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The need for ATFM/CDM

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Outline

- What is ATFM/CDM
- ATFM Main Objectives
- ICAO Guidance Material
- Why ATFM is needed
- Link to ASBU
- ATFM Regional developments



What is ATFM?





What is ATFM?

- ATFM is an **enabler** of air traffic management **efficiency** and **effectiveness** in a way that **minimizes delays** and **maximizes/optimizes** the use of the available airspace
- It contributes to the **safety** and **environmental** sustainability of an ATM system.
- **Managing** traffic flows means **more than** simply applying ATFM measures.
- **ATFM solution** is the **combination** of capacity optimization and ATFM measures





Global ATFM

Is a Long Term Objective

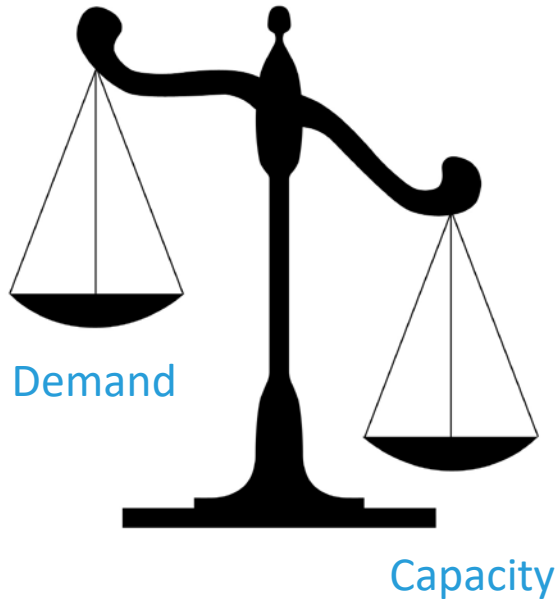
- Over time, local ATFM implementations conducted worldwide are going to shape a **global ATFM**
- **Standardized ATFM** processes will be implemented **globally**





ATFM is demand/capacity balancing

If demand exceeds the capacity, "flow" management is required





The objectives of ATFM/CDM

- Enhance safety
- Reduce workload
- Optimize the use of available airspace
- Improve operational benefits, predictability and efficiency
- Effective management of capacity and demand
- Increased situational awareness among stakeholders
- Provide for coordinated, collaborative development and execution of operational plans
- Reduce fuel burn and operating costs
- Support effective traffic management of irregular operations, Contingency, Emergency, and the recovery of such situation



Keys to successful implementation

- The CDM process is a key enabler of an ATFM
- Achieving a robust coordination among aviation stakeholders
 - 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





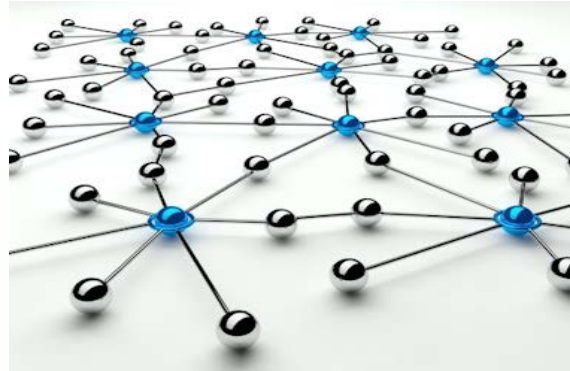
Keys to successful implementation

ATFM and its applications should NOT be restricted to one State or FIR

- Due to 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**



Drivers for the ATFM Guidance material



ATFM systems Interdependencies



Hub operations





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Doc 9971: Manual on...

Doc 9971 was published in 2012 (3rd Edition in 2018)

Part 1 – Collaborative Decision Making (CDM)

Part 2 – Air Traffic Flow Management (ATFM)

Part 3 – Airport CDM (A-CDM)



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Doc 9971

Manual on Collaborative
Air Traffic Flow Management (ATFM)

Third Edition, 2018



Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION



Doc 9971 (Cont'd)

PART I. COLLABORATIVE DECISION-MAKING (CDM)

Chapter 1. Introduction

Chapter 2. Description of collaborative decision-making (CDM)

Chapter 3. Role of information exchange

Chapter 4. Articulating a CDM process

PART II. AIR TRAFFIC FLOW MANAGEMENT (ATFM)

Chapter 1. Introduction

Chapter 2. The ATFM service

Chapter 3. Capacity determination

Chapter 4. ATFM phases and solutions

Chapter 5. ATFM service interfaces

Chapter 6. ATFM communication

Chapter 7. ATFM structure and organization

Chapter 8. ATFM implementation



Doc 9971 (Cont'd)

- Appendix II-A. Sample contingency plan
- Appendix II-B. Determining airport arrival rate
- Appendix II-C. Determining sector capacity
- Appendix II-D. Capacity planning and assessment process
- Appendix II-E. Sample letter ATM exchange agreements
- Appendix II-F. Sample international ATFM operations planning telephone conference format plan
- Appendix II-G. Sample LOA between FMU and ACC
- Appendix II-H. Template letter of agreement between ANSP on flow management



Doc 9971 (Cont'd)

PART III. AIRPORT COLLABORATIVE DECISION-MAKING

Chapter 1. What is A-CDM?

Chapter 2. Airport-CDM partners and stakeholders

Chapter 3. A-CDM methods and tools

Chapter 4. A-CDM implementation

Appendix III-A. Generic MOU between A-CDM partners and stakeholders

Appendix III-B. Template of generic aeronautical information publication (AIP) provided to EUROCONTROL States implementing A-CDM

Appendix III-C. Example of an MOU: FAA membership agreement for collaborative decision making (CDM) exchange of data

Appendix III-D. Examples of A-CDM KPI



Doc 9971 Stakeholders

- Air navigation service providers
- Airspace users
- Airline operation centers
- Airport operators
- Airport ground handlers
- Airport slot coordinators
- Regulators
- Military authorities
- Meteorological agencies
- Others



