

# Long-Range Air Traffic Flow Management - LRATFM

Delivering a balanced flow of long-haul and short haul aircraft to  
an ATM resource

**ICAO ATFM SG 13**

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# LRATFM – so what is it ?

# Stuart Ratcliffe

Product Manager AireonFLOW - Aireon

Co-Chair of the CAN SO ATFM ACDM Workgroup

# CANSO ATFM/A-CDM Workgroup

Author guidance and best practice materials on ATFM, A-CDM, and related topics



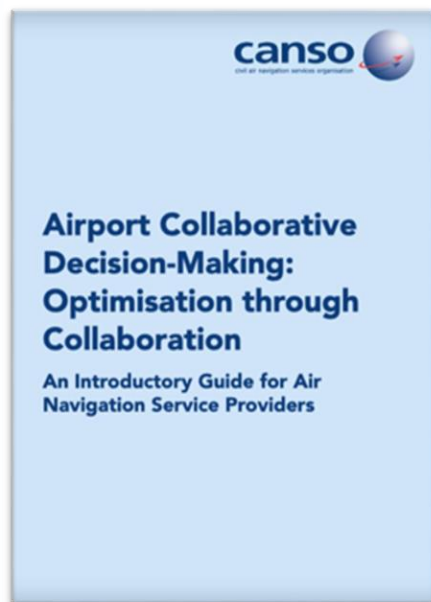
Provide ATFM and A-CDM implementation support and aid in regional framework development

Explore novel concepts in ATFM and A-CDM such as LR-ATFM, TTA, and ATFM evolution in FF-ICE/TBO

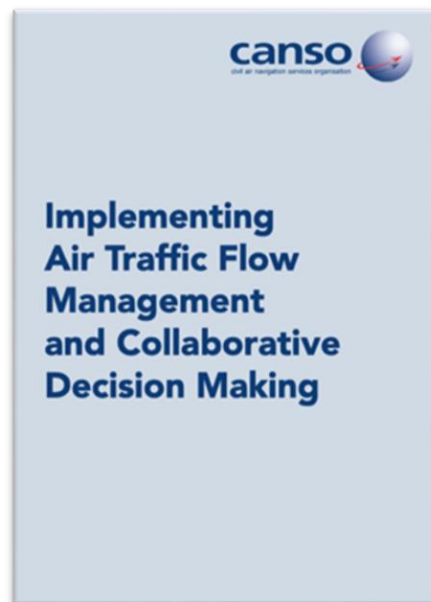


Aid the work of *Complete Air Traffic System (CATS)* Global Council on the roadmap to Vision 2045

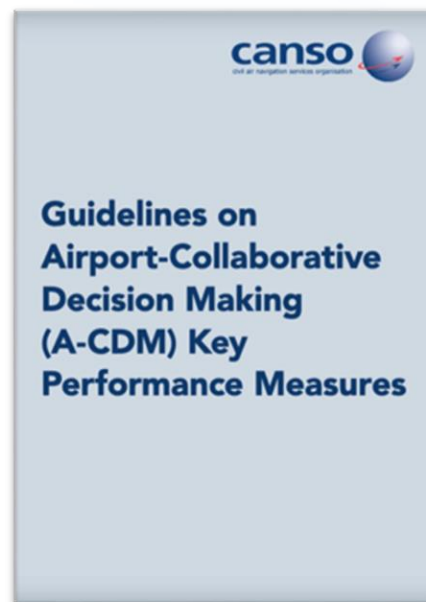
# CANSO ATFM/A-CDM Workgroup



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*Before LRATFM:*  
**Existing Trials and Approaches**



