ICAO

الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

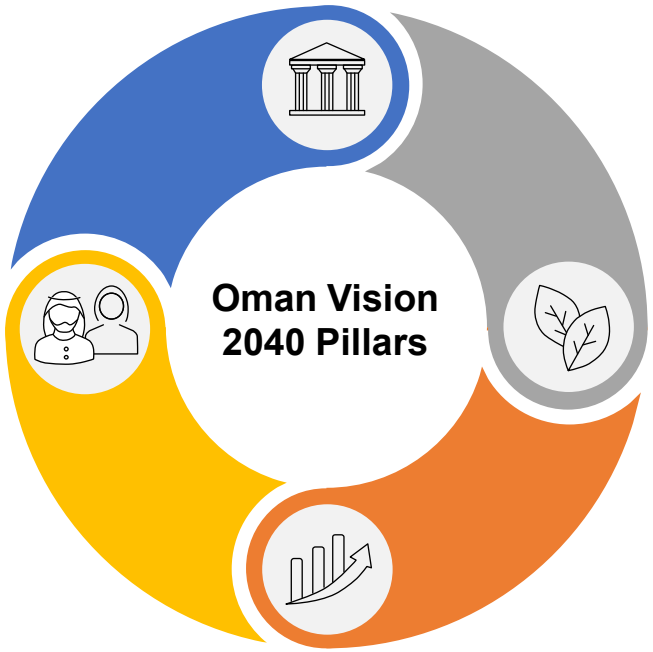
ATM SG/11 & CNS SG/14 MEETINGS

19-23 Oct. 2025 Abu Dhabi, UAE

Oman Airspace Strategic Project

Airspace Enhancement and Optimization Initiative at the interface between the Middle east and Asia pacific region

Oman CAA has set the strategic objectives for the Airspace Project that are aligned with the Oman CAA's strategic vision and the country's 2040 Vision



Responsible State Agencies

An Environment with Sustainable Components

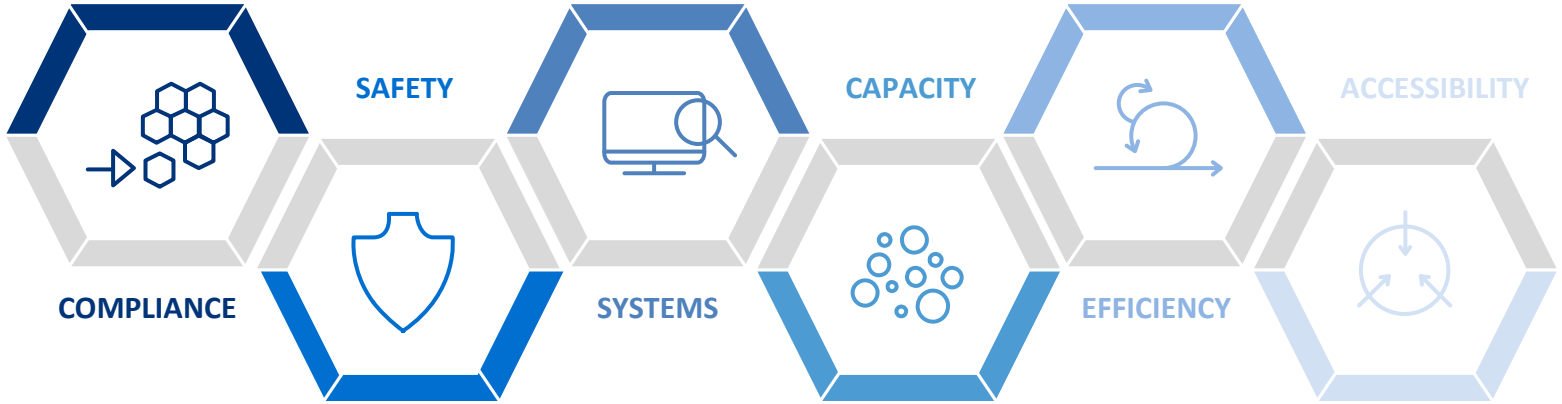
A Society of Creative Individuals

A Competitive Economy

Airspace Enhancement Objectives

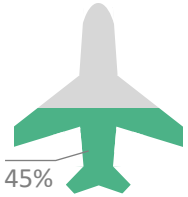
- Improved Airspace Design
- Deployment of latest ATM Technology
- FUA Implementation
- FRA Adoption
- Reduce the CO_2 emissions

Project Objectives



The project is to be developed in eight Work-Packages, with a structured schedule and a breakdown of every task to perform