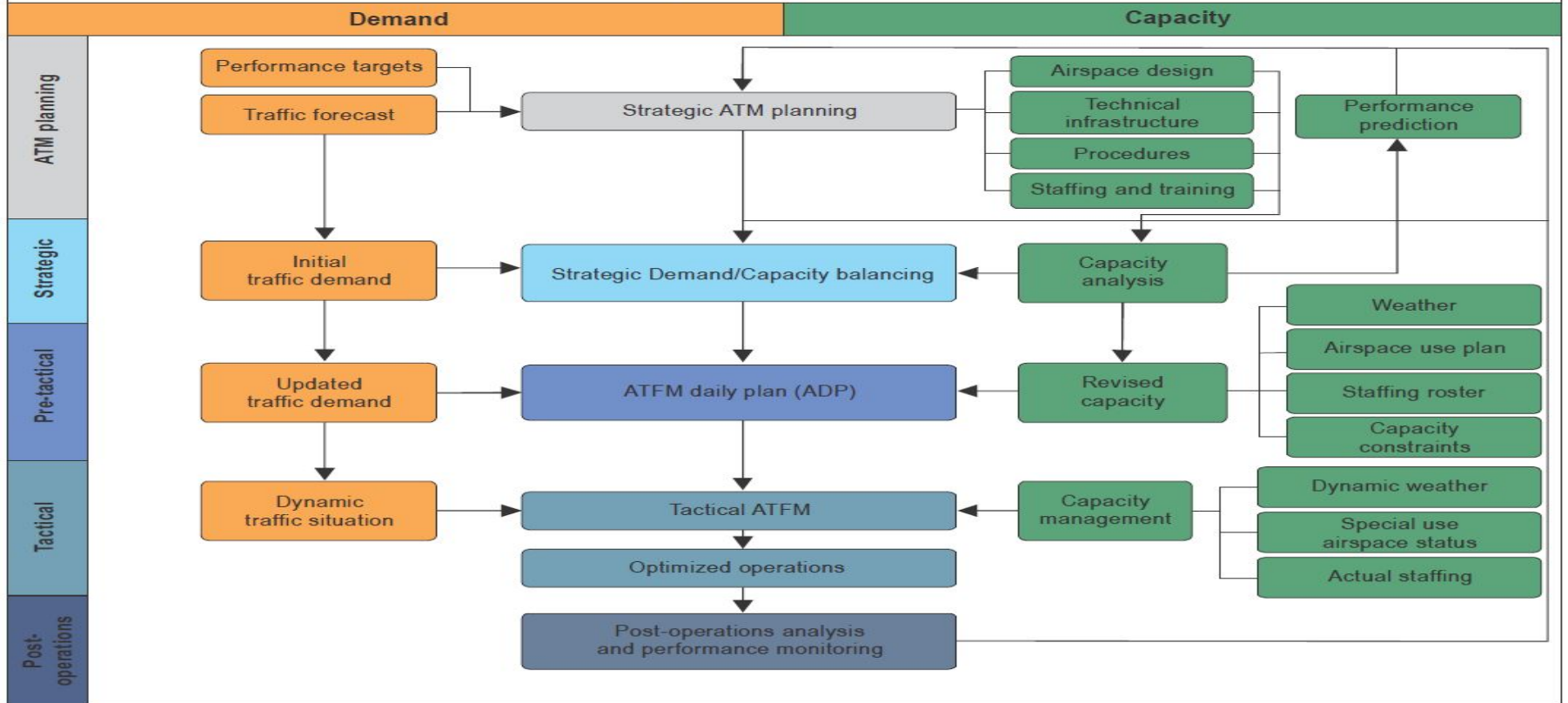


Doc 9971 shows:

- What is the starting point regarding the development of an ATFM service?
- What are the foundational objectives and principles of ATFM?
- What are the benefits of implementing an ATFM service?
- How does an ATFM service operate?
- How is an ATFM service structured and organized?
- What are the roles and responsibilities of the stakeholders in the ATFM service?
- How is the capacity of an airspace sector and airport determined?
- How are ATFM processed applied in order to balance the demand and capacity within its area of responsibility?
- How is an ATFM service implemented?
- What are ATFM Measures and how are they established and applied?
- What data and information are exchanged in an ATFM service?
- What terminology/phraseology is used in ATFM?
- What resources are available to States regarding the various aspects of ATFM?