# BOBCAT ATFM Operations

An early arrangement for trans-regional long-range ATFM



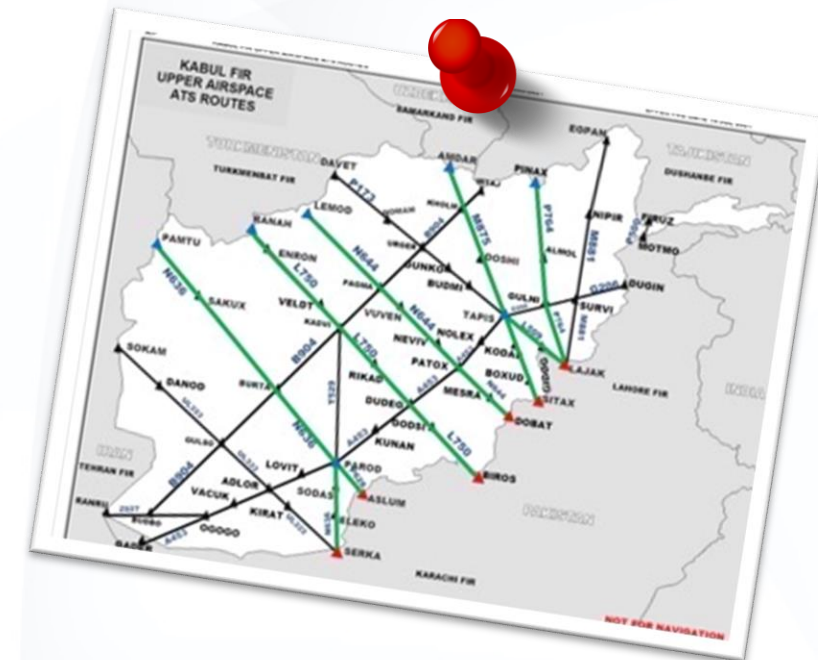
What: An ATFM service for westbound traffic over Kabul FIR (Afghanistan) between 2000 – 2359 UTC, provided by AEROTHAI since 2007

How: Issuance of “BOBCAT ATFM Slots” comprising

- Assigned Kabul FIR entry waypoint & flight level
- **CTO at entry waypoint**
- **CTOT from departure aerodrome**

Challenges:

- Low CTO compliance despite high CTOT compliance
- **Variabilities of flight profiles while enroute**
- **Inability to support “dynamic” requirements**



# Japan CTO Trial

## An ongoing trial for Fukuoka FIR

What: **An ongoing trial to equitably distribute ATFM delays to both domestic and international arrivals through CTO assignment for inbound aircraft**

How: Issuance of **CTO at arrival waypoint**, communicated to the flight deck via **ATCO voice communication** once aircraft **has entered Fukuoka FIR**

### Challenges:

- **Large difference between time estimates (ETO)** computed by the ATC system and the aircraft FMS
- Late assignment of CTO → **insufficient time to adjust aircraft speed** to meet the requirement

# Trials by Airways NZ, CAAS, Airservices

## Ongoing trials on LRATFM by various ANSPs

What: **Ongoing trials in various countries to issue ATFM delays to long-haul flights** to stream or pre-condition traffic arriving from upstream FIRs.

How: Issuance of **CTO at waypoints**

Challenges:

- **High ETO variability** due to unpredictable weather condition enroute
- **Differences in ETO calculation** between ATC system and aircraft FMS