33 *tasks*



15 *tasks started*

WP0. Project start

3 *total tasks*
0 *tasks in progress*
3 *tasks completed*

WP1. Actual scenario review

4 *total tasks*
0 *tasks in progress*
4 *tasks completed*

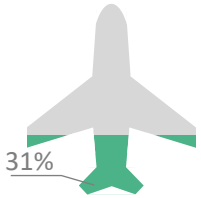
WP2. Airspace and ATM CONOPS

5 *total tasks*
4 *tasks in progress*
1 *tasks completed*

WP3. Conceptual design

6 *total tasks*
1 *tasks in progress*
0 *tasks completed*

550 *total days*



172 *former days*

WP4. Project Safety Management

5 *total tasks*
2 *tasks in progress*
0 *tasks completed*

WP5. Formal design

6 *total tasks*
0 *tasks in progress*
0 *tasks completed*

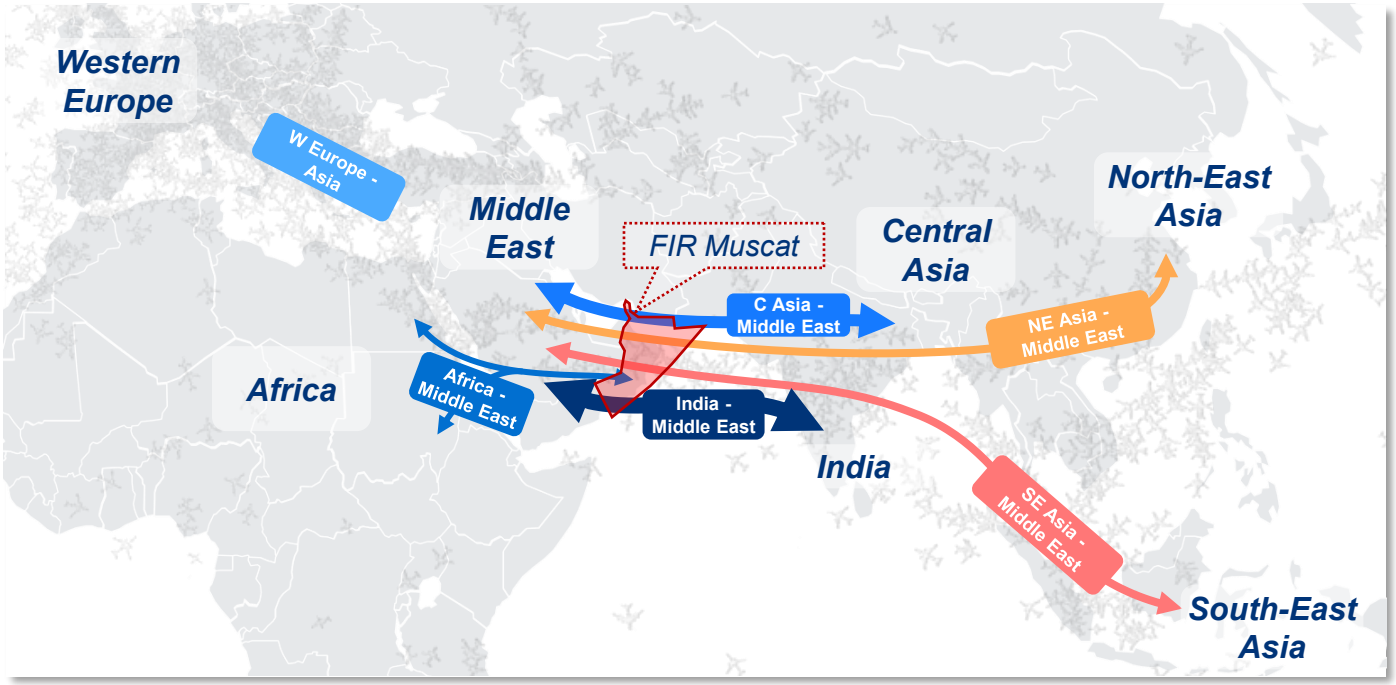
WP6. Implementation preparations

2 *total tasks*
0 *tasks in progress*
0 *tasks completed*

WP7. Implementation support

2 *total tasks*
0 *tasks in progress*
0 *tasks completed*

Oman CAA handles key traffic flows in the Middle East, coordinating with six neighbouring ANSPs and managing more than 640k flights per year (2024)



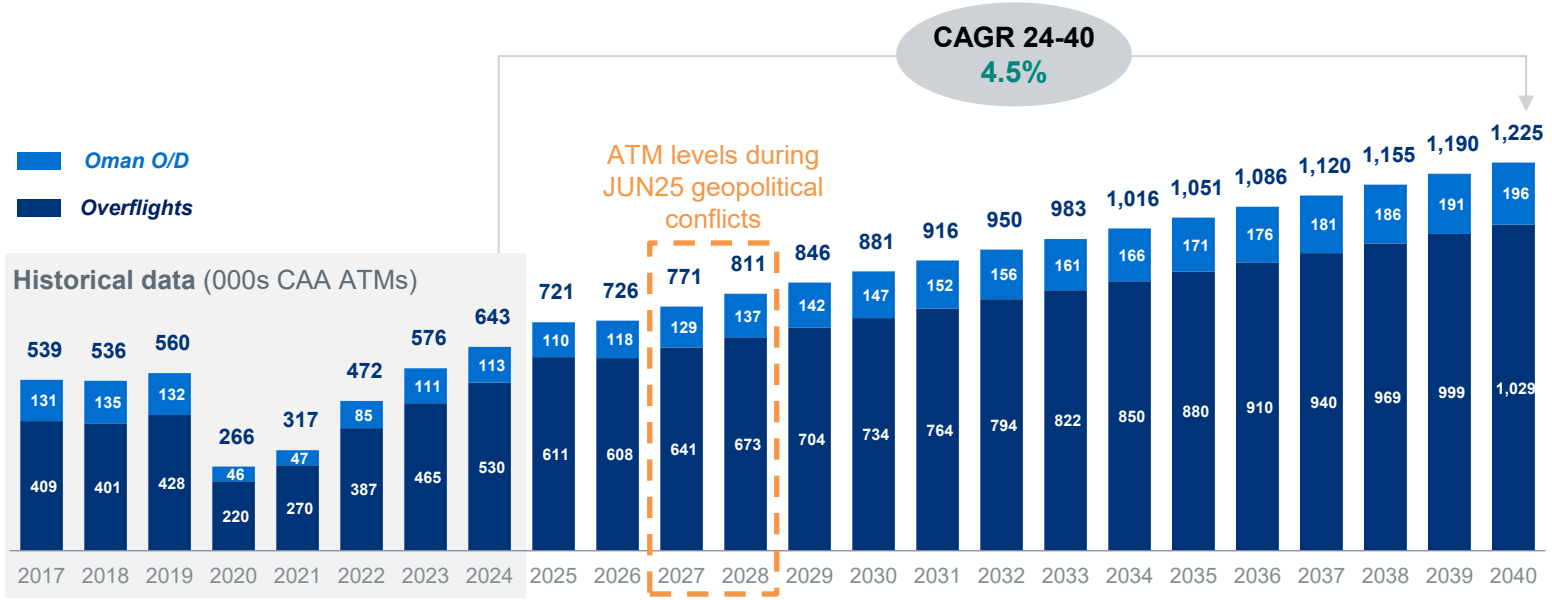
Key triggering factors for the project:

- Oman's airspace **currently operates close to full capacity in four of its seven** ATC sectors (particularly in the north) with **Alpha** and **Central** experiencing slight full capacity peaks
- **Flight trajectory analysis** reveals a **funnel effect** from the Mumbai boundary toward UAE

Suboptimal airspace and route structures impose **avoidable costs on airlines** in time, fuel, and CO_2 emissions. These **could become even more substantial in the future** if neighbor airspace which is currently closed does not reopen and the airspace stays as-is.

Future airspace redesign efforts must focus on **unlocking this underused potential**, **improving CNS/ATM systems**, and **enhancing civil-military cooperation** to accommodate growing demand safely and efficiently.