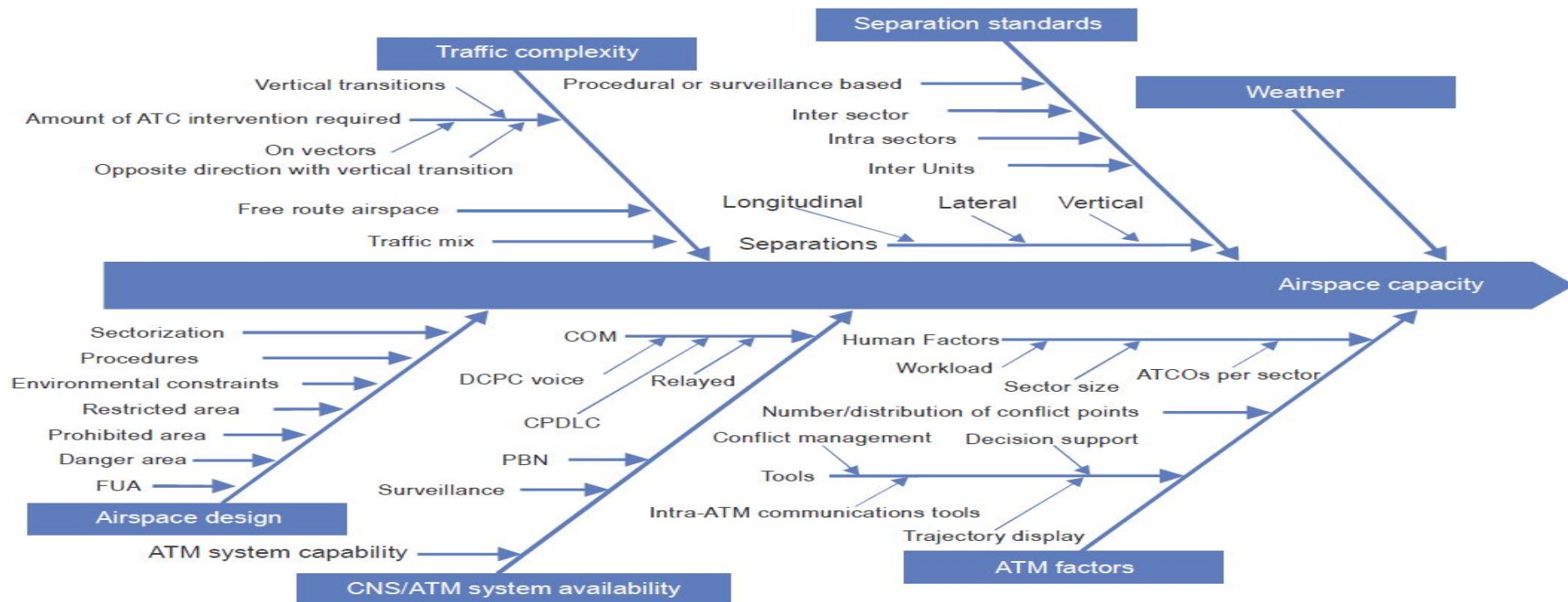


ATM planning and ATFM phases



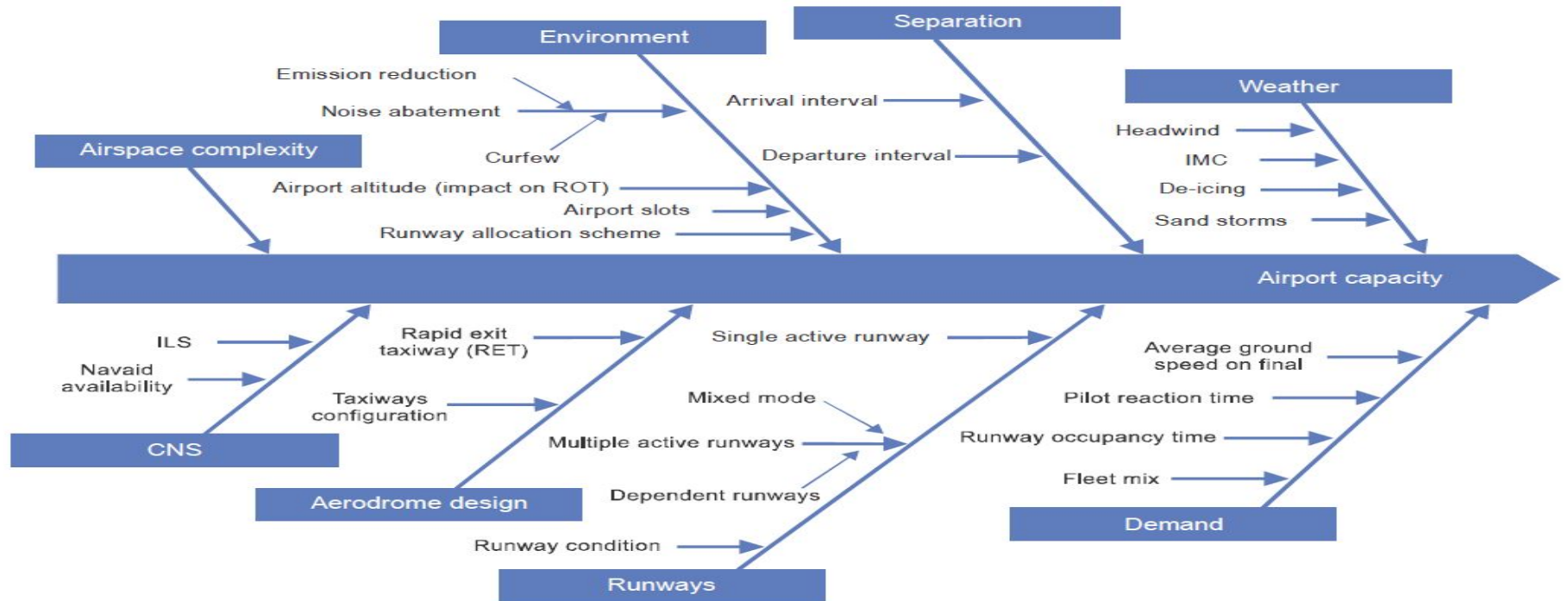


Factors Affecting Airspace Capacity





Factors Affecting Airport Capacity





ATFM Measures

ATFM measure	Constraint			Control mechanism	Time frame	Requirements to be effective
	Airport arrivals	Airport departures	Airspace			
GDP	X	X	X	CTOT	Pre-tactical and tactical	Participation in percentage and distance
Re-route			X	Flight path change to avoid constraint	Pre-tactical and tactical	Access to airspace and published routes
Ground stop	X			Prevent departures from specific aerodromes to address existing tactical load on an arrival aerodrome	Tactical	
MIT/MINT	X		X	Time- or distance-based separation on a single stream of traffic	Tactical	
MDI	X		X	Time-based separation from departures from the same aerodrome	Tactical	
Fix balancing	X		X	Flight path change to avoid	Tactical	
Level capping			X	Flight path change to avoid	Tactical	



