

CANSO Academy



ATFM Performance Analysis

CANSO Academy Webinar

Tuesday 20 April 2021

12:00 – 14:00 UTC

Moderator



Sugoon (Kin) Fucharoen

Senior ATM Officer
AEROTHAI

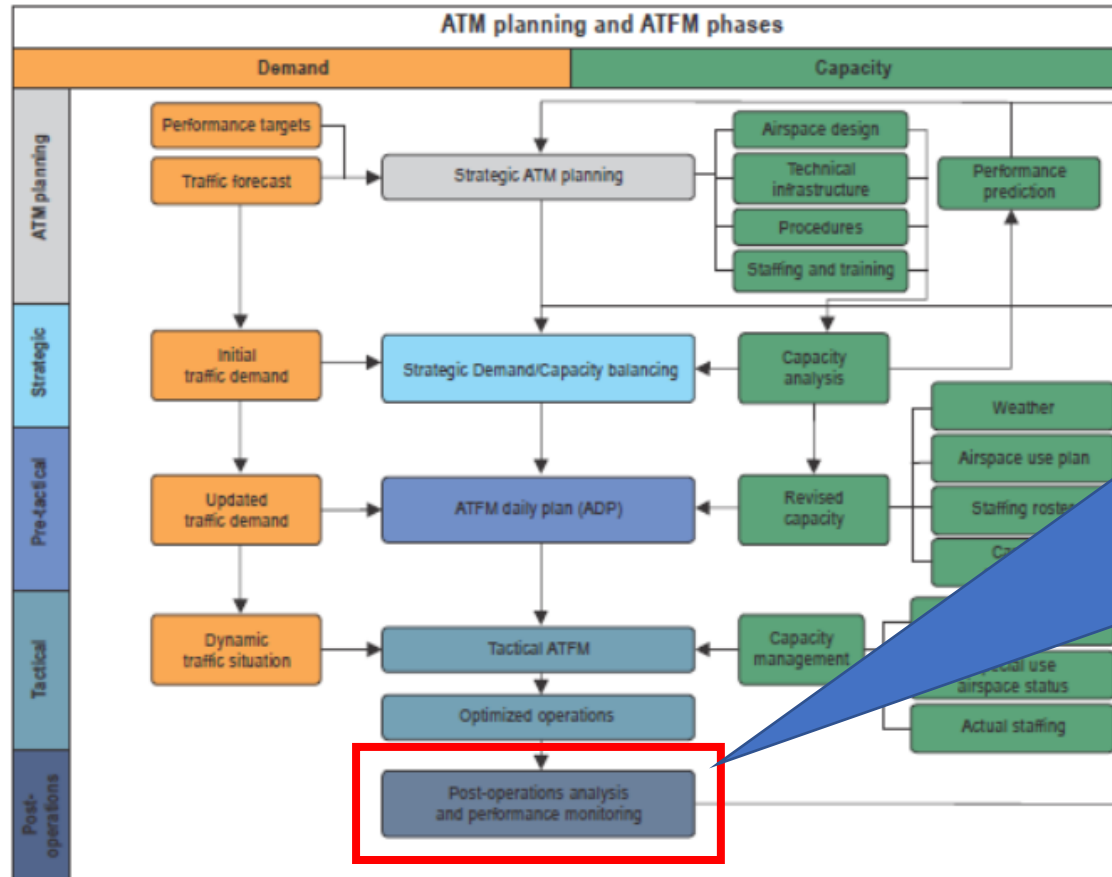
Co-Chair
CANSO ATFM/A-CDM Workgroup



*Life can only be
understood
backwards; but it
must be lived
forwards*

- Søren Kierkegaard, 1844

ATFM also needs to be understood backward...



*"[Post-operations analysis] is the **cornerstone** in developing **best practices** and/or **lessons learned** that will **further improve** the operational processes and activities."*

(ICAO Doc 9971, para. 4.1.4.4.2)

Figure II-4-1, ICAO Doc 9971, 3rd Ed.

...to improve it going forward!

What You Will Hear Today:

Key Considerations in Analyzing
ATFM Performance

Case Study 2:
ATFM Performance Analysis in the
UK

Key Considerations in Assessing
ATFM Implementation Benefits

Case Study 1:
ATFM Performance Analysis in
Australia

Case Study 3:
ATFM Performance Analysis in the
US

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Key Considerations in Analyzing ATFM Performance

Jesper Bronsvoort

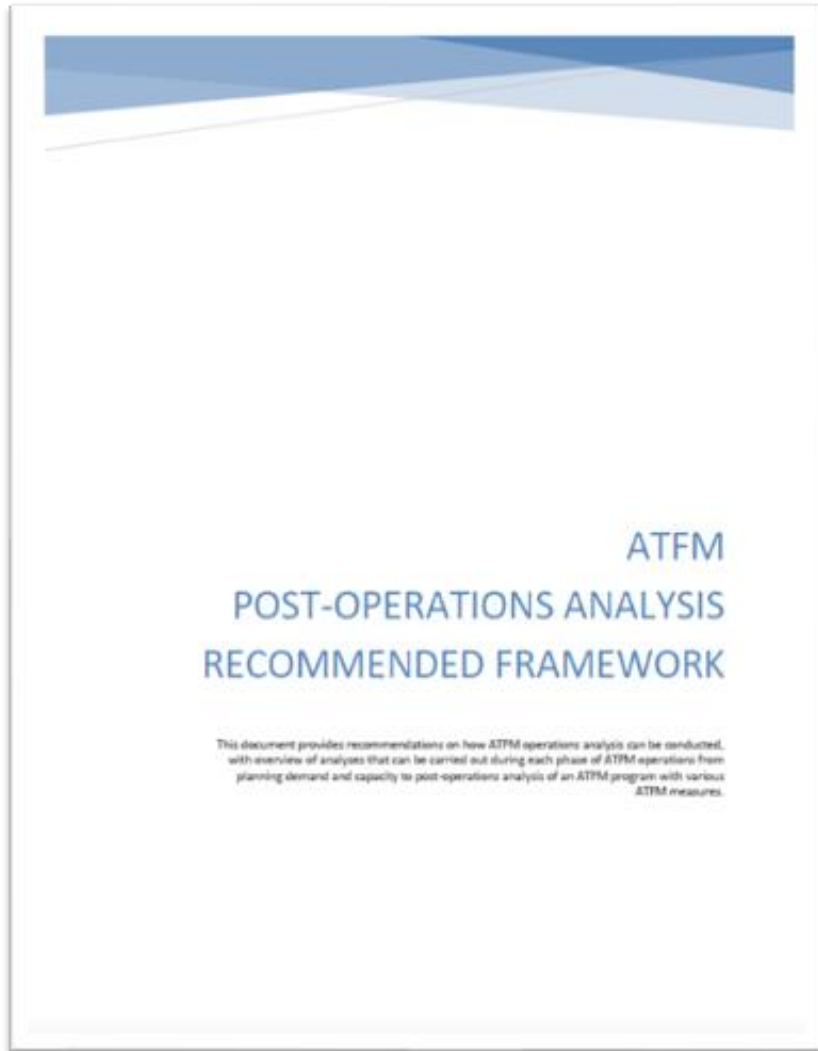
*Network Performance & Analysis
Manager*

Airservices Australia

Why does analyzing ATFM matter?

- ATFM Performance Analysis is integral to the success of ATFM and Collaborative Decision Making in general
 - A predictable ATM Network is the responsibility of **all** stakeholders
 - ATFM Performance Analysis is therefore about providing insight into **ATFM performance** and driving **accountability** by every stakeholder in the CDM process
- 
- A blue geometric graphic consisting of several overlapping triangles and polygons, located in the bottom right corner of the slide.

Where to find guidance?



This document provides **recommendations** on how **ATFM performance analysis** can be conducted, with overview of analyses that can be carried out **from planning demand and capacity to post-operations analysis** of various ATFM measures.

[Access the Document Here](#)

Document Structure

1 Introduction	Introduction to the document with objectives, structures, nomenclature
2 Guidance Documents	Post-operations analysis as mentioned in guidance documents
3 Demand Reliability	How to assess accuracy and reliability of traffic demand information

4 Capacity Analysis	How to determine and analyze operational capacity
5 ATFM Analysis	How to analyze the “success” of an ATFM measure
6 Collaborative POA	How to collaboratively perform post-ops analysis with stakeholders
7 Case Studies	Case studies on post-operations analysis from those with experiences

Analyzing ATFM measures: The 3 Questions

What did we “DO” to the flights?

Impact Analysis

Who are impacted by the ATFM program and how?

How did the flights “REACT”?

Compliance Assessment

How well do stakeholders comply?

And was it “HELPFUL”?

ATFM Effectiveness Analysis

How effective was it in delivering the outcome intended?

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Case Study: ATFM Performance Analysis in the UK

Dan Schuller

*Manager, SESAR Concept and Future
ATM Evolution*
NATS

ATFM Performance Analysis in the UK

NATS' experience of post-ops capture and operational
use

Presented by Dan Schuller

The NATS logo is displayed in a white, italicized, sans-serif font. It is positioned in the lower right area of the slide, with a large, light blue swoosh graphic element curving around it from the top right towards the bottom left.

NATS

Our airspace



Flight Information Regions

- London & Scottish FIRs:
1m km² – 11% of Europe's
airspace and 25% of traffic
- Shanwick
2.2m km² – 80% of North
Atlantic traffic

Our centres

En route locations



Prestwick Centre
Handles on
average 3,400
flights/day

- Scottish Oceanic Control Centre
- Scottish Area Control Centre
- Manchester Area Control Centre

PRESTWICK CENTRE

SWANWICK
CENTRE



Swanwick Centre
Handles on
average 5,500
flights/day

- London Area Control Centre
- London Terminal Control Centre
- London Military Air Traffic Control

Post Ops - NATS' experience



- The NATS operation is a node within the EUR region coordinated via the Brussels-based Network Manager.
- NATS is subject to national performance targets set by its regulator in terms of delay and efficiency. Failure to meet these targets results in financial penalty.
- NATS has its own dedicated Airspace and Capacity Management (ACM) operation, tools and team to manage DCB activities.
- Aim is to optimise our capacity before we intervene to manage demand using:
 - Airspace (e.g. segregated activity)
 - Sectorisation (combinations to best match demand)
 - ATC staffing
- Post Ops is a key element in informing the decision making in each ATM phase.

