Sector capacity

By Hanaa Sultan Al Maskary

Sector capacity project team

OUR TEAM

Project director :

1	3	1
Project manager	**Work stream leaders**	**Data analysis engineer**

CAPAN,s

Capacity analyzer (CAPAN) 20 ATCO's

A	1. Anwar Mohammed Al Rawahi
	2. Mazin Abdullah Al Juneibi
	3. Aljulandah Suliman Al Adwani
	4. Jamal Nasser Al Hasani
B	1. Said Hamad Al Qulhati
	2. Abdulaziz Khalfan Al Yahyai
	3. Rashad Yahiya Al Rawahi
	4. Majid Al Mur Al Ghabshi
C	1. Aflah Said Al Maawali
	2. Zahir Farooq Al Shuhaibi
	3. Majid Nasser Al Hasani
	4. Hilal Hamad Al Subhi
D	1. Hussain Hamad Al Ajmi
	2. Ibrahim Zahir Al Abri
	3. Munther Mahmood AlBalushi
	4. Mohammed Ahmed Al Alawi
E	1. Zainab Said Al Rawahi
	2. Rashid Khamis Al Kasbi
	3. Maher Yahya Al Malki
	4. Turki Abdullah Al Mamri

ATCO's

ATCO'S to be observed 20 ATCO's

A	1. Ayman Amer Al Sheyadi
	2. Salim Sultan Al Miqbali
	3. Ahmed Khalid Al Ghailani
	4. Yasser Eid Al Rubkhi
B	5. Sulaiman Ali Al Kindi
	6. Khalil Issa Al Rawahi
	7. Mohammad Salih Al Sineidi
	8. Valdemaras Batuchtinas
C	9. Said Abdulkarim Al Mandhari
	10. Nasser Ahmed Al Humaimi
	11. Mohammad Ali Al Ma'amari
	12. Rebecca Neszvecsko
D	13. Mohammed Rizq Faiz
	14. Ali Abdullah Al Ma'ani
	15. Sulaiman Salim Al Nofli
	16. Roberto Moura
E	17. Mohammed Sulaiman Al Qasimi
	18. Said Wahid Al Hooti
	19. Waleed Mohammad Al Busaidi
	20. Daniel Neszvecsko

What Is sector capacity ?

The ATM sector capacity is the **maximum number of aircraft** which a **single ATCO can handle** simultaneously in one sector.

Why?

ICAO audit finding