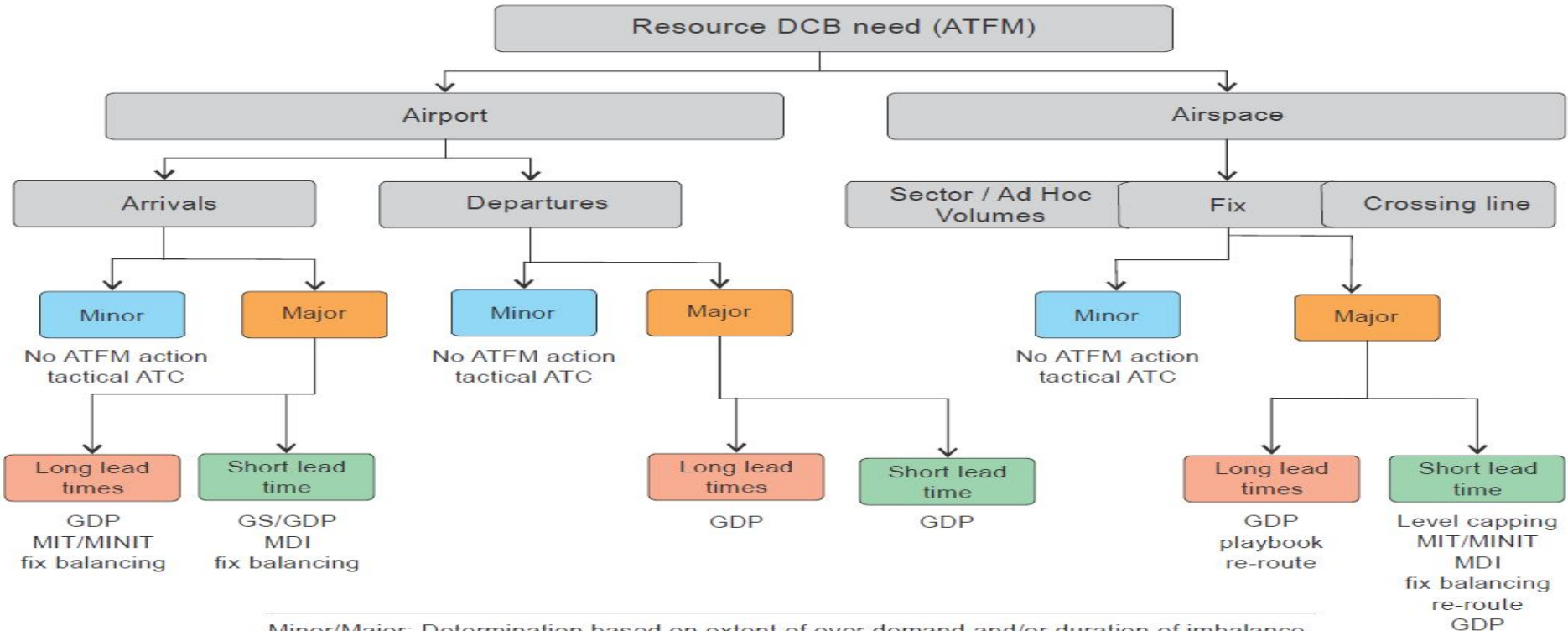
ATFM Measures (cont'd)

- ATFM measures are **important** initiatives for **managing** the flow of air traffic.
- They are very **efficient** when used to manage traffic **demand**.
- They can have a **significant impact** on Airspace Users, and should only be implemented and used when **necessary** to maintain the **safety and efficiency** of the ATM system, **minimizing** as much as possible the impact on flight OPS.
- Mitigation action could be taken by Airspace Users to minimize impact:
 - Re-routing
 - Slot Swapping
 - Airborne Holding





Selection process of ATFM Measures



Minor/Major: Determination based on extent of over demand and/or duration of imbalance.
GDPs require sufficient participation for effectiveness.

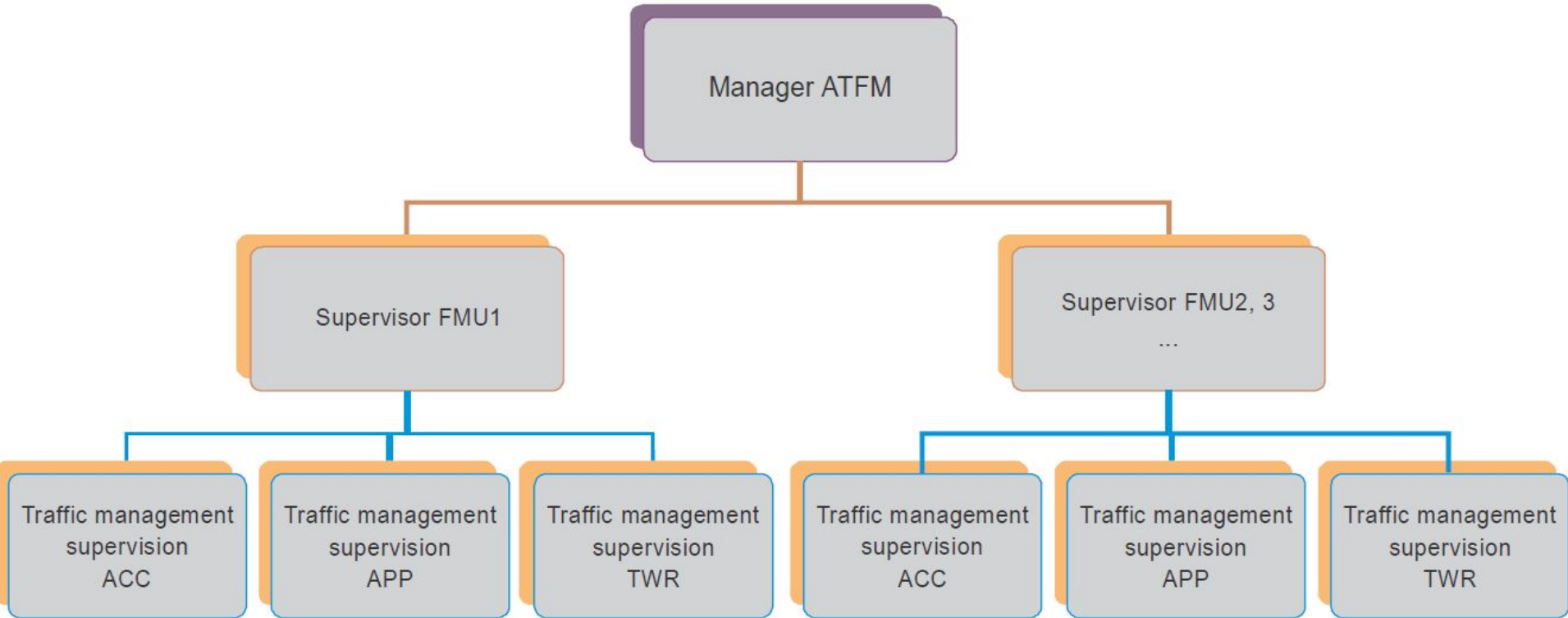


ATFM SERVICE AND ORGANIZATION STRUCTURE

- ❑ State should ensure that an **ATFM organizational structure** which meets the needs of the aviation community is **developed**.
- ❑ This structure should, at a **minimum**, allow the management and **oversight** of the ATFM service and the **coordination and exchange of information**, both **internally and externally**.
- ❑ The structure should also ensure the **existence** of a **line of authority** for the implementation of **decisions** and **compliance** with the **mission requirements** assigned to the ATFM services.
- ❑ A line of authority to support the ATFM service should to include the following:
 - a) an **ATFM service manager**;
 - b) the flow management unit (**FMU**) that provides ATFM service for a specific set of ATS units; and
 - c) flow management positions (**FMPs**) at specific ATS units responsible for the day-to-day ATFM activities



ATFM SERVICE AND ORGANIZATION STRUCTURE





ATFM TRAINING REQUIREMENTS (Chap 7.5)

- An ATFM service should be staffed by personnel with sufficient knowledge and understanding of the ATM system they are supporting and the potential effects that their work may have on the safety and efficiency of air navigation.
- To ensure this and in line with their training policies, States and ANSPs should establish core training plans to educate the ATFM service staff in the importance of the availability, continuity, accuracy and integrity levels required for the services provided.