Traffic overflights in the FIR are expected to double by 2040 with 4.5% CAGR; however, recent regional scenarios have pushed the airspace traffic beyond its limits, reaching the 2027-28 levels



In June 2025, an already stressed airspace exposed regional **weaknesses**

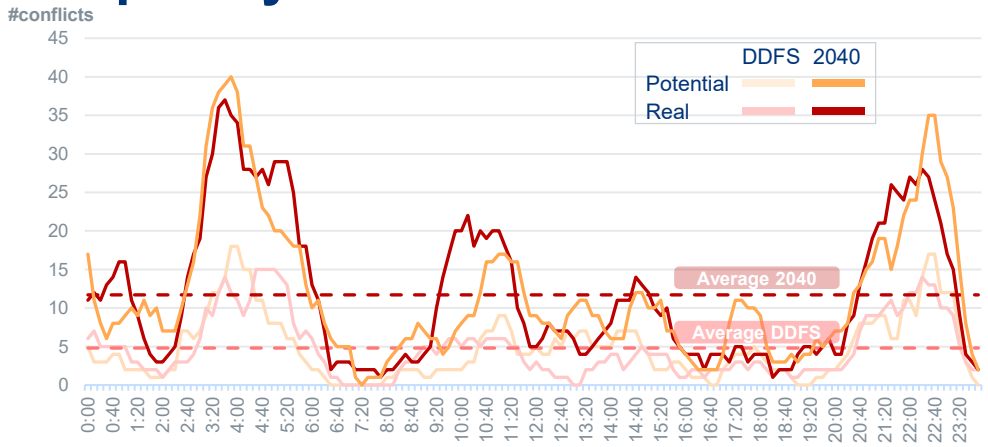
Urgent need to upgrade Oman's airspace to ensure safety and capacity to meet expected demand

During the June 2025 geopolitical conflicts, **traffic in Oman surged by 17%, further saturating** an **already strained airspace**

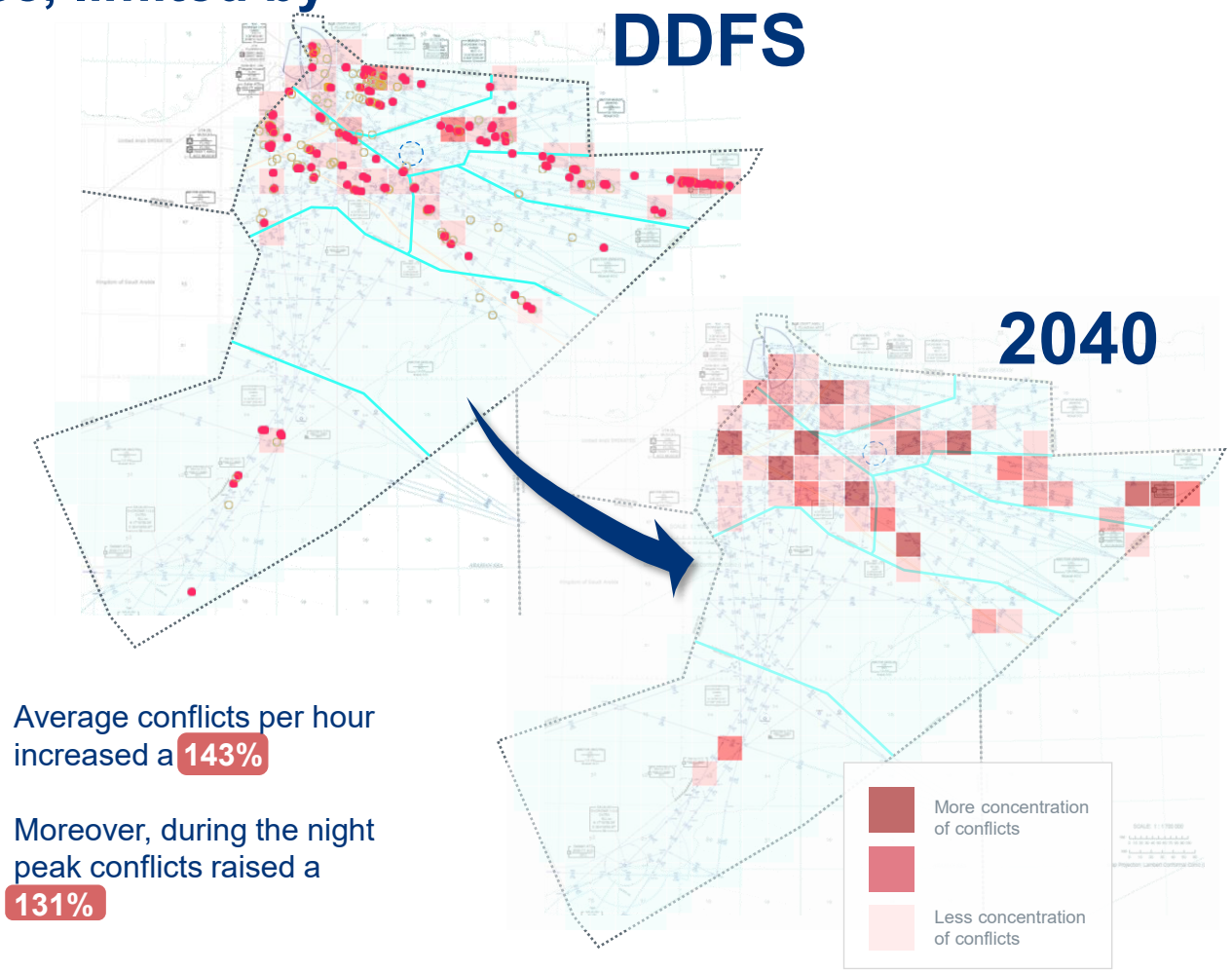
Average (01-12 jun)	1,815 ATMs	17%	Conflict avg. (13-29 jun)	2,120 ATMs

Air Navigation Service Operations (2024-2025

Impact: Conflicts are projected to increase 130% in the peak by 2040, driven by a traffic increase in the peak of “only” 50%, indicating complete saturation of the airspace, limited by complexity



- FTS conflicts do not represent actual incidents, but rather points where ATC intervention is required to prevent them.
- While conflict potential grows with traffic, the relationship is not linear. For example, with a 54% increase in peak traffic, the number of peak hourly conflicts rises by 131%.
- **This suggests that the current airspace structure has reached a saturation point and cannot safely absorb such traffic growth.**
- Most conflicts are concentrated around high-density ATS route intersections.