# Lessons Learned from LRATFM Trials



# Lessons Learned

## Distance is important

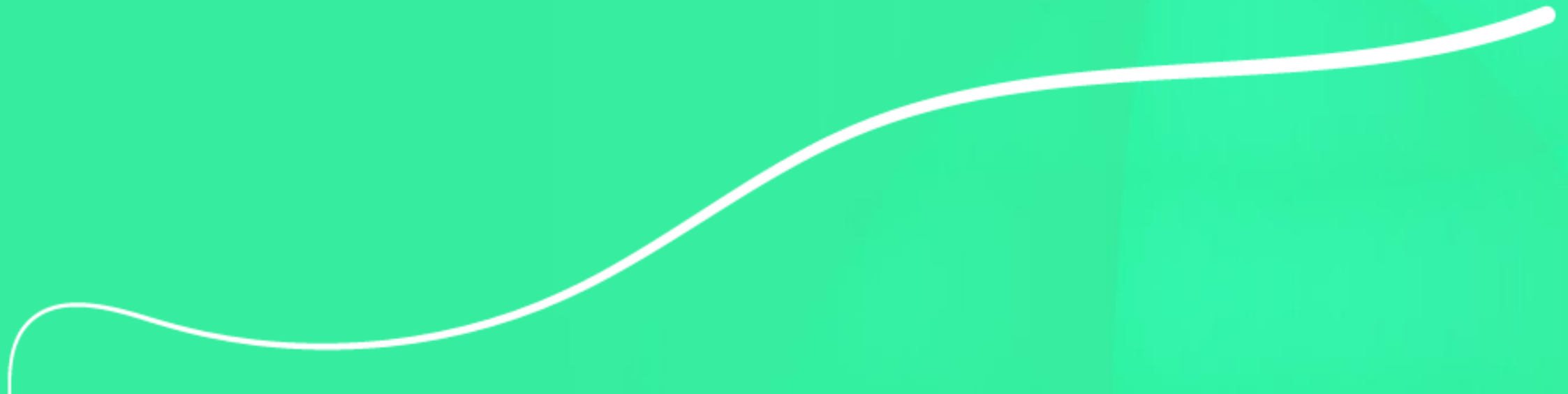
- Modern aircraft fly efficiently and losing speed/time over short distances is not easily achievable.
- Time loss- originally forecast to be 4 min/ hour is not achievable
- Demonstrated reliability is 1-3 min/hour- therefore look ahead time is critical

# Lessons Learned

## Data accuracy is critical

- The availability of reliable, accurate weather information is critical to calculating accurate ETO
- Accurate flight planning is important
- Demand prediction accuracy from flight position and trajectory modelling is critical
- ATC awareness of cross-boundary (neighbouring FIR) constraints is important
- CTO should be issued instead of speed control
- The achievement of reliable LRATFM will be limited without cross-boundary (FIR) collaboration

# LRATFM Potential Benefits



# Why do we need LRATFM?

- **Predictability** – improved common data sharing with the goal of schedule adherence
  - Building on A-CDM input increases enroute demand prediction accuracy
- **Equity** – distribution of ATFM delays across all airspace users
- **Efficiency**
  - more efficient end-to end flight time management leading to reduced airborne holding, radar vectoring, speed control and increased Continuous Descent Operations
  - Increased earlier identification of delay to allow more efficient delay management models
- **Safety**
  - early identification and management of demand in a sector of airspace can reduce controller/pilot workload

