International Civil Aviation Organization

MIDANPIRG Air Traffic Flow Management Task Force

Fifth Meeting (ATFM TF/5)
(Virtual, 25 – 27 May 2021)

Agenda Item 2: Regional Framework

FWC2022 ATFM IMPLEMENTATION

(Presented by FWC 2022 TF Chairman, Qatar)

SUMMARY

This paper presents the FWC 2022 ATFM Implementation.

Action by the meeting is at paragraph 3.

REFERENCES

- FWC2022 TF/5 meeting Summary of Discussions (virtual, 23 - 24 March 2021)

1. INTRODUCTION

1.1 The FWC 2022 TF/5 meeting (virtual, 23 – 24 March 2021) noted the development and endorsement of ICAO Doc 014: MID Region ATM CONOPS V1.0. Based on that, the meeting agreed that ATFM CONOPS will be developed by end of May 2021 to be presented to the ATFM TF/5 meeting for review.

2. DISCUSSION

2.1 *FWC 2022 ATFM Implementations*

2.1.1 The FWC 2022 ATFM Implementation is part of the FWC 2022 Operational Plan and Roadmap. The ATFM CONOPS, at **Appendix A** was developed in reference to the MID Region ATFM CONOPS, to manage and control the expected high volume of traffic movements in an optimized manner. It includes the expected measures, Actions Plan, contingency arrangements, temporary LoAs proposals and special Air traffic exchange arrangements.

2.1.2 On national level, Qatar has established an Air Navigation operational committee, tasked to manage the Operational plan, on strategic and pre-tactical levels and to coordinate the related activities with the concerned ATS units and stakeholders.

2.1.3 The national committee will coordinate with the adjacent ATS units to provide update on the action plan items, mainly related to the cross-border activities, and will propose amendments the LoAs if required during the Q1/Q2 2022.

2.2 ***Ongoing Projects***

2.2.1 Currently, Qatar is running main projects for airspace improvements, including airspace re-structure, ATFM implementations and (slot management specifically during the FWC2022), the initial airspace designs and traffic flows will be available in September 2021. While the other project will be delivered Q1/Q2 2022 to allow a sufficient time for the implementation.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the progress made by Qatar for the FWC 2022 in development of the Operational Plan and roadmap along with ATFM CONOPS, at **Appendix A**,

b) review and comment on the FWC 2022 Operation plan, in order to provide an update to the ATM SG to start the implementation phase; and

c) MID State are invited to support the implementation of the FWC 2022 Operation plan and the tasks of the operational committee.

Concept of Operations (CONOPs)

Air Traffic Flow Management

Table of Contents

1 EXECUTIVE SUMMARY

This document contains the Concept of Operations (Con Ops) for the provision of an Air Traffic Flow Management System for the State of Qatar; it will start with the current situation and then systematically progress to a detailed description of the proposed ATFM solution.

Section 2 will provide a high-level introduction to the document and describe the audience for this Con Ops and the relationship with the Strategic Programme Requirements that will be impacted by ATFM.

Section 3 will detail the current problem statement of a demand and capacity imbalance at HIA and provide a prognosis of the traffic scenarios targeted by the Strategic Programme Requirements (SPRs)

Section 4 will describe the concept of operations, the ICAO background, the Regional background and the Objectives and Principles of ATFM in the Qatari context. It will also explain the reasoning behind the selection of the multi nodal ATFM concept for the State of Qatar.

Section 5 will describe the detailed implementation process for all the elements of ATFM in Qatar as well as the relevant stages of implementation of the service.

Section 6 will describe how the normal ATFM phases will be interpreted and applied in Qatar. It will also expand on the various ATFM solutions in Qatar, how it will optimise capacity and how to deal with capacity constraints in Qatar.

Section 7 and 8 deals with the ATFM Communication and ATFM System Requirements as will be deployed, respectively.

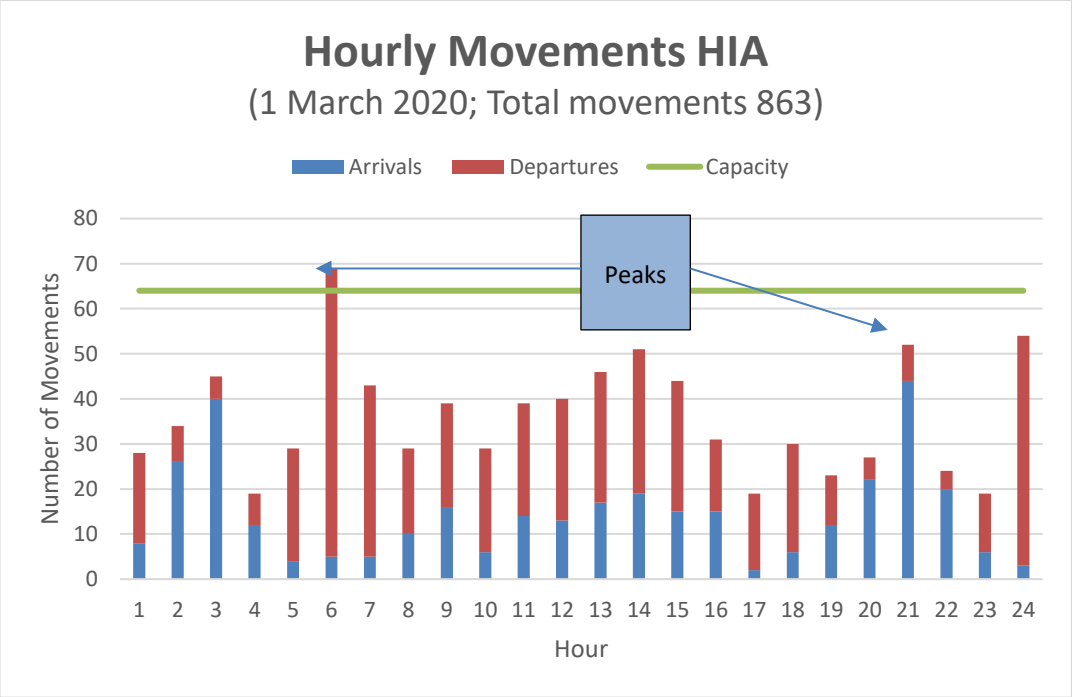
Section 9 and 10 contains the Benefits and a summary of Reference Material, respectively.

Five Annexures (A – E) contain the Project timelines, Training Plan, ATFM Messaging, ATFM Interface Requirements and the Regulatory Framework to support ATFM.

2 THE CURRENT SITUATION AT HIA

a. On 1 March 2020, 863 flights were handled at Hamad International Airport[1]. An analysis of the arrivals and departures on that day shows that the available hourly capacity of 64[2] aircraft movements were already being fully utilized during some hours.

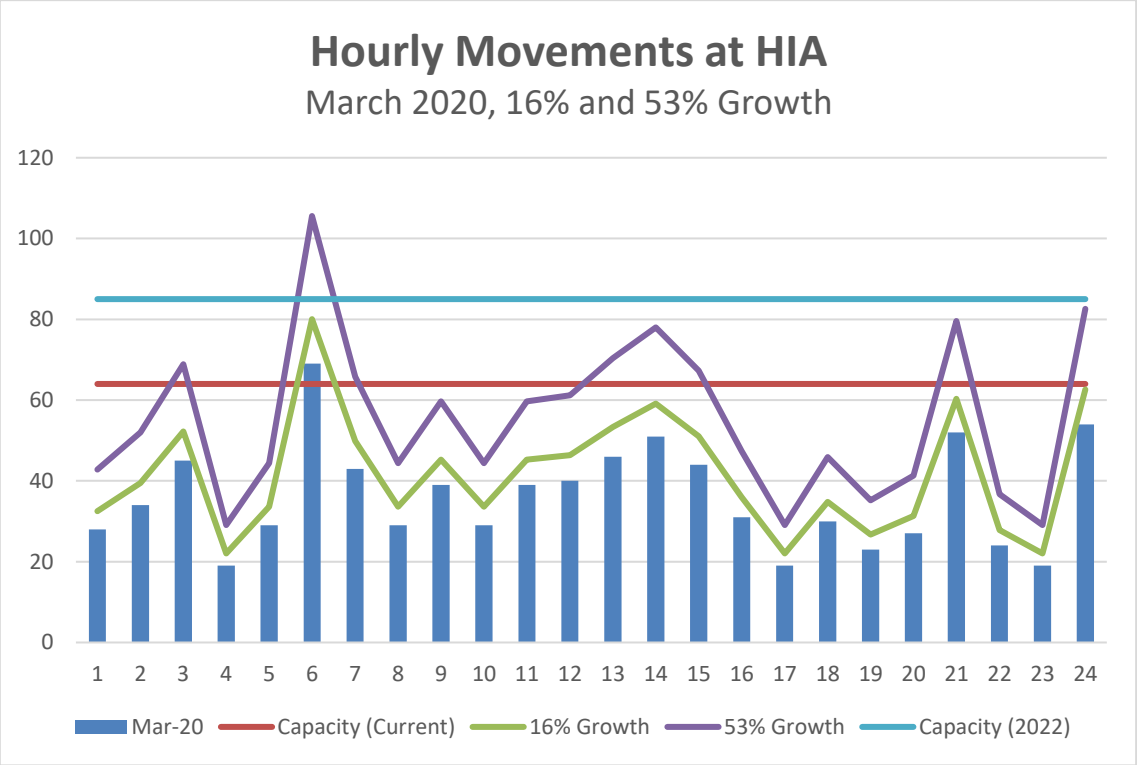
b. This will result in additional delays to departing flights if the hourly demand is not matched to the available capacity. At least two distinct peak traffic periods are identified.



Graph 1: HIA Number of Hourly Movements

[1] The date was chosen as it represents a typical day of two runway operations in pre-COVID conditions.

[2] Seasonal capacity declarations at conducted at HIA. The capacity may vary between 58 and 66. For the purpose of this submission an average of 64 movements (landings and take-offs) will be used.



