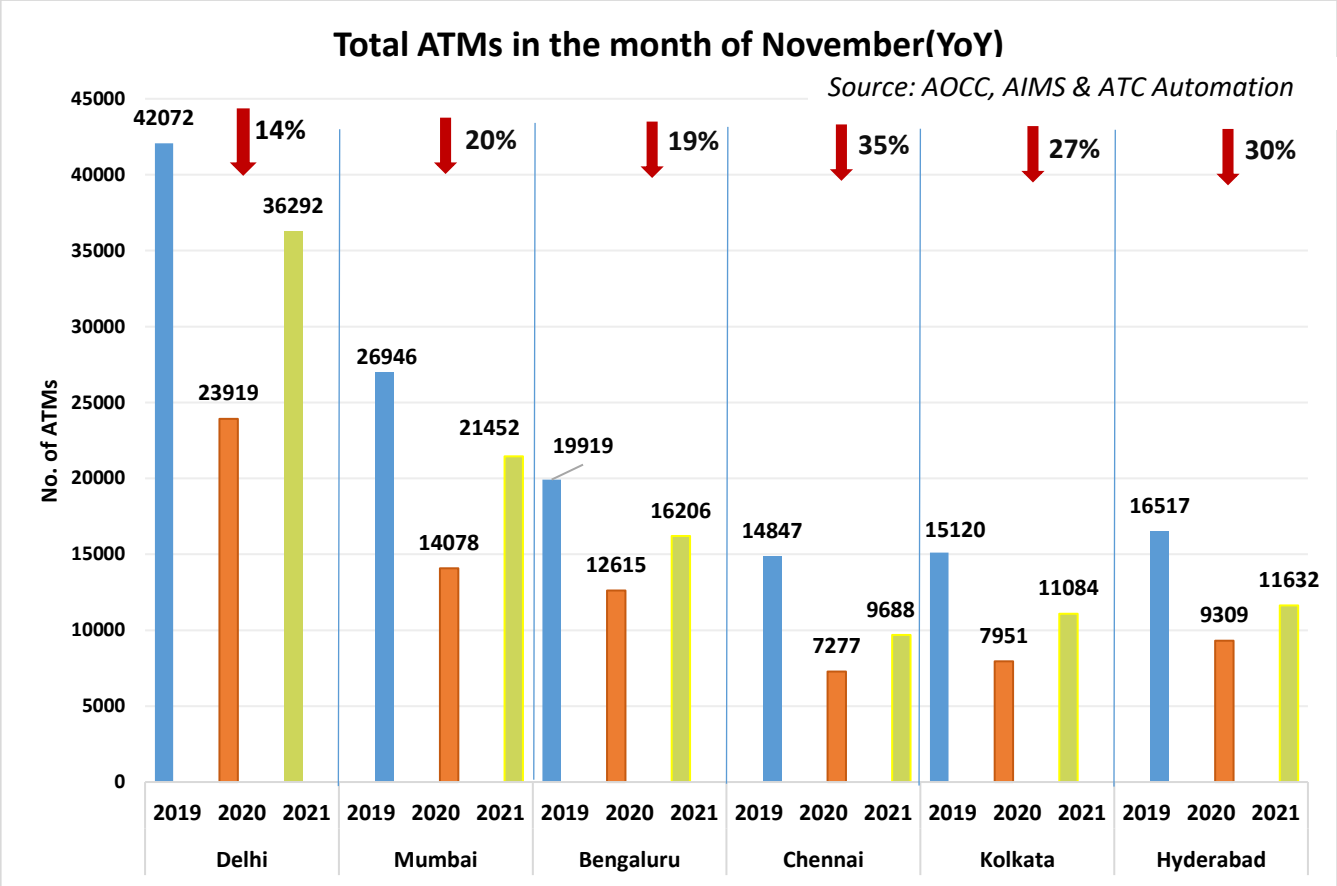

Figure 6:Total ATMs in November & Percentage Traffic Variation

III. Flight Operations – Airlinewise

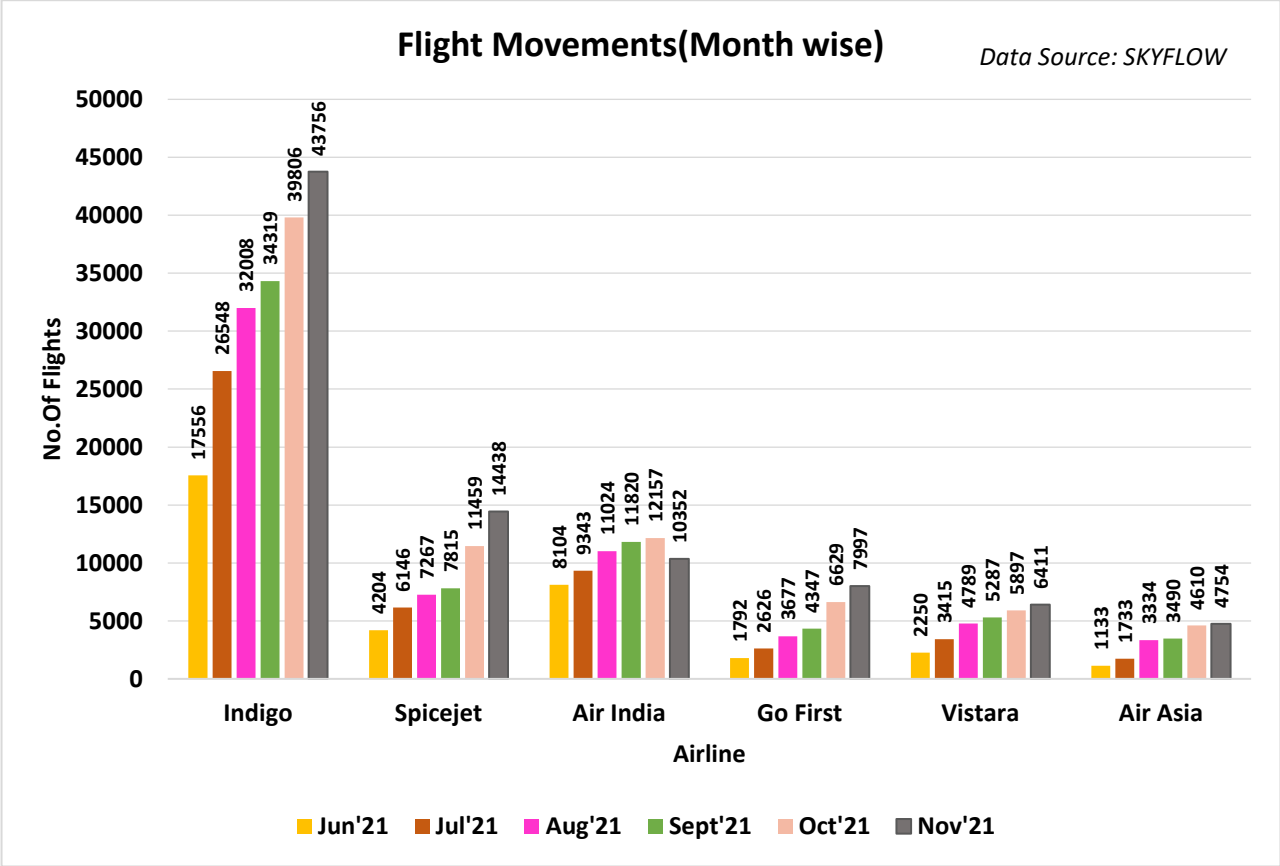

Figure 7: Flight Movements –Airlinewise

B. ATFM Post Operations – CDM Analysis

I. Introduction

Analysis Period 1st – 30th November'21

Back Ground During the above mentioned period, **Three** ATFM measures were applied **for Delhi Airport** due to the following reason as illustrated in the bar chart below:–