Limitations of data in current planning

- To plan the UK operation, we use NM data services comprising an extensive demand/data repository (DDR2) which captures historic filed plans within the entire EUR region.
- Within the pretactical timeframe, the network forecast view is transitioned onto the operational toolset (NM PREDICT) which also introduces the effect of forecast MET and planned network status.
 - Advantages – provides a common baseline for CDM
 - Disadvantages – No direct correlation to the tactical operation
- Post ops is used to provide context to the raw data in the planning phases to mitigate the gap between forecast and actual

Application of post ops (pretactical)

- Enables informed allocation of capacity resource
 - ATC staff
 - Airspace allocation
- Enables effective Planning of sector configurations that favours tactical measures
- Enables planned demand intervention using regulation delay that manages the core flow most effectively.
 - NATS has over 700 TFBs in its regulation catalogue.
- Provides baseline for understanding workload/complexity of a scenario in planning
- Enables identification of preferred strategies in planning for the tactical operation to utilise

Application of post ops (tactical)

- As the operation moves into the tactical day, FPL data is used by ops teams.
- Post ops continues to form backbone of response to monitoring and reaction to hotspots:
 - Validating a newly identified imbalance – confidence and probability of it shifting or dissipating
- As tactical action to rebalance at local supervisor level is limited – aim to provide a current set of network-friendly options to offload traffic that simultaneously satisfies their need to assure safety. Plus how to coordinate and with whom.

Post event – extraction of lessons (i)

- The challenge is how to extract relevant data and lessons for the future – what went well/not well?
- Trigger for analysis using poor performance as a measure is relatively straightforward and driven by statistical threshold - e.g. delay above forecast/target.
- However, once triggered, the process to contextualise any analysis is more complex. We are still reliant on human debrief/assessment/cataloguing, which is workload-intensive and open to subjectivity.

Post event – extraction of lessons (ii)

- To start to tackle these challenges - NATS has a current programme to link the ops narrative from multiple logs/calendars/applications onto a common platform that is manageable via apps.
- This capability to effectively attach searchable narrative to data represents a significant step in post ops towards more efficient and effective use of the human resource, and is a real step towards systemisation of this task.
- And finally, the next challenge starting to opening up is how we digitalise this post ops process to effectively reintegrate this extracted data into planning to close what can be a somewhat linear process into a cyclical one.

Thank you

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Case Study: ATFM Performance Analysis in Australia

Daniel Schauries

Senior ATM Performance Analyst

Phil Dowson

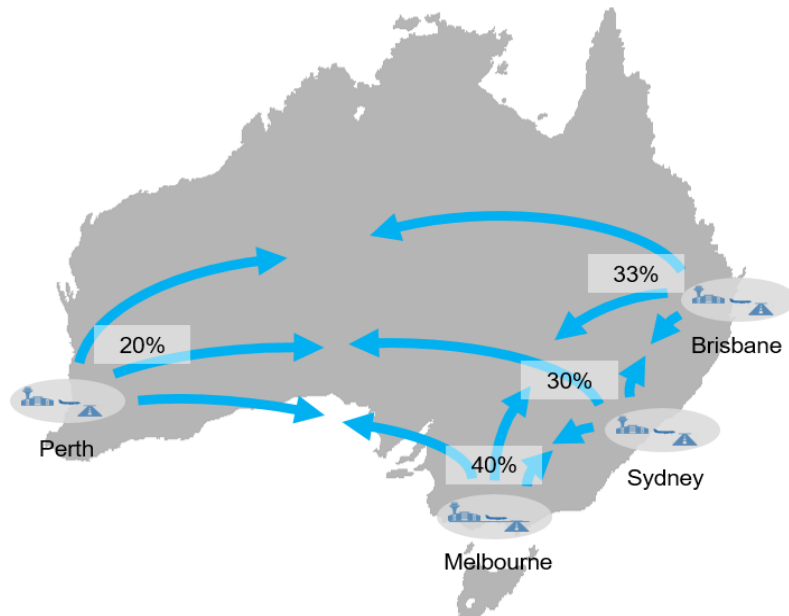
Metrics and Reporting Development Lead

Airservices Australia

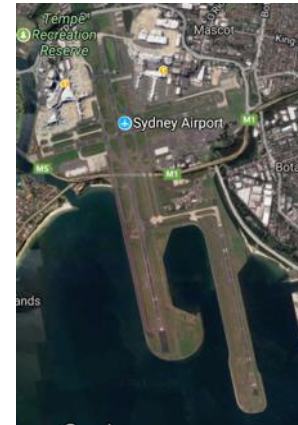
Our Operating Environment

- Network characterised by high volume of traffic between major capital cities

- E.g. 30% of aircraft departing Sydney go to Melbourne (~80 flights/day) or Brisbane (~50 flights/day) or Perth (~12 flights/day) - pre-COVID

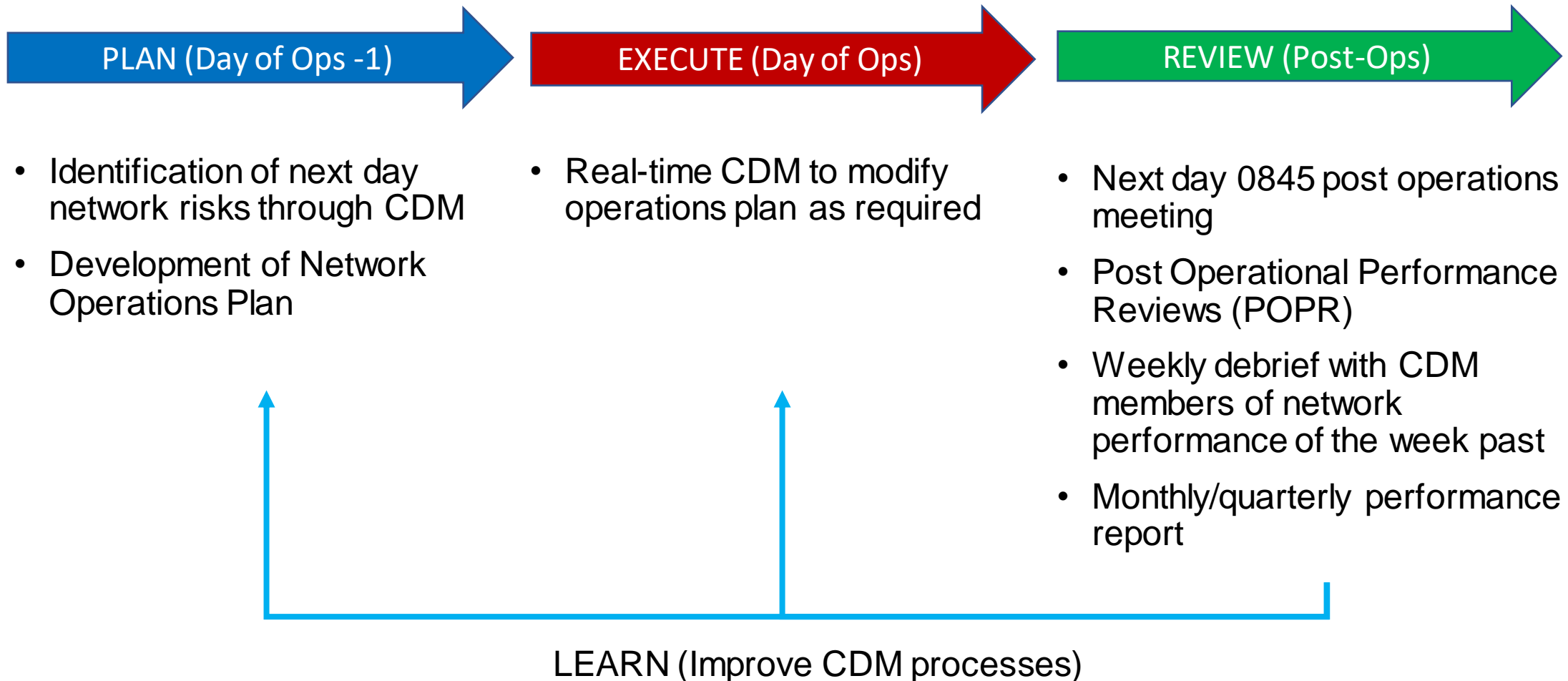


- Limited and large variation of Airport capacity (IMC and VMC) at major airports



- ATFM used to manage airport capacity and demand imbalances

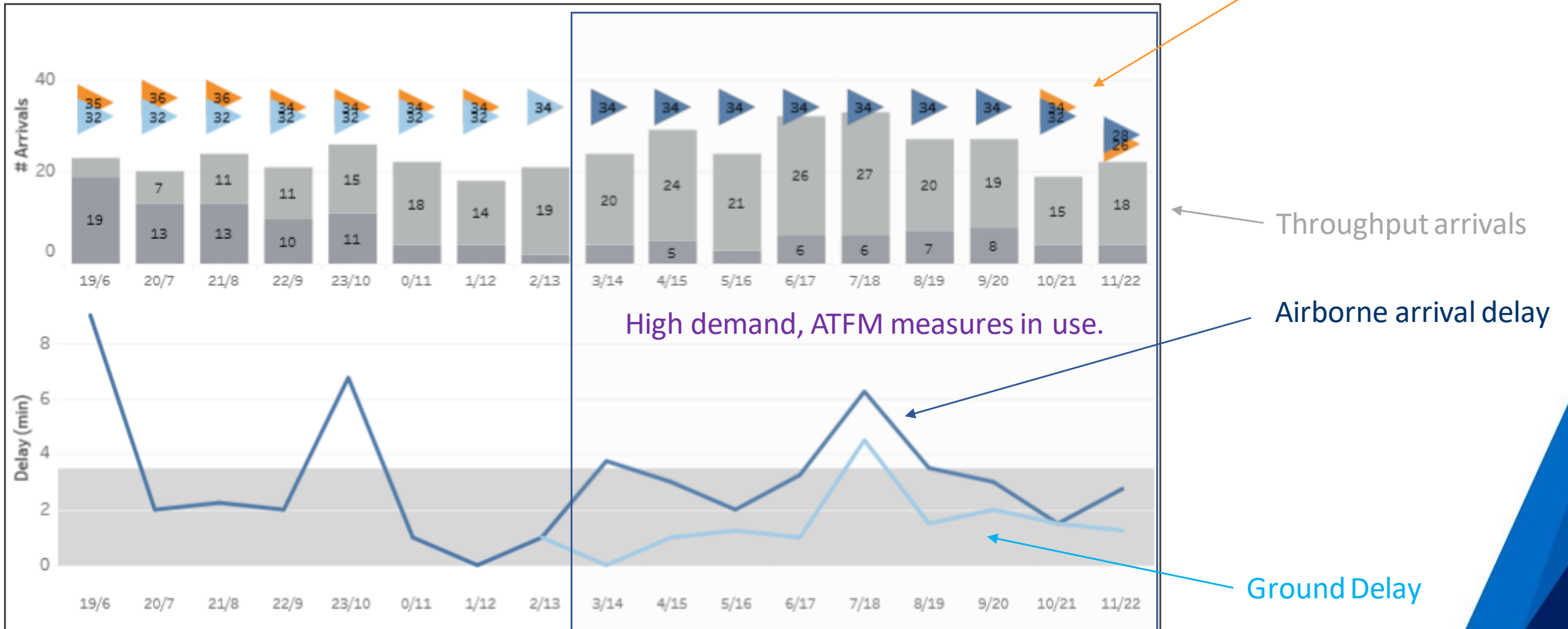
How Post Operational Performance fits with CDM