Graph 2: HIA Hourly Movements

c. It needs to be considered that the peak traffic period that is indicated above is for all departures. As most of these departures are routing through the same TMA exit fix, it adds an additional en-route delay as the peak in departures requires parallel departure operations thereby exceeding the capacity of a single exit fix. This en-route delay would be significantly more as certain routes have dependencies even if departing off different runways.

d. The fundamental problem is that existing capacity is not optimally used.

3 ATFM CONCEPT

3.1 Concept of Operations

a. There is a national need to manage the increasing demand on air traffic control services by means of demand / capacity balancing over the coming years and more so for the air traffic associated with the FIFA World Cup that will be hosted by Qatar in November and December 2022. Additionally, the airspace embargo has been lifted, which will further increase the traffic volumes, further emphasizing the need for a demand and capacity balancing solution.

b. This CONOPS Document has been produced to demonstrate the need for the introduction of Air Traffic Flow Management services within the State of Qatar and to describe the proposed solution.

3.2 Development of Air Traffic Flow Management in ICAO MID Region

a. With the increasing traffic levels being experienced in the Middle East region it has been evident that demand often exceeds the existing capacity. The ICAO MID Region States have sought to address this issue by introducing Air Traffic Flow Management initiatives for the States within the ICAO MID region.

b. This subject was addressed initially with an ATFM seminar held in Dubai, UAE during December 2016. The Seminar recognized the need for a collaborative phased approach toward the implementation of a regional ATFM system in accordance with the region requirements.

c. The main outcomes from the ATFM seminar in December 2016 were:

- establishment of a MID ATFM Task Force Working Group (TF/WG) under the ATM Steering Group.
- development of ATFM Concept of Operations taking into consideration Asia Pacific and Europe experiences.
- expedite MID IFPS project implementation.

d. During this meeting, a conclusion that given the present geopolitical circumstances the Cross-Border Multi-Nodal Model for ATFM was the preferred choice due to the present geopolitical circumstances in the MID region.

3.3 Air Traffic Flow Management Objectives and Principles

a. ATFM is an enabler of Air Traffic Management (ATM) efficiency and effectiveness. It contributes to the safety, efficiency, cost-effectiveness, and environmental sustainability of an ATM system. It is also a major enabler of global interoperability of the air transport industry.

b. Annex 11 to the Convention on International Civil Aviation says, "ATFM shall be implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.[3]" This is supported by ICAO Document 9971 Manual on Collaborative Air Traffic Flow Management, which states, "As a general rule, ATFM is needed whenever airspace users are faced with constraints on their operations, and in areas where traffic flows are significant".

c. As the practice of ATFM has grown since its first implementation, ICAO has recognised that it is necessary for all air navigation service providers (ANSP) to have a common understanding of what ATFM is. To that end, ICAO published the following definition[4]:

> ***"ATFM is a service established with the objective of contributing to a safe, orderly, and expeditious flow of air traffic by ensuring that air traffic control (ATC) capacity is utilised to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate air traffic services (ATS) authority."***

3.3.1 The objectives of ATFM in Qatar

The objectives of ATFM are:

a. enhancing the safety of the ATM system by ensuring the delivery of safe traffic densities and minimising traffic surges. Typical example of a surge is the high-density departure period at HIA between 06H00 to 08H00 in the mornings;

[3] Paragraph 3.7.5

[4] ICAO, Official definition, PANS-ATM Procedures for Air Navigation Services — Air Traffic Management [Doc 4444] 2001, 14th ed. (Amendment 3, 29/06/2004)

b. ensuring an optimum flow of air traffic throughout all phases of the operation of a flight by balancing demand and capacity. When this is achieved, unnecessary fuel burn at the runway holding points at HIA can be minimized, airborne holding is reduced, and ATC capacity is utilized to the fullest ensuring optimal traffic flow when demand is expected to exceed the available capacity of the ATC system.
c. facilitating collaboration among system stakeholders to achieve an efficient flow of air traffic through multiple volumes of airspace in a timely and flexible manner that supports the achievement of the business or mission objectives of airspace users and provides optimum operational choices. Importantly, for QAG this will introduce predictability and consistency of operations.
d. balancing the legitimate but sometimes conflicting requirements of all airspace users, thus promoting equitable treatment.
e. reconciling ATM system resource constraints with economic and environmental priorities. The potential savings from a relatively small base has been demonstrated, it will undoubtedly be larger when the SPR traffic volume targets are being met.
f. facilitating, by collaborating with all stakeholders, the management of constraints, inefficiencies, and unforeseen events that affect system capacity to minimize negative impacts of disruptions and changing conditions; and
g. facilitating the achievement of a seamless and harmonized ATM system while ensuring compatibility with international developments. Traffic arriving from neighbouring airports can be coordinated at departure point, to ensure a smooth traffic flow at HIA and in the HIA Terminal Airspace. Significant airborne delay avoidance will be achieved.

3.4 Air Traffic Flow Management for Qatar

3.4.1 Scenario Choices

Each of the possible scenarios were assessed against 30 criteria, advantages and challenges as discussed above, with a scoring and weighting assessment system. The result was favourable to the Multi-Nodal Cross-Border scenario and was presented to the MIDANPIRG/17 Meeting held in Cairo in April 2019, where the decision was ratified.

3.4.2 Cross Border Multi-Nodal Regional ATFM/CDM

a. A state/ANSP implements and operates an ATFM system based on the application of remote CTOT delivery impacting multiple flight information regions (FIRs) / sectors of airspace or airports coordinated via one single node within the country, illustrated below:

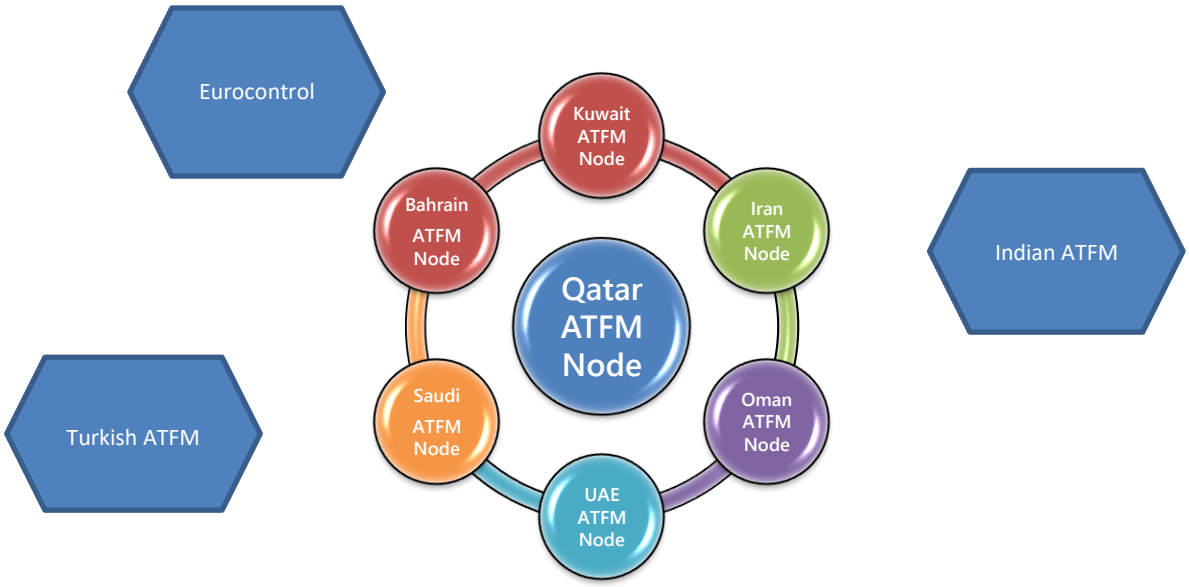


Figure 1: Multi Nodal ATFM

b. In this concept, each ANSP operates an independent, virtual ATFM/CDM node where they are responsible for ATFM/CDM within their own area of responsibility. However, they are supported by an interconnected information-sharing framework. The flows of air traffic will then be effectively managed based on a common set of principles agreed among the participating ANSPs and airports. A node comprising the ANSP and associated airports will be able to manage the demand and capacity through adjustments in aircraft calculated landing times (CLDTs), which will in turn generate CTOTs for aircraft at the departure airport.

c. An ANSP performs demand and capacity balancing within its own area of authority and where ATFM measures require participation of regional and international flights, the flows will be managed by the agreed coordination procedures.

3.4.3 Key Components of the Cross-Border Multi-Nodal Regional Concepts

a. The concept of multi-nodal regional ATFM/CDM is already in use by ANSPs in the ICAO Asia Pacific Region. It should be noted that what follows here describes a mature multi-nodal ATFM system.

b. The key components of the cross-border multi-nodal regional concept are as follows:
    - Multi-nodal stakeholders are interconnected via a virtual communication framework
    - Each ANSP has an independent ATFM system.
    - Each ANSP independently manages demand/ capacity of its own airport(s) / airspace.
    - There is a common agreement to share essential data for ATFM by all multi-nodal stakeholders.
    - Stakeholders and ANSPs in the network communicate via agreed / established communication network.
    - There is harmonised and integrated data exchange between all stakeholders in the multi-nodal network.
    - Accurate prediction can be done either using flight progress via manual input or via an automated data feed such as flight data processing system (FDP), aeronautical fixed telecommunication network (ATFN), or space-based ADS-B.

3.5 Distributed Multi-Nodal ATFM Network

a. The Distributed Multi-Nodal ATFM Network concept is based on a network of ANSPs leading independent ATFM operations within their domain and connected to other ANSPs and stakeholders through effective information sharing mechanism. ATFM in Qatar will consist of two basic components:

- Procedures Common operating procedures and common ATFM operational guidelines and procedures, detailing responsibilities to be borne by QCAA and the stakeholders involved
- System An interconnected information sharing framework is a fully interconnected information sharing mechanism or protocols between stakeholders that ensure efficient communication of ATFM information. This include simple e-mails and

AFTN message exchanges up to automated system-to-system information sharing based on the system-wide information management (SWIM) concept.

b. Through these two components, QCAA will independently implement ATFM measures to regulate traffic into resources where demand exceeds capacity, while other ANSPs and stakeholders in the network can effectively comply with the measures by following the common operating procedure developed. Additionally, an effective communication and information sharing framework allows stakeholders to be involved in the decision-making process during all four phases of ATFM.

c. Below is a graphical representation of the procedures and systems under this concept. In this environment, an arrival ATFM unit (arrival ATFMU) responsible for the constrained resource would implement and publish ATFM measure(s) on a cloud-based information sharing network, while the departure ATFMU and relevant stakeholders subscribe or receive the information and adjust their operations accordingly.

