ATFM FUA integration and CDM process

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Outline

- Basic Concept of ATFM
- ATFM/FUA Integration
- CDM Process of FUA

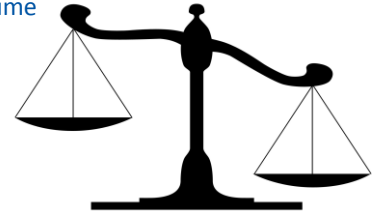
BASIC CONCEPT OF ATFM

WHAT IS ATFM?

- ATFM is

  demand/capacity balancing

Demand: The traffic volume
In a certain airspace

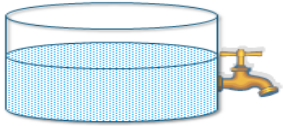


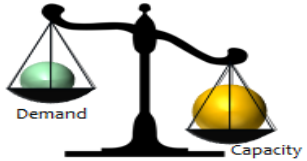
Capacity: The maximum number of flights
Which can be safely managed

Demand vs Capacity

Demand=80, Capacity=100

80/100=**80%**

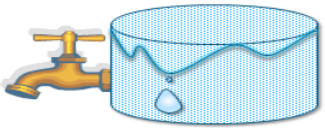




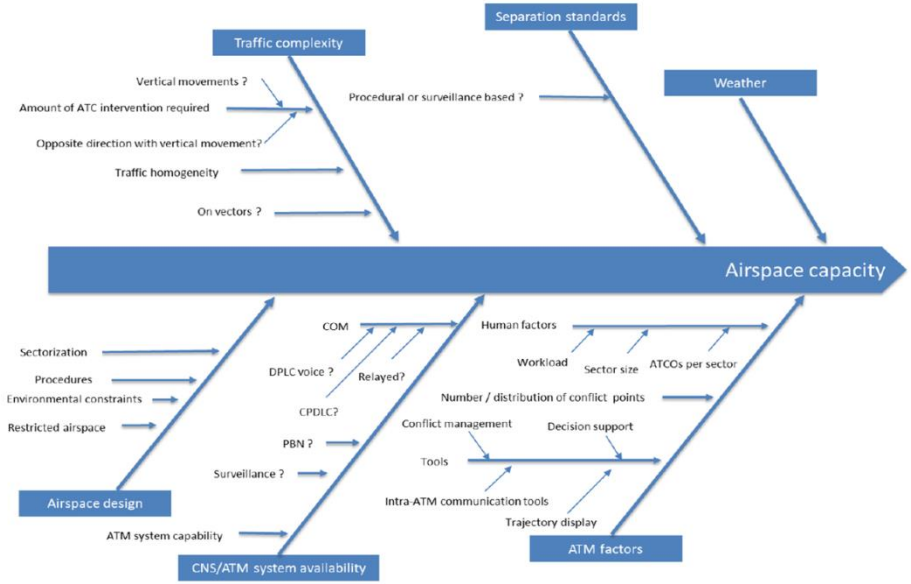
Demand vs Capacity (cont'd)

Demand=125, Capacity=100

125/100=**125%** (exceeding capacity by 25%)

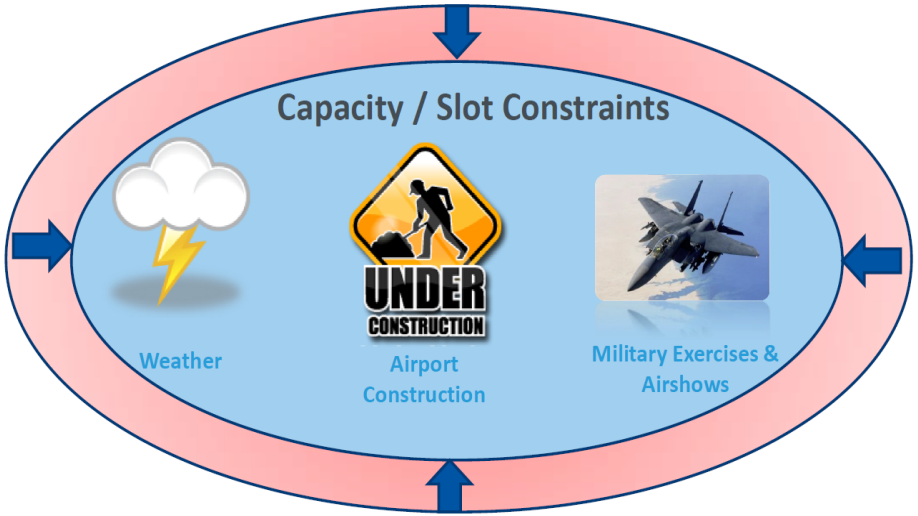


Why we need ATFM?



1. ATC capacities are ***NOT*** static values and depend on many factors

2. Traffic volumes are also ***NOT*** static values



The objectives of ATFM

- Enhance the safety
- Reduce ATC workload
- Optimize airspace capacity
- Maximize operational benefits and global efficiency

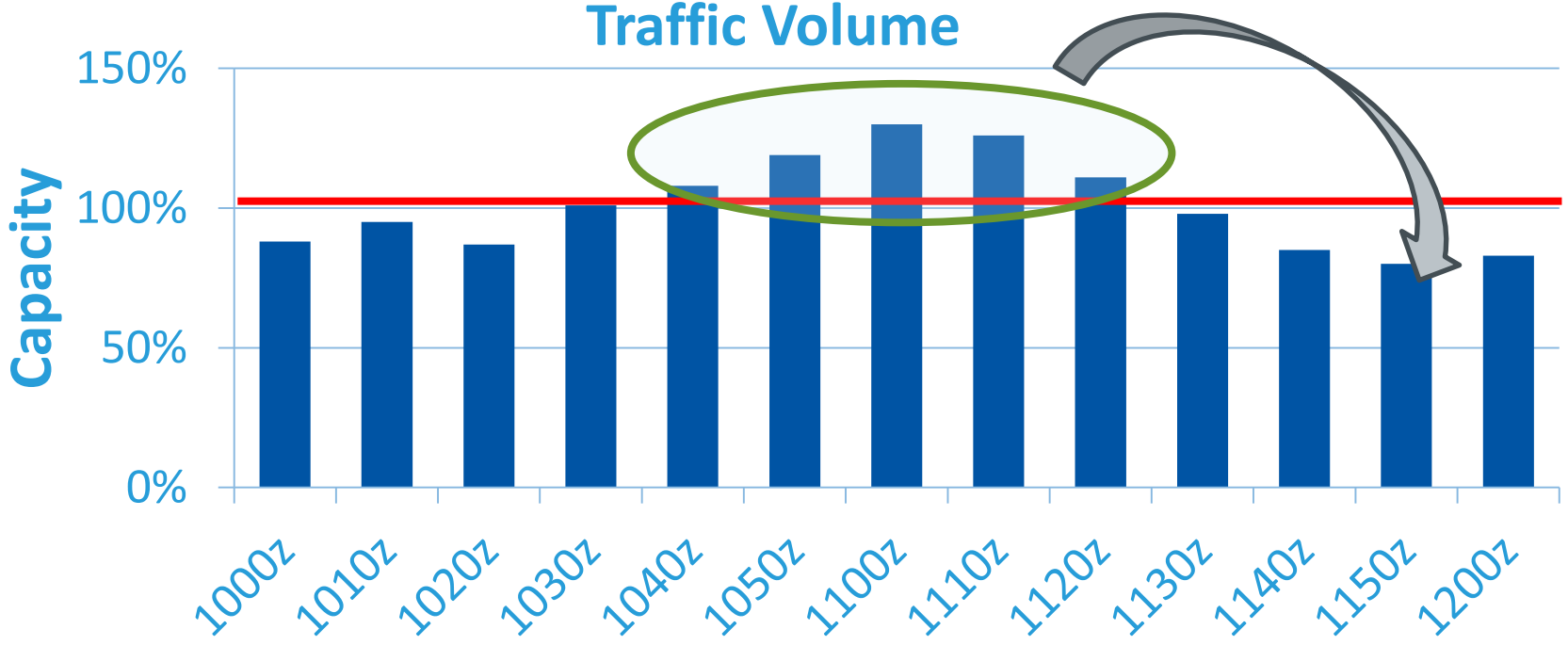
Keys to the successful implementation

- **The CDM process is a key enabler of an ATFM strategy**
- **Achieving a robust coordination among aviation stakeholders (CDM)**
  - All the stakeholders work together to improve the overall performance of the ATM system
  - Such coordination will take place within a FIR, between FIRs, and ultimately, between regions