Daily Post-Operational Report

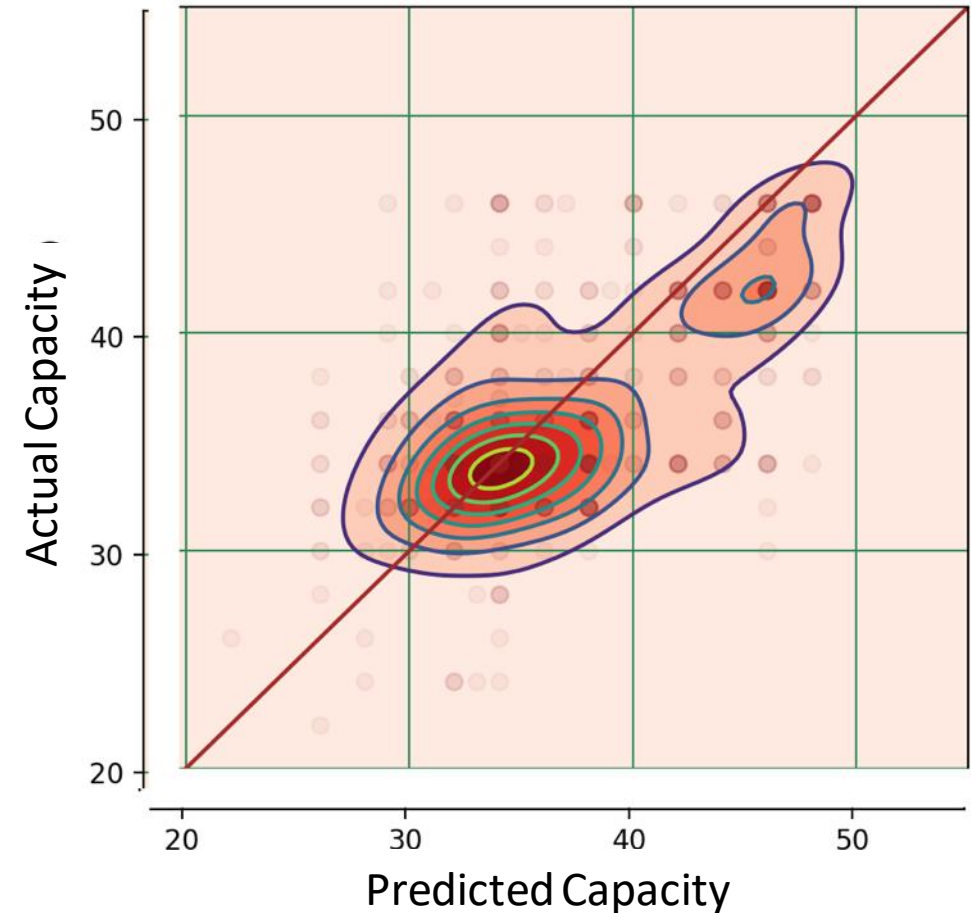


Post Operational Performance
Sydney - Sunday, 19 January 2020



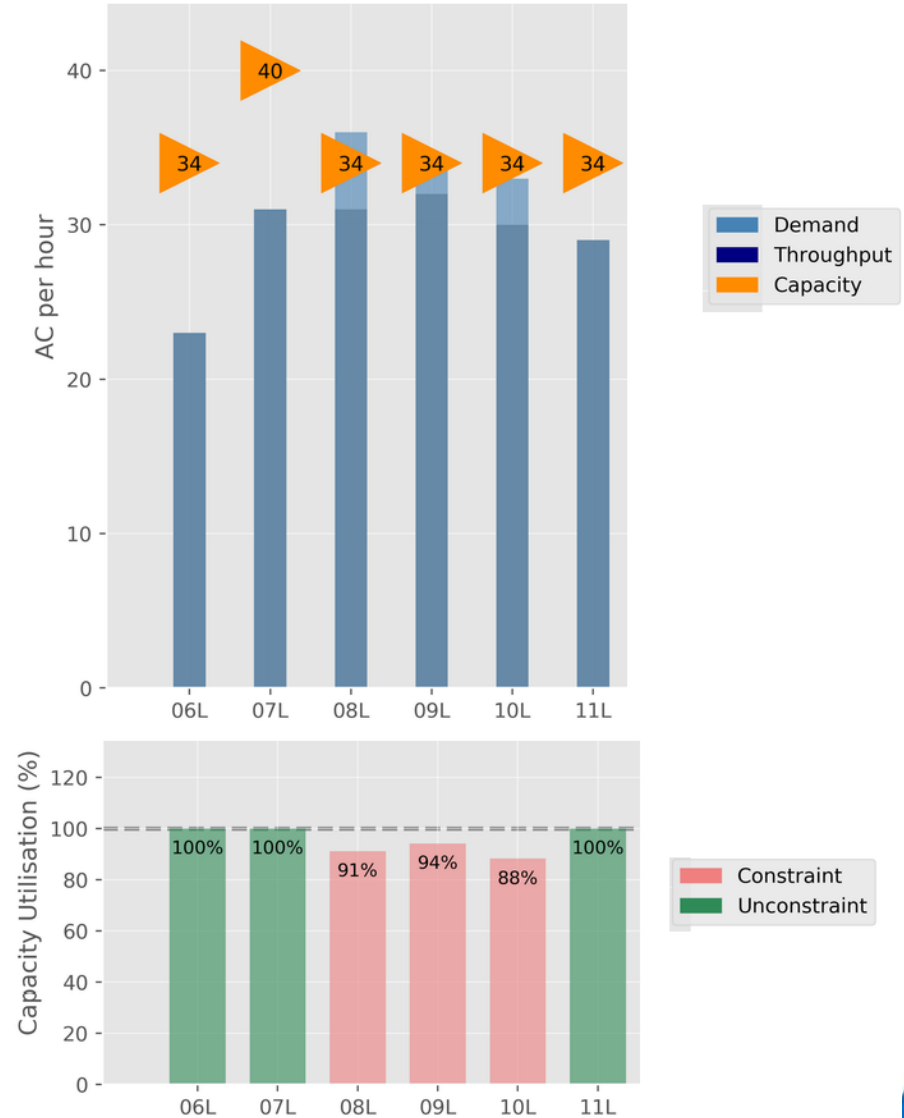
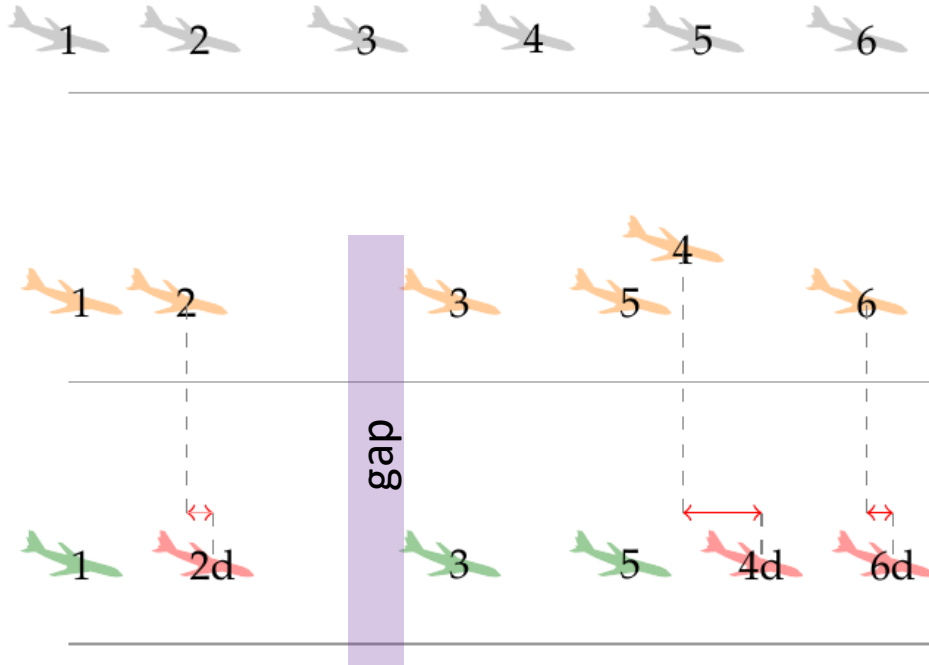
KPI - Capacity Predictability

- Capacity is weather-dependent
- Rate prediction through CDM
- KPI to assess the effectiveness of this process.
- **Incorrect rates lead to inefficient ATFM!**