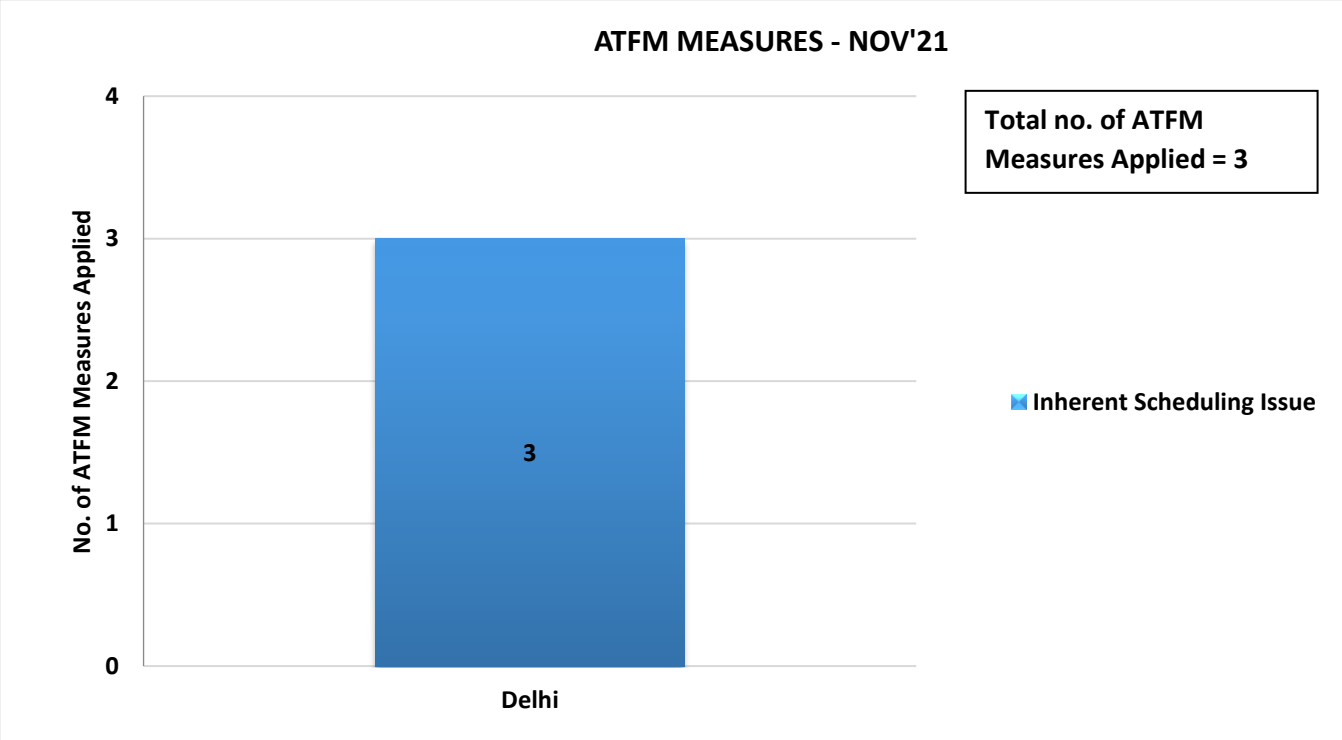

Figure 8: ATFM Measures –Nov'21

II. ATFM Measures Overview

	Delhi Airport
Number of ATFM measures applied	3
Average ATFM Ground delay due to measures*	13 Min
Maximum ATFM Ground delay due to measures	35 Min
% Compliance	52

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

Total Arrivals	302
Total International Arrivals(Exempted)	33
Total affected flights in scenario (Domestic Arrivals)	269
Total Domestic Arrivals with zero ATFM delay	24
Total Domestic Arrivals with ATFM delay	245