# Proposed LRATFM Concept



# Proposed LRATFM Definition

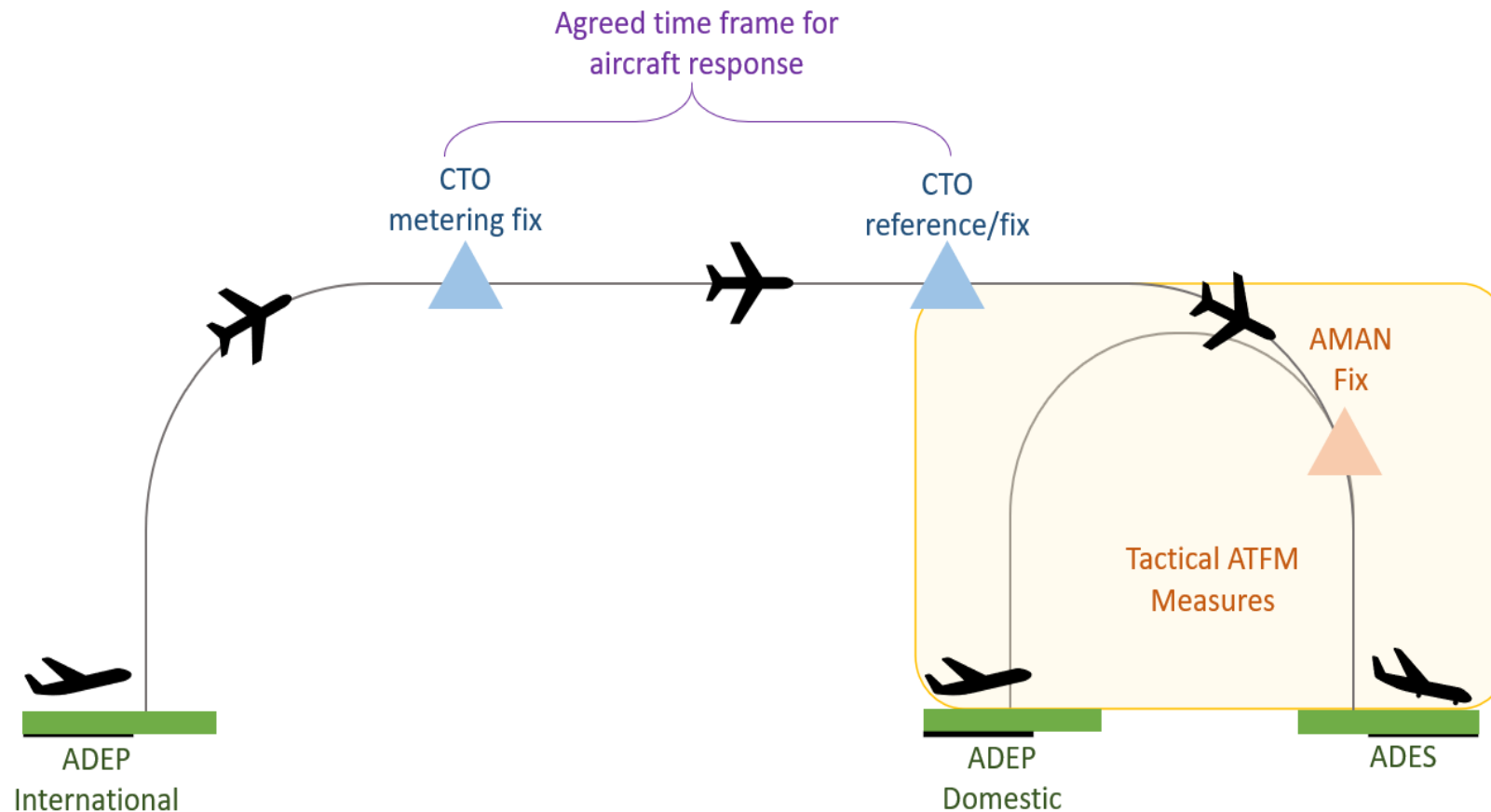
*The integration of ATFM solutions to deliver a collaboratively balanced flow of long-haul and short haul aircraft to an ATM resource (airport, waypoint, or a sector of an airspace).*