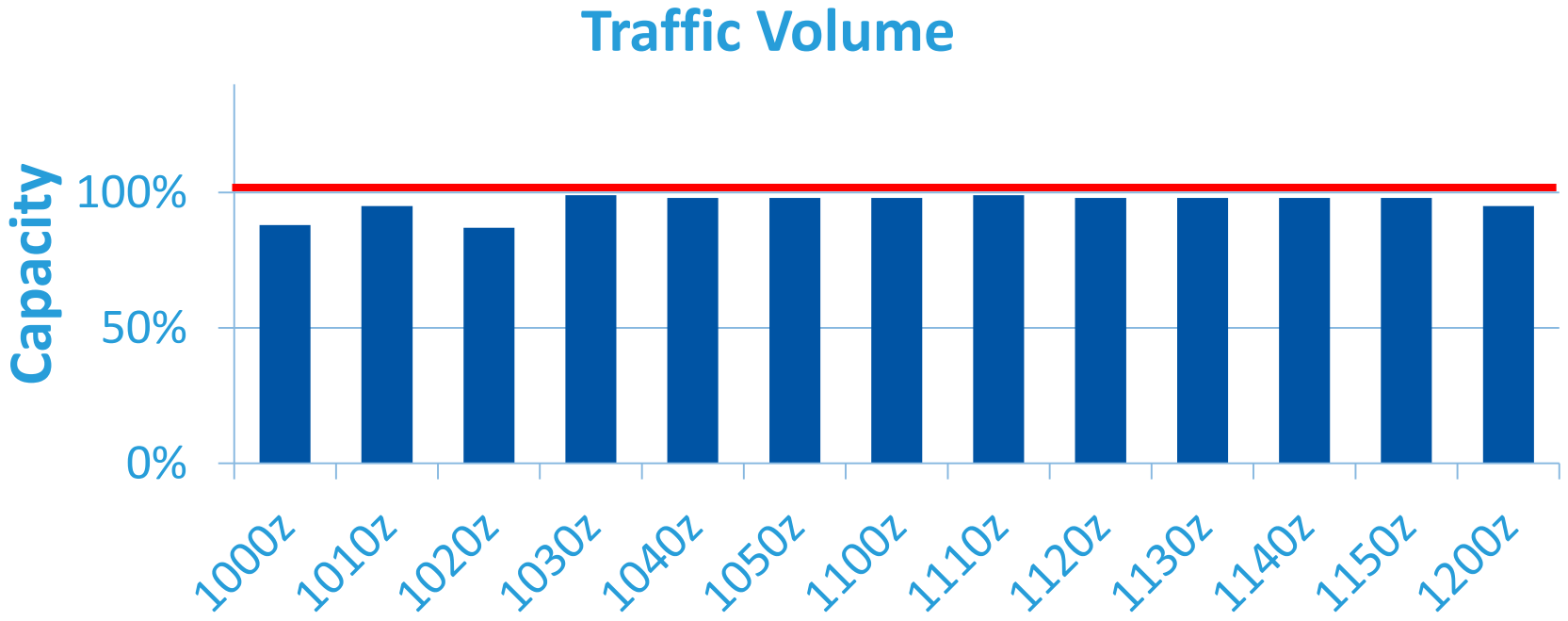
Keys to the successful implementation

- **ATFM and its applications should *NOT* be restricted to one State or FIR**
  - because of their far-reaching effects on the flow of traffic elsewhere
  - PANS-ATM, Doc 4444 states that ATFM should be implemented on the basis of a regional air navigation agreement or, when appropriate, as a multilateral agreement
- **Airspace is a common resource for all users and ensure equity and transparency**

How do you manage it?



How do you manage it? (cont'd)

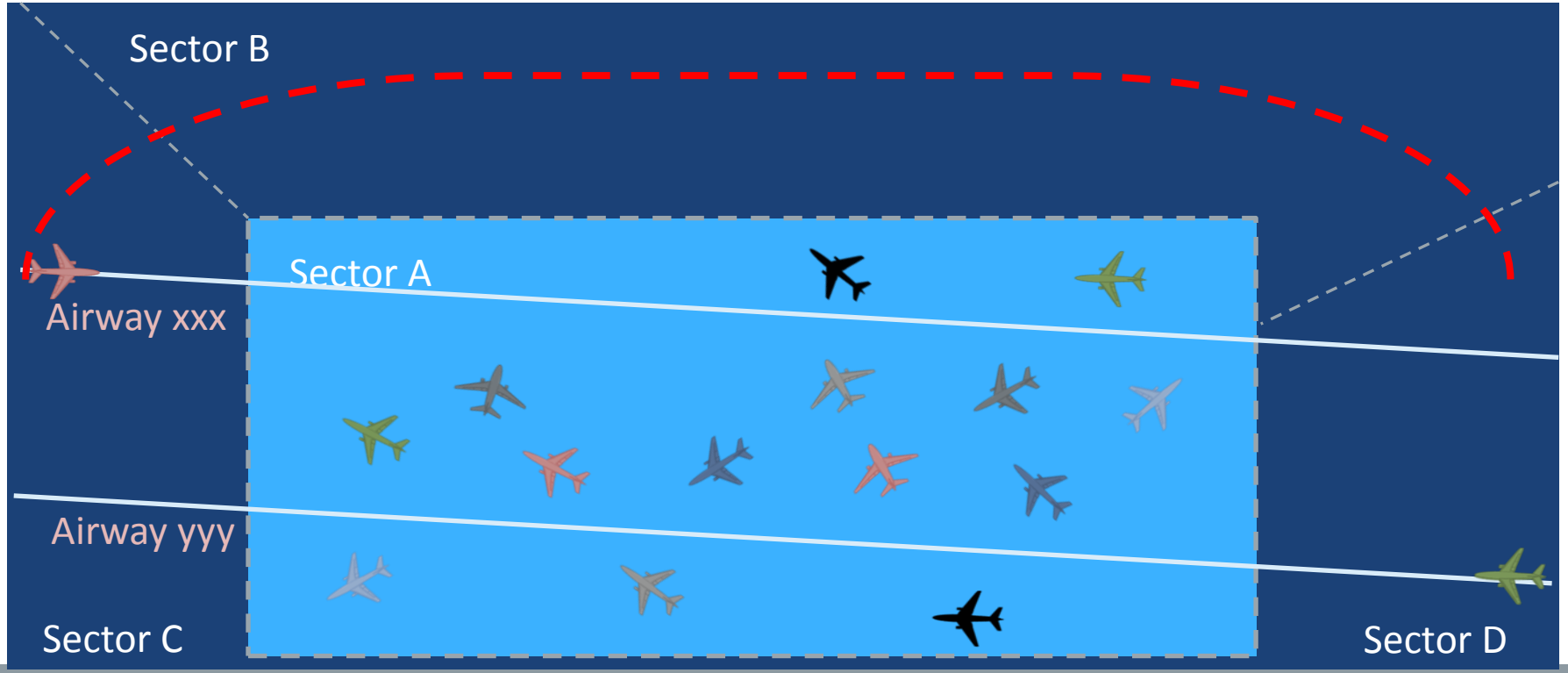


How do you manage it? (cont'd)

- Pre-Flight
  - Rerouting
  - Ground Delay Program
  - Ground Stop
  - Minutes in Trail

- In-Flight
  - Rerouting
  - Miles in Trail
  - Fix Balancing
  - Airborne Holding

Rerouting



Ground Delay Program (GDP)

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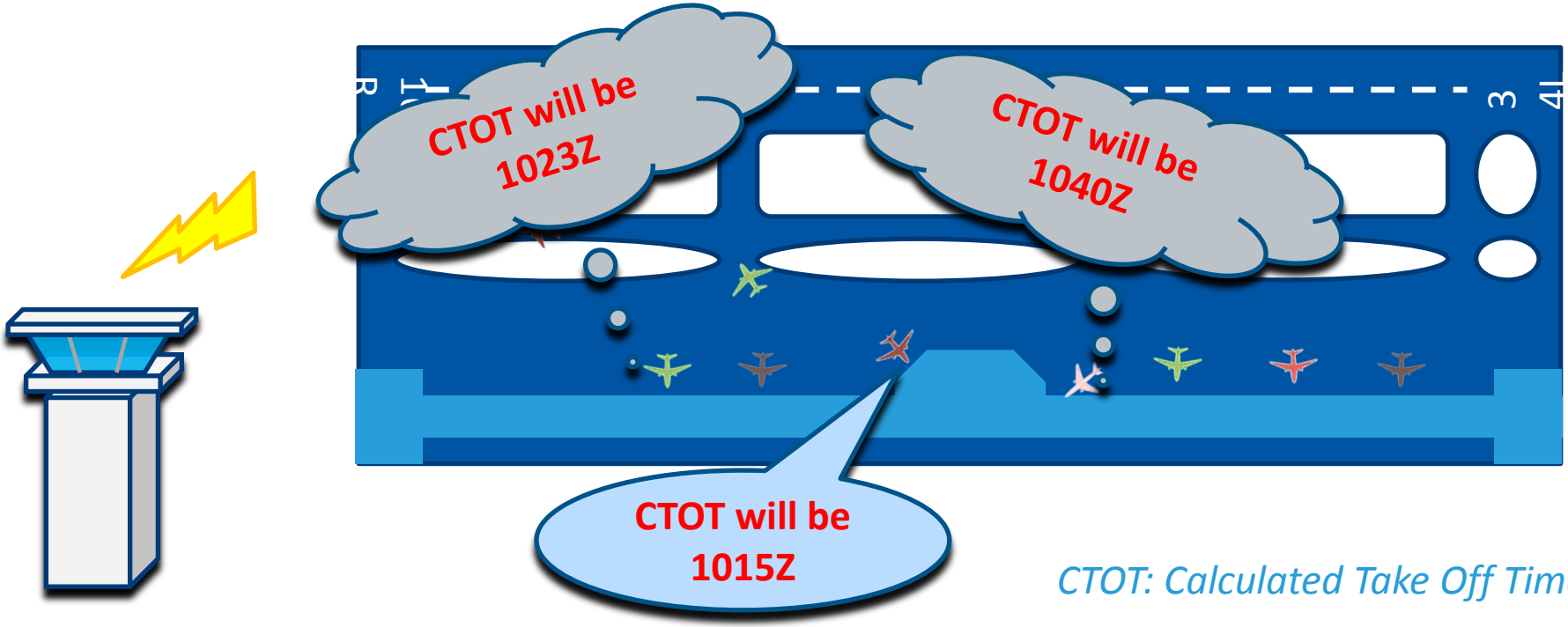