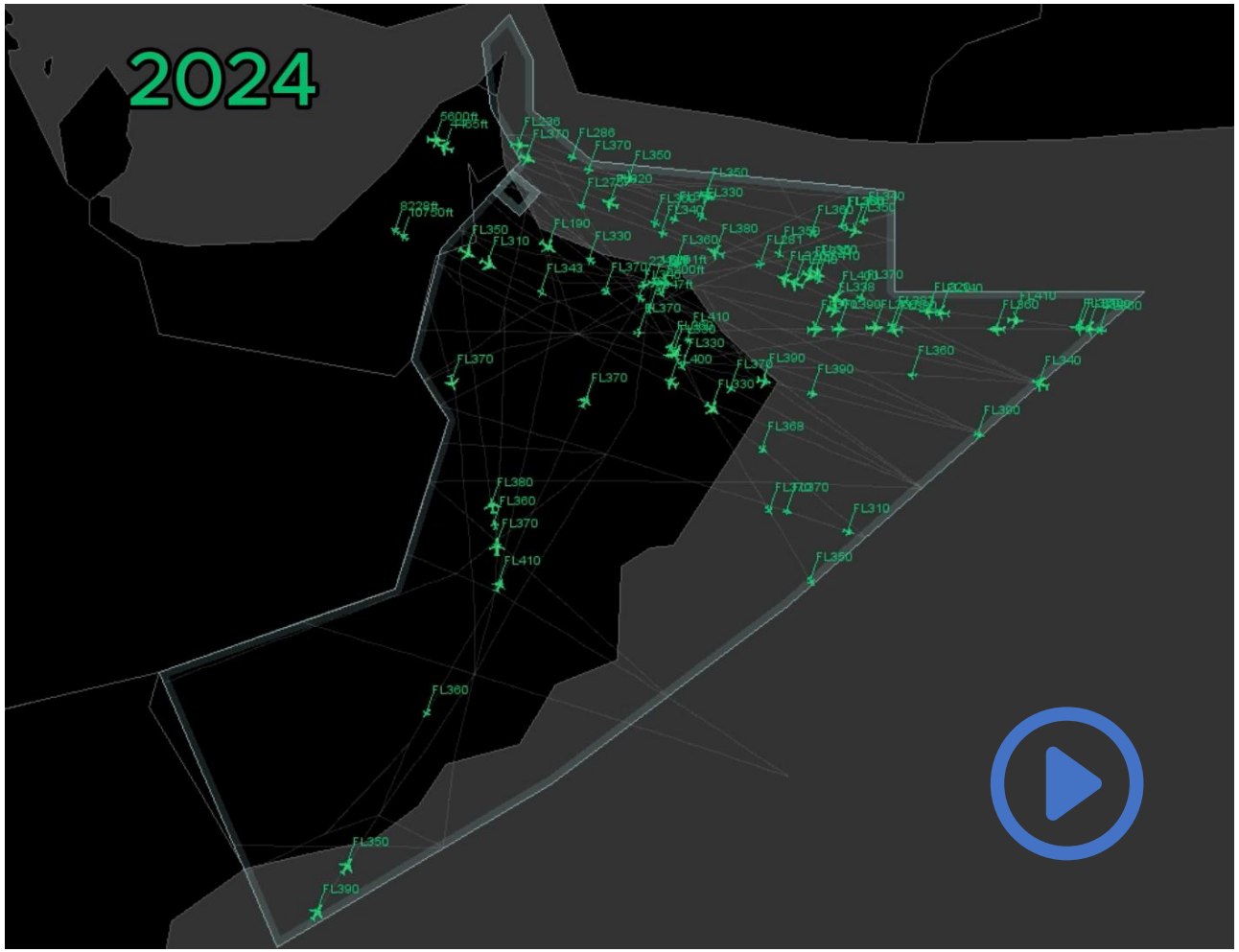


Average conflicts per hour increased a **143%**

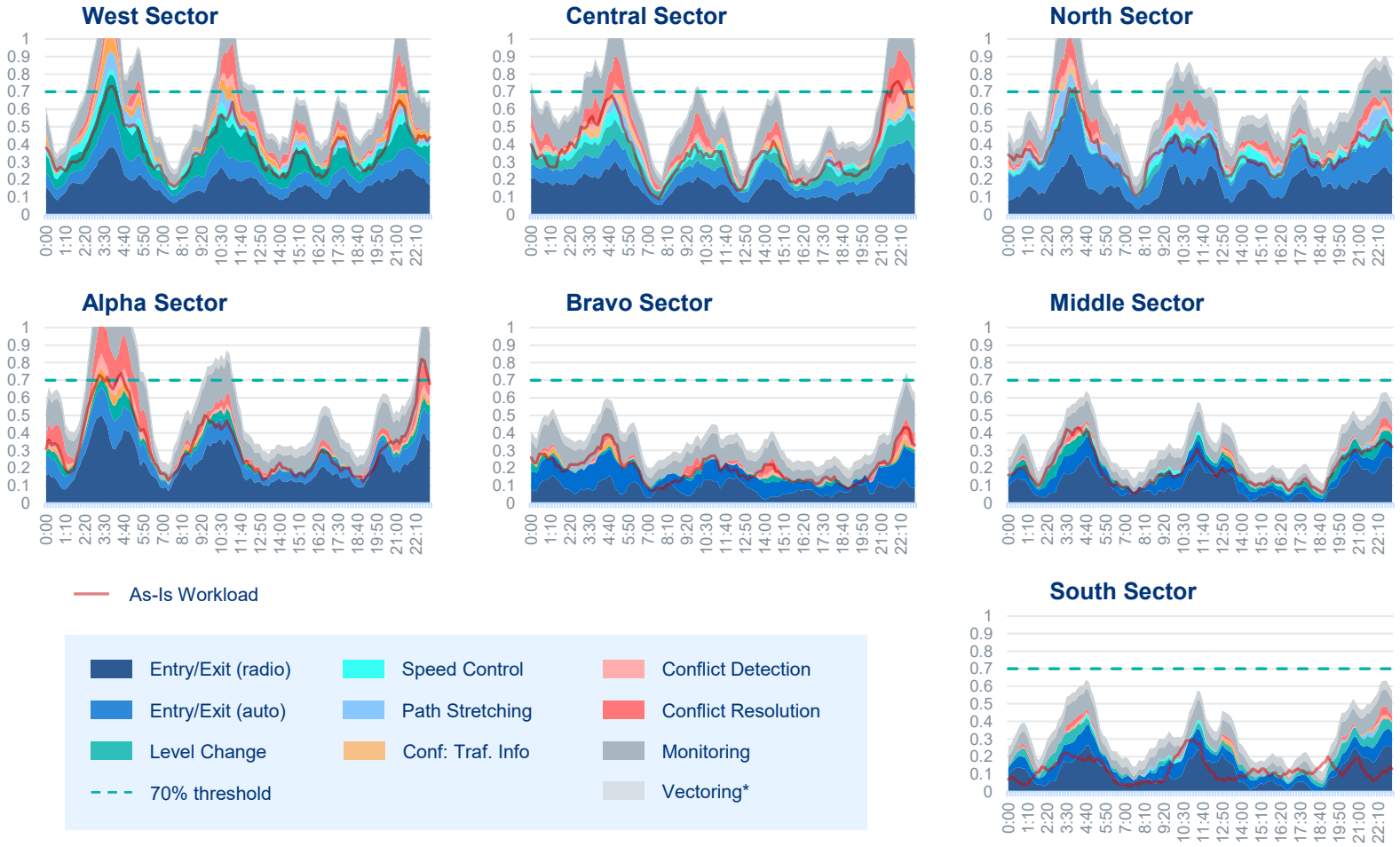
Moreover, during the night peak conflicts raised a **131%**