*Developed by the ATFM/A-CDM Workgroup*

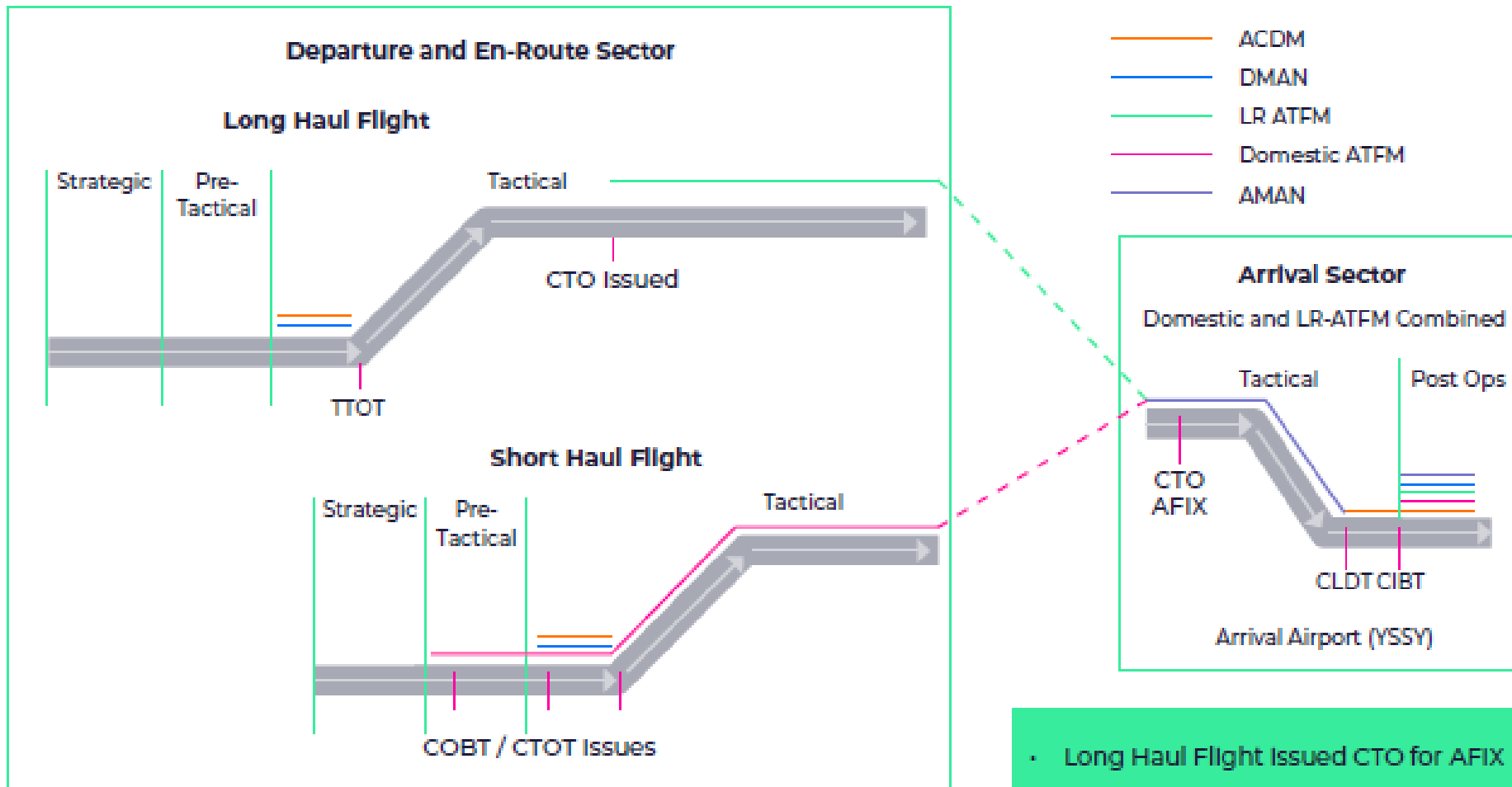


# Proposed Concept

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# Proposed Concept



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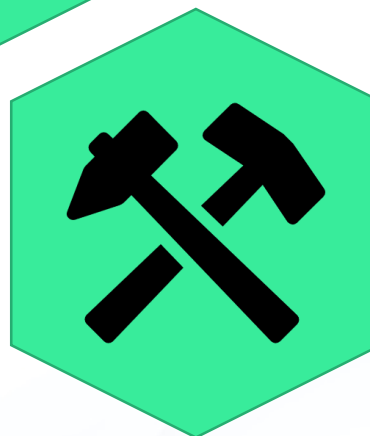
## Key Elements

- A tool or tools generate **an integrated CTOT/CTO programme to manage** demand at a constraint
- The delay allocated to airborne aircraft through LRATFM is restricted to **what can be realistically achieved** through speed reduction for the remainder of the flight.
- A **longer look ahead** will allow **more delay absorption**.
- **CTOT/CTO will be sent upstream** to ANSP from the unit managing the constraint.
- CTO issue should be considered **pre-conditioning the demand to reduce excess** demand

# Considerations

## **Conceptual Considerations:**

Elements to be considered when adapting the proposed concept to real-world operations