CTOT: Calculated Take Off Time

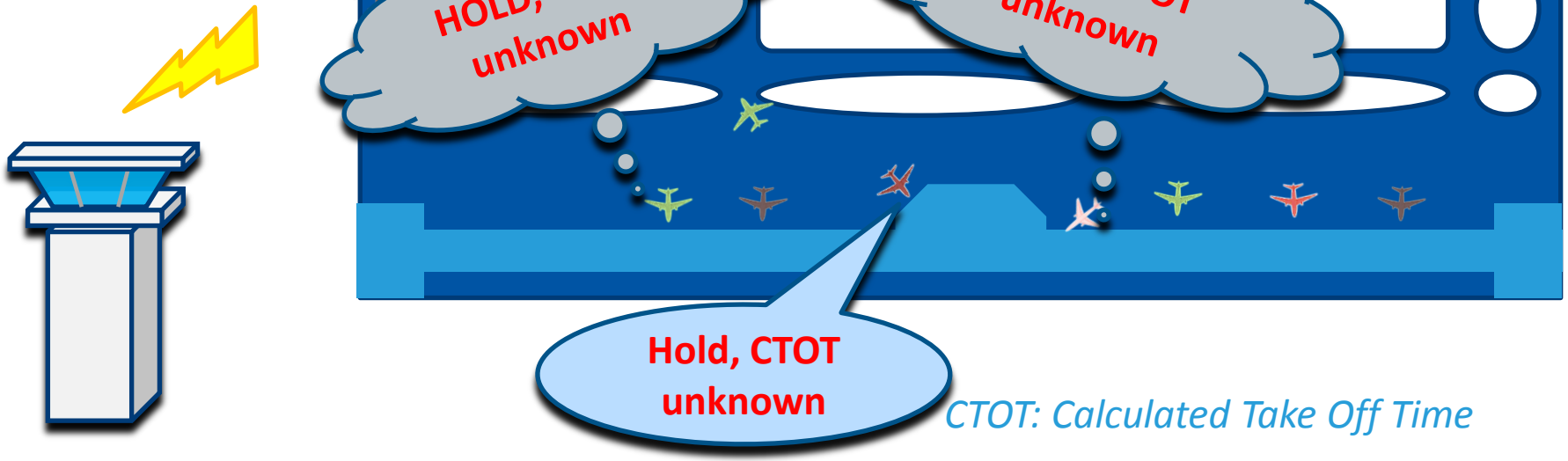
Ground Delay Program (GDP)

- GDP minimize airborne holding
- GDP shall be carried out in a planned manner (at least a few hours prior to the over capacity)
- Delays have great impact on AUs
- CTOT have to be informed AUs as early as possible
- CTOT may be modified with AUs coordination

CTOT: Calculated Take Off Time

TSAT: Target Start-up Approval Time

Ground Stop

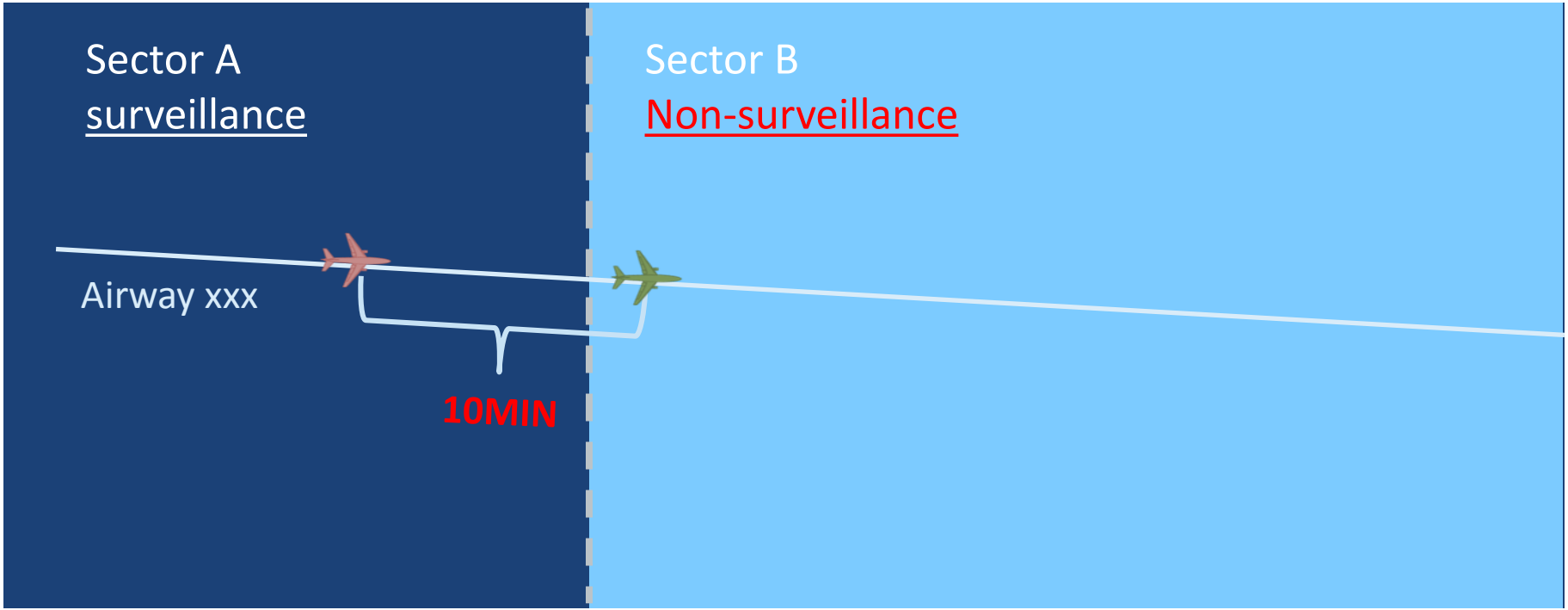


CTOT: Calculated Take Off Time

Ground Stop

- Ground Stop is typically used:
  - In cases destination airports are unavailable due to significant WX or due to accident/incident
  - To preclude extended periods of in-flight holding
  - To preclude sector reaching near saturation levels or airport gridlock
  - In the event of a facility is unable to provide ATC services due to unforeseen circumstances
  - In cases routings are unavailable due to severe WX or catastrophic events
- AUs need further information as soon as possible

Minutes in Trail (MINIT)