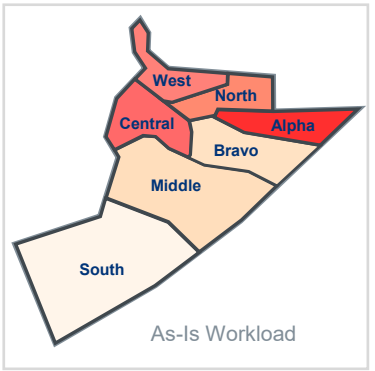
Impact: OMAN Analysis of the Actual Scenario

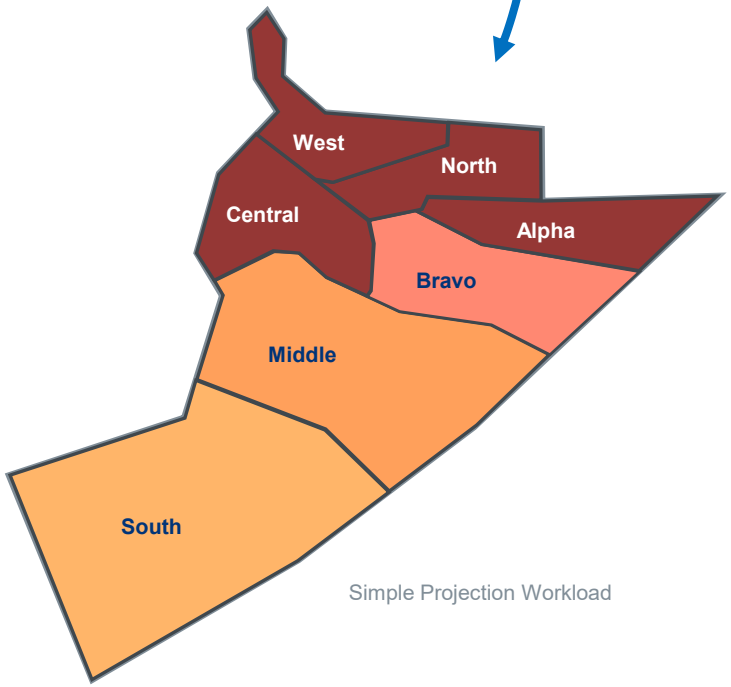
Fast Time Simulation



This projected traffic growth cannot be accommodated without airspace changes, as the resulting workload would become unmanageable and could compromise safety







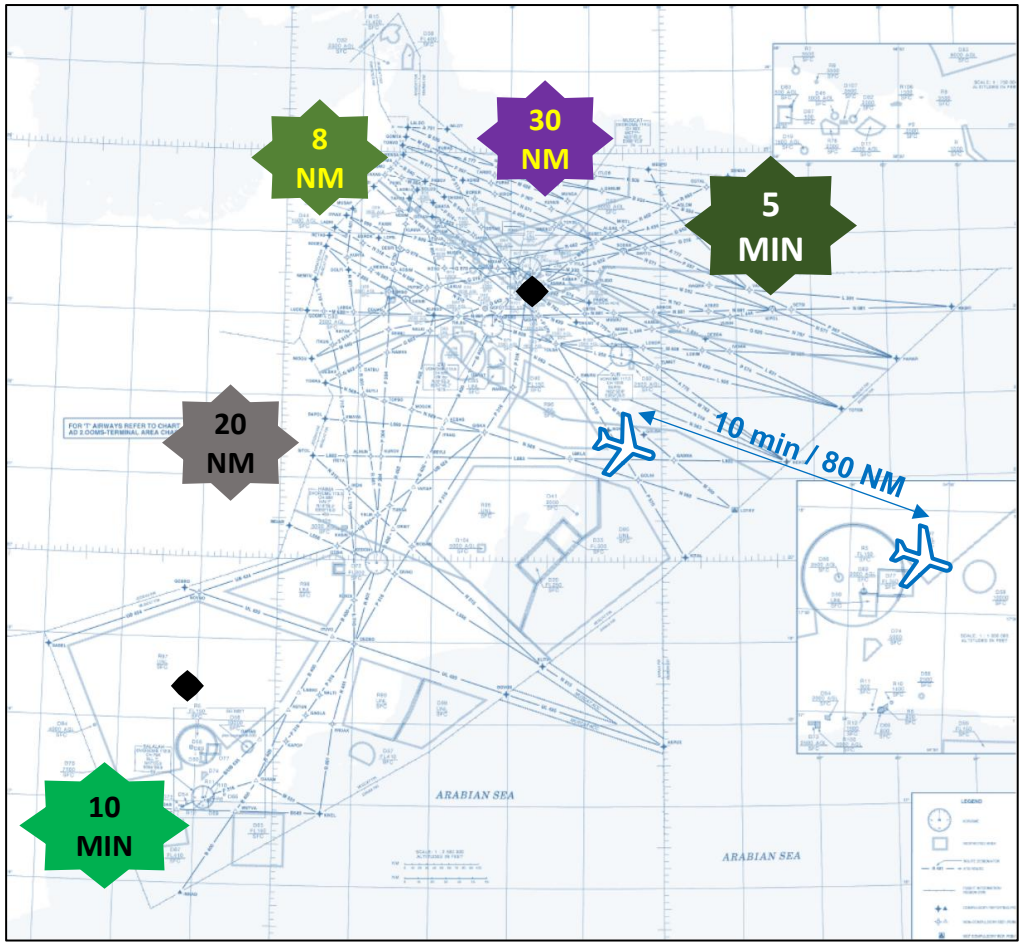
The differences on longitudinal separation between adjacent FIRs increases workload due to the need of traffic separation (up to x6)

Westerly Traffic

- Traffic enters the FIR **from UAE FIR** longitudinally separated **8 NM** (normal conditions)
- When exiting **to Mumbai FIR**, traffic must be separated **at least 10 min / 80 NM**
- **While crossing Muscat FIR**, these **traffics must be separated** in order to comply with this longitudinal separation requirements, **increasing ATC workload** and **limiting the capacity** of the sectors

Easterly Traffic

- On the **opposite flow**, the situation turns as a possibility to **reduce longitudinal separation** between traffics that, whilst not increasing substantially ATC workload, is still a **limitation to capacity**.