## **Implementation Considerations:**

Challenges to be considered when implementing LRATFM

# Conceptual Considerations

## Holistic Solution

- As per all ATFM, it is important to **ensure the capacity of the ATM resource is at its maximum** before applying an ATFM measure
- **LRATFM should be applied as part of a holistic ATFM solution** rather than an isolated ATFM measure
- LRATFM should not be applied without **integration with short-haul Ground Delay Programs**
- LRATFM must be **applied equitably across all airspace users** wherever possible

# Conceptual Considerations

## Achievable Delay Allocation

- **ATFM delays issued should be realistic, achievable**, and lead to efficient operations.
- As a general rule, aircraft can be expected to lose **2 min/flight hour**
- **Delay by CTO** should be issued only to the level that is **achievable for an aircraft**.
- The need for the use of LRATFM must be firm and **based on accurate demand prediction**
- Allocation of **too much delay may unreasonably reduce capacity**
- **Cross boundary (FIR) collaboration** will enhance LRATFM performance

# Conceptual Considerations

## CTO Assignment and AMAN

- LRATFM delays should be issued as a **CTO at a specific fix rather than as a speed advisory**
- The issue of a CTO does not preclude the requirement for aircrew to **advise ATC of speed reductions**
- Consideration should be given to providing **LRATFM delays as advice** rather than requirements
- ATC must be **allowed discretion to manage the delay** in other ways if necessary such as a track stretch rather than a speed reduction
- If the **LRATFM area overlaps with the AMAN area** then the **integration of both processes is desirable** but not mandatory

# Implementation Considerations

## Stakeholder Engagement

- **Stakeholder engagement is at the core** of every successful ATFM implementation
- **ATFM is a collaborative process** requiring ANSP's and airspace users to work together to achieve the optimised use of ATM capacity
- The **ability of aircraft to meet speed reductions must be confirmed** with airspace users before implementation planning is completed
- Engagement should be managed through **regional ATFM work groups and should also involve ICAO and IATA**
- Where it is intended that LRATFM CTO's are issued across boundaries then **close coordination and LOA should be developed between ANSP's**

# Implementation Considerations

## Predictability

- The **early advice of CTO to flight crews** will achieve the best result
- In order to achieve this, ANSPs must be able to **predict their demand/capacity imbalances many hours in advance**
- Early prediction of demand capacity imbalances requires **accurate estimates based on both flight planning, weather prediction and continuous position reporting of flights**.
  - The availability and accuracy of this information is important in identifying areas where LRATFM can be successfully implemented
- The application of **LRATFM establishes a pre-conditioned arrival sequence of traffic** to an ATM resource where demand is exceeding capacity.
  - XMAN and AMAN should be considered the natural next step in the process of streaming these pre-conditioned aircraft to constrained airports

# Implementation Considerations

## Data Exchange

- Successful LRATFM implementation will be **based on accurate and predictable methods of data exchange** between both ANSPs and between ANSP and airspace users
- CTO information should ideally be issued by ATC to flight crews
- Existing ATFM data elements such as CTOT should be used wherever possible as they are supported by SWIM standards such as FIXM which already integrates ATFM and A-CDM operations

# Research Areas



# Research areas

## Increased Accuracy of Trajectory Predictions

- LRATFM would benefit from **increased research into trajectory prediction** for ATM systems.
- ATM systems are generally design for ATM purposes. This means that they don't plan trajectories the way that FMS do, yet that **level of trajectory planning is required for accurate demand prediction**

# Research areas

## AMAN/XMAN/LRATFM integration

- As LRATFM demand grows, the **ability integrate a pre-conditioned arrival sequence of aircraft into an AMAN tool** will prove beneficial in managing the entire flight profile.
- This capability would **allow time loss already achieved by aircraft to be considered** when assigning the final delay instructions using an AMAN.
- Use of **A-CDM (DMAN and PDS) data and to predict demand at enroute and arrival airport constraints**, will increase predictability – essentially integrate all movement information into capable LRATFM systems to allocate both CTOT and CTO.



# QUESTIONS AND ANSWERS

# Acknowledgment

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**THANK YOU**

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