In addition to the staff of the ATFM unit itself, other units/areas/entities where staff should be aware of and understand the ATFM services provided and the specific roles and responsibilities they carry in this process. Units where ATFM is exercised or directly experienced and where staff therefore need training include:

- a) ATC;
- b) aircraft operators;
- c) pilots;
- d) airport operators;
- e) military, both service providers and users; and
- f) regulatory bodies (CAAs and equivalent).



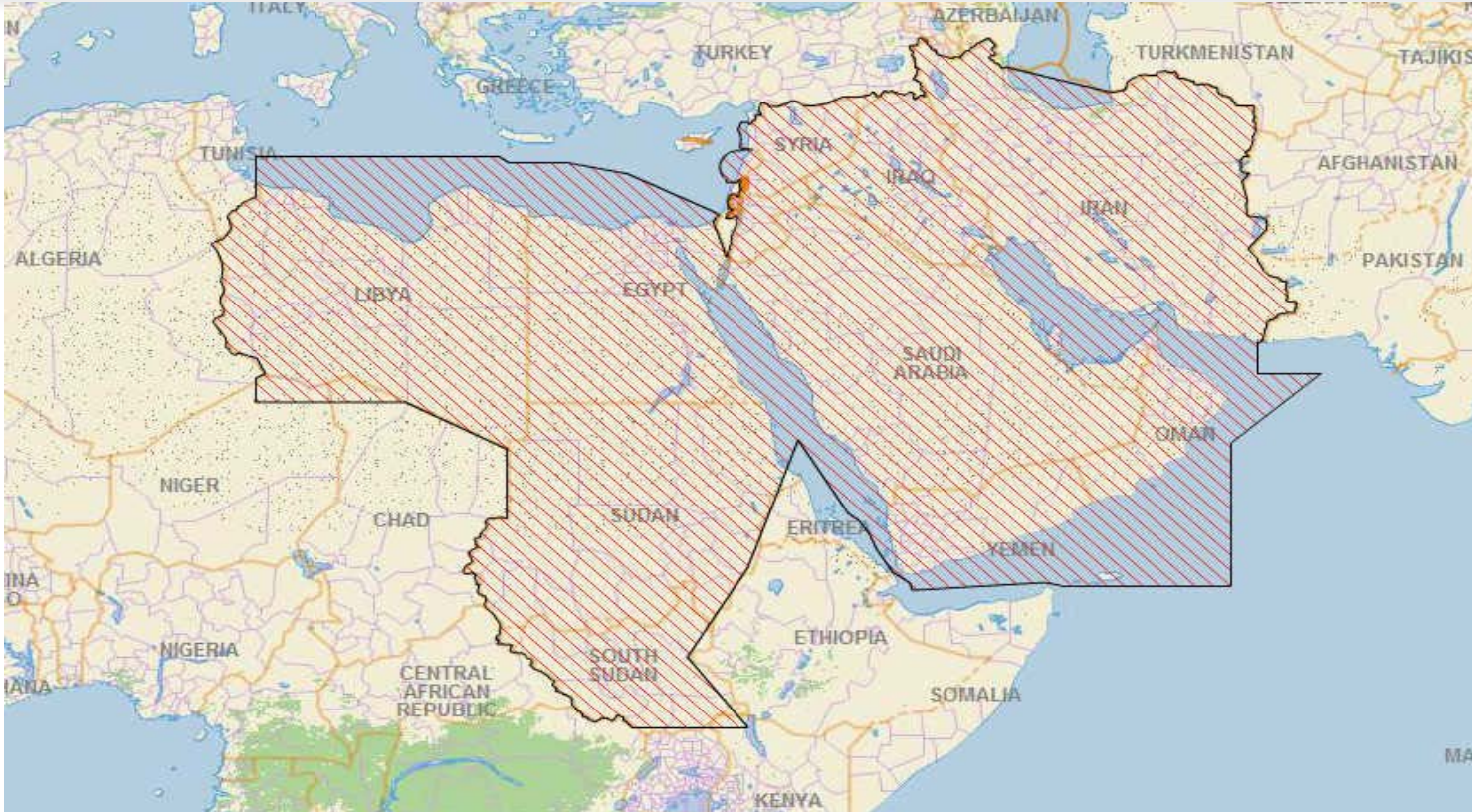
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Why ATFM is needed



ICAO Middle East Region is composed of **15 States**:



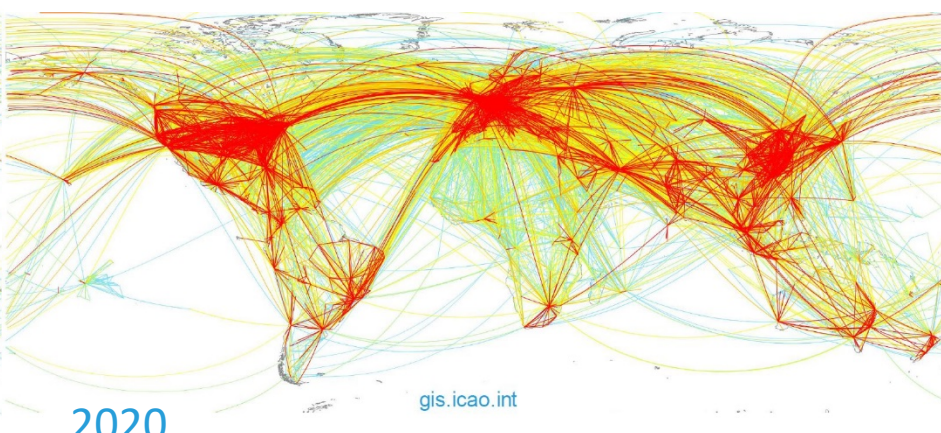
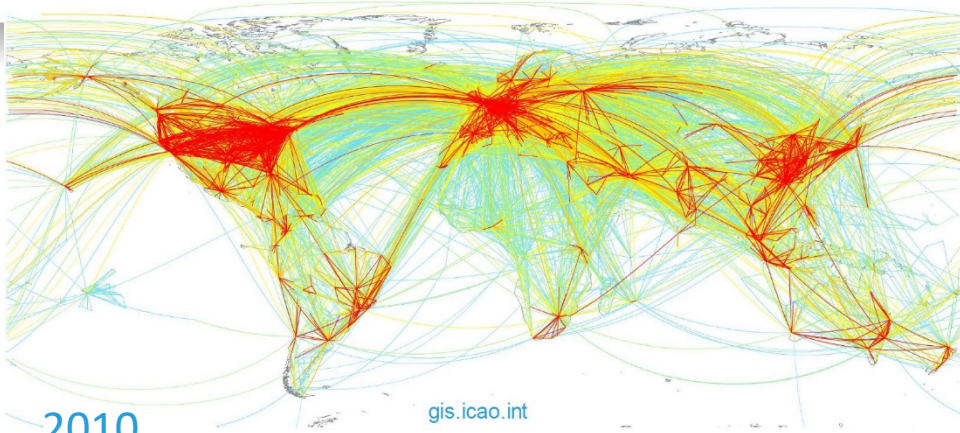
- | | |
|---------|--------------|
| Bahrain | Oman |
| Egypt | Qatar |
| Iran | Saudi Arabia |
| Iraq | Syria |
| Jordan | Sudan |
| Kuwait | UAE |
| Lebanon | Yemen |





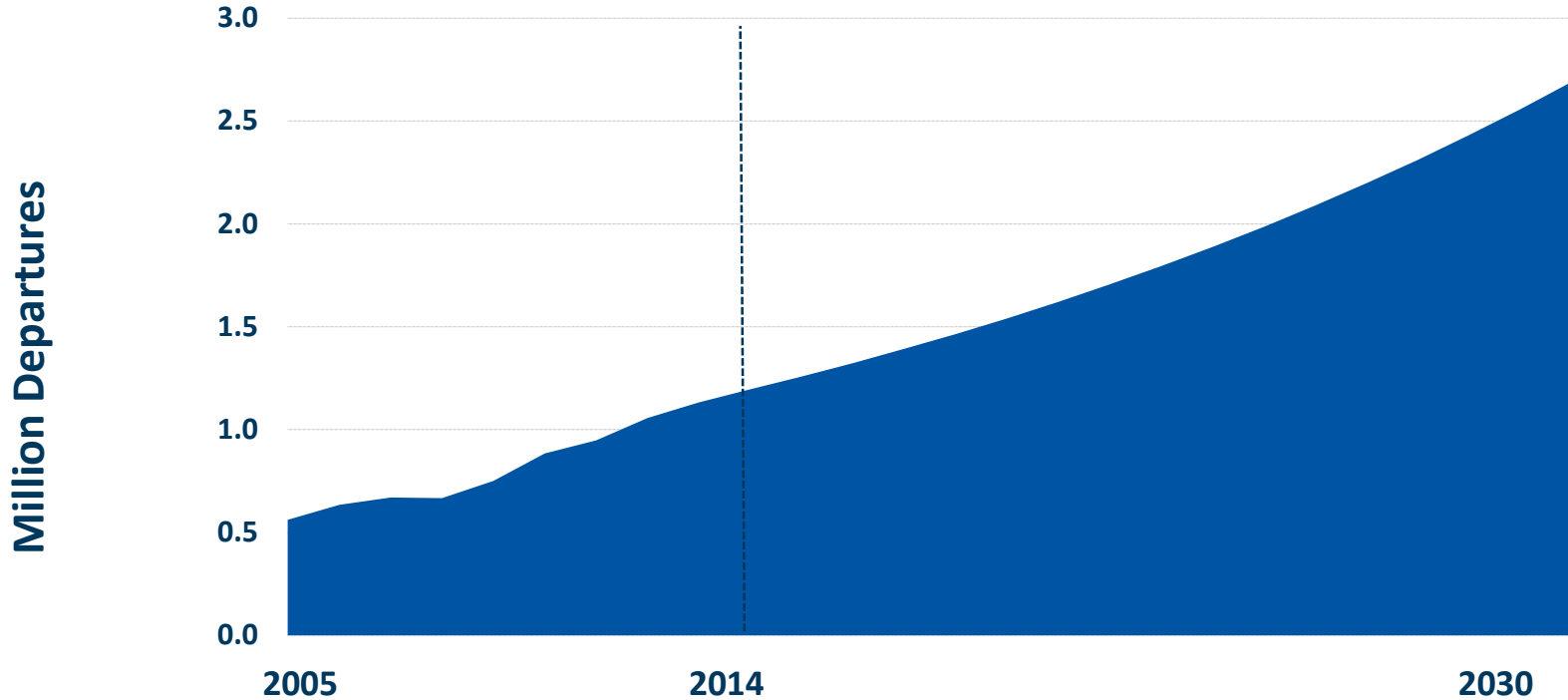
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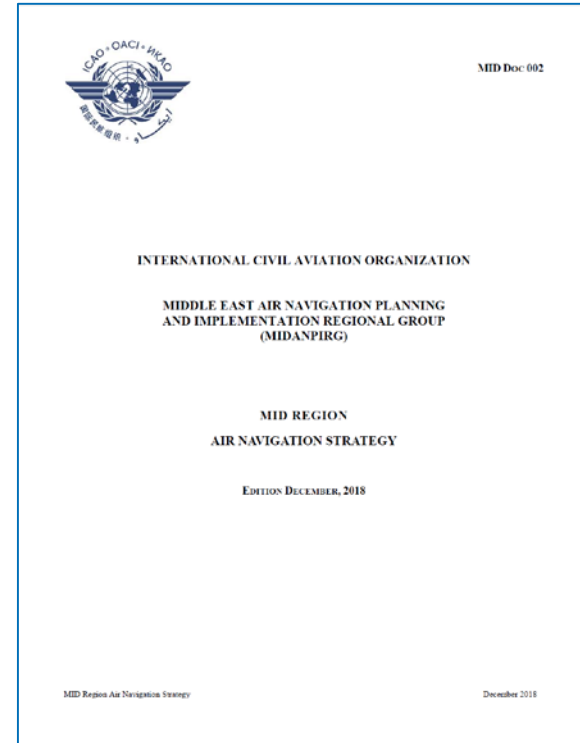
Middle East Aircraft Movements & Growth