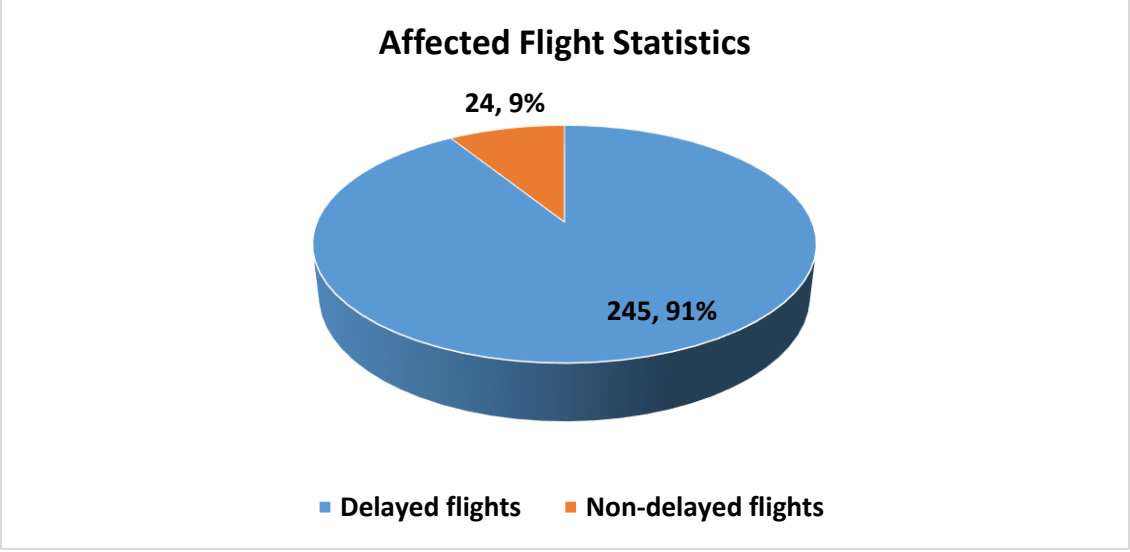

Figure 9: Affected Flight Statistics –Nov'21

III. Overall Compliance

Total arrivals	302
Domestic arrivals	269
Flights with complete data (ATOT)	258
Flights with incomplete data	2
Flights Not Operated	9
Compliant*	134
Non-Compliant	124

*Total No. of Revised CTOTs issued = 27 (Compliance calculation for flights which were issued revised CTOT is w.r.t. new CTOT issued)