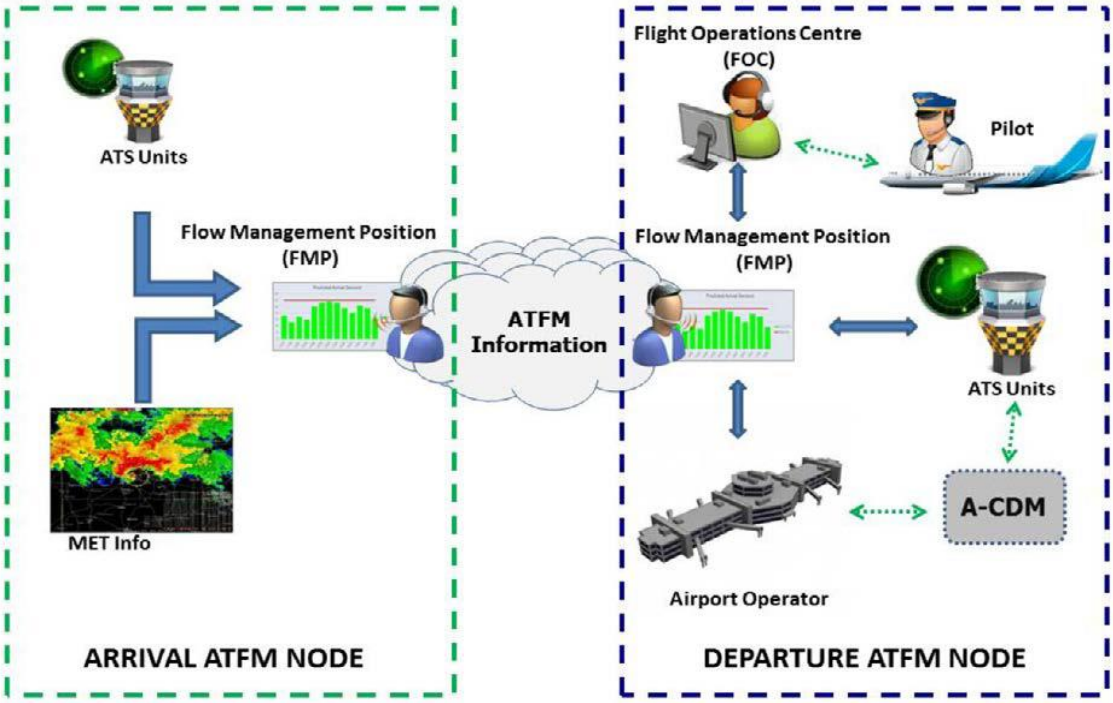


Figure 2: ATFM Nodes

d. The information sharing network also allows for a collaborative decision-making (CDM) process to take place between all relevant parties during the operations.

4 AIR TRAFFIC FLOW MANAGEMENT IMPLEMENTATION PRINCIPLES FOR QATAR

4.1 General Requirements

a. Implementing ATFM in an international environment requires a common understanding and robust coordination among all relevant stakeholders. ATFM implementation shall be supported by QCAA quality and change management processes.
b. ATFM is performed as a CDM process where HIA, QCAA, Airspace Users, military entities, and other stakeholders collaborate to improve the overall performance of the ATM network in the region.
c. ATFM in QCAA will support QR's business model as the primary operator at HIA.
d. The level of an ATFM service required will depend on several factors. Initially it will be a phased solution that balances HIA demand and capacity.
e. Appropriate acceptance will be sought from the Regulator. Such approval includes drafting of new ATFM Regulations and certification of the ATFM Service.

4.2 QATAR ATFM Implementation Elements

The following general elements will underscore the implementation of ATFM in Qatar:

a. a project management approach clearly defines the tasks for each stakeholder and contain milestones. This role will be fulfilled by IBG.
b. QCAA will oversee the implementation process in collaboration with the relevant oversight authorities, involving, when relevant, affected stakeholders. In this regard QCAA will play a vital role with the on boarding of the regulator and stakeholders; and
c. the ATFM Structure in QCAA and personnel who will lead the development of ATFM shall be identified by QCAA.
d. The ATFM/CDM requirements have been assessed, QCAA (or its delegated representative - IBG) will develop the ATFM Implementation Plan.
e. In its initial application, ATFM needs a phased approach processes, procedures or tools. The goal is to collaborate with stakeholders and to communicate operational information to QAG, QCAA, and to other stakeholders in a timely manner.
f. The proposed ATFM system will automate all ATFM related processes. Additional to the automated processes, e-mail and point-to-point telephone calls designed to exchange

information of operational significance and to relay information on factors affecting capacity, system constraints and significant meteorological conditions can be used as redundancy options.

5 AIR TRAFFIC FLOW MANAGEMENT IN QCAA

5.1 General

a. Collaborative Decision Making (CDM) is a key enabler in any ATFM strategy, allowing for the sharing of all relevant information among decision makers and supporting an ongoing dialogue between the various stakeholders throughout all phases of flight. CDM enables the various organizations to keep each other continuously updated on events resulting from the strategic to tactical phases.

b. CDM is built on the principle that all users have equitable access to the airspace and recognizes that stakeholders may have different priorities. It also acknowledges that the ultimate responsibility for the safety of air navigation services lies with the QCAA, which must take the final decision on initiatives to manage the flow of traffic.

> *Note: The goal of Global ATM Operational Concept is an evolution to a holistic, cooperative and collaborative decision-making environment, where the expectations of the members of the ATM community would be balanced to achieve the best outcome based on equity and access. Hence the need to follow a collaborative process to satisfy the requirements of the affected stakeholders. 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.*

c. Timely and regular operational briefings and conferences can not only provide an overview of both the current and future ATM situation, but they also allow for the discussion of any issues and may provide an outlook on operations for the coming period. Traffic patterns and the severity of demand and capacity imbalances will dictate the frequency of those meetings. They will occur on a daily basis at minimum but may also become more frequent depending on the situation (e.g., evolving meteorological events).

d. The outcome of these daily conferences will result in the publication of an ATFM daily plan (ADP) complete with subsequent updates. The ADP will be a proposed set of ATFM solutions prepared by the Qatar ATFM unit, with input from all stakeholders. It will align with the solutions established during the strategic phase and be kept under review, periodically updated and republished as required.

e. Feedback and review from ANSPs, AUs, and the ATFM unit during the post-operation analysis phase of the ATFM process can be used for the continuous improvement of pre-

tactical and tactical planning. This feedback helps the ATFM unit identify the reason(s) for ATFM solutions. The unit can then determine corrective actions to avoid reoccurrence, if possible, and improve the implemented solutions.

f. In addition to the daily conferences, the ATFM unit will hold periodic and post-event analysis meetings to review the effectiveness of ATFM processes, the compliance of AUs and ATC units, the accuracy of meteorological forecasts, etc. The objective shall be to ensure the effectiveness of the chosen ATFM processes after having taken stakeholders' requirements into consideration.

g. ATFM takes place during all phases of the ATM process. In the strategic phase, long-term planning and monitoring of resource capacities takes place. Where possible, long-term measures are implemented to match resource capacities to foreseen traffic demand. Examples include strategic airport slot allocation, military exercises, sporting events, air shows, significant weather systems, planned sectorisation, and ATC roster adjustment. In certain cases, such as planned large-scale airspace/airport disruption (runway/taxiway rehabilitation, CNS maintenance), traffic demands are adjusted via strategic means such as airport slot allocation or flight schedule adjustment long before the day of operations.

h. The process of demand-capacity monitoring continues in the pre-tactical phase, taking into consideration plans developed in the strategic phase, short-term constraints such as weather and equipage serviceability as well as updated traffic demands from adjusted airline schedules, flight permissions, and early submitted flight plans. If demand - capacity imbalance is apparent in the pre-tactical phase, ATFM solutions/measures can be prepared and communicated before execution.

5.2 Graphic depiction of ATFM Phases

The following figure provides a holistic perspective of ATFM Planning and the associated phases. Each of the elements will be discussed in greater detail below.