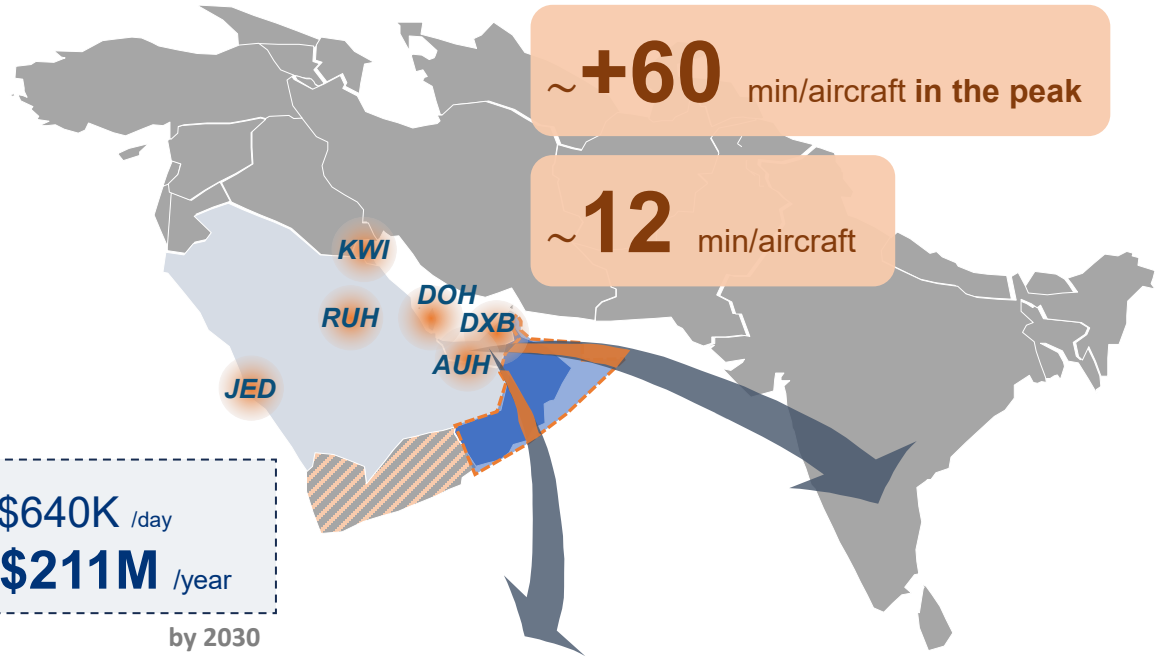


Enabler

- Reduction of the longitudinal separation between Muscat FIR and Mumbai FIR

Impact: A future lack of capacity in Oman may trigger flow management regulations, driving up airline regional costs up to $200M annually in 2030, and $315M, due to possible ATFM delays…

- **Dubai and Doha lead as the region's global hubs**, with JED, RUH, AUH, KWI, and MCT also playing significant roles, what turns Muscat FIR in a key piece of airspace that needs to be able to match all this traffic.
- **Without improvements**, Oman risks becoming a **bottleneck**, **with limited alternatives** due potential closure of neighbouring airspaces.
- **Traffic flow restrictions, if applied, would** generate average delays of 12 minutes per aircraft, over 200 hours lost every day.
- **These delays would be translated** into **$1M daily**, or **more than $315M annually extra costs**



~1 MUSD/day

~315 MUSD/year

by 2040

Extra Cost of ATFM Delay

The **network average cost of ATFM delay** is estimated at **80$ per minute**.*

It represents an **average, overarching reference value** and should be interpreted accordingly.

~$640K /day

~$211M /year

by 2030

On top of the previously stated impact, having unmet demand due to lack of capacity, may lead to airlines not scheduling the expected flights and losing potential benefits for the industry and Region

By 2040, Oman's limited airspace capacity could severely constrain growth by 200 flights per day (Calculated at ~70,000 flights annually)

Potential Airline & Sector Revenue Loss from Unmet Demand

→ **Airlines may not schedule certain flights** as the **system will lack sufficient capacity**

→ **Sector producers** (Airports, ANSPs, travel agents…) **will also be impacted**

Potential Airline & Sector lost value

~$500 K /day

~**$180 M** /year

Potential Regional GDP Loss from Limited Flight Growth

→ Based on ATAG estimates ($150K impact per flight), **capacity constraints could result in a $10B annual GDP loss for the region.**

→ Given that aviation contributes **4.3% of ME regional GDP (~$3.6T),** this loss equates to nearly **6% of the aviation sector's economic value.**

Potential ME Region lost value

~$10 B /year

~**6%** **ME Aviation Business**/year

•Source: Airline Revenue Loss from Unmet Demand computed with flights with more than 30minutes of delay during the DD (200 flights/day). Value of a flight from *Eurocontrol Standard Inputs for Economic Analysis* and *Aviation Benefits (ATAG)*

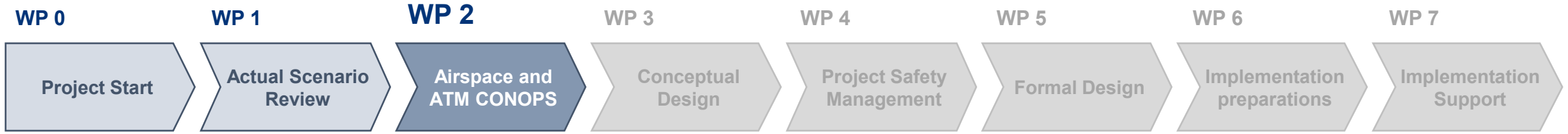
The objective of the ConOps is to define the general design guidelines, considerations, constraints and assumptions to be taken on-board for the upcoming design phase

WHY is needed to pursue these changes through defined objectives

WHAT will be done to fulfil the objectives

HOW will it be done

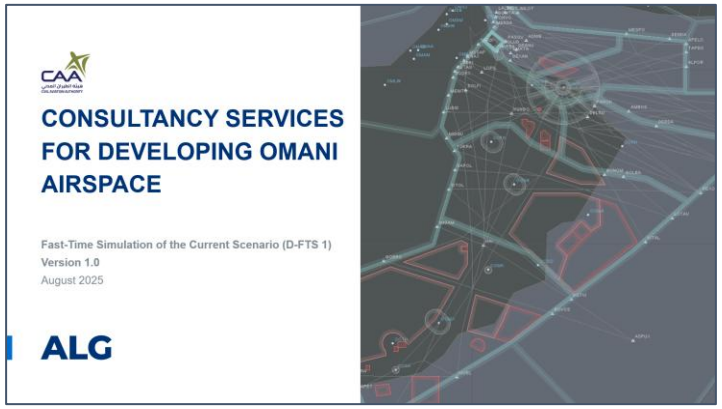
- Define a clear methodology to guide the airspace design development and implementation.
- Establish the ATM concept as the foundation for airspace design and operations.
- Specify CNS requirements ensuring interoperability, reliability, and safety.
- Identify the documentation that needs to be modified beyond the AIP and develop a publication plan to the proposed changes