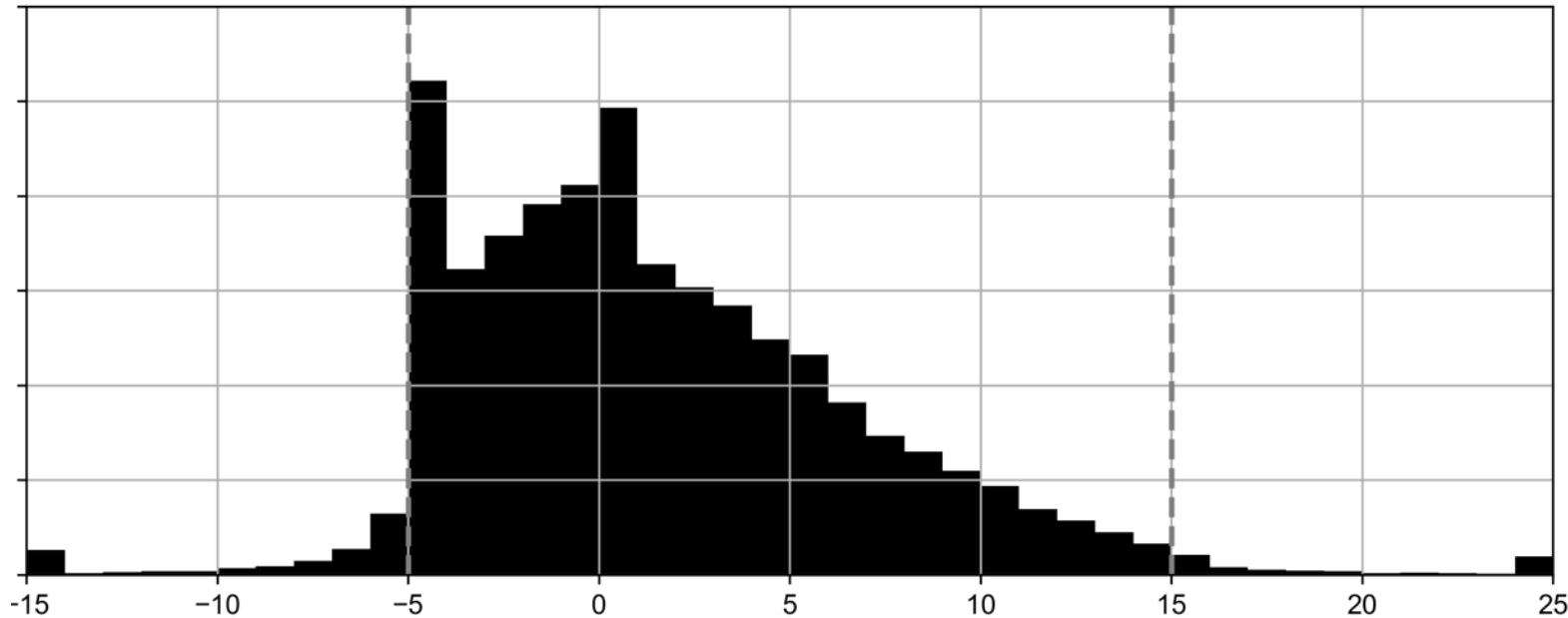


KPI - Capacity Utilisation

- Efficiency of arrival capacity.
- Primary cause for utilisation < 100% is the non-uniform arrival sequence:



KPI – GDP Departure Compliance

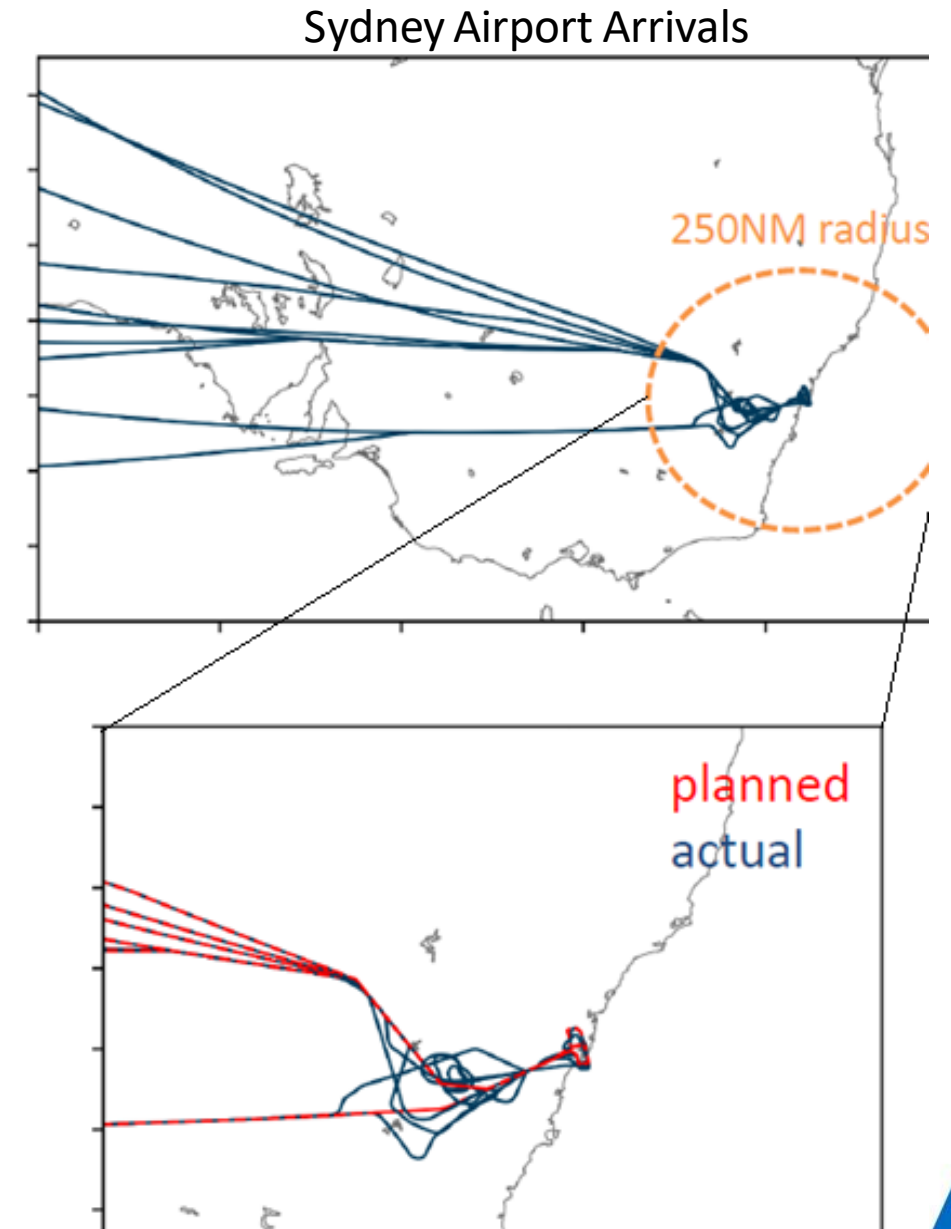
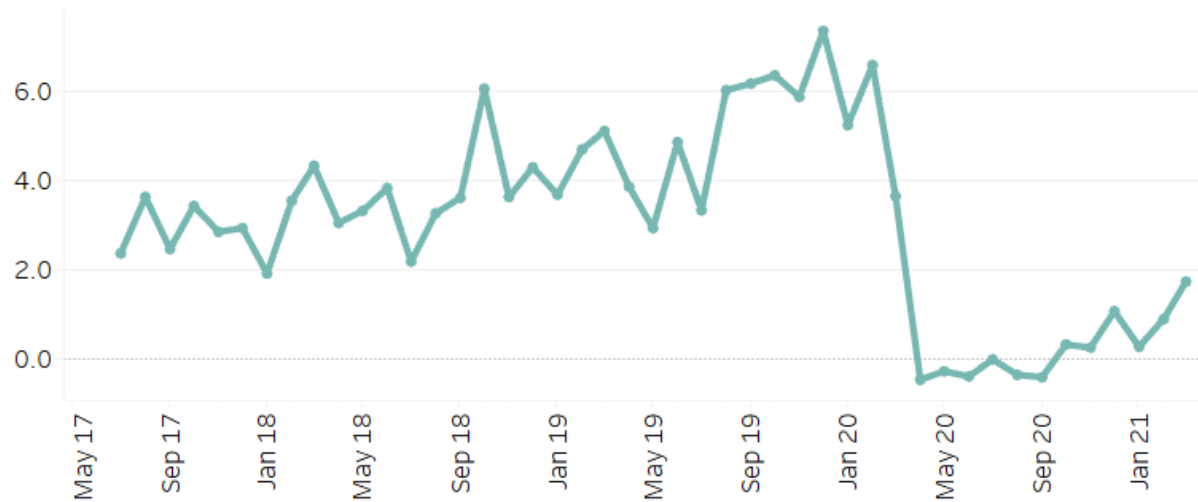


Compliance Metrics: AOBT – COBT (Off-Block Time)

Compliance Range: - 5 to +15 minutes

KPI – Airborne Delay

- Effective ATFM should result in predictable airborne delay!
- Monthly KPI: average delay for Sydney Airport arrivals



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Case Study: ATFM Performance Analysis in the US

Vern Payne

*Quality Control Manager, ATCSCC
FAA*

FAA PERTI process



- The FAA has done the **PER** of PERTI for many years.
- The emphasis is now on the **T** and **I** of PERTI which are the hardest elements.
- In order to Train and Improve, the Review element is critical in identifying the problem that needs to be solved.
- Data driven review is the key to understanding what is the root cause and which areas to focus on.

Reviews - Collaborative Effort

Daily

- National System Review (NSR)
 - Facilitated by ATCSCC Quality Control Office
 - Previous day data and review presented by FAA regions
 - CDM partners provide commentary and feedback

Monthly

- National Collaborative Forum (NCF)
 - Data trends are presented, reviewed and discussed collaboratively

Event Driven

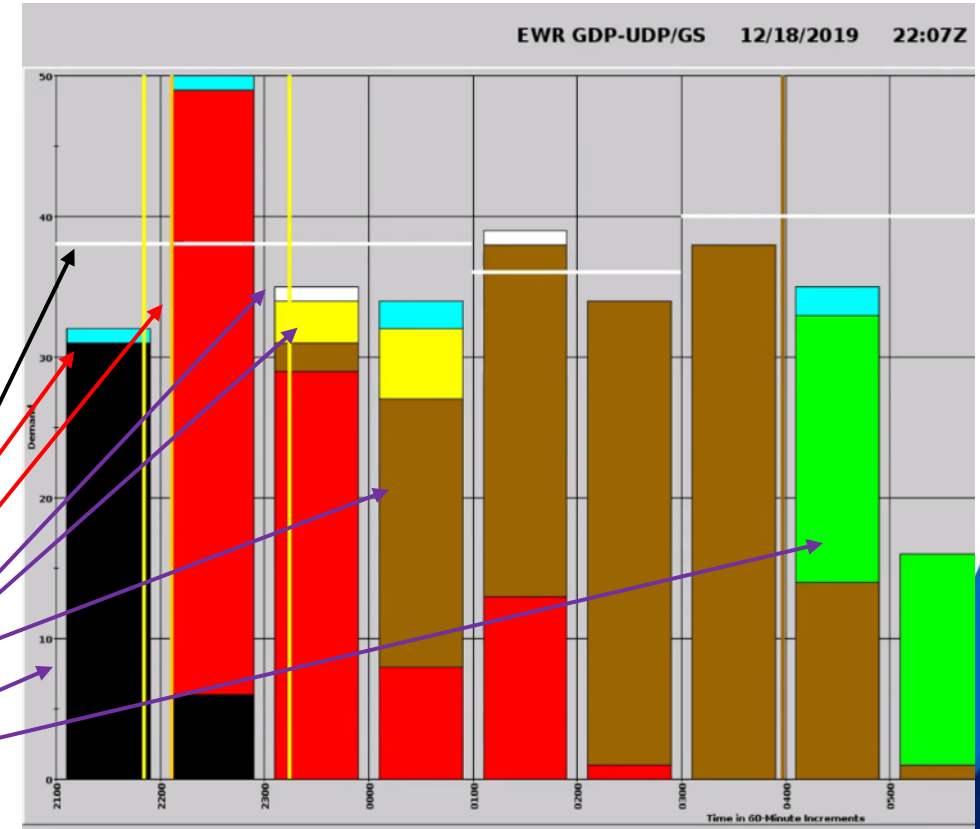
- Traffic Management Reviews
 - Conducted by the ATCSCC, FAA facilities and Flight Operators
 - Findings and recommendations are briefed at the monthly NCF