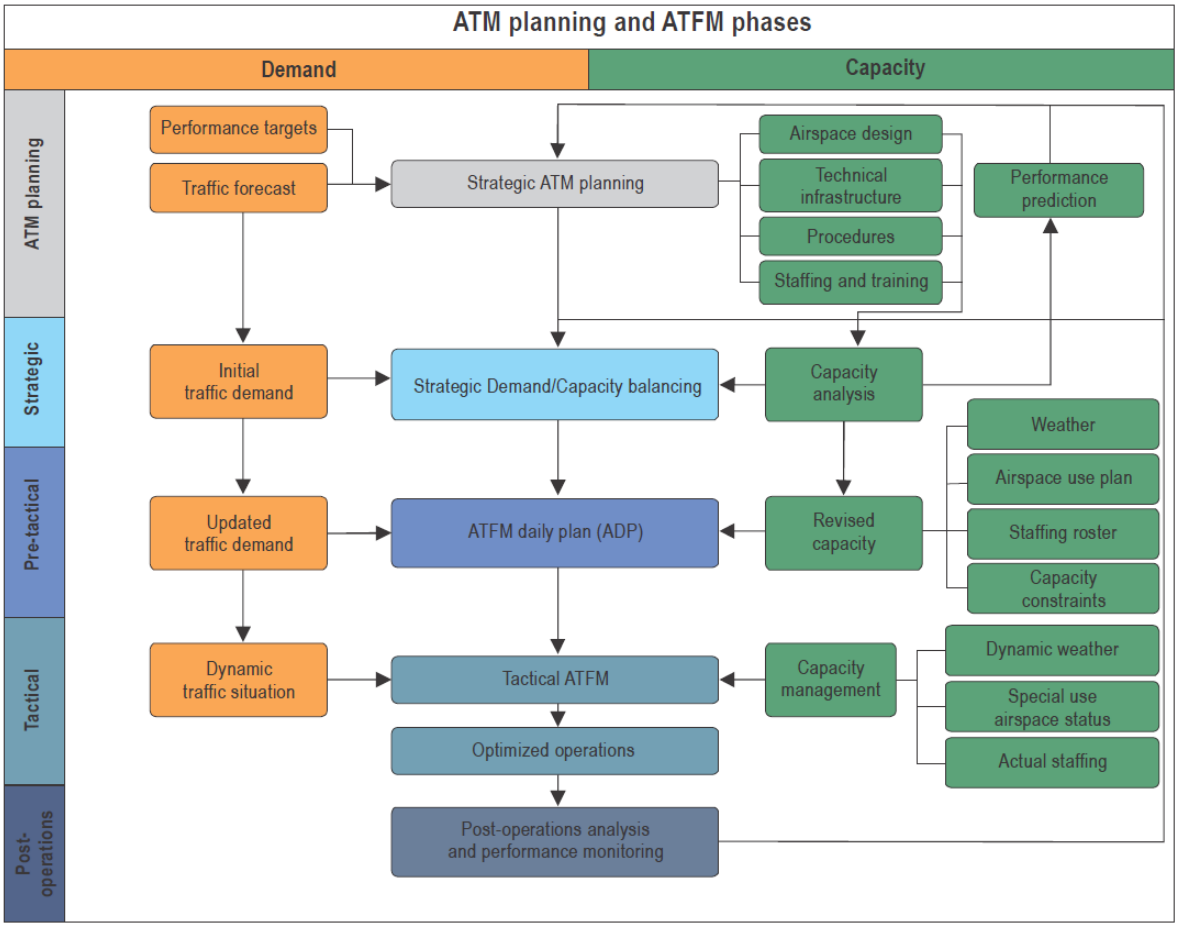


Figure 3: ATFM Planning and ATFM Phases

5.3 ATFM Phases

To balance demand and capacity a methodology is required to minimise the effects of the constraints within the Qatar ATM system. This methodology has several phases which lead to measures taken and solutions provided. ATFM will be carried out in several phases:

5.3.1 ATFM Planning

This is a preparatory activity required for the implementation of ATFM and is a continual process of the long-term planning activities within QCAA. The development of this CONOPS document is the beginning of the process, followed by a review of the airspace design (route structure and sectors); the technical infrastructure; and ATM procedures to search for potential capacity improvements. At this stage it is necessary for all to establish an accurate picture of the expected traffic demand through the collection, collation and analysis of the air traffic data, before moving onto the ATFM execution phase.

5.3.2 Strategic Planning

Strategic planning is normally carried out well in advance, typically from 1 week up to 6 months in advance. This occurs during the 6-monthly scheduling meeting. The strategic phase of planning does not only include scheduling e.g. winter and summer schedule, it can also be for a specific event or situation that can be planned for e.g. FIFA or also equipment upgrades, or loss planned. Strategic planning is carried out in conjunction with QCAA and QAG. It shall consist of examining the demand for the forthcoming season, assessing where and when demand is likely to exceed the available ATC capacity and taking steps to resolve the imbalance by:

a. arranging with the ATC authority to provide adequate capacity at the required place and time.
b. re-routing certain traffic flows (traffic orientation).
c. scheduling or rescheduling flights as appropriate. The operator needs to book a slot to arrive at the airport, but scheduling is not a function of ATFM and it depends on the airport if it is a level 3 co-ordinated airport. Rerouting of flows of traffic can only be done when the routing becomes available and is part of the pre-tactical planning;

Where a traffic orientation scheme (TOS) is to be introduced, the routes shall, as far as practicable, minimize the time and distance penalties for the flights concerned, and allow some degree of flexibility in the choice of routes, particularly for long-range flights.

5.3.3 Pre-tactical Planning

Pre-tactical planning entails fine-tuning the strategic plan in the light of updated demand data and would take place a week before operations. The ATFM Unit staff are responsible for this activity, and changes to the daily plan is communicated via existing ATFM channels. During this phase:

a) During this phase, the traffic demand for the day is analysed and compared to the predicted available capacity. The plan, developed during the strategic phase, is then adapted and adjusted accordingly.
b) The main objective of the pre-tactical phase is to optimize capacity through an effective organization of resources (e.g., sector configuration management, use of alternate flight procedures).

Note: While a CONOPS document is ideally a blueprint for the work methodology, when the work methodology is based on a CDM process

established between the stakeholders (e.g., flow management unit (FMU), airspace managers, AUs), better outcomes have resulted.

c) The tasks to be performed during this phase may include the following:
   i. determining the capacity available in the various areas, based on the particular situation that day;
   ii. determining or estimating the demand;
   iii. studying the airspace or the flows expected to be affected, the aerodrome expected to be saturated, calculating the acceptance rates to be applied according to system capacity;
   iv. conducting a comparative demand/capacity analysis;
   v. preparing a summary of ATFM measures to be proposed and submitting them to the ATFM community for collaborative analysis and discussion; and
   vi. at an agreed-upon number of hours before operations, conducting a last review consultation involving the affected ATS units and the relevant stakeholders, in order to fine-tune and determine which ATFM measures shall be published through the corresponding ATFM messaging system.

d) The final element of this phase is the ATFM daily plan (ADP), which describes the necessary capacity resources and, if needed, the measures to manage the traffic. The plan is based on hypotheses developed in the strategic phase, refined to the expected situation. It should be noted that the time limits of the pre-tactical phase may vary, as they depend on the precision of the forecasts, on the nature of operations within the airspace and on the capabilities of the various stakeholders.

e) The ADP must be developed collaboratively and aims to optimize the efficiency of the ATM system while balancing demand and capacity. The objective is to develop strategic and tactical outlooks for a given airspace volume or airport that can be used by stakeholders as a planning forecast.

f) It is recommended that the ADP cover a 24-hour period, at the very minimum. The plan may, however, cover a shorter period of time, provided that appropriate mechanisms are in place to update the plan on a regular basis.

g) The operational intentions of AUs shall be consistent with the ADP (developed during the strategic phase and adjusted during the pre-tactical phase).

h) Once the process has been completed, the agreed measures, including the ATFM measures, shall be disseminated using an ATFM message, which may be distributed using the various aeronautical communication networks or any other suitable means of communication, such as the Internet, e-mail, etc.

5.3.4 Tactical Operations

Tactical ATFM operations take place on the day it will take effect and shall consist of:

a. executing the agreed tactical measures to provide a balanced and even flow of traffic where demand would otherwise have exceeded capacity;
b. monitoring the evolution of the air traffic situation to ensure that the ATFM measures applied are having the desired effect and to take or initiate remedial action when long delays are reported, including re-routing of traffic and flight level allocation, to utilize the available ATC capacity to the maximum extent.

When the traffic demand exceeds, or is foreseen to exceed, the capacity of a particular sector or the airport the responsible ATC unit shall advise the ATFM unit, and other ATC units concerned. ATC to also advise ATFM in any unusual events e.g. weather, staff or equipment outages. Flight crews of aircraft planned to fly in the affected area and operators shall be advised, as soon as practicable, of the delays expected or the restrictions which will be applied.

5.3.5 Post Operations

During this phase, an analytical process is carried out to measure, investigate and report on operational processes and activities. This process is the cornerstone in developing best practices and/or lessons learned that will further improve the operational processes and activities. It shall cover all ATFM domains and all the affected stakeholders (Annexure F). Post-operations analysis may be used to:

a. identify operational trends or opportunities for improvement;
b. further investigate the cause-and-effect relationship of ATFM measures to aid in the selection and development of future actions and strategies;
c. gather additional information with the goal of optimizing ATM system efficiency in general or for ongoing events;
d. perform the analysis of specific areas of interest, such as irregular operations, special events, or the use of re-route proposals; and
e. make recommendations on how to optimize ATM system performance and to further improve the impact of ATFM measures on operations.

5.3.6 Summary of ATFM Phases

Phase	Who	When	Where	Why
ATFM Planning	ATFM Management and staff	Continuous	At organizational level	To develop the CONOPS, the required airspace infrastructure, the required Technical infrastructure, ATM procedures, staffing practices and associated training
Strategic Planning	Executive management in conjunction with ATFM management	Six months to 1 week before operation	At the ATFM Unit	a. The collection and processing of data with regular review of procedures. b. A review of available capacity. Where there is an imbalance ATFM will try to optimize/maximize the capacity e.g. new procedures or more staff. c. Result of this stage is a plan with what is expected to happen and when/where the imbalance may be.
Pre-tactical Planning	Conducted by ATFM staff	ATFM daily coordination and next day planning	At the ATFM Unit	• Usually a week until day before operation. • Utilizing the plan from the strategic phase, compare the available data to further optimise the plan. • Capacity can be optimized with sectorization, better management of staff etc. • Conduct an analysis of demand vs. capacity and assess the flow that might be affected or airport that might be saturated and calculate the expected maximum rate. • Communicate the proposed solution (CDM). • After consulting final changes or fine tuning can be completed. • The output of this phase is the ATFM Daily Plan.
Tactical Operations	ATFM Staff	Day of operation	At the ATFM Unit / at a flow control position in Operations	In the tactical phase, any plans formulated in the strategic and pre-tactical phases are refined, demand-capacity monitoring and balancing continues with the execution of various ATFM solutions/measures such as capacity enhancements, ground delay programme (GDP), Ground Stop (GSt), or other

Phase	Who	When	Where	Why
				measures prescribed elsewhere in this document and in ICAO Doc 9971.
Post Operations	Data collection by ATFM unit Presentation of findings to executive management Proposal of changes, as required.	Subsequent to Operations, both dynamic and periodic	At the ATFM Unit	To ensure post-operations analysis carried out can provide a view of how a chosen ATFM measure(s) have achieved the desired performance objective

5.4 Air Traffic Flow Management Solutions for Qatar

5.4.1 ATFM Solution Categories

When demand exceeds capacity either at an airport or within a given airspace, a solution needs to be found to correct the imbalance. The QCAA traffic managers and stakeholders shall adopt the least restrictive mitigation and exit strategy for the situation. Typically, ATFM solutions can be categorised into capacity optimisation and ATFM measures. A brief explanation will follow each solution.