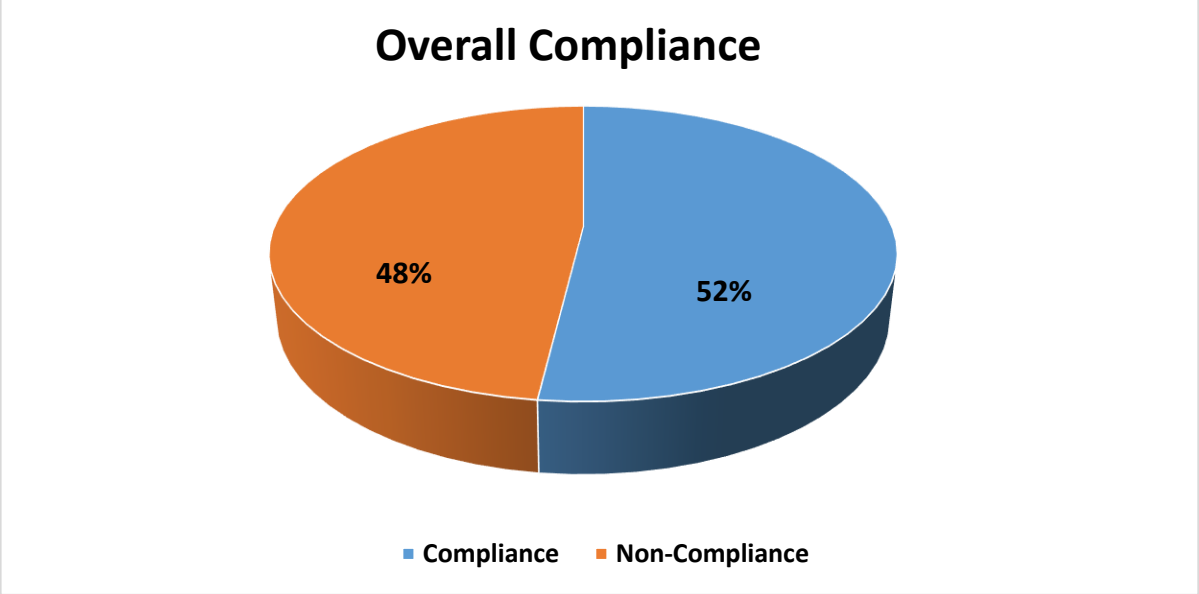

***Figure 10*: Overall Compliance – Nov'21**

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

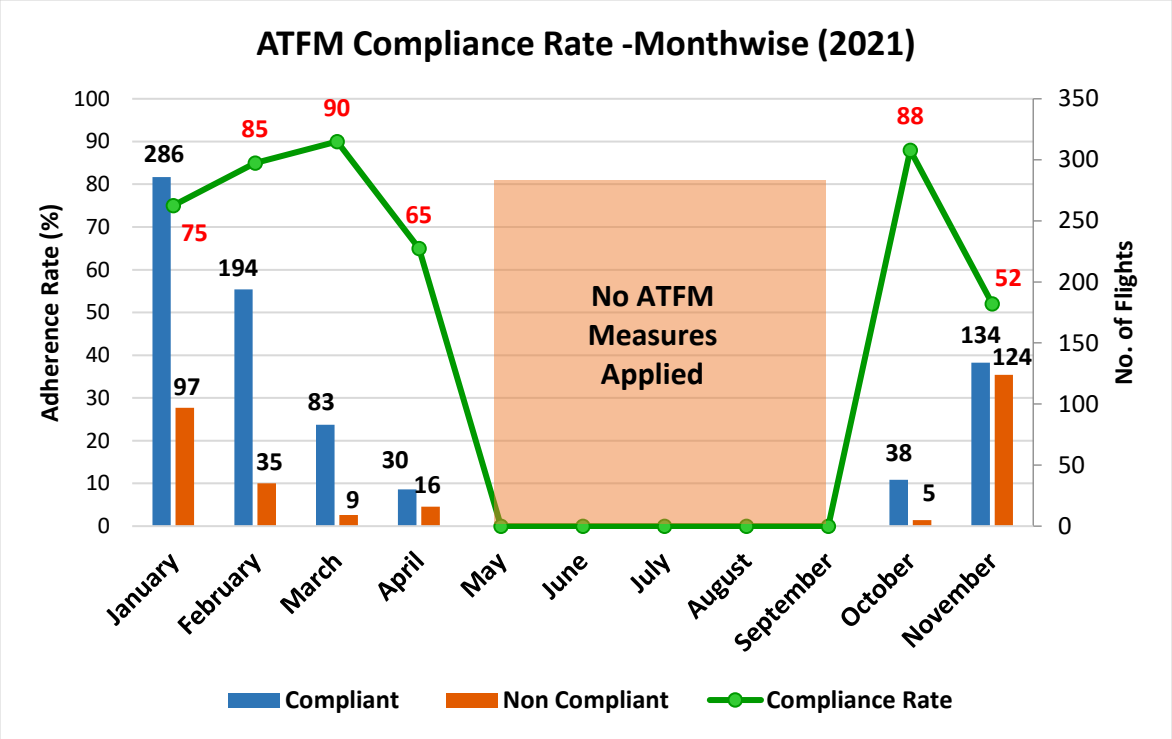

Figure 11: ATFM Compliance-Monthwise

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, 91% of arrivals are assigned ATFM ground delay.