ATFM and ASBU in MID Region

- The MID Region Air Navigation Strategy was endorsed by MSG/4 meeting (Cairo, 24-26 November 2014), based on the outcome of the relevant MIDANPIRG subsidiary bodies and inputs received from stakeholders.
- The Strategy was further reviewed and updated by MIDANPIRG/15 (Bahrain, 8-11 June 2015), and endorsed as ICAO MID Doc 002, which is available on the MID Office website.
- Some additional amendments to the Strategy were approved by MIDANPIRG/16 (Kuwait, 13-16 February 2017).
- Latest version approved by MIDANPIRG/17 meeting (Cairo, 15-18 April 2019)





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MID ASBU Block 0 Modules Prioritization

Performance Improvement Areas (PIA)	Module	Priority	Module Name
PIA 1: Airport Operations	APTA	1	Optimization of Approach Procedures including vertical guidance
	WAKE	2	Increased Runway Throughput through Optimized Wake Turbulence Separation
	RSEQ	2	Improved Traffic Flow through Sequencing (AMAN/DMAN)
	SURF	1	Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)
	ACDM	1	Improved Airport Operations through Airport-CDM
PIA 2: Globally Interoperable Systems and Data - Through Globally Interoperable System Wide Information Management	FICE	1	Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration
	DATM	1	Service Improvement through Digital Aeronautical Information Management
	AMET	1	Meteorological information supporting enhanced operational efficiency and safety
PIA 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM	FRTO	1	Improved Operations through Enhanced En-Route Trajectories
	NOPS	1	Improved Flow Performance through Planning based on a Network-Wide view
	ASUR	2	Initial Capability for Ground Surveillance
	ASEP	2	Air Traffic Situational Awareness (ATSA)
	OPFL	2	Improved access to Optimum Flight Levels through Climb/Descent Procedures using ADS-B
	ACAS	1	ACAS Improvements
	SNET	1	Increased Effectiveness of Ground-based Safety Nets
PIA 4: Efficient Flight Path – Through Trajectory- based Operations	CDO	1	Improved Flexibility and Efficiency in Descent Profiles (CDO)
	TBO	2	Improved Safety and Efficiency through the initial application of Data Link En-Route
	CCO	1	Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)



BO – NOPS: Improved Flow Performance through Planning based on a Network-Wide view				
Elements	Applicability	Performance Indicators/Supporting Metrics	Targets	Timelines
ATFM Measures implemented in collaborative manner	All States	Indicator: % of States that have established a mechanism for the implementation of ATFM Measures based on collaborative decision Supporting metric: number of States that have established a mechanism for the implementation of ATFM Measures based on collaborative decision	100%	Dec. 2018
ATFM Structure	All States	Indicator: % of States that have established an ATFM Structure Supporting metric: number of States that have established an ATFM Structure	100 %	Dec. 2019



Regional developments related to ATFM

- It was agreed to the implementation of Regional/sub-regional ATFM project under the framework of the MAEP in 2015, which was supported by MIDANPIRG, DGCA-MID, etc.
- ICAO ATFM Seminar was held in Dubai, UAE, 13-15 December 2016
- ATFM Task Force was established by MIDANPIRG to develop a CONOPS for ATFM implementation in the MID Region
- ATFM TF/1 meeting was held in Muscat, Amman, 23-25 September 2018.
- ATFM Core Team meeting was held in Abu Dhabi, UAE, 22-24 January 2019





The main outcome of the Seminar are as follows:

- Establishment of a MID ATFM TF/WG under the ATM SG.
- Development of ATFM Concept of Operations taking into consideration Asia Pacific and Europe experiences.
- Need to raise awareness about ATFM.
- Conduct training courses related to ATFM.
- States to consider the establishment of ATFM Cell or National Operation Centre composed of all concerned Stakeholders.
- Carry out a survey to determine airspace and sector capacity, hotspots, ATFM systems/measures, etc.
- Expedite MID IFPS project implementation.
- Continue working on airspace improvements.



- ✓ The MAEP Board/3 meeting (Cairo, Egypt, 16-18 January 2017) agreed that the first step for the initiation of the MID ATFM project would be the establishment of a dedicated ATFM TF/WG under the framework of the ATM SG, that will be responsible for the development of the MID Region ATFM Concept of Operations. Accordingly, the meeting encouraged States and Stakeholders to implement the Recommendations emanating from the ATFM Seminar and support the work of MID ATFM TF/WG.
- ✓ MIDANPIRG/16 (Kuwait, 13 – 16 February 2017) established the MID ATFM Task Force through MIDANPIRG Decision 16/16.



**DECISIONS 16/16:****ATFM TASK FORCE**

That,

- a) an ATFM Task Force be established to develop an ATFM Concept of Operations for the MID Region;
- b) the ATM SG/3 meeting develop the terms of reference of the ATFM Task Force; and
- c) States support the ATFM Task Force through:
 - i. assignment of ATFM Focal Point to contribute to the work of the Task Force; and
 - ii. provision of required data in timely manner, and in particular to the survey that will be carried out related to the airspace and sectors capacity, hot-spots, ATFM measures/system, etc.



DECISIONS 16/18:

WORLD CUP 2022 TASK FORCE

That,

- a) a World Cup 2022 Task Force be established to develop and follow-up the implementation of a collaborative action plan to accommodate the expected high increase in traffic, in a safe and efficient manner, taking into consideration similar experiences;
- b) the Task Force address other major events such as the EXPO 2020; and
- c) the ATM SG develop the terms of reference of the Task Force



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Terms of Reference

ToRs of ATFM and FWC2022 Task Forces were developed by ATM SG

Reviewed by the ATFM TF/1 and FWC2022 TF/1 (Muscat, Oman, 23 -26 September 2018)

Endorsed by MSG/6 (Cairo, Egypt, 3 -5 December 2018)





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ATFM TF Meetings

The First Meeting of the Air Traffic Flow Management Task Force (ATFM TF/1) was successfully held in Muscat, Oman, 23 - 25 September 2018. The meeting was gratefully hosted by the Public Authority for Civil Aviation (PACA), Oman.