5.4.2 Capacity Optimisation

Capacity optimisation is the process of identifying additional capacity to meet the demand placed on the resource; usually by doing this, little or no impact is borne by the airspace users. Typical capacity optimisations for Qatar, as used in ATFM are as follows.

- **Sectorisation** Should it be identified that demand is going to exceed capacity in a particular sector of airspace, active measures such as splitting the sector into two or

more sectors or changing the configuration of the sector to spread the demand may be warranted.

- **Flexible Usage of Airspace** Flexible usage of airspace is one of the most effective ways of increasing capacity. Should demand exceed capacity, Collaborative Decision - Making discussions shall take place with authorities which have primary control over danger, restricted and/or prohibited airspace. This is typically the military or recreational airspace users. By negotiating the use of this airspace during peak demand, additional routings or vertical airspace can be affected and sectors can be amended to facilitate optimisation of airspace.
- **Balancing Arrival and Departure Capacity** Advance planning and facility directives at HIA dictates the establishment of "shared" use runways. This mixed mode operation significantly increases airport capacity and minimise delay.
- **Staff Optimisation** Additional ATC operational staff can be appointed to assist a controller should demand exceed capacity. For example, an executive controller can be appointed to a sector to assist with coordination, clearance creation and delivery.

5.4.3 ATFM Measures

ATFM mitigation strategies, when needed, are necessary measures for managing the flow of air traffic. Use of ATFM initiatives is considered based on both the level of intervention needed and the impact on stakeholders. The measures shall only be implemented when other solutions to optimise the capacity of a resource have been exhausted. An explanation and recommendation for when each ATFM measure shall be implemented is given below.

- **Minimum Departure Intervals (MDIs)** MDIs are tactical ATFM measure applied by setting a MINIT or MIT rate to departure flow.
- **Rerouting** Route-based ATFM measures (horizontal or vertical) aim to remove several flights scheduled to arrive at a constrained ATM resource.
- **Alternative or Advisory Routing Scenarios** Alternative routing scenarios are routes which are made available to airspace users on an optional basis to offload traffic from certain areas.
- **Fix Balancing** Fix balancing is a tactical ATFM measure usually applied during flight that aims to distribute demand and avoid holding and delays. The aircraft is assigned a different arrival or departure fix than the one indicated in the flight plan.

- **Ground Delay Programmes (GDP)** A ground delay programme is a pre-tactical or tactical ATFM measure used to manage capacity and demand in a volume of airspace or at an airport. Aircraft are issued departure times (ATC slots) which correspond to entry times at the constrained airspace or arrival time at the airport. A GDP aims to reduce costly airborne holding and tactical ATC actions (radar vectoring, speed control, etc.) by delivering a manageable flow to the point of constraint for the conditions.
- **Ground Stop (GSt)** Ground Stop is an ATFM measure implemented when a severe unpredicted constraint is encountered in a sector of airspace or at an airport.
- **STAM (Short term ATFM Measures)** An approach to smooth sector workloads by reducing traffic peaks through short-term application of minor ground delays, appropriate flight level capping and exiguous rerouting to a limited number of flights.

5.5 ATFM Measure Selection Flowchart

a. The figure below shows the information to be taken into consideration in deciding whether an ATFM flow measure is required and the measure to be applied.
b. The flow chart is divided into the two resources which are monitored during the ATFM process – airports and airspace. The flow chart will assist flow managers in their decision-making process to manage the resource with least effect on airspace users.

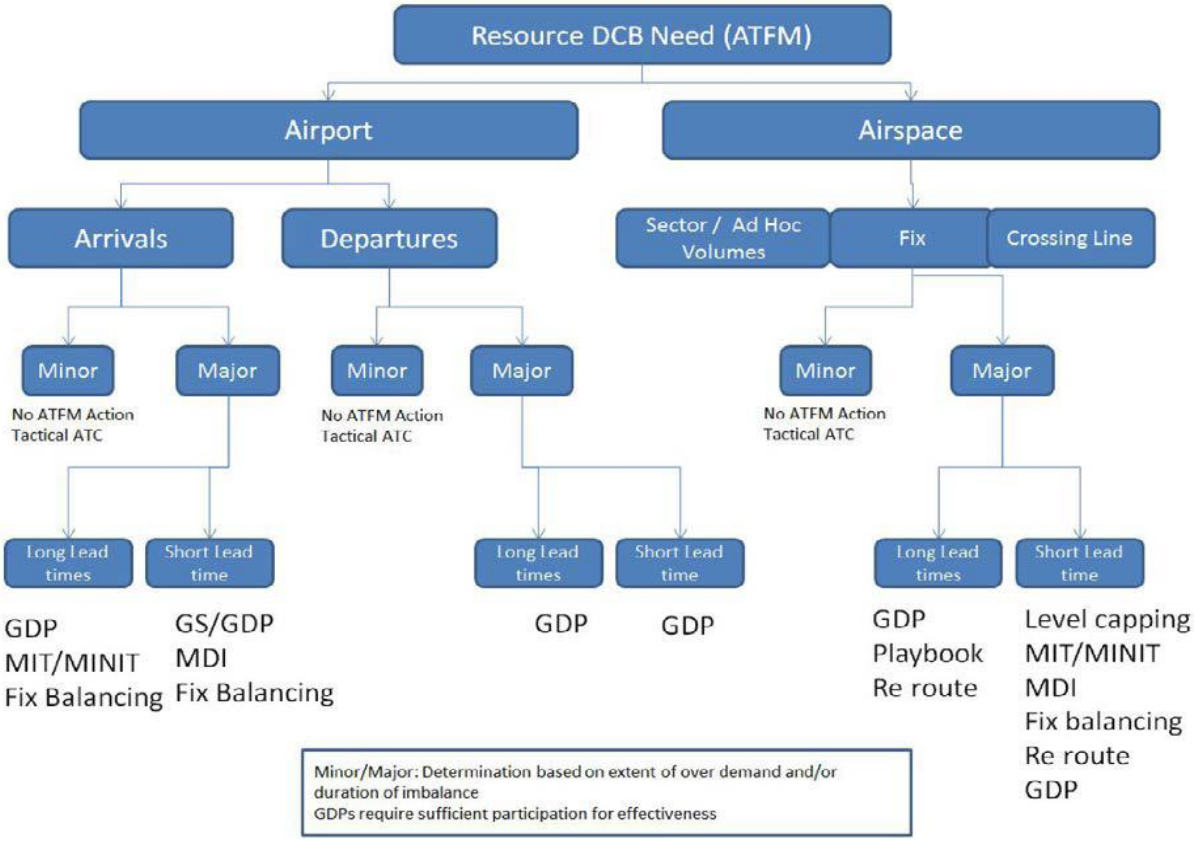


Figure 4: ATFM Measure Flowchart

6 AIR TRAFFIC FLOW MANAGEMENT COMMUNICATION

The ATFM procedures that will be developed for use in Qatar will apply to all flights subject to Air Traffic Flow Control and slot allocation departing from within Qatar or from within an agreed adjacent area. These procedures will describe the functions and responsibilities of ATFM across all stages of ATFM, and most of the functionality and communication and information exchange will be normal system functions. It is however recognized that from time to time some communication and information sharing functions may require ATFM staff to manually interact with the ATFM system to ensure the optimal outcome.

6.1 Communication Exchange

a. The communication and exchange of operational information among stakeholders on a real-time basis forms the backbone of ATFM. This exchange may be accomplished by a variety of means including telephone calls, web conferences, e-mail messages, and electronic data exchange including, but not limited to web page displays. The purpose of the information exchange is to increase stakeholder situational awareness, improve operational decision-making, and enhance the efficiency of the ATM system in Qatar.

b. The ATFM unit requires several layers of communication. As a basis for the exchange of information, notices to airmen (NOTAMs) and AIP supplements could initially be used to distribute instructions relating to the application of ATFM measures. For example, strategic ATFM routing information and certain ATFM operating procedures could be published as a NOTAM or in the AIP supplement.

c. The State of Qatar AIP will include information on specific arrangements for dealing with ATFM issues and coordination matters, in the same section as is located the brief description of the ATFM system. The AIP shall also include the telephone numbers of relevant ATFM units, in the event that they would need to be consulted for advice and/or information.

d. For consistency, the QCAA shall ensure that a single entity oversees the dissemination of ATFM information as well as its measures, and is responsible for monitoring, collecting and disseminating the information. This will ensure that applicable information is shared by all

ANSPs and operational stakeholders in a timely and efficient manner. As a best practice, this information shall be available electronically and kept current.[5]

6.2 ATFM Information

ATFM information in QCAA will include:

a. meteorological (MET) information having an effect on capacities (e.g., winds, runway visual range (RVR), thunderstorms (TS);
b. aerodrome and approach control (APP) infrastructure issues affecting routings or capacity;
c. capacity-limited APP areas including SIDs and STARs;
d. current and planned aerodrome runway configurations;
e. airport arrival and departure rates;
f. airport arrival and departure demand; and
g. applicable ATFM measures and off-load options;
h. en-route sector configurations, capacities and demands;
i. infrastructure issues affecting routings or capacity; and
j. airspace issues affecting routings or capacity (e.g., reserved airspace).

[5] A non-exhaustive list of the ATFM messages can be found in Annexure C.