Annual Efficiency Goals

- Goals are established by the CDM process and measured through the year

Recent Example – Poor GDP delivery

- The FAA uses Flight Schedule Monitor (FSM) to monitor demand and implement Ground Delay Programs (GDPs), Ground Stops (GS) and Airspace Flow Programs (AFPs)
- Long duration GDPs frequently need a GS and revision due to under and over delivery.
- Analysis showed two factors
 1. Controllers not complying with CTOT
 2. Flight Operator inaccurate EET



White Line – Airport capacity

Blue – Canceled flights

Red – Airborne flights

White – Reserved for demand that becomes known after the GDP is implemented

Yellow - Ground stopped flights

Brown – Proposals controlled by the GDP

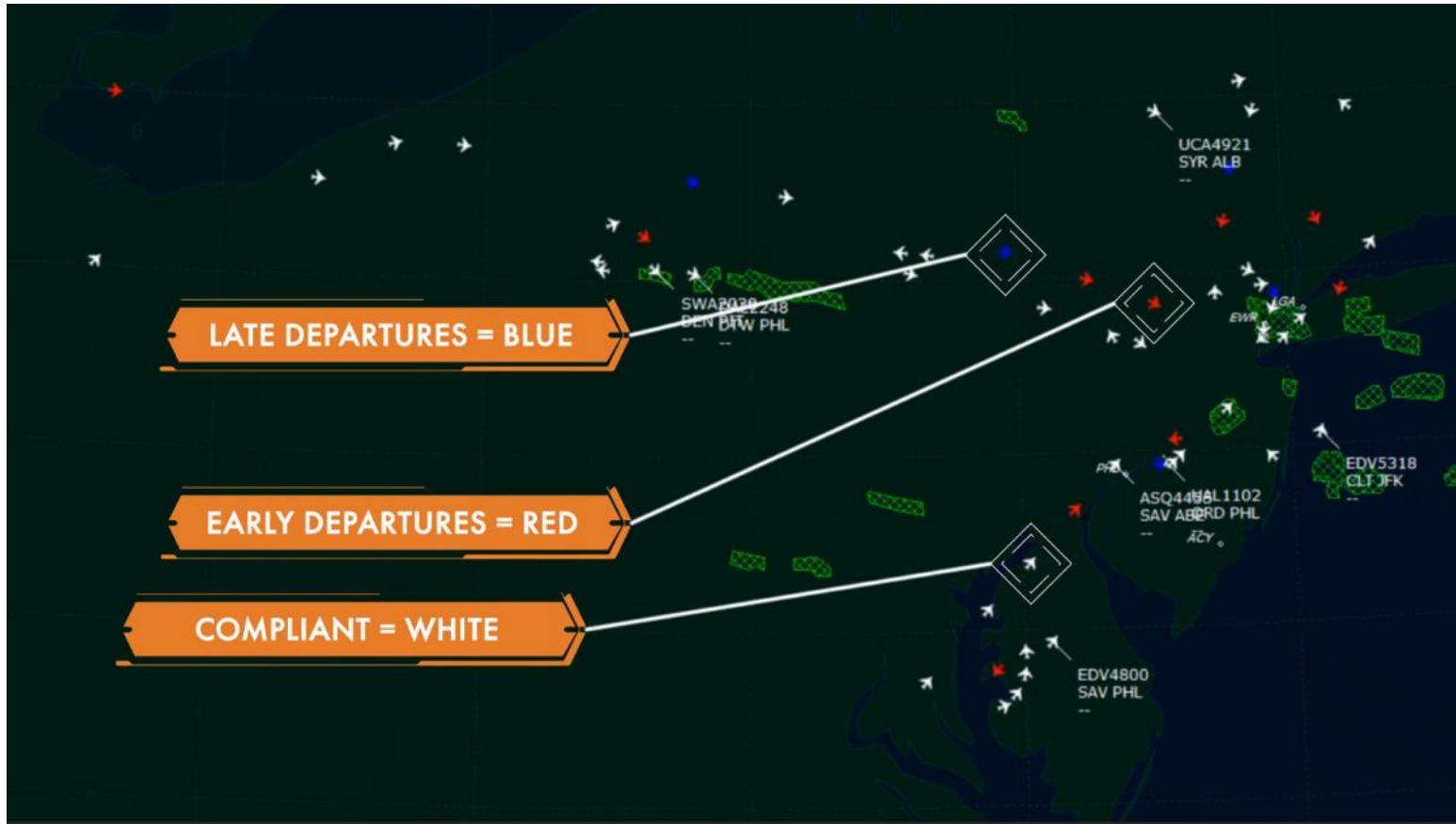
Black – Completed flights

Green – Uncontrolled flights after the GDP ends

R (review) leads to T (Training)

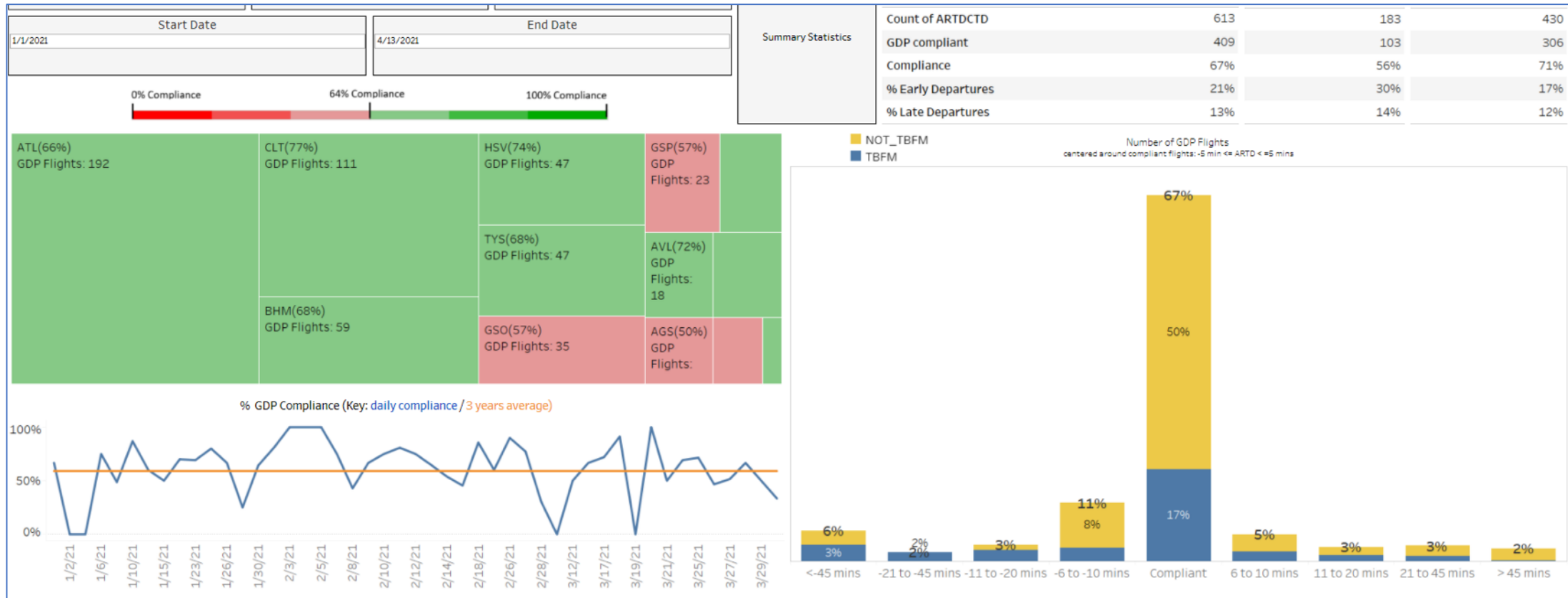
- Training was developed to educate tower controllers of the impact of their actions. Training used is available here:

<http://tfmlearning.faa.gov/video/Program%20Compliance%20Training%20Briefing%20-%20Storyline%20output/story.html>