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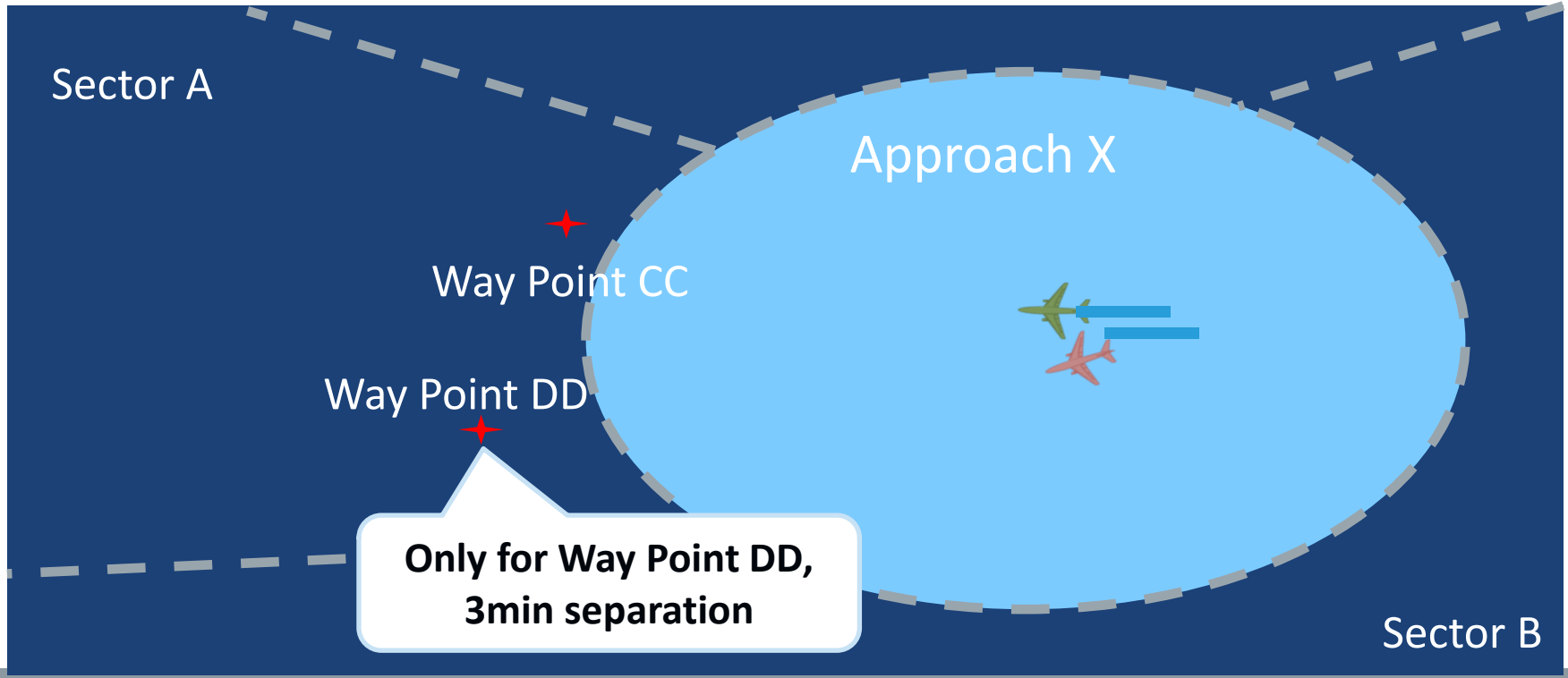
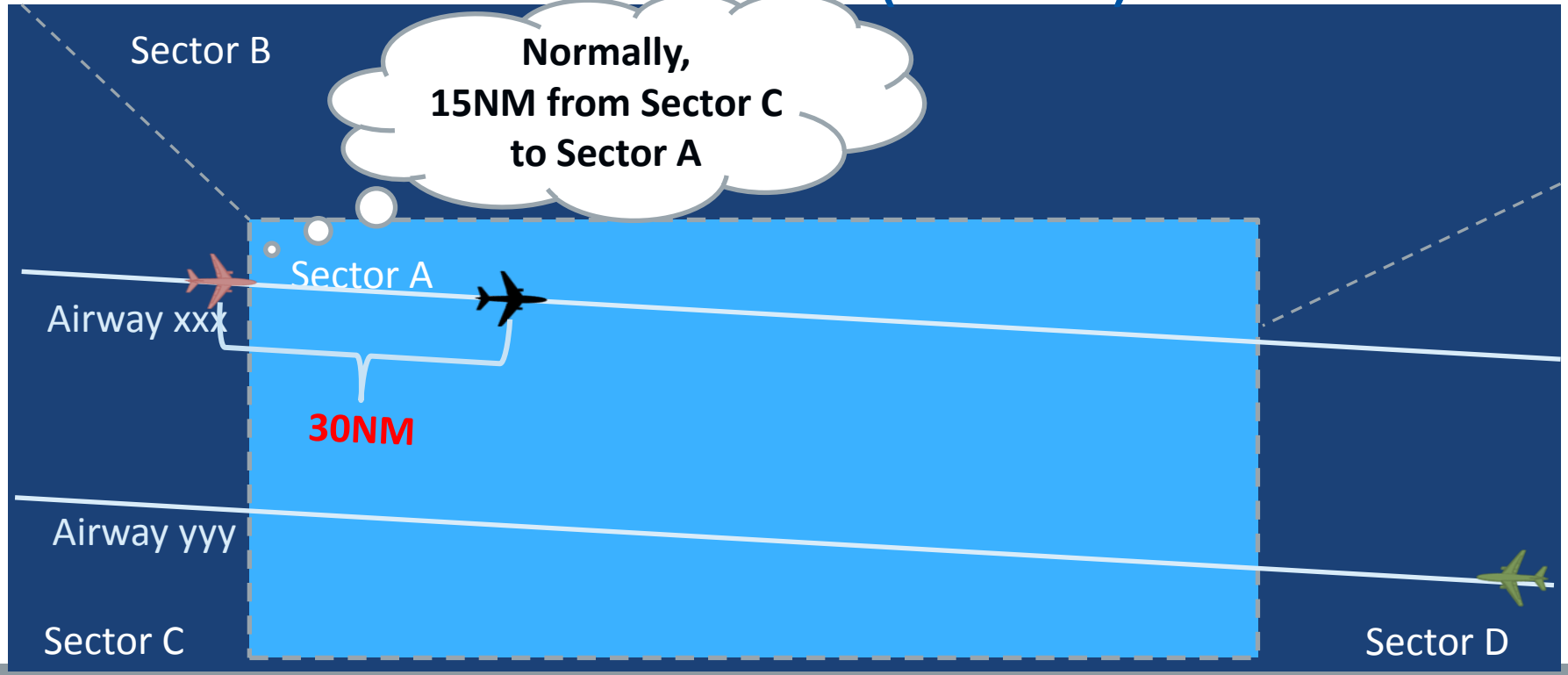


Minutes in Trail (MINIT)

- MINIT is expressed as the number of minutes required between successive aircraft
- MINIT is normally used in airspace without surveillance, or from surveillance to non-surveillance
- MINIT is also used when the spacing interval is such that it would be difficult for a sector controller to measure it in terms of miles

Minutes in Trail (MINIT)



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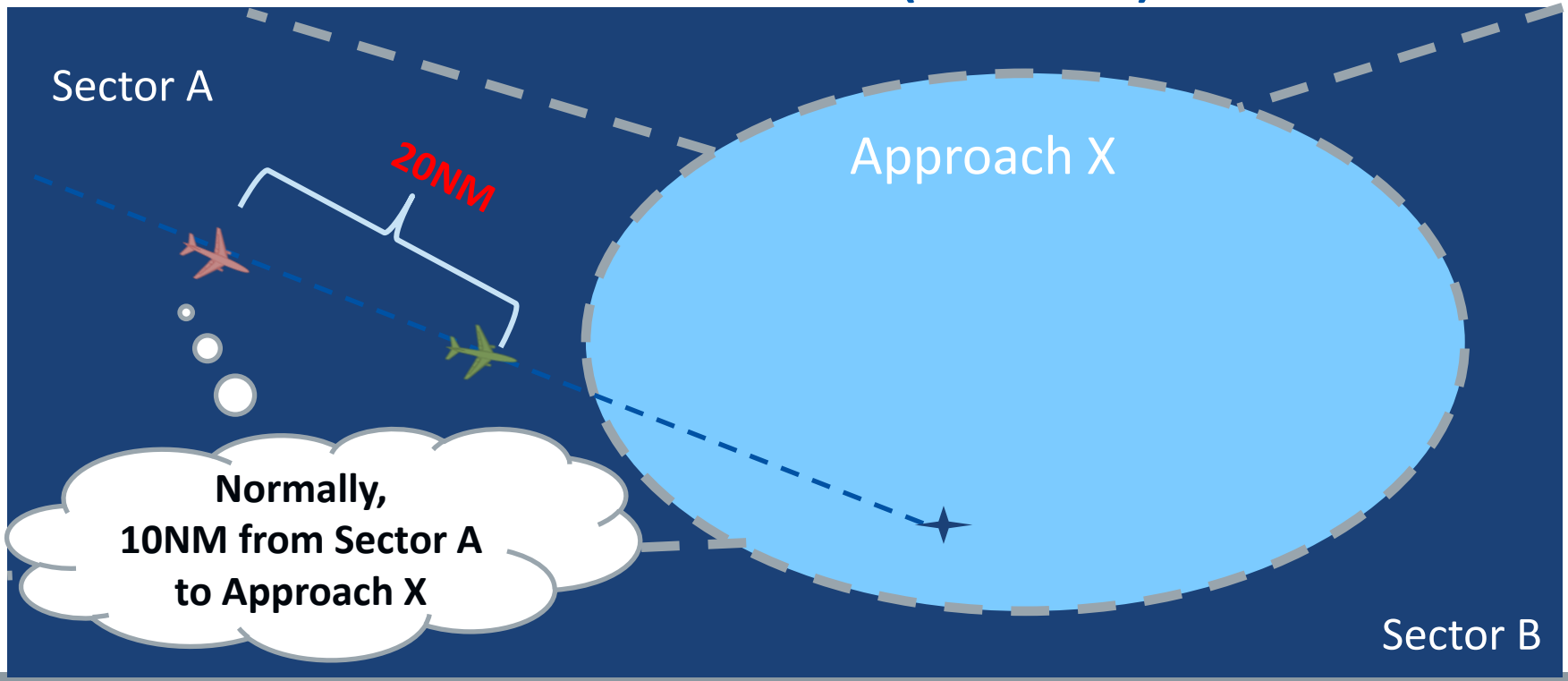
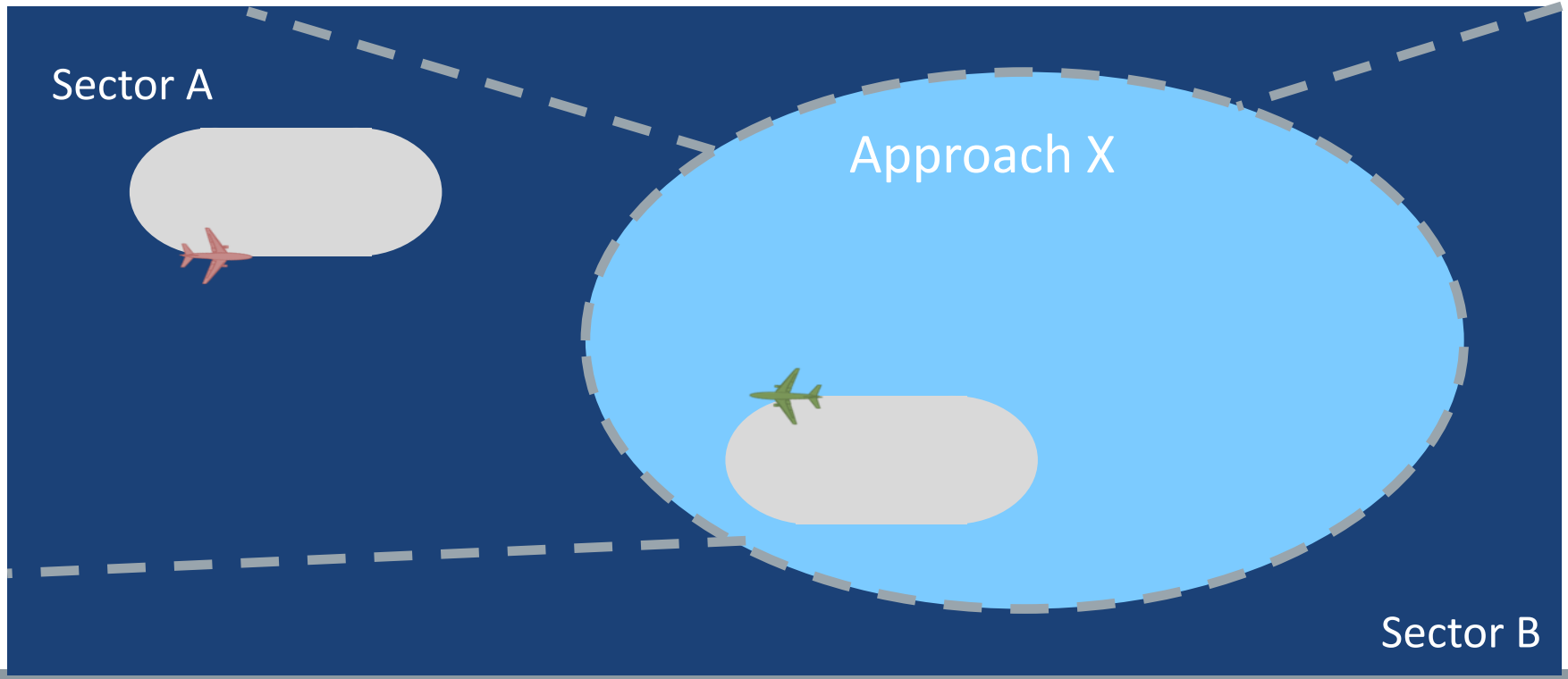