7 AIR TRAFFIC FLOW MANAGEMENT SYSTEM REQUIREMENTS

7.1 General Capabilities

The ATFM system will have the following capabilities:

a. Demand prediction and monitoring for airport and airspace resources in the strategic, pre-tactical, and tactical timeframes[6]
b. Perform Demand / Capacity Balancing of a selected resources through modelling, initiation, monitoring, and revision of automated ATFM Measure during the strategic, pre-tactical, and tactical phase
c. To take tactical ATFM/CDM actions (GDP/AFP/GS) at short notice (i.e., within a 5-minute time-period).
d. Automated CDM with Aircraft Operators, Airport Operators, and other ANSPs.
e. Common situational awareness for stakeholders, for example but not limited to, awareness of demand and capacity at airports/airspaces/fixes/routes, anticipated delays, allocated COBT, CTOT, CTO, ETA, etc.
f. Record operational data
g. Post Operations analysis and performance reporting
h. Automated reporting on the performance of an ATFM Measure and the benefits of an ATFM measure, both of which are capable of drill-down type analysis
i. System administration, monitor, and control
j. Adaptation reference data administration

[6] Timeframes are defined based on ICAO 9971: Tactical = day of operations, pre-tactical = one day to one week prior to the day of operations, strategic = any time more than one week prior to the day of operations, post-operations = begins after flight has arrived at the gate or after the ATFM Measure has ended, depending on the context.

7.2 Collaborative Decision Making in ATFM

Group decision-making (or collaborative decision-making) is a situation faced when affected role players collectively make a choice from the alternatives before them. The decision is then no longer attributable to any single individual who is a member of the group.

a. The system will provide a web-based interface for authorized users to access flight-specific data for the purpose of decision making. Users of the web-based interface include, but are not limited to, ANSP users (e.g., Flow Managers, Area Control Centre users, Approach Control users, Air Traffic Control Tower users), aircraft operator users (e.g., operations centres users, airport operations users), and airport users.
b. The system provides a system-to-system interface for authorized external systems (e.g., other ANSP ATFM/CDM systems, aircraft operator systems, airport systems, A-CDM) to exchange data related to flights, resources, and ATFM Measures.
c. The system provides authorized users with the capability to dynamically configure, filter, and sort the web-based Flight List.
d. The system provides authorized aircraft operator users the capability to update flight-specific data, pre-departure, for their flights.
e. The system provides authorized aircraft operator users the capability to provide batch flight schedules and flight schedule updates.
f. The system provides authorized aircraft operator users the capability to cancel a flight. If the flight is part of an implemented ATFM Measure, the assigned slot can be held for a period of time for subsequent use by the aircraft operator.
g. The system provides authorized aircraft operator users with the capability to substitute slots associated with their own flights. Specifically, A CDM platform for the aircraft operator users to optimize their schedules through slot substitutions etc.
h. The system provides authorized aircraft operator users with the capability to substitute a flight's slot with an unassigned slot.
i. The system provides authorized aircraft operator users with the capability to perform a blind trade of their slot for a later slot in a user-specific time window that results in delay reductions to one or more other flights.
j. The system provides authorized aircraft operator users with an indication if their flight's delay has been reduced due to a blind trade requested for another flight.
k. The system provides authorized aircraft operator users with the capability to specify a flight-specific operational time that the system will not move a flight earlier than to protect

an aircraft operator's operational decision. Aircraft operators can move their own flights earlier than this time.

l. The system provides authorized ANSP users with the capability to specify the maximum delay permitted to be absorbed at the parking stand, on the surface – not at the parking stand. The remaining allocated delay is expected to be absorbed in flight via flight planning intent.
m. The system provides the ability for authorized users to exchange an ATFM daily plan (ADP).
n. The system provides the ability for authorized users to view an Operational Information System, on which relevant NOTAMs, ADP and ATFM measures are provided for informational purposes.
o. The system provides the ability for an authorized user to curate NOTAMs such that a specific subset of all available NOTAMs are displayed on the OIS.
p. The system provides the ability for an authorized user to provide text-based comments on individual flights for display through the OIS page.

7.3 Equipment

7.3.1 System Architecture Requirements

The vendor will define the system architecture for the ATFM system including system hardware, networking, network devices (e.g., routers, firewalls, switches), storage, external interface connectivity, required bandwidth to support end users, and end user positions and connectivity.

7.3.2 Three distinct environments

The system architecture will support the following distinct environments:

a. Operational: The primary environment used for operational ATFM. Requirements for availability, user load, flight load, and long-term data storage apply to this instance.
b. Test/Training: A second instance of the ATFM that supports user training and testing of software/adaptation/system updates prior to use on the Operational instance.
c. Backup (Recommended): A Backup instance is required to support a complete failure of the Operational instance.

7.3.3 Location

The system architecture will support the following distinct environments:

a. Operational: The primary environment used for operational ATFM. Requirements for availability, user load, flight load, and long-term data storage apply to this instance.
    i. Operational ATFM includes the Flow Management Unit (FMU) and the Flow Management Positions (FMP). The FMU houses two FMPs in a dedicated office space and is the primary FMP.
    ii. ATFM System access is also available at the ATC Supervisor's workstation at the supervisor's desk in the operations room for tactical ATFM applications.

7.4 ATFM Data Requirements

a. Multi-nodal ATFM provides a path for ANSPs in a common geographic region to autonomously deploy ATFM/CDM systems and processes. It sets technical requirements for the implementation of the regional ATFM operational concept in Qatar for cross-border ATFM.
b. In order for QCAA to develop ATFM services which operate in a multi-nodal environment, a standard interface definition is required for ATFM-service-to-ATFM-service data and control exchange. Regional and global interoperability of communications is critical to the implementation of effective, network-based cross-border ATFM. The Standard Interface Definition can be found in Annexure D
c. The ATFM-service-to-ATFM-service interface definition at HIA will address the following data types and controls:

    1) flight information (e.g., flight identification, aircraft type, departure aerodrome (ADEP), destination aerodrome (ADES), expected event time (e.g., off-block time (OBT), take-off time (TOT), landing time (LDT), and in block time (IBT)), route of flight, source of flight intent information);
    2) resource information (e.g., aerodrome configurations, airspace configurations, capacity, route availability);
    3) ATFM measure information (e.g., constrained resource (e.g., aerodrome or airspace), start and end times, type (e.g., GDP, GSt, MINIT or MIT); and d) CDM actions (e.g., pre-flight flight cancellations, slot substitutions, flight intent updates).

7.5 Data Management

The primary data for ATFM services in Qatar and elsewhere is reliable and accurate flight intent data. This data will be provided by the various organizations responsible for the authorization or execution of flights. The following data associated with flight intent are to be provided to ATFM services for use in demand predictions:

a. Airspace Users marketing schedule data; (Official Airline Guide OAG, or something similar);
b. Airport strategic slot data or any strategic slot allocation system;
c. ATM automation system data (e.g., ATS messages via aeronautical fixed telecommunication network (AFTN) or ATS message handling systems (AMHS), or data provided by the flight data processing (FDP) component) including:

    1) flight plans (FPL ATS message or comparable data);
    2) flight plan amendments (CHG ATS message or comparable data);
    3) flight plan cancellation (CNL ATS message or comparable data);
    4) indication of departure (DEP ATS message or comparable data)
    5) indication of arrival (ARR ATS message or comparable data);
    6) indication of flight delay (DLA ATS message or comparable data); and
    7) flight coordination (CPL and EST ATS messages or comparable data);

d. forecast weather data (usually GRIB-2 formatted);
e. FIR aeronautical data in electronic format and in AIX 5.1 format; and
f. correlated surveillance data (e.g., ADS-B, SSR, WAM, MLAT) via a surveillance feed via TCP/IP in CAT-062 format.

7.5.1 Graphic depiction of ATFM Data Requirements

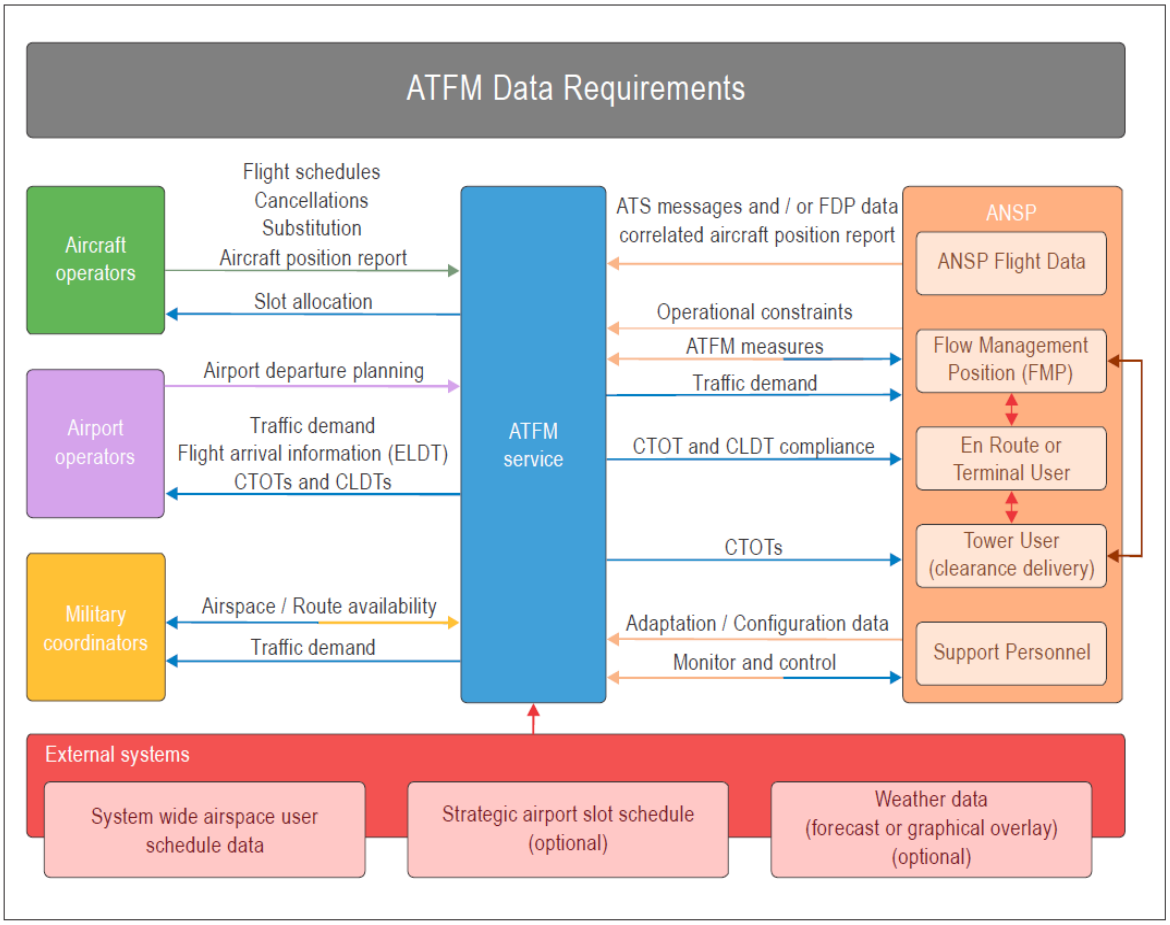


Figure 5: ATFM data Requirements

8 CONCLUSION

8.1 Production of the CONOPS

This CONOPS was developed by the user community to communicate the vision for the operational system to the acquisition and developer community.