T (Training) drives I (Improvement) with Metric Dashboards to track performance

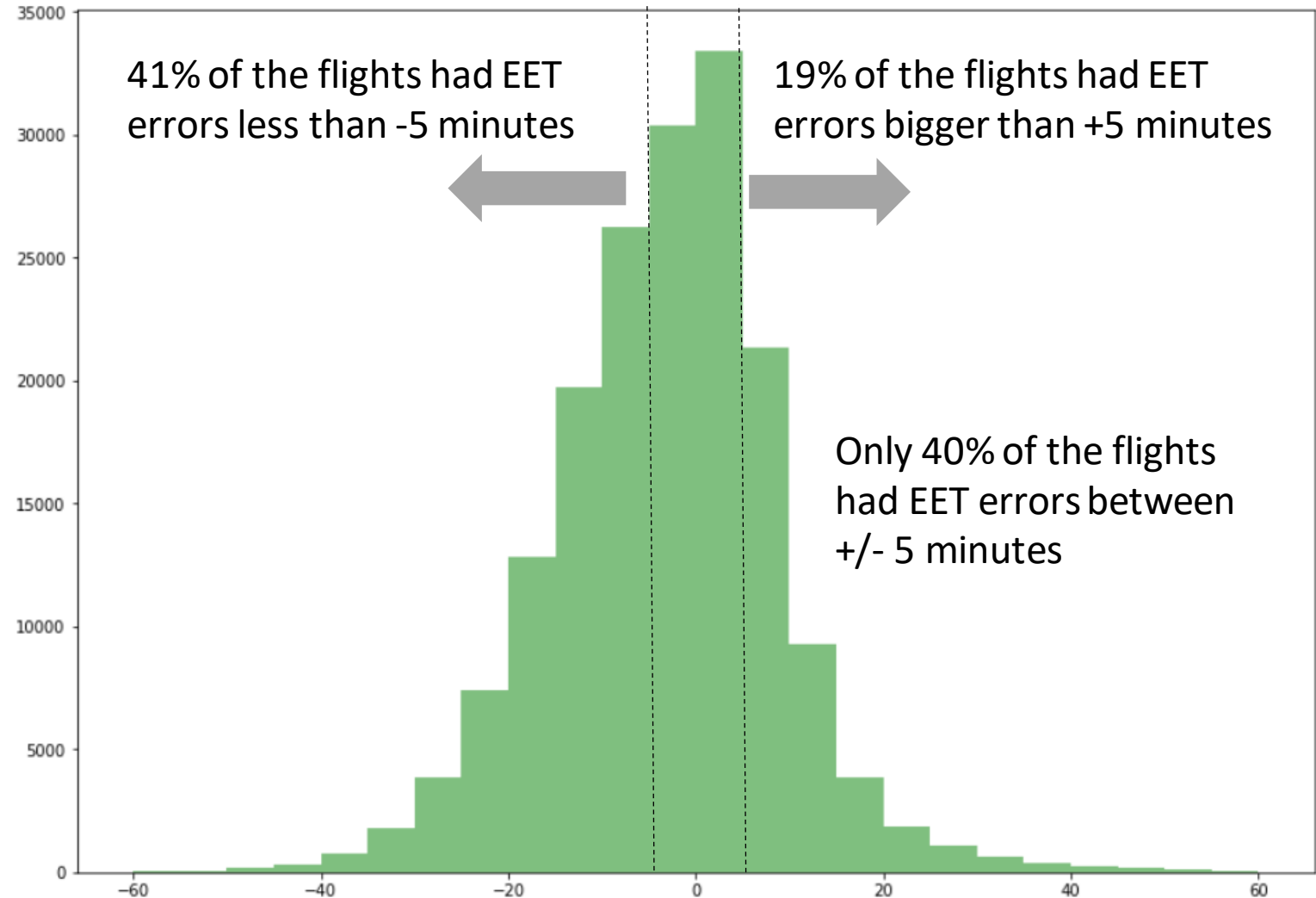
Atlanta District Year to Date view



Next Step – Analysis of inaccurate EET impact

EET Errors For KEWR Arrivals in 2019

Validating data and continuing analysis. Once finalized, the FAA will collaborate with the operators to improve EET reliability



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Key Considerations in Assessing ATFM Implementation Benefits

Stuart Ratcliffe

*Business Development Director &
Principle SME: ATFM/CDM
Metron Aviation*

*Co-Chair
CANSO ATFM/A-CDM Workgroup*

ATFM provides safe and orderly traffic flows

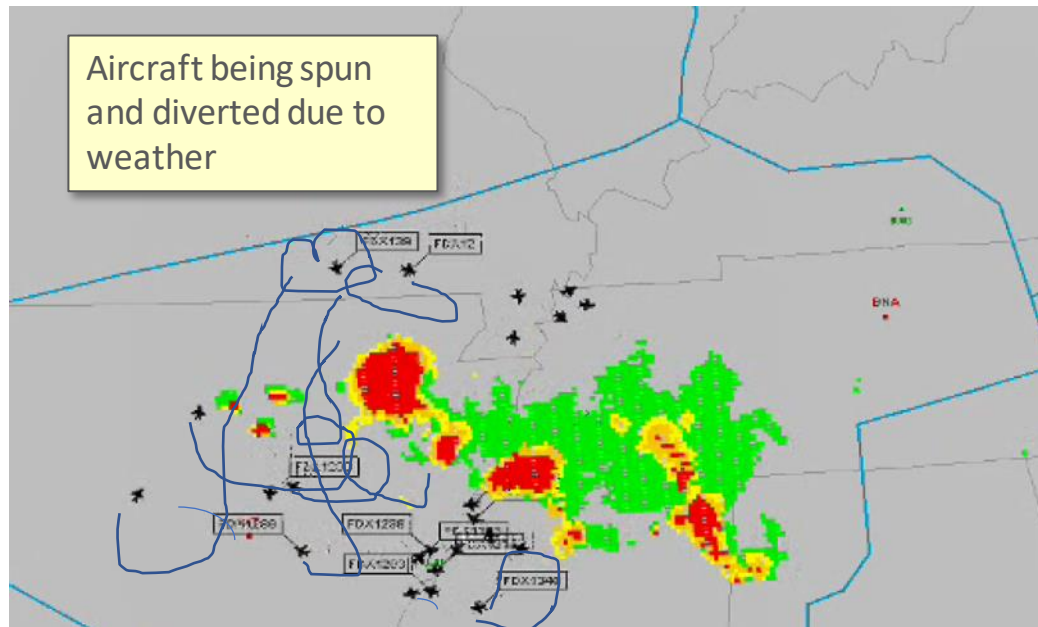
Without ATFM

Air Traffic Controllers

- Erratic, peaked steady traffic flows
- Last-minute control actions
- High stress levels

Flight Operators

- Unable to anticipate delays and mitigate network schedule
- Little/no lead time on necessary delays



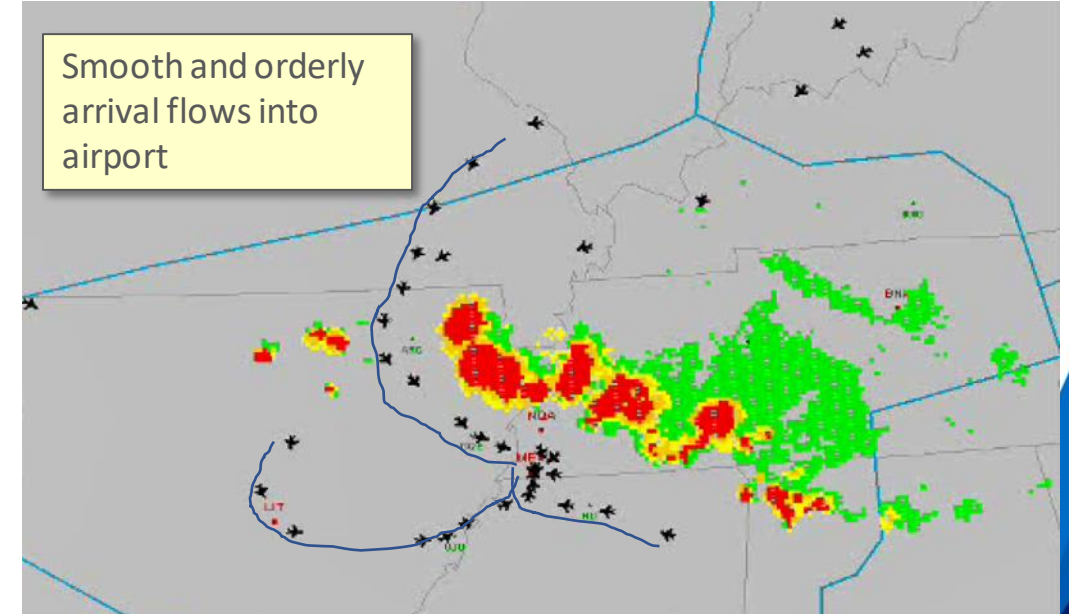
With ATFM

Air Traffic Controllers

- Smooth, steady traffic flows
- Safety ensured
- Lower stress levels

Flight Operators

- Reliable service levels
- Greater lead time on necessary delays



3-Step Process for Benefits of ATFM

1. Understand and derive benefits
 - Know what benefits to expect
2. Assess performance
 - Collect the right data
 - Compute the right metrics
 - Track performance improvements
3. Improve performance
 - Conduct regular analysis to identify areas for potential improvement
 - Enact modifications to procedures

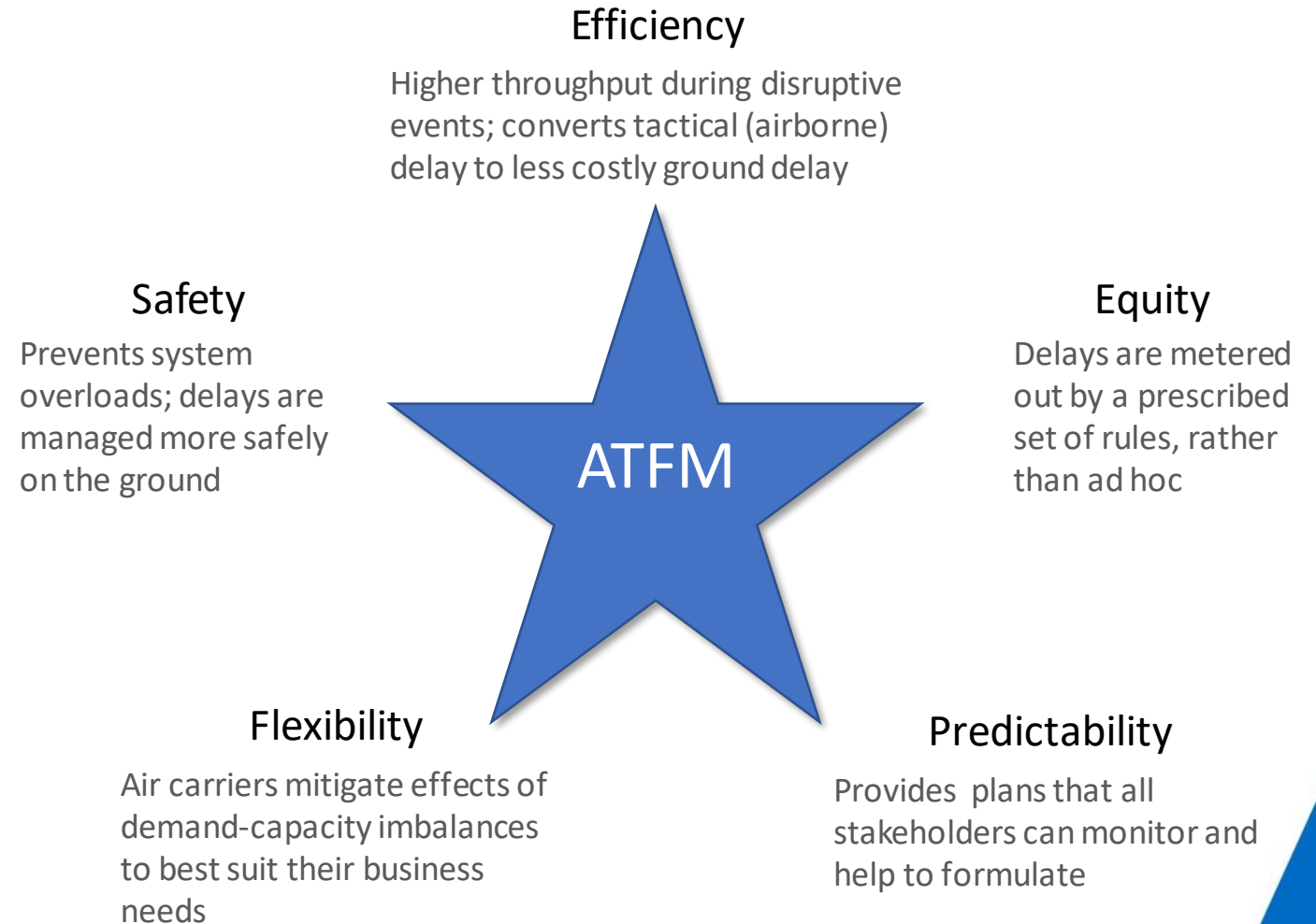
Benefits Categories

Major Benefits Categories

- Efficiency
- Safety
- Equity
- Flexibility
- Predictability

Long-Term Benefits

- ICAO compliance
- Enables economic growth
- Admits future technologies
- Global harmonization, interoperability