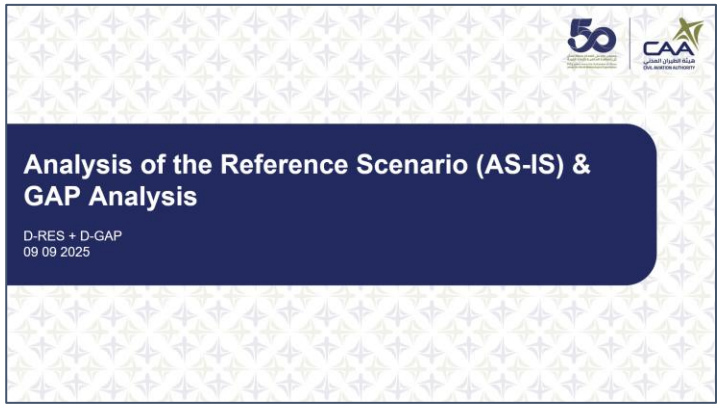
The Concept of Operations feeds from the outcomes of the analysis of the reference scenario and sets the basis of the future design

Traffic Forecast

Fast Time Simulations



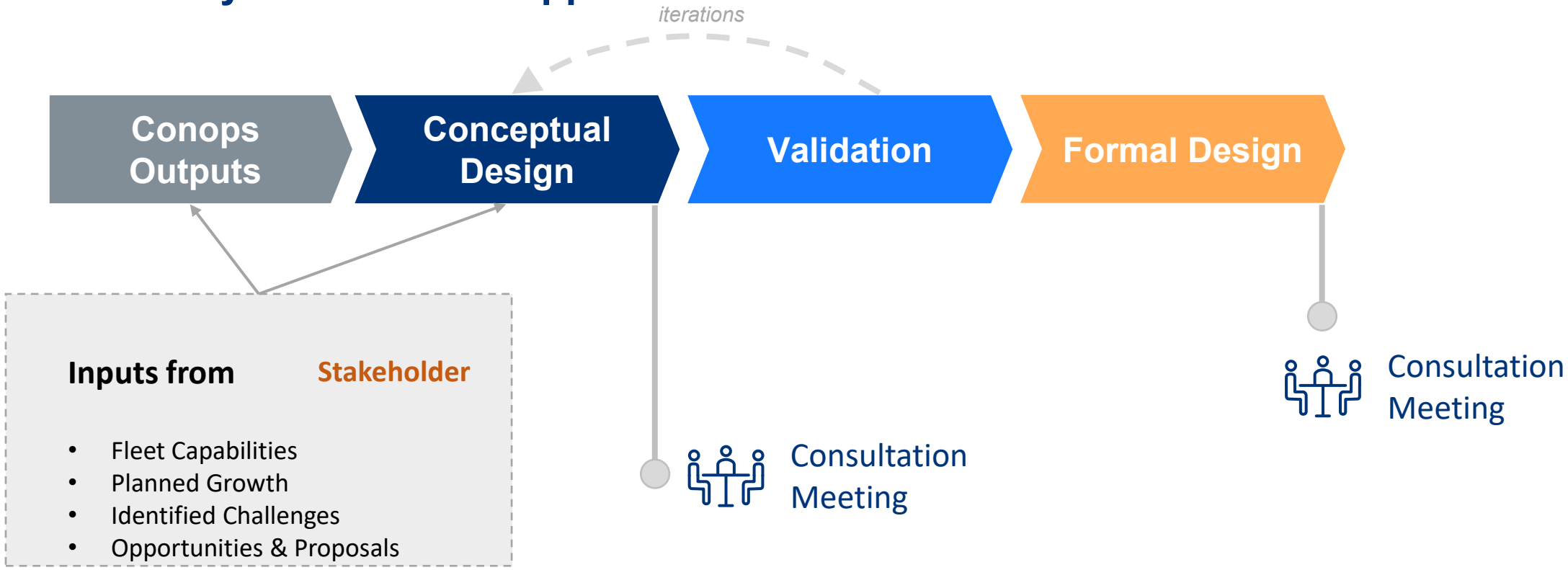
AS-IS + GAP Analysis



Stakeholder Consultations — *in parallel* — **Concept of Operations** — *in parallel* — *Safety Activities*

Stakeholder Engagement :

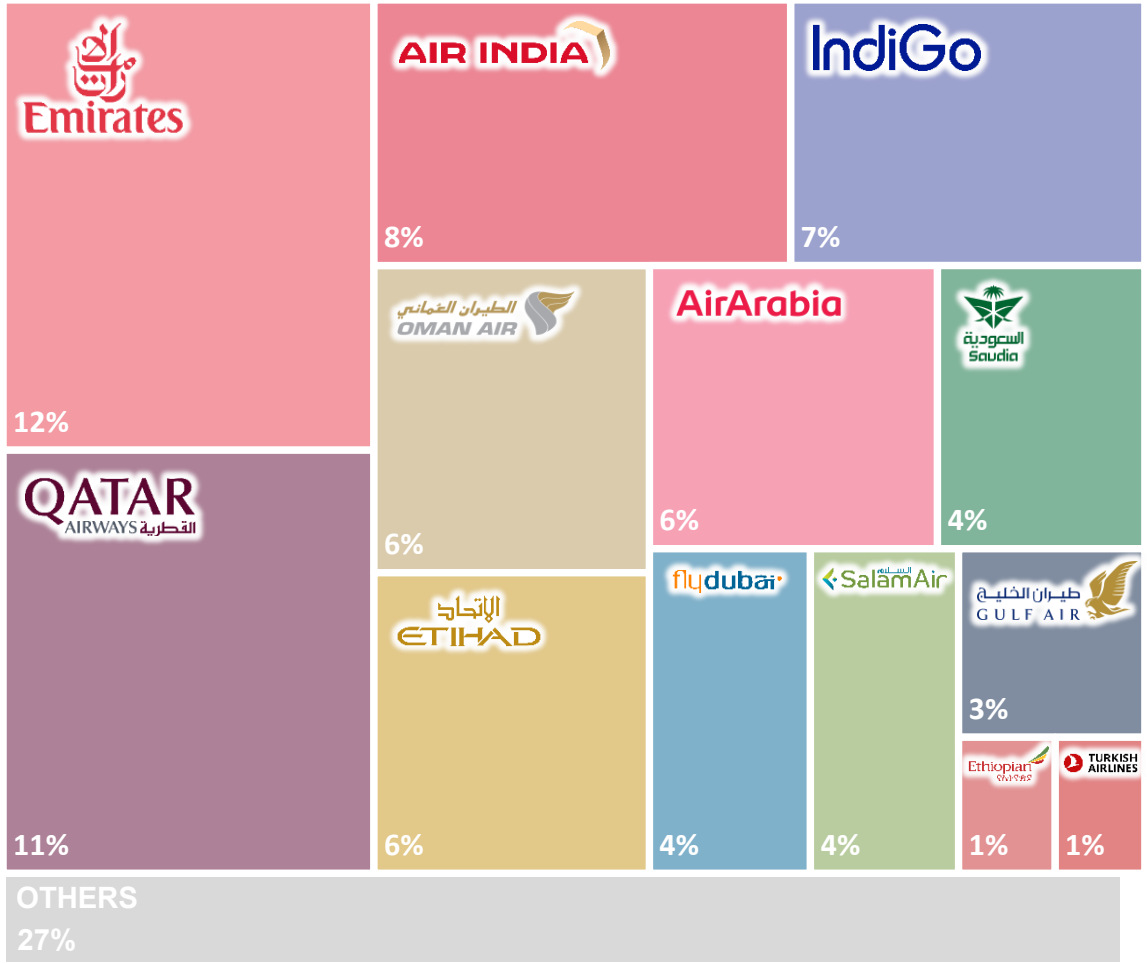
The participation of Stakeholders in the different activities of the project are really welcome and appreciated