8.2 Stakeholders

The stakeholder identification, roles and responsibilities are described in Annexure F.

8.3 Assumptions to be tested

There are no known assumptions in this CONOPS which need to be tested.

8.4 Risks due to disrupted / abnormal operational concepts

There are no known risks to normal operations foreseen in this CONOPS.

8.5 Items to be further described in other project documents

The following items need to be described in other project documents:

a. Training Plan
b. Interface Control Documentation
c. Implementation Plan
d. Standard Operating Procedures

8.6 Sign-off from stakeholders

The normal document approval process will apply to this document.

8.7 AIR TRAFFIC FLOW MANAGEMENT BENEFITS

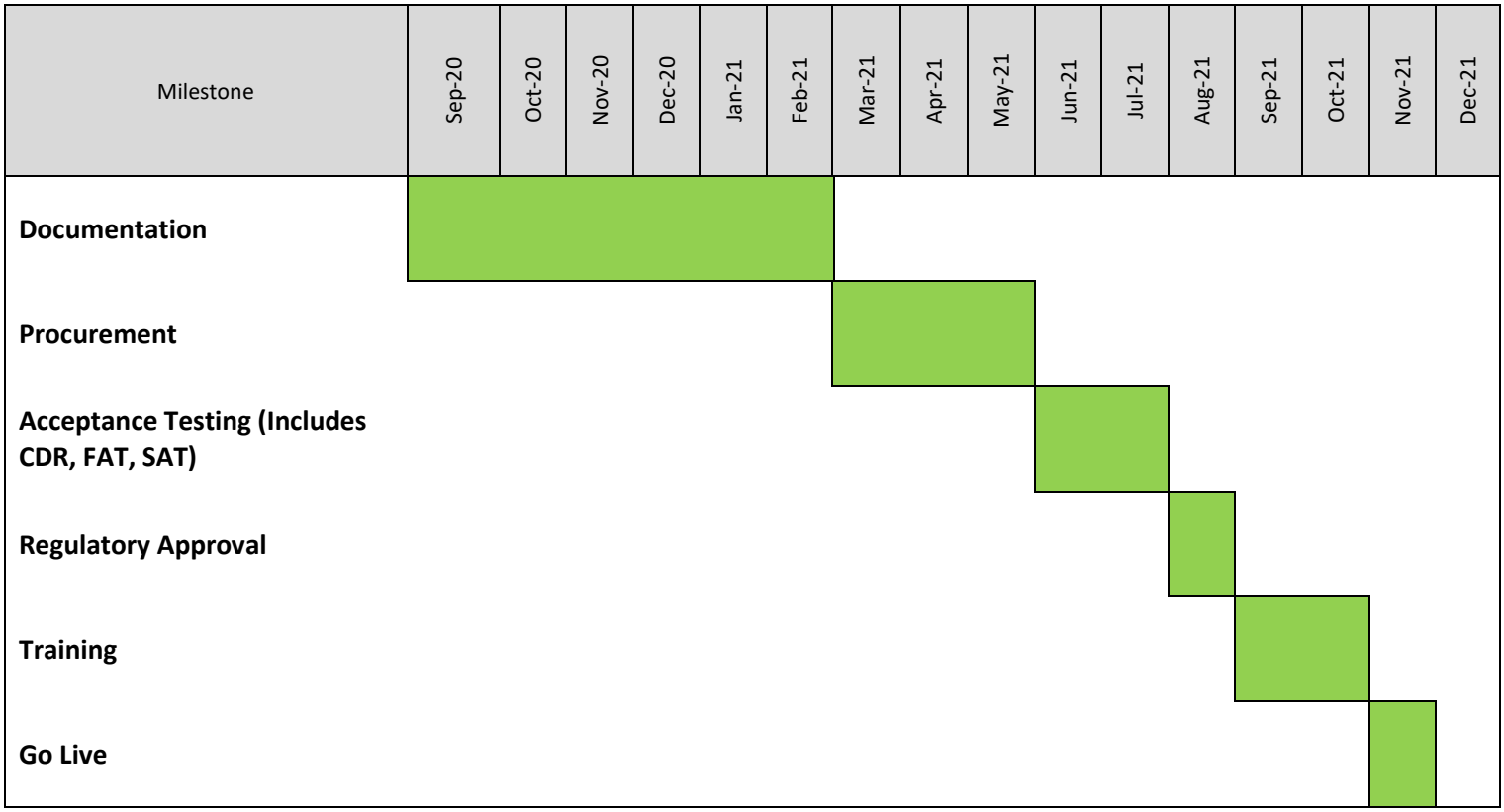
The operational benefits of ATFM in Qatar cover various domains of the ATM system which include:

a. enhanced ATM system safety throughout the ATM Value Chain from increased system operational efficiency and predictability through CDM processes for all stakeholders. These include, but are not limited to QAG, HIA, other role players;
b. effective management of capacity and demand through data analysis and planning with airlines avoiding significant fuel burn on the ground;
c. increased situational awareness among stakeholders and a coordinated, collaborative decision-making process;
d. development and execution of operational plans provides predictability to all stakeholders with fewer surprises and an ability to have a reasonable expectation around a day's operations;
e. improved punctuality, reduced fuel burn and other airspace user operating costs;
f. effective management of irregular operations and effective mitigation of system constraints and consequences of unforeseen events; and
g. provision of post-operational data related to traffic movements available to stakeholders.

9 APPLICABLE DOCUMENTS, STANDARDS AND REGULATIONS

- ICAO Global Air Navigation Plan (GANP)
- ICAO Air Traffic Management Operational Concept (ATMOC);
- Doc 4444 (Procedures for Air Traffic Management),
- Annex 2 (Rules of the Air),
- Annex 11 (Air Traffic Services).
- Local Air Traffic Control Instructions (LATCI) Edition 15
- ICAO Global Air Navigation Plan (GANP);
- ICAO Air Traffic Management Operational Concept (ATMOC);
- ICAO Doc 9971 Manual on Collaborative Air Traffic Flow Management (ATFM);
- Implementing Air Traffic Flow Management and Collaborative Decision Making, CANSO;
- Updated QCAR, as developed, approved and published.
- Manual on the System-Wide Information Management (SWIM) Concept (Doc 10039)

10 ANNEXURE A: WP 1.2.2 TIMELINES



11 ANNEXURE C: ATFM MESSAGES[7]

Number	Message	Description
1.	SAM – Slot Allocation Message	The SAM is used to inform AOs and ATS of the Calculated Take-Off Time (CTOT)
2.	SRM - Slot Revision Message	To notify all concerned of either a significant change (>5') to the original CTOT.
3.	SLC – Slot Cancellation message	An SLC is sent to AOs/ATS to advise that a flight which has received a CTOT is no longer subject to an ATFM restriction.
4.	SIP – Slot Improvement Message	A Slot Improvement Proposal message is sent to the AO by the ATFM UNIT for a flight to propose a new take-off time if it is possible to improve the existing.
5.	REA – Ready message	The REA message can only be sent by ATC following a request from AO. AO may ask ATC to send REA in 2 situations: 1. The flight is ready to depart before the EOBT (maximum 15 minutes before) 2. The flight is ready to depart before its CTOT
6.	FLS - Flight Suspension Message	The ETFMS indicates with an FLS that this flight is considered as not taking off. The flight data are kept in the database but suspended (non-availability of an aerodrome for a long period).
7.	DES - De-Suspension Message	This ATFM message indicates that a flight which was previously suspended is now de-suspended.
8.	RRP - Rerouting Proposal Message	This message is sent to an AO to offer a different CTOT or to avoid the need for a slot on a new route.
9.	RRN - Rerouting Notification Message	This message is sent to an AO to notify a rerouting triggered through the NM Client Application.
10.	ERR - Error Message	The error message indicates that an error has been found in a message previously received by ETFMS.
11.	SMM - Slot Missed Message	This message is originated by an AO when a slot time given in the SAM cannot be achieved but where a new EOBT cannot be supplied.
12.	SPA - Slot Improvement Proposal Acceptance Message	This message is a positive response to a Slot Improvement Proposal (SIP) message.
13.	SRJ - Slot Proposal Rejection Message	This message is confirmation that an AO cannot comply with a Slot Improvement Proposal (SIP) message.
14.	RFI - Request for information Message	The RFI message is used by the AO to change the flight's readiness status from SWM (RFI NO) to RFI. The RFI status of the flight will be set to YES.

[7] This is a non-exhaustive list. Final Operational Procedures will refine this list.