Miles in Trail (MINIT)

- MIT is expressed as the number of miles required between aircraft (in addition to the minimum longitudinal requirements)
- MIT can be carried out without a planned manner (compared with GDP)
- MIT may increase the workload of the other sectors

Airborne Holding



Airborne Holding

- Airborne Holding is generally used to cope with short notice demand and capacity imbalances
- Airborne Holding is complementary to ground delay programmes and ground stops
- Airborne Holding generates high workload for ATC and pilots
- Consideration must be given to reducing sector capacity during airborne holding periods

ATFM/FUA INTEGRATION

FUA PRINCIPILES

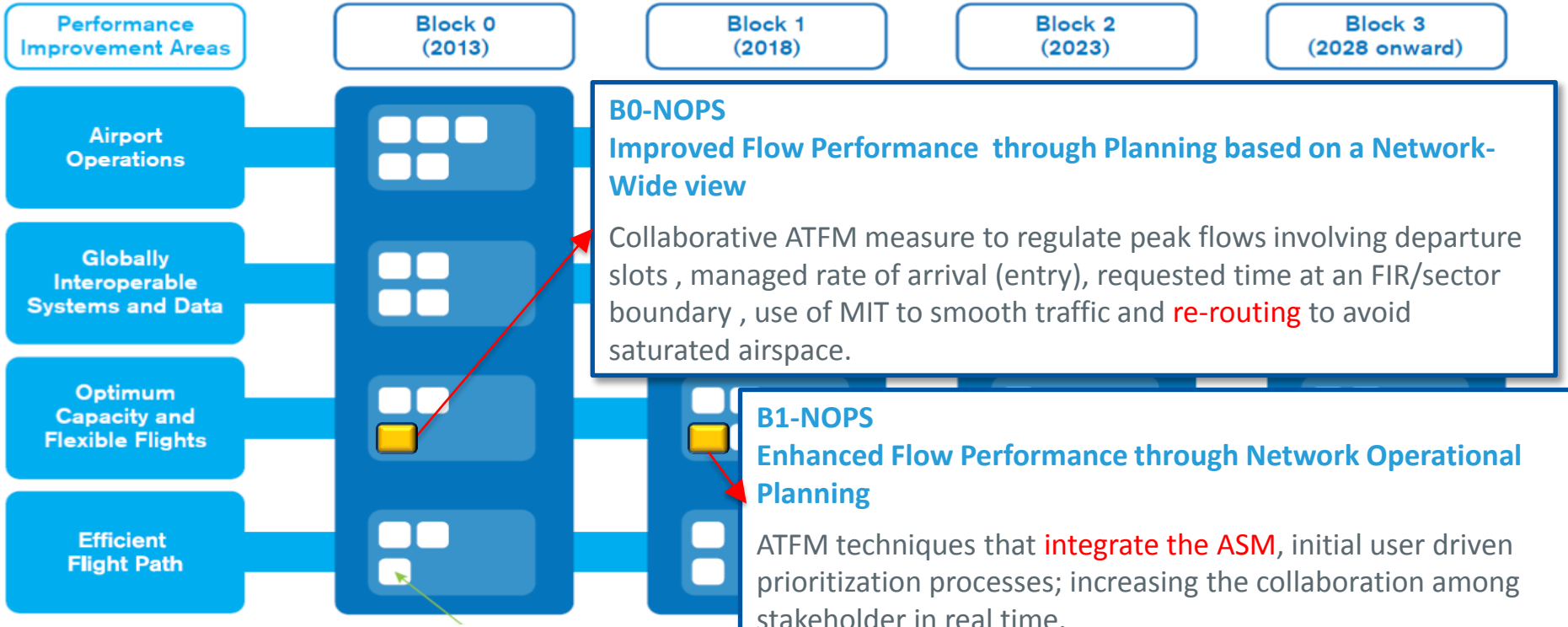
- Coordination between civil and military authorities should be carried out at the strategic, pre-tactical and tactical levels

- Consistency between ASM, ATFM and ATS should be established and maintained at three levels of ASM

Interoperate of ASM/ATFM/ATS

- ASM : Provide existing airspace and route structures a sufficient level of availability to address the various traffic demand
- ATFM: Ensure an optimum flow of traffic during times when demand exceeds the available capacity of the ATC system
- ATS : Organize the sectorization in accordance with available airspace and route structures.

ATFM Thread and Modules



B0-NOPS
Improved Flow Performance through Planning based on a Network-Wide view

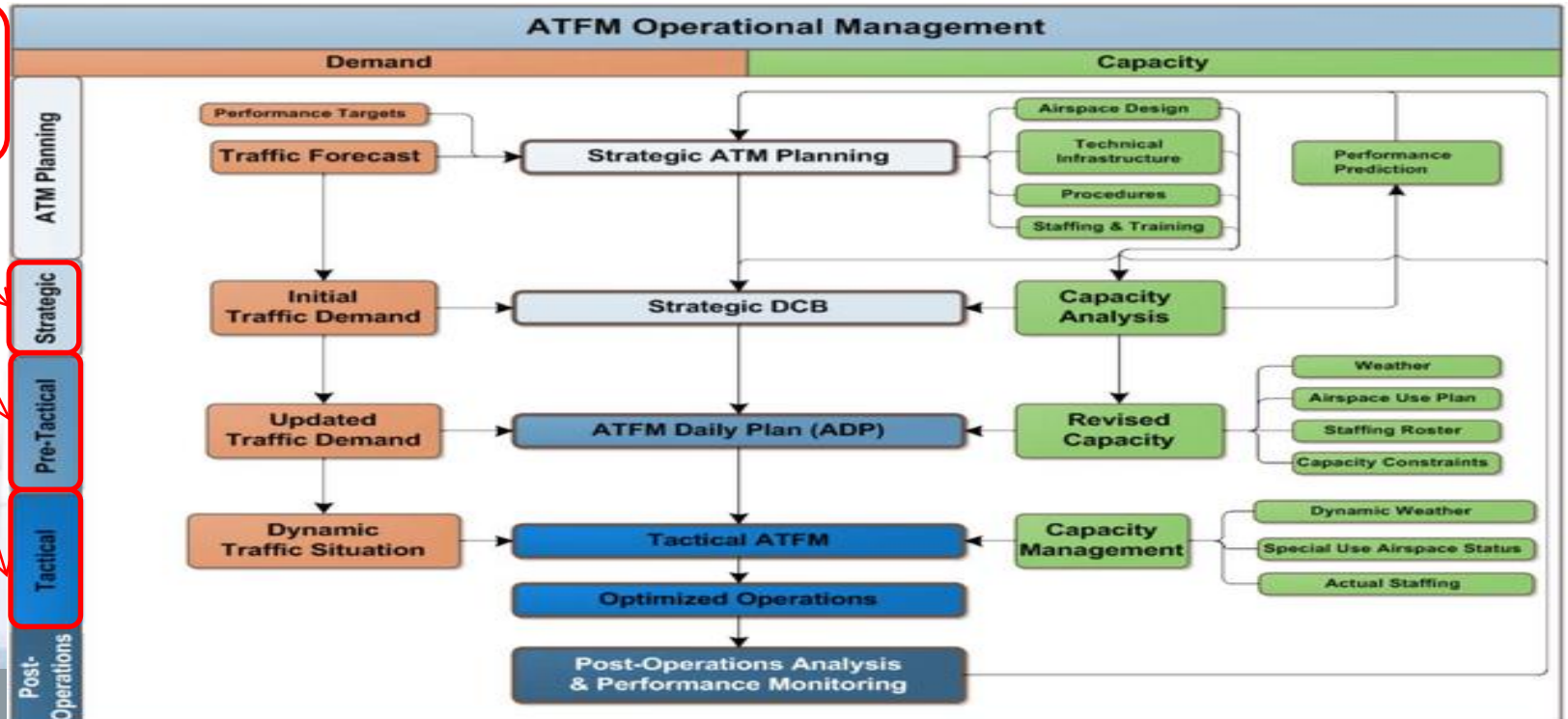
Collaborative ATFM measure to regulate peak flows involving departure slots , managed rate of arrival (entry), requested time at an FIR/sector boundary , use of MIT to smooth traffic and re-routing to avoid saturated airspace.

B1-NOPS
Enhanced Flow Performance through Network Operational Planning

ATFM techniques that integrate the ASM, initial user driven prioritization processes; increasing the collaboration among stakeholder in real time.