Efficiency

Benefit mechanism:

- ATFM converts delays that would have been absorbed tactically (in the air) into ground delay,
- This saves fuel and emissions
- Also saves diversions and vectoring

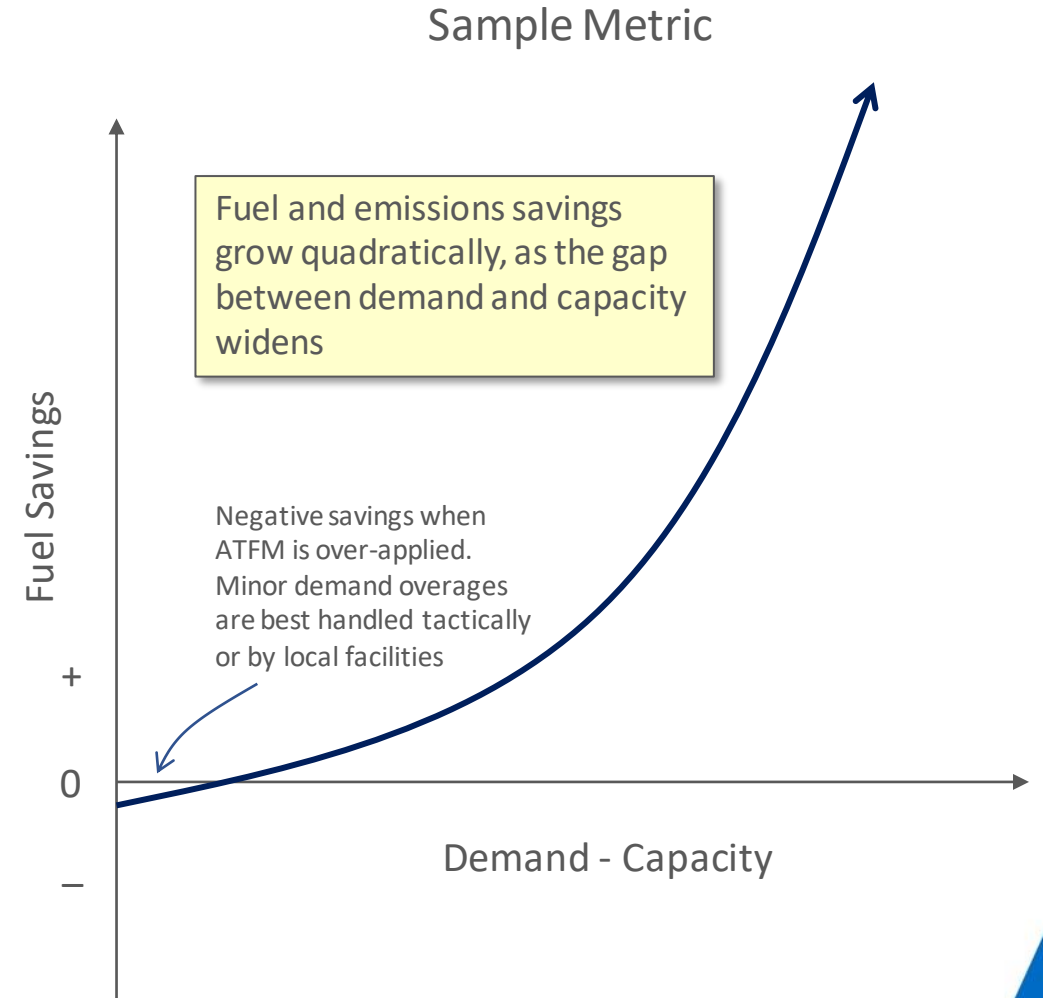
Tactical Delay

- In the air
- High fuel use
- High emissions

ATFM

Strategic Delay

- On the ground
- Low fuel use
- Low emissions



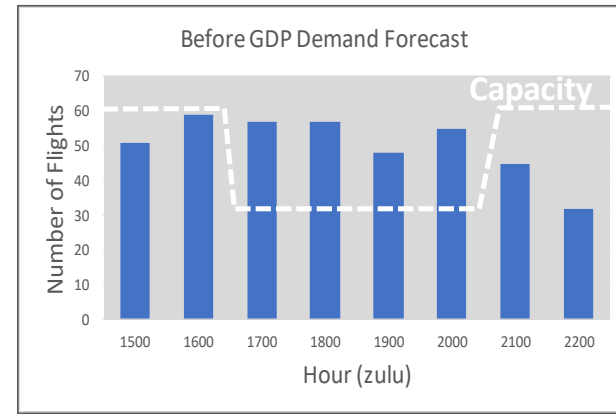
ICAO KPIs:

- Reduced average delay of arriving/departing flights
- Improve punctuality

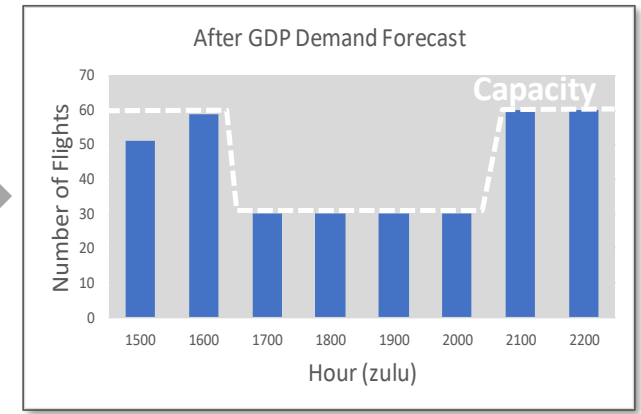
Safety

Benefit mechanism:

- ATFM anticipates demand overages at airports and airspace
- Prevents system resources and air traffic controllers from being overwhelmed



Demand will be above capacity in four consecutive hours



GDP smooths out demand to below capacity

Reactive Responses

- Short lead time
- Locally managed

ATFM

Proactive Responses

- Long lead time
- Centrally coordinated

Equity

Benefit mechanism:

- Delays are administered by a prescribed set of rules
- More equitable delay distribution across
 - Air carriers
 - Individual flights

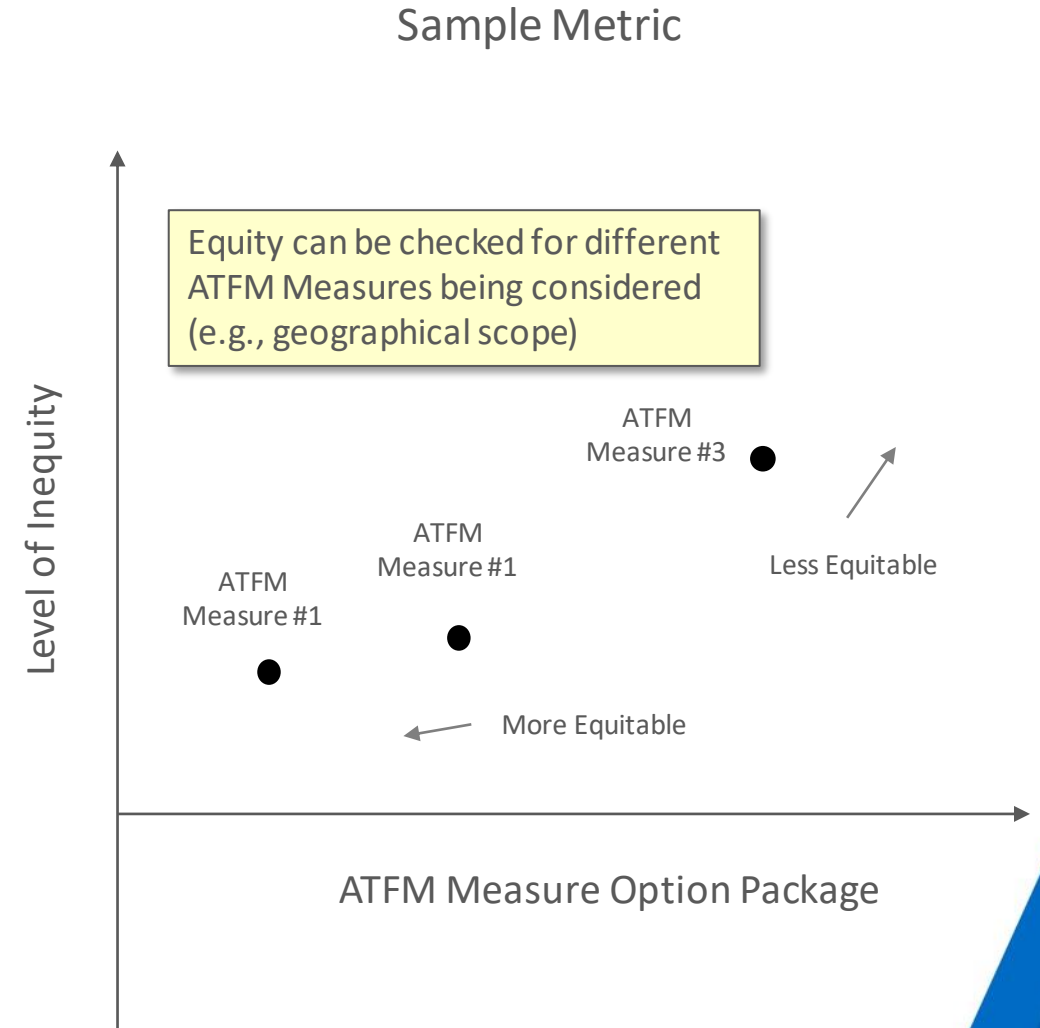
Inconsistent Delays

- Higher delays for short-haul flights
- Resource awards are inconsistent with claims on resources