Number	Message	Description
15.	SWM - Sip Wanted Message	The SWM message is used by the AO to indicate that it cannot accept SRM when an improvement is possible but wants to be in a position to refuse an improvement. The RFI status of the flight will be set to NO.
16.	FCM - Flight Confirmation Message	An AO indicates to ETFMS the RVR capability of a flight with an EOBT in the future.
17.	RJT - Rerouting Rejection Message	Used by an AO to reject an RRP message.

12 ANNEXURE E: REGULATORY REQUIREMENTS TO SUPPORT ATFM

a. A national Qatari Regulation that describes and regulates the service will be developed, submitted for approval and adopted. The Regulations will describe, among other:
    i. Air traffic flow management framework
    ii. General obligations of the Air Navigation Services
    iii. Obligations of the Air Navigation Services concerning the ATFM Unit
    iv. General obligations of ATS units
    v. General obligations of operators
    vi. General obligations of airport operators
    vii. Consistency between flight plans and airport slots
    viii. Obligations concerning critical events
    ix. Monitoring of compliance to ATFM measures
    x. Performance assessment
    xi. Safety requirements
    xii. Additional requirements
    xiii. Penalties
    xiv. Entry into force and application
b. ICAO provisions for ATFM are contained in Chapter 3, Section 3.2 of Doc 4444. Regional ATFM provisions will be published by means of Doc 7030 by each ICAO region where ATFM is established.
c. Detailed procedures for the application of flow management in Qatar will be published by means of the QCAA ATFM operations manual and temporary operational instructions for each flow management area.
d. Due to the wide and collaborative nature of ATFM provisions, the operational procedures will be published and will be freely available to all ATFM stakeholders.
e. A summary of flow management procedures will be published in the Qatar AIP (Annex 15, Section ENR 1.9).
f. ATFM will be subject to the oversight of the responsible national or regional regulatory oversight body. Whereas ATFM does not have the same safety impact as ATC, it is nevertheless suggested that an appropriate level of regulatory oversight be established.
g. Regulatory authorities are important stakeholders in ATFM. They will therefore be fully involved in the development and implementation of the ATFM process, as soon as possible from the project's conception.

13 ANNEXURE F: ROLES AND RESPONSIBILITIES OF STAKEHOLDERS IN THE QATARI ATFM SERVICE

a. This section describes the roles and responsibilities of the various stakeholders relevant to ATFM operations in Qatar. These stakeholders form the backbone of the Collaborative Decision Making (CDM) processes established to support ATFM.
b. When local experience dictates that stakeholders other than those presented in this section are needed, the affected parties will be included in the stakeholder approach by means of a collaborative process.

13.1 Flow management unit (FMU)/flow management position (FMP)

The QCAA FMUs/FMPs monitor and balance traffic flows within their areas of responsibility in accordance with ATM directives. They also direct traffic flows and implement approved traffic management measures. Their operations are overseen by the appropriate authority. FMU/FMP duties will include:

a. liaising with the ATS units within their area of responsibility to understand the current and anticipated capacity conditions;
b. collecting all relevant information, such as meteorological conditions, capacity constraints,
c. infrastructure outages, runway closures, automated system outages, and procedural changes that affect ATS units. This may be accomplished through various means available, such as teleconferences, e-mail, Internet, or automated data gathering;
d. ensuring the distribution of all relevant information to the appropriate stakeholders, relying on the CDM processes supporting ATFM operations, and on the structures implemented to disseminate the information (such as websites, for example);
e. coordinating, with the affected stakeholders relying on CDM processes, the formulation of strategies to manage the flows in order to deal with, in accordance with the scenarios established at a strategic level, anticipated capacity/demand imbalance including those processes pertaining to routine operations, significant meteorological conditions, abnormal levels of traffic demand, and more generally to significant capacity constraints, planned or unplanned. Such coordination generally involves daily telephone and/or web conferences as required;
f. creating and distributing the ATFM daily plan (ADP) based on the previous coordination;
g. executing the daily plan and continuously monitoring, in real time, the ATM system, managing ATFM measures (implementing or cancelling them when no longer required,

adjusting hourly capacities, etc.) in coordination with the relevant units (meteorological units, adjacent ATS and ATFM units, etc.);

h. documenting, in real time, a complete description of all ATFM measures (for example, ground delay programmes, miles-in-trail) in a designated log. This shall include, among other data, for each measure, the start and end times, the affected stakeholders and flights, and its justification; and
i. managing regular (daily as well as at ad hoc intervals) post-operations analyses, participating in continuous improvement programmes.

13.2 Airspace users (AUs)

AUs in Qatar participate in the ATFM process by providing and updating flight plan or airspace utilization information as well as by participating in CDM processes (e.g., discussing ATFM strategies to improve flight efficiency and participating to share their priorities with the other stakeholders). AUs are essential stakeholders in the CDM processes and generally participate in telephone conferences and/or provide input and participate as CDM web-based interfaces.

The term “airspace user” is a broad denomination and encompasses different actors, both civil and military. Their actions can therefore be broken down by function, into airline operation centres, pilots, and military authorities. AUs encompass all entities that make use of airspace and that affect the availability of airspace.

The role of the AU is to:

a. provide strategic input into capacity/demand scenarios and mitigation plans, including internal measures such as schedule compression;
b. ensure that the latest schedule information and flight planning information are supplied to the ATFM service;
c. participate in ATFM/CDM teleconferences;
d. provide tactical input into capacity/demand scenarios and the selection of required appropriate ATFM measures;
e. perform mitigating actions supported by the ATFM service;
f. ensure ATFM information such as ATFM measures (calculated take-off time (CTOT)) is distributed to each affected flight;
g. comply with the ATFM measures in place, for example, CTOT compliance; and
h. participate in post-event analyses.

13.2.1 Pilots

Pilots play a specific role in ATFM insofar as they are to operate their flights in compliance with relevant ATFM measures. This may include adhering to controlled times, re-routes, or altitude capping restrictions. Pilots also have the responsibility to communicate with ATC if they foresee not being in a position to comply with a given measure.

They shall be aware of the ATFM measures intended to affect them, in order to ensure that the flight is not operated in a way that intentionally negates the delay absorption measure (e.g., accelerating to offset the effects of a GDP).

13.2.2 Military

The Qatari military users have specific requirements and require an environment wherein their mandate can be fulfilled. Their needs and the impact of their actions on the network can carry significant consequences. Military users therefore have a specific role to play in ATFM. Their use of airspace ranges from reserving blocks of airspace needed for the conduct of specific missions to operating flights in the exact same way as a civilian operator. For the purpose of simplicity, in this section the term military user refers, without distinguishing among them, to military authorities, flying units and non-flying airspace users (such as ranges, etc.). As far as ATFM is concerned, military users are therefore expected to:

a. provide airspace utilization plans to the appropriate ATC and ATFM units in a timely manner in accordance with flexible use of airspace (FUA) principles when relevant;
b. ensure that operations comply with the agreed-upon FUA plan and advise the appropriate unit immediately of completion or cancellation of FUA operations;
c. participate in ATFM/CDM teleconferences or provide input to the calls;
d. ensure that the latest flight information is supplied to the ATFM system;
e. ensure that the flights comply with the ATFM plan in place;
f. coordinate with the ATFM/ATC unit(s) for tactical release of airspace or permission to fly through restricted/active airspace when required by circumstances; and
g. participate in post-event analyses.

13.3 ATS units

QCAA ATS units providing the various ATC services play a central role in ATFM. Whereas each unit controls flights at different moments, the roles and responsibilities of ATS units are similar within their specific area of responsibility (aerodrome, approach, area). They are expected to:

a. participate in relevant ATFM/CDM teleconferences;
b. provide input regarding capacity and configuration for their area of responsibility;
c. provide strategic input into capacity/demand scenarios;
d. provide pre-tactical input into capacity/demand scenarios;
e. provide tactical input into capacity/demand scenarios;
f. deliver aircraft as per the ADP, ensuring compliance with ATFM measures;
g. monitor resource throughput and ATC workload during ATFM situations and request amendments, when necessary;
h. liaise with the unit responsible for ATFM to ensure that the ATFM plan is suitable, if not part of an ACC/approach control unit; and
i. participate in post-event analyses.

13.4 HIA / DIA Airport operators

Airport operators' involvement can be direct, or when they operate from an airport collaborative decision-making (A-CDM) standpoint, coordination can occur through the A-CDM structures. In terms of ATFM, airport operators are expected to:

a. participate in relevant ATFM/CDM teleconferences;
b. provide input to the strategic capacity declaration of airports;
c. coordinate with the pertinent ATFM/ATC unit and affected airspace users to schedule activities such as construction, maintenance and repairs or snow removal that will affect the flow of traffic or the airport capacity;
d. participate in CDM coordination discussions where the airport capacity will be affected by meteorological conditions, maintenance or other airport-related issues; and
e. participate in post-event analyses.

13.5 Meteorological service provider

There are a variety of meteorological phenomena that can impact traffic and trigger the need for flow management. As a result, MET information providers play a crucial role in ATFM, both in

forecasting those events to mitigate their consequences, as well as in providing accurate real-time meteorological information. Adverse meteorological conditions can impact an aerodrome — in which case MET service providers would be involved in ACDM if it has been set up for that aerodrome (thunderstorms, fog, significant changes in surface wind speed or direction) — or can cover large portions of airspace (squall lines, tropical cyclones, frontal systems, etc.). The involvement of MET services in ATFM is systematically relevant, whether it is direct or indirect (in the case of A-CDM processes, for example).

In the Qatari ATFM service, QCAA Meteorology service is expected to:

a. participate in ATFM/CDM coordination discussions (teleconferences) where meteorological conditions will affect capacity;
b. provide accurate and timely information on meteorological conditions at aerodromes, digital gridded forecasts of upper wind and temperature, and information about significant meteorological conditions that have an influence on capacity of a given volume of airspace or an airport; and
c. participate in post-event analyses.

13.6 States

Even though States and State authorities are not required to be systematically involved in the daily operations of ATFM, they still have specific responsibilities, the first of which is, to ensure that ATFM is “implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.”

States are also responsible for the publication of ATFM procedures and information in the State AIP. The QCAA as delegated service provider will be responsible for this role.

- END -