3. Out of the total arrivals captured to the constrained Airport during the ATFM scenario, 91% of flights are assigned ATFM Ground Delay.

IV. CTOT Compliance rate – Airportwise

MUMBAI FIR (61%)*	Compliant	Non Compliant	%Compliant
Pune	3	2	60
Mumbai	4	7	36
Bhopal	2	0	100
Jabalpur	1	1	50
Aurangabad	0	1	0
Indore	0	2	0
Udaipur	1	0	100
Vadodra	1	1	50
Ahmedabad	4	5	80
KOLKATA FIR (53%)*			
Varanasi	1	3	33
Kolkata	2	4	33
Guwahati	4	3	57
Bhubhaneshwar	1	1	50
Raipur	1	2	33
Imphal	1	0	100
Patna	2	3	40
Ranchi	2	4	33
DELHI FIR (35%)*			
Chandigarh	0	1	0
Jaipur	2	0	100
Lucknow	0	2	0
Srinagar	2	3	40
Dehradun	1	0	100
Amritsar	1	0	100
CHENNAI FIR (62%)*			
Goa	2	1	67
Bangalore	5	9	56
Chennai	1	1	50
Shamshabad	1	3	33
Cochin	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. CTOT Compliance rate – Airlinewise

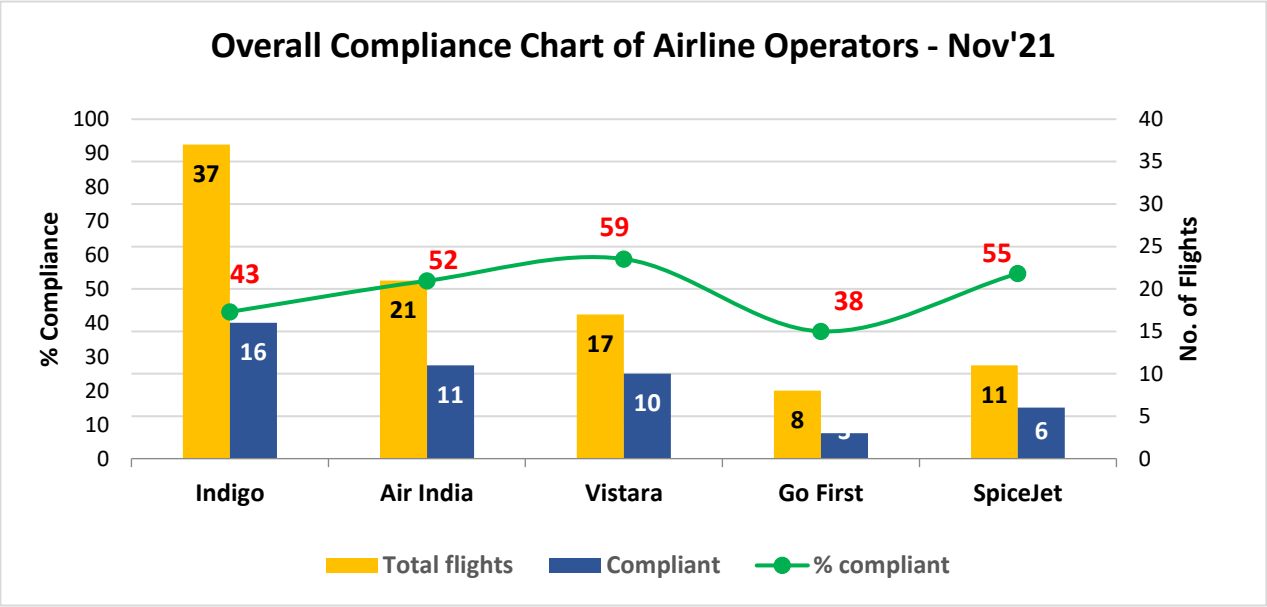

Figure 12: Airlines Overall Compliance –Nov'21

Inference

1. Out of the total domestic arrivals with complete data in the CDM scenario, 52% arrivals are compliant.
2. Delhi region has the lowest compliance rate of 35% whereas Chennai region has highest compliance rate of 62%.
3. Vistara and SpiceJet Airlines have a CTOT Compliance better than the average recorded compliance for the month of Nov'21.