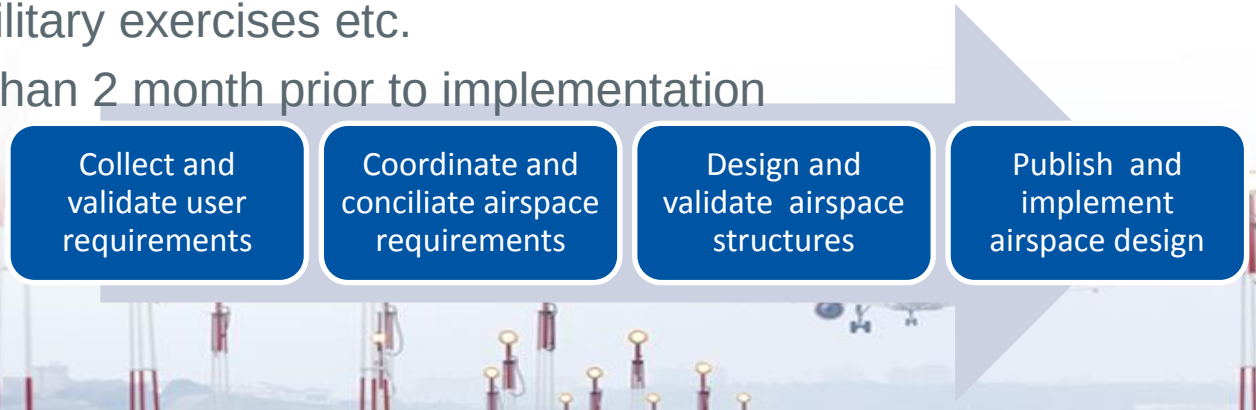
ATFM Phases

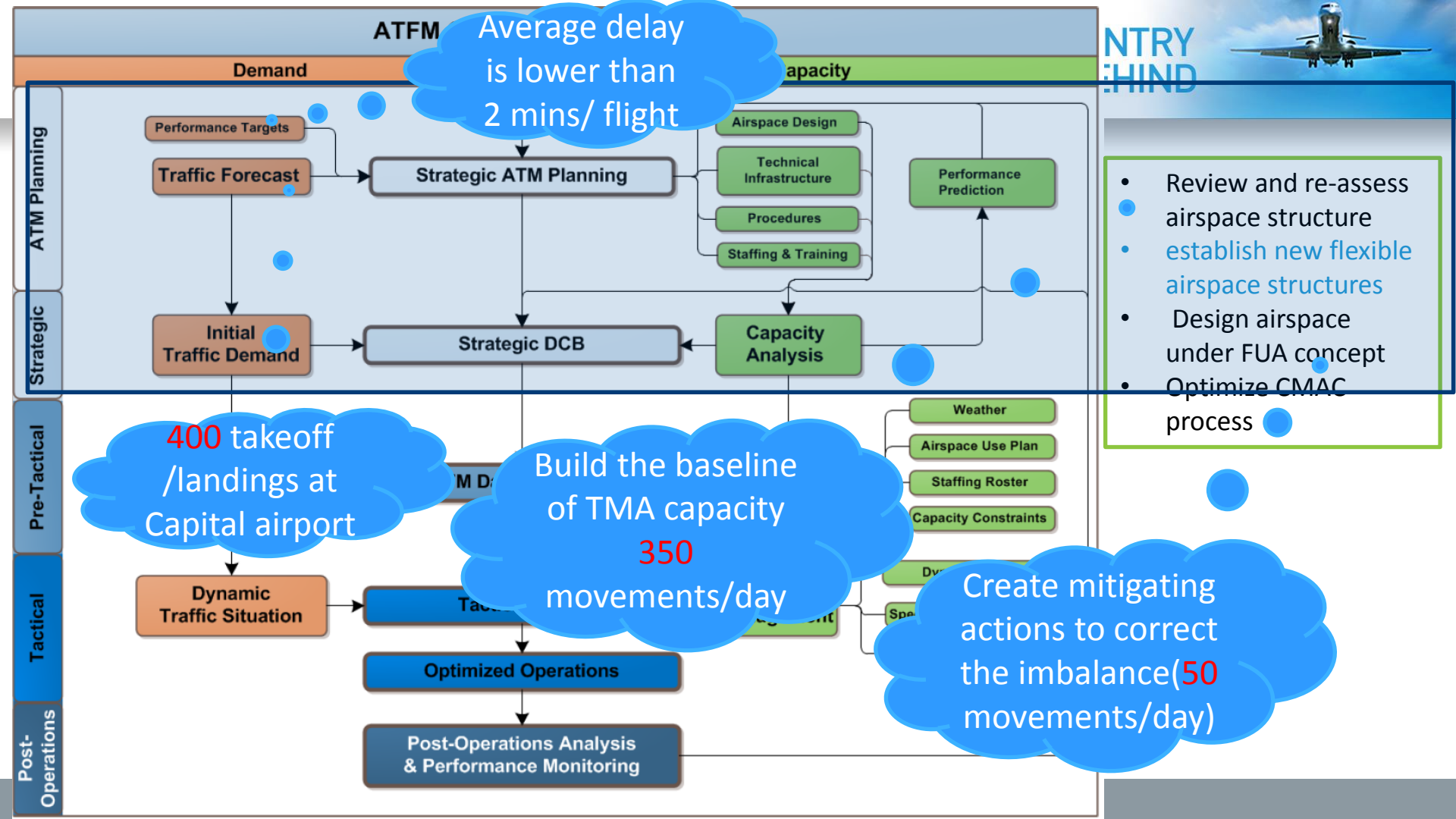
3 Phases of ATFM Execution



FUA Timeline

- Strategic phase
  - Long term airspace planning , design and publication
    - New airspace and route structure
    - Large scale military exercises etc.
    - Usually more than 2 month prior to implementation





NTRY
HIND

- Review and re-assess airspace structure
- establish new flexible airspace structures
- Design airspace under FUA concept
- Optimize CMAC process