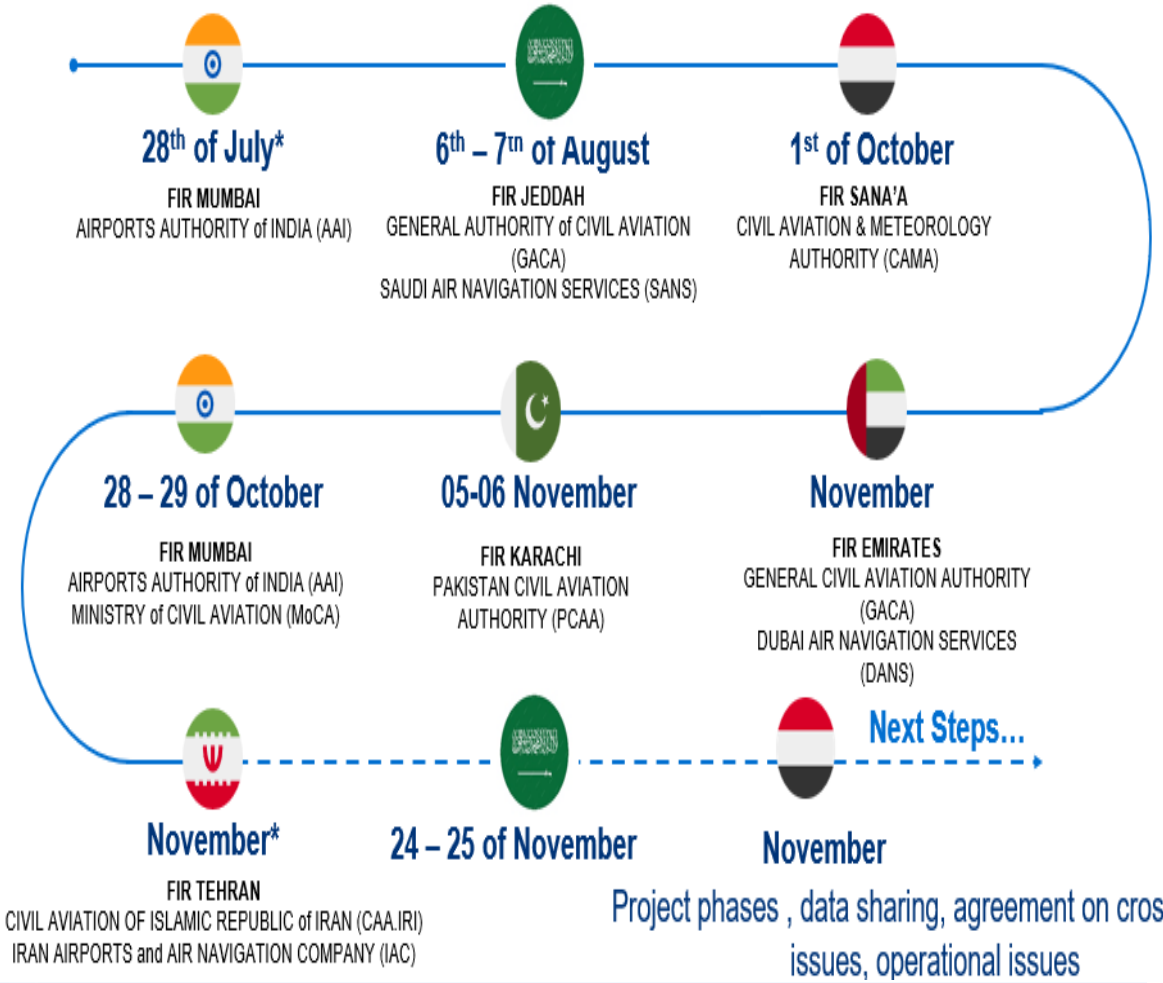
Stakeholder Engagement External

Enabling Global Connectivity and Performance for Leading Airlines

With Airlines



adjacent FIRs



Airspace and ATM CONOPS

WP 0	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7
Project Start	Actual Scenario Review	Airspace and ATM CONOPS	Conceptual Design	Project Safety Management	Formal Design	Implementation preparations	Implementation Support

CONOPS objectives:

- Define a clear methodology to guide CONOPS development and implementation. This document will serve as a guideline during the design and implementation process.
- Establish the ATM concept as the foundation for airspace design and operations.
- Specify CNS requirements ensuring interoperability, reliability, and safety.
- Identify the documentation that needs to be modified beyond the AIP and develop a publication plan to the proposed changes.
- Address additional aspects such as traffic forecast, stakeholder coordination, etc

Internal Stakeholder Engagement workshops to develop the CONOPS

Stakeholder Engagement Participation

The following GAPs represent some of the findings obtained from the AS-IS analysis, these challenges that will be addressed during the project execution with close coordination with the project Internal and External stakeholders

Lack of capacity to meet short- and long-term demand

Four of the seven sectors are already **operating at full capacity** during night peaks. Without airspace improvements, the airspace will become shortly **unmanageable**.

Airspace Design | ATM Developm. | Neighbours | ATC | FUA | FRA

Reduce CO_2 emissions in line with international standards

Horizontal inefficiencies, which generate **extra miles flown**, and level capping, result in **increased fuel consumption.**

Airspace Design | FRA

Ensure safety alignment with international best practices

To maintain the **highest safety standards**, it is essential to keep controller **workload within safe and manageable limits**.

Airspace Design | ATM Developm. | Neighbors | ATC | FUA | FRA

Limited airspace accessibility

Between others, on the eastern boundary, **waypoint availability** is limited, with waypoints spaced **50 NM** apart compared to just **8 NM** in the UAE to the west.

Airspace Design | ATM Developm. | Neighbours

ASBUs blocks implementation in time

According to the **National Navigation Plan**, at least **six ASBU** threads have **not been implemented on schedule**

Airspace Design | ATM Developm. | Neighbours | ATC | FUA | FRA

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THANK YOU

Presented by :Hanaa Al-Maskari
Oman Civil Aviation Authority (OCAA)