The ATFM TF/2 was successfully held in Casablanca, Morocco, 19 – 20 March 2019. The meeting was gratefully hosted by the Arab Civil Aviation Organization (ACAO).

The Meeting supported the recommendations emanating from the ACAO/ICAO ATFM Workshop (Casablanca, Morocco, 17 – 18 March 2019) held-back-to-back with the ATFM TF/2 meeting

To be highlighted that the ATFM TF and FWC2022 TF meetings are being held back-to-back





- Based on the discussions and the experience from other regions, the ATFM TF/1 meeting agreed that it would not be feasible to define and develop a CONOPS for the implementation of ATFM during the meeting without assessment of the current ATM and ATFM States' capabilities.
- The meeting agreed to a set of actions to be undertaken till the ATFM TF/2 meeting, with a view to facilitate the coordination and follow-up the implementation of the agreed actions,
- The meeting established the ATFM Core Team composed of volunteer experts from Bahrain, India, Oman, Qatar, Saudi Arabia, UAE (ATFM TF Chairman), USA, ACAO, AEROTHAI, CANSO, EUROCONTROL, IATA and ICAO.



1. The Core Team is expected to carry out the task assigned by the ATFM Task Force which include but not limited to:
 1. Develop a questionnaire to be disseminate to States by ICAO MID Office for surveying the current status of the MID Region related to ATM/ATFM capabilities, airspace, sectors and airports capacity, etc. (The questionnaire should be sent to ATFM/ATM focal points and MIDANPIRG Members)
 2. Analyze the received responses for the questionnaire;
 3. Carry out teleconferences with States' ATFM focal points to explore their views and thoughts related to ATFM taking into consideration the questionnaire responses
 4. Consolidate the responses and prepare a progress report to be presented to the ATFM TF/2 meeting
 5. Define the required minimum set of data that should be exchanged and explore means that would be used for the exchange of data including the development of a common template.



6. Prepare an initial draft ATFM CONOPS.
7. Develop guidance as required to support States addressing issues related mainly to:
 - a) aerodromes and airspace capacities under the normal circumstances and adjustment factors affecting the capacity;
 - b) regular review for aerodromes and airspaces where traffic demand is expected to reach capacity, or is resulting in traffic congestion;
 - c) mechanisms for ATFM data gathering, collation and sharing between States, Organizations and ICAO, which may include:
 - i. adjusted aerodromes and airspace capacity due to factors affecting capacity such as special use airspace status, runway closures and weather information;
 - ii. traffic demand information which may include flight schedules, flight plan data, repetitive flight plan data as well as associated surveillance updates of flight status; and
 - iii. ATFM Daily Plan



7. c) mechanisms for ATFM data gathering, collation and sharing between States, Organizations and ICAO, which may include:
 - i. adjusted aerodromes and airspace capacity due to factors affecting capacity such as special use airspace status, runway closures and weather information;
 - ii. traffic demand information which may include flight schedules, flight plan data, repetitive flight plan data as well as associated surveillance updates of flight status; and
 - iii. ATFM Daily Plan
 - d) compliance by airspace users with ATFM measures; and
 - e) any other guidance relevant to the regional ATFM Framework.
8. Develop a Template to support States with the development of National ATFM Implementation Plan.



Name/Title	State/Organization	Contact details
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Outcome of ATFM TF based on the Core Team Work that was supported by MIDANPIRG/17

- The meeting reviewed the responses to the survey received from 10 States.
- It was recognized that the MID Region is still in the first steps related to the establishment of ATFM capabilities.
- It was recommended that qualification of experts in ATFM as well as raising awareness should be given high priority.
- The meeting agreed to a set of criteria to be used for the evaluation of the scenarios based on the severity of the challenge to achieve the criteria as well as its weight/importance on the success of the scenario.
- The meeting emphasized that establishing a **centralized ATFM Unit** would be the optimal solution followed by the scenario in having **2 Centres for 2 participating areas**, then a centralized scenario through a **third party providing the ATFM service** and the last one would be the **Multi-Nodal**. However, considering the challenges, feasibility and time and efforts required, the **Multi Nodal Scenario** achieved the highest Score
- MIDANPIRG/17 agreed that **Multi Nodal Scenario** to be implemented as the initial a start



High level outline to be considered during the development of the CONOPS

Phase I- Building State's National ATFM Capabilities:

1. Raising awareness related to ATFM
2. Establishing the regulatory framework for ATFM at national level
3. Establishment of ATFM Services within the ATS organizational structure (FOC, FMP, FMU, etc.)
4. Human resources
5. Training
6. Operating Procedures
7. National ATFM Team to ensure Collaborative Decision Making (CDM)
8. Tools to be used
9. Determine and declare Airspace and airports capacity
10. Establishment of State's National ATFM CONOPS



High level outline to be considered during the development of the CONOPS

Phase II – Establishment of Regional Framework

- 1- *Setting up the concept/framework for Cross border ATFM in the MID Region*
- 2- *Define which ATFM Measures would be required including GDPs (where applicable to be defined by States)*
- 3- *Agreement on the Format of the ATFM Messages*
- 4- *Means to be used for Communication between adjacent States ATFM FOC*
- 5- *Development of Common Operating Procedure (COP)*
- 6- *Agreement on LoA template for ATFM (App G of ATS LoA Template)*
- 7- *Agreement on the coordination procedures*
- 8- *Signature of LoAs between adjacent ATFM FOC*
- 9- *Establishment of platform to be used for sharing of information*



High level outline to be considered during the development of the CONOPS

Phase III- Implementation of Cross border ATFM

- 1- Exchange of information through the established platform and/or periodic daily teleconferences*
- 2- Sharing of the ATFM Daily Plan*
- 3- Implementation of the ATFM/CDM process for regulating traffic when required (regional and later inter-regional)*
- 4- Post Implementation Review*
- 5- Research and future development*



After implementation of ATFM focus will be on **inter-regional aspect** as well as **integration** with **A-CDM** where it is implemented





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