VI. Air Delay during the CDM Scenario period

Average Air Delay to domestic arrivals* within the CDM Scenario period for Delhi is 5 minutes

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

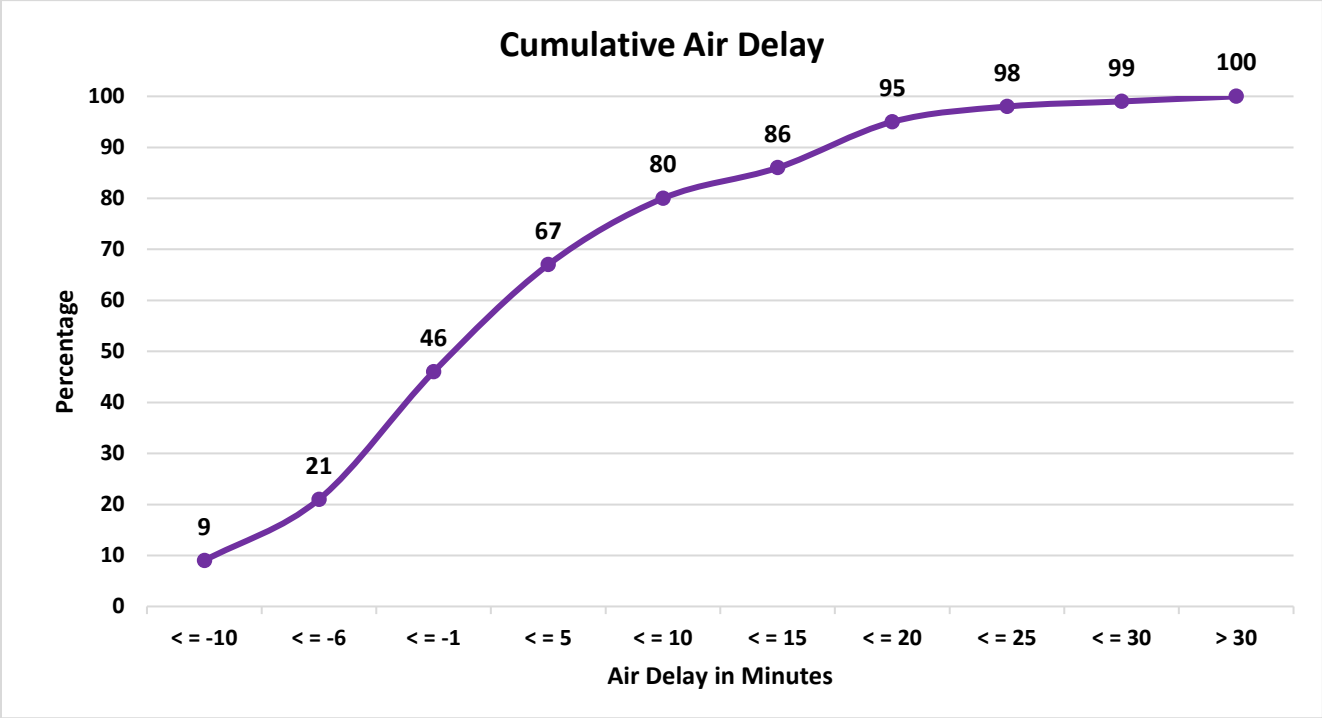

Figure 13:Cumulative Air Delay during CDM period

Inference

1. 80% of arriving flights to Delhi had an Air delay of equal to or less than 10 minutes during the CDM period.

C. 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 theATFM 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, whereAET(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*