Airspace Design

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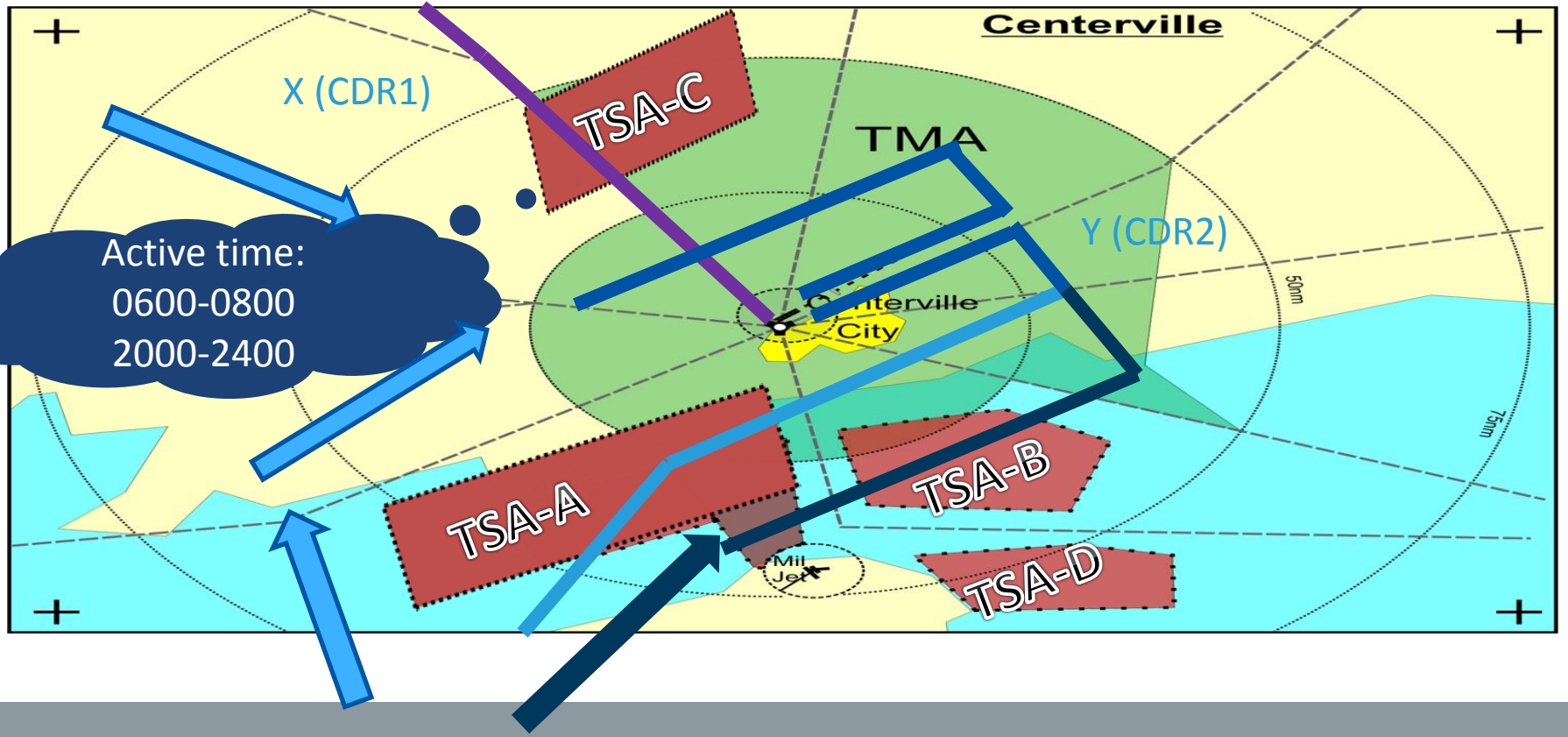
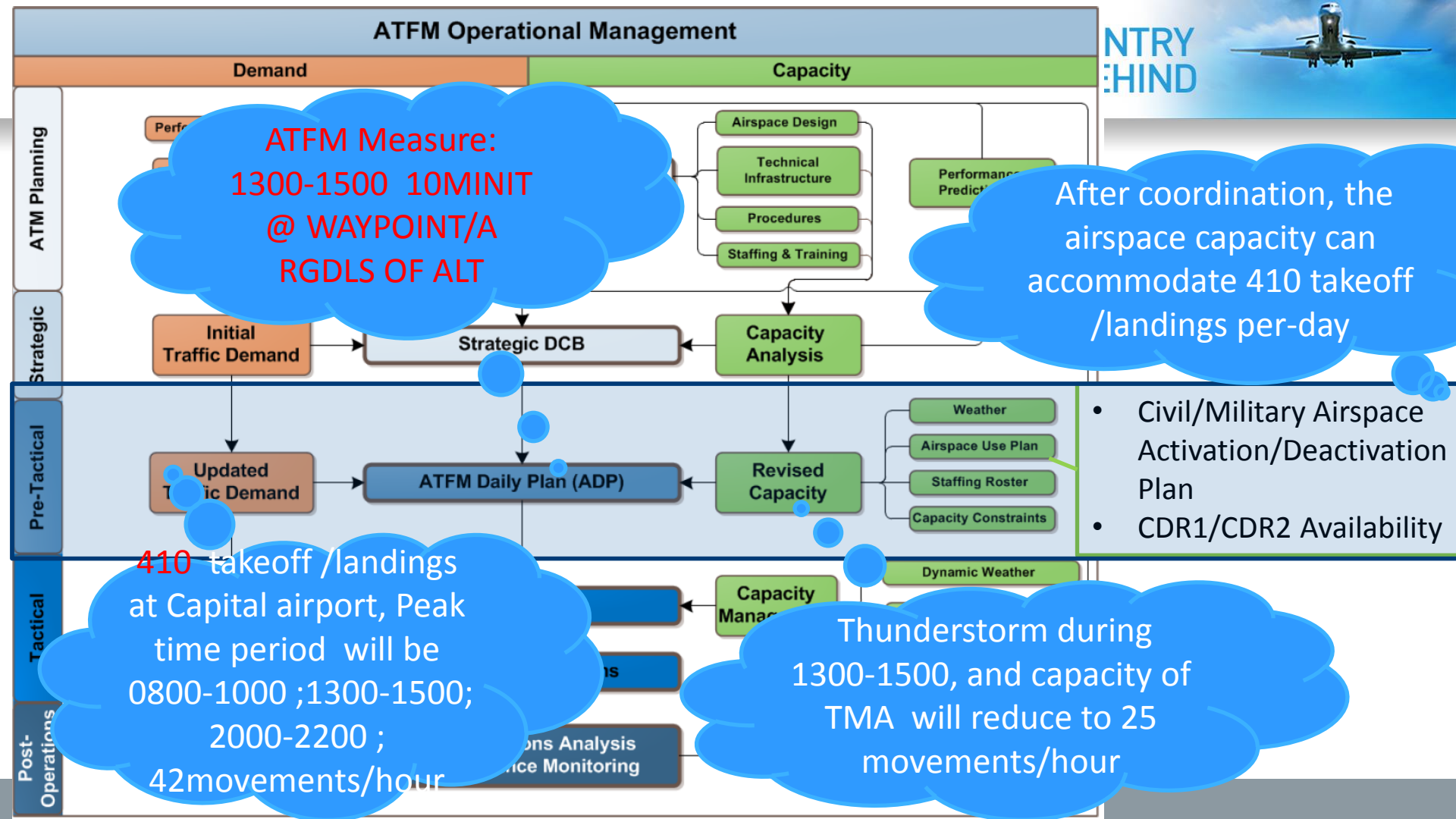


FUA Timeline

- Pre-tactical phase
  - Day to day allocation of airspace
    - Check the airspace(capacity) availability
    - Coordinate and allocate the airspace based on actual needs
    - Usually based on a CDM process between airspace managers(civil and military), AUs etc.
    - Usually 1 day prior to operations
    - Create ADP


ATFM Operational Management
Demand
Capacity
ATM Planning
Strategic
Pre-Tactical
Tactical
Post-Operations
Airspace Design
Technical Infrastructure
Procedures
Staffing & Training
Initial Traffic Demand
Strategic DCB
Capacity Analysis
Updated
ATFM Daily Plan (ADP)
Revised Capacity
Weather
Airspace Use Plan
Staffing Roster
Capacity Constraints
Dynamic Weather
ATFM Measure:
1300-1500 10MINIT
@ WAYPOINT/A
RGDLS OF ALT
After coordination, the airspace capacity can accommodate 410 takeoff /landings per-day
• Civil/Military Airspace Activation/Deactivation Plan
• CDR1/CDR2 Availability
410 takeoff /landings at Capital airport, Peak time period will be 0800-1000 ;1300-1500; 2000-2200 ; 42movements/hour
Thunderstorm during 1300-1500, and capacity of TMA will reduce to 25 movements/hour

Airspace Allocation

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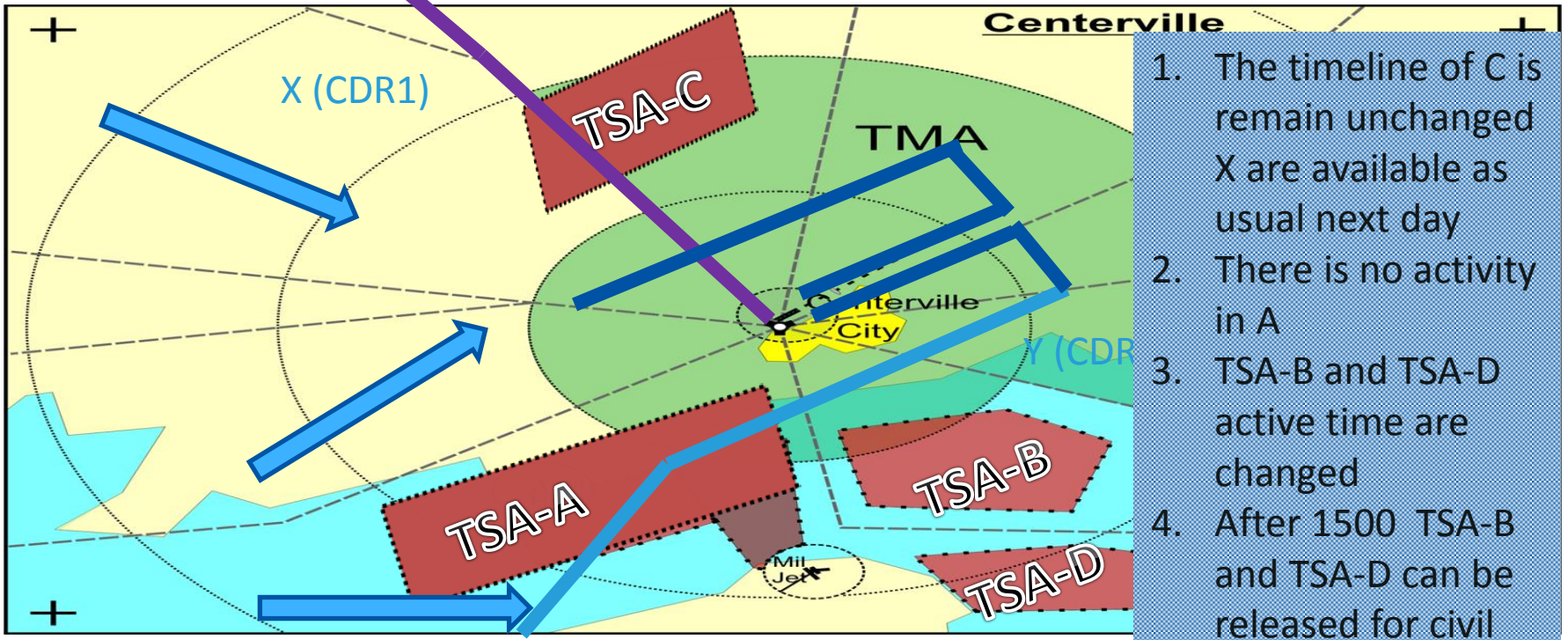
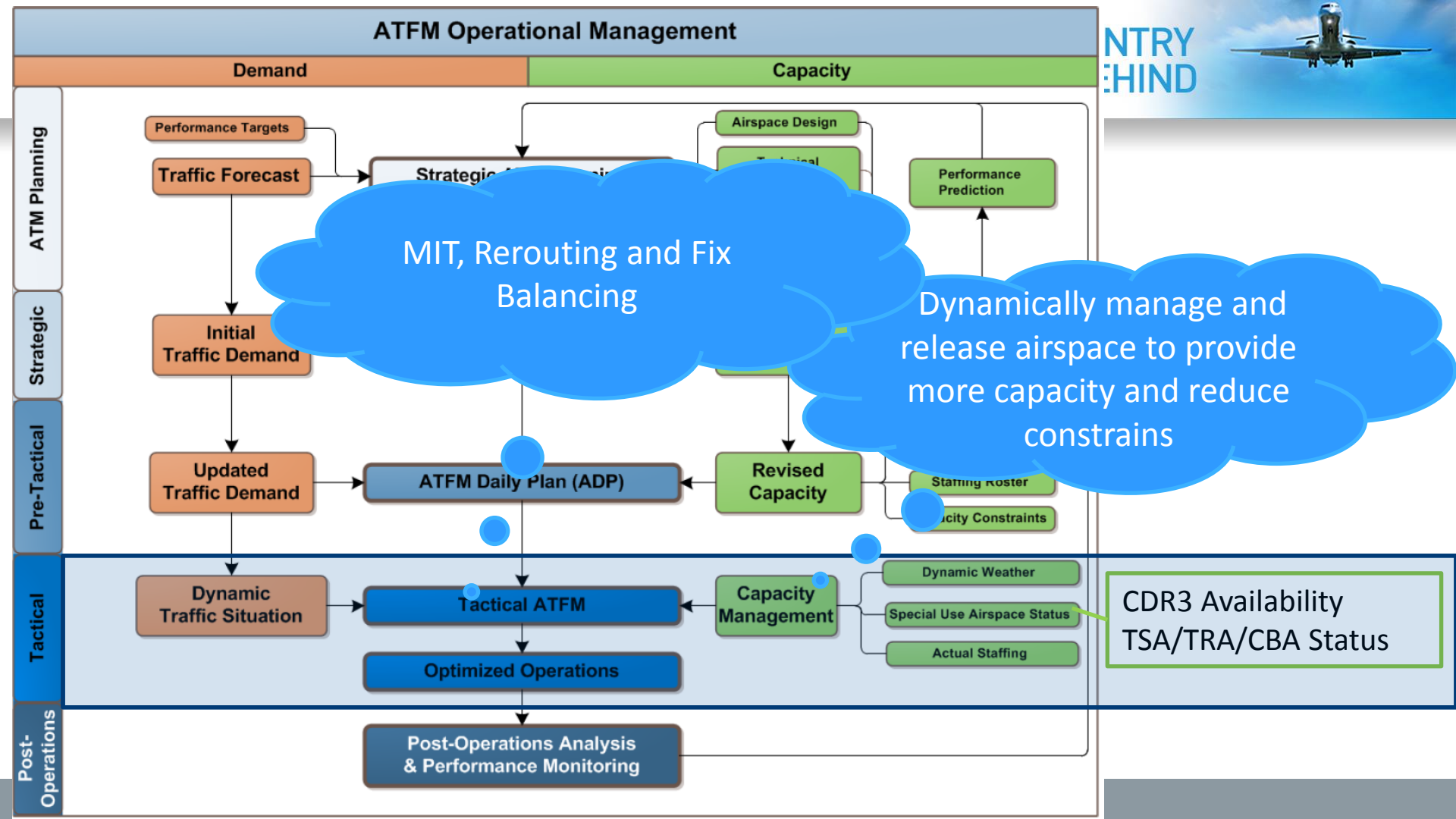