ATFM

Consistent Delays

- Delays absorbed over a broader base of flights
- Resource awards are consistent with claims on resources



Predictability

Benefit mechanism:

- Control measures are discussed and formed well in advance
- Greater stakeholder awareness and involvement

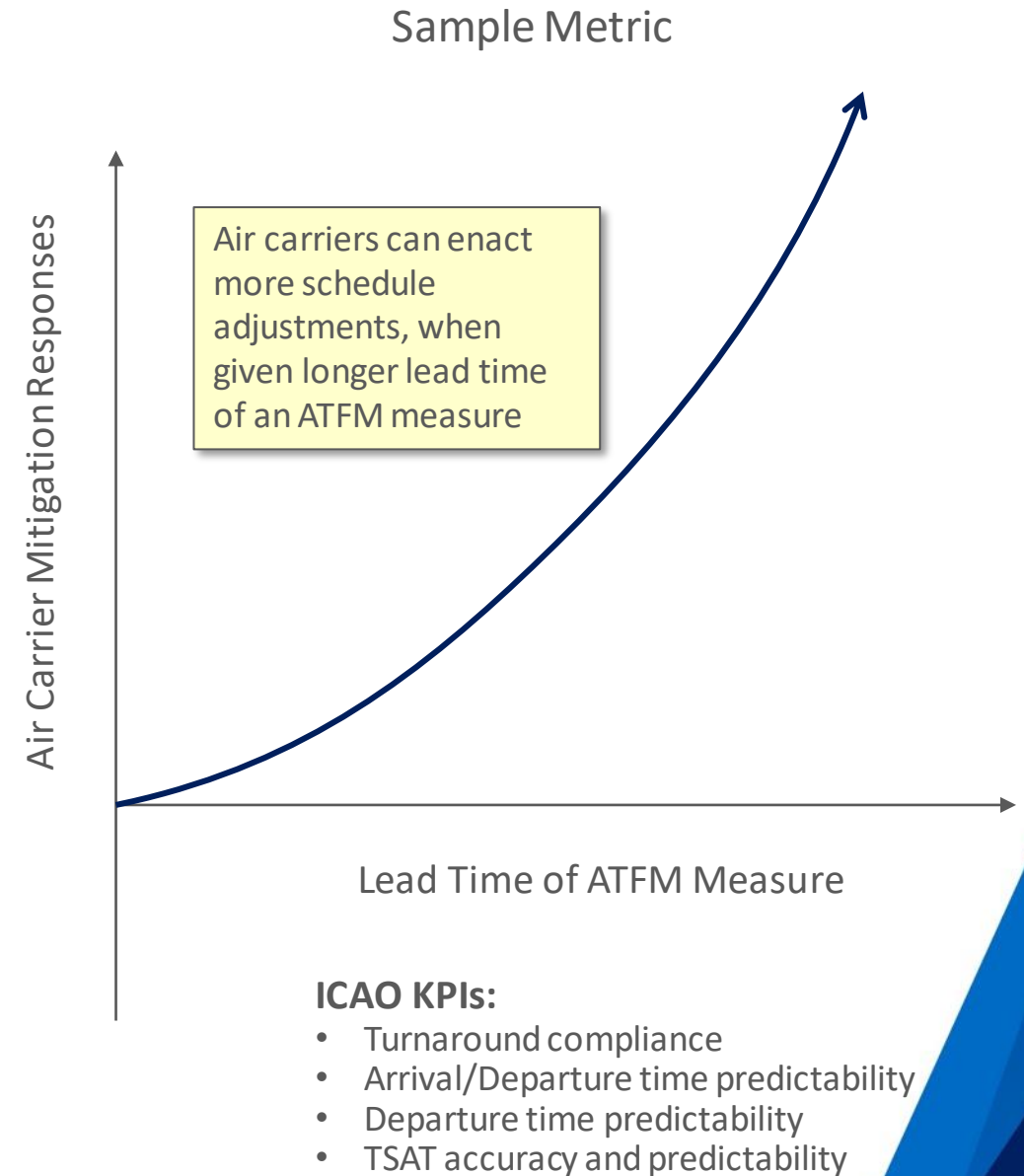
Volatile Plans

- Changing plans
- Short lead times



Stable Plans

- Consistent plans
- Longer lead times



Flexibility

Benefit mechanism:

- ATFM allows a wider array of air carrier responses and schedule adjustments, e.g.,
 - Slot substitutions
 - Reserved spots after flight cancellations
- Higher airspace/airport throughput

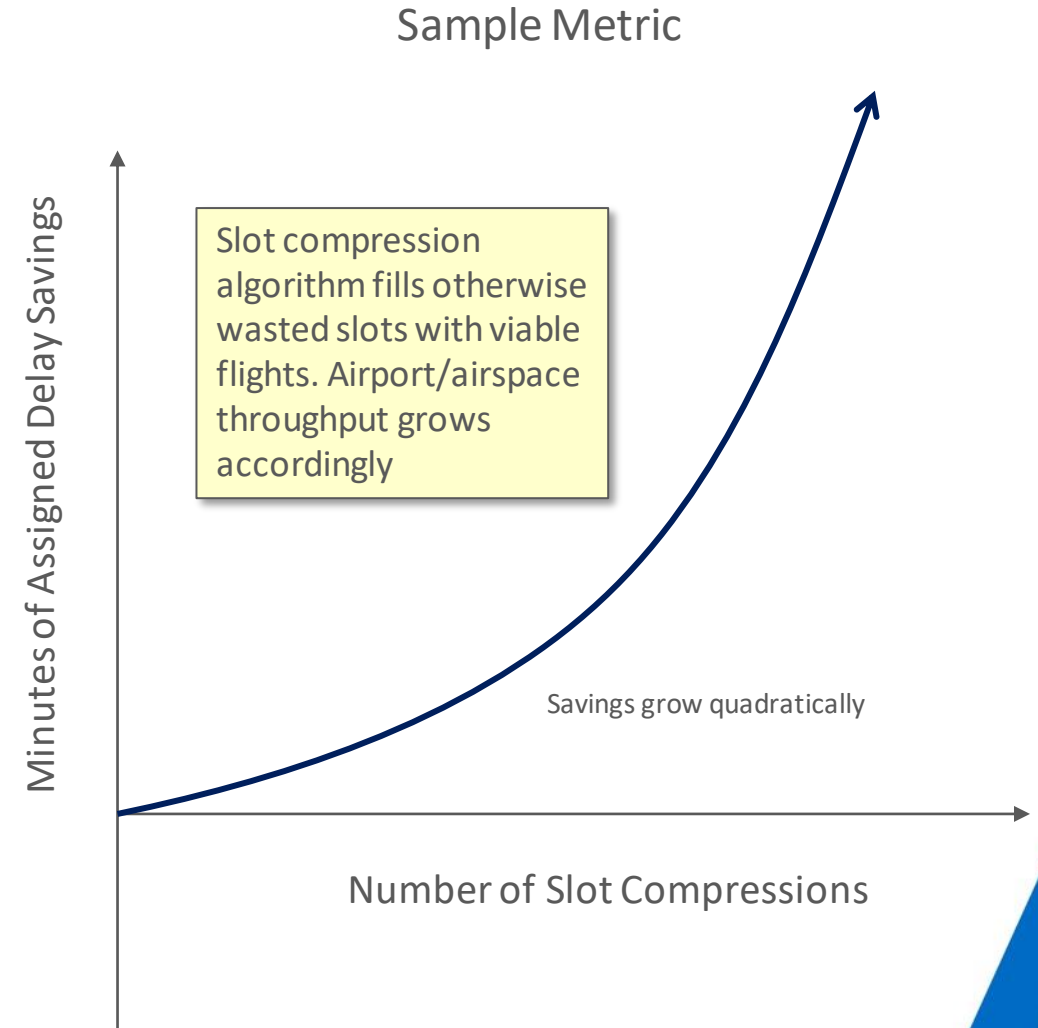
Few Mitigation Options

- Lost slots
- Fixed delays on high-priority flights

ATFM

Numerous Mitigation Options

- Slots retained by owning air carrier
- Delay relief for high-priority flights



ICAO KPIs:

- Reduce reaction time for air operators, ANSP, ground handlers

Summary of Recommended Metrics (Efficiency)

Category	Metric	Associated Benefit
Efficiency	Max, Average delay over all flights	
	Rate Control Index (RCI) for Measure Flow Rate	High values (e.g., 98%) indicate that ATFM Measure closely achieved its target throughput
	Fuel savings	Fuel burns associated with airborne delays are anticipated and converted back to the ground
	Emissions savings	Emissions associated with airborne delays are anticipated and converted back to the ground
	Reduced vectoring	ATFM Measures employing ground delay reduce the need for vectoring aircraft en route
	Reduced diversions	Diversions should be reduced by taking more proactive ATFM actions
	Delay minutes saved from compression	Flights are compressed into arrival slots that would otherwise have gone wasted

Summary of Recommended Metrics (All Others)

Category	Metric	Associated Benefit
Safety	Minutes of highly tactical delays avoided	Delays were anticipated and addressed in a more strategic manner
	Number of demand-capacity imbalances and addressed	Demand-capacity imbalances were anticipated and addressed
	Number of minutes of delay overaged addressed	Delays were anticipated and addressed in a more strategic manner
Equity	Equity metric for air carriers (EMA)	Inequitable distribution of delays across air carriers
	Equity metric for flights (EMF)	Inequitable distribution of delays across individual flights
Predictability	Lead time of ATFM measures	Greater lead time allows stakeholders to better prepare
	Number of stakeholders involved in ATFM decisions	Enhances situational awareness
	Flight instances in which departure or arrival was at or before target time	Arrival and departure time stability
Flexibility	Number of flights involved in slot substitutions	Air carriers are able to prioritize their more valuable/critical flights
	Number of minutes of slot substitution movements	Air carriers are able to prioritize their more valuable/critical flights

3-Step Process for Benefits of ATFM

1. Understand and derive benefits
2. Assess performance
3. Improve performance

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ATFM Performance Analysis

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Questions and Answers

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Thank you

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