1. The timeline of C is remain unchanged X are available as usual next day
2. There is no activity in A
3. TSA-B and TSA-D active time are changed
4. After 1500 TSA-B and TSA-D can be released for civil use

FUA Timeline

- Tactical phase
  - Day to day flight operation
    - Monitor the status of the airspace
    - Coordinate and re-allocate the airspace based on real time situation
    - Usually during the day of the operations
    - Update the ADP


ATFM Operational Management
Demand
Capacity
ATM Planning
Strategic
Pre-Tactical
Tactical
Post-Operations
Performance Targets
Traffic Forecast
Airspace Design
Performance Prediction
Initial Traffic Demand
Updated Traffic Demand
ATFM Daily Plan (ADP)
Revised Capacity
Staffing Roster
Dynamic Traffic Situation
Tactical ATFM
Capacity Management
Dynamic Weather
Special Use Airspace Status
Actual Staffing
Optimized Operations
Post-Operations Analysis & Performance Monitoring
MIT, Rerouting and Fix Balancing
Dynamically manage and release airspace to provide more capacity and reduce constrains
CDR3 Availability
TSA/TRA/CBA Status

CDM PROCESS OF FUA

COLLABORATION DECISION MAKING (CDM)

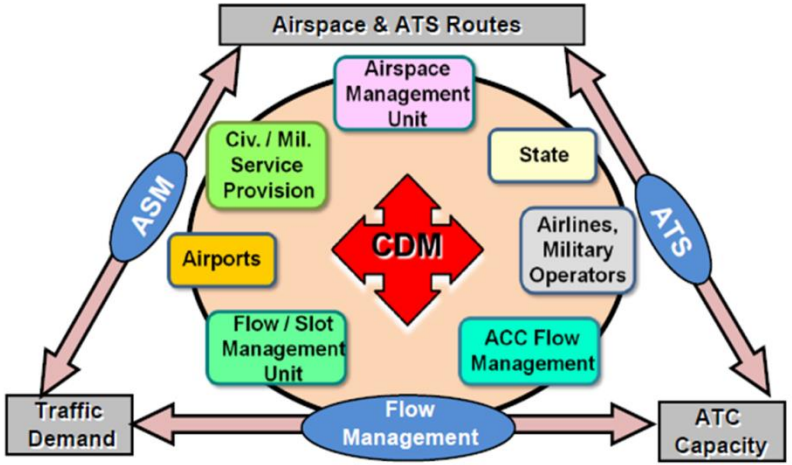
- This philosophy of collaboration promises to become the standard in aviation
- Not limited to any specific domain such as airport or en-route
- Applies to all layers of decision-making from longer-term planning activities through to real time operations
- Allows air traffic management (ATM) community to participate in ATM decisions that affect them

COLLABORATION DECISION MAKING (CDM)

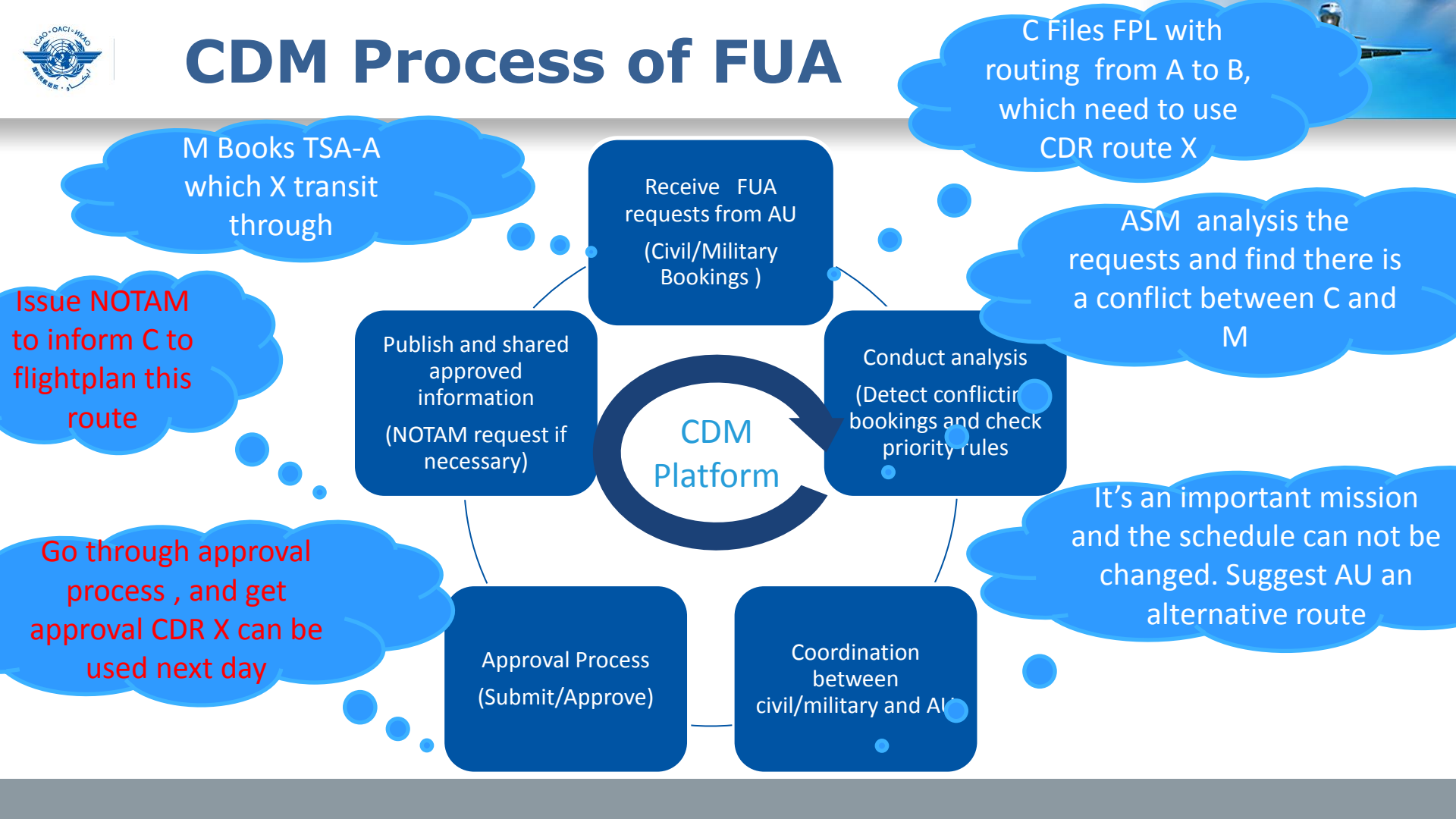
- Intention
  - Ensures effective information management and sharing
  - Enables each stakeholder to be aware of relevant information
  - Allows stakeholder to propose a solution

COLLABORATIVE DECISION MAKING (CDM)

- CDM
  - A tool to support ASM(FUA)
  - Base
    - Information exchange and data sharing
  - Process
    - Brings together airlines, airports ,civil and military aviation authorities and units
    - Facilitate decision-making



CDM Process of FUA



ICAO

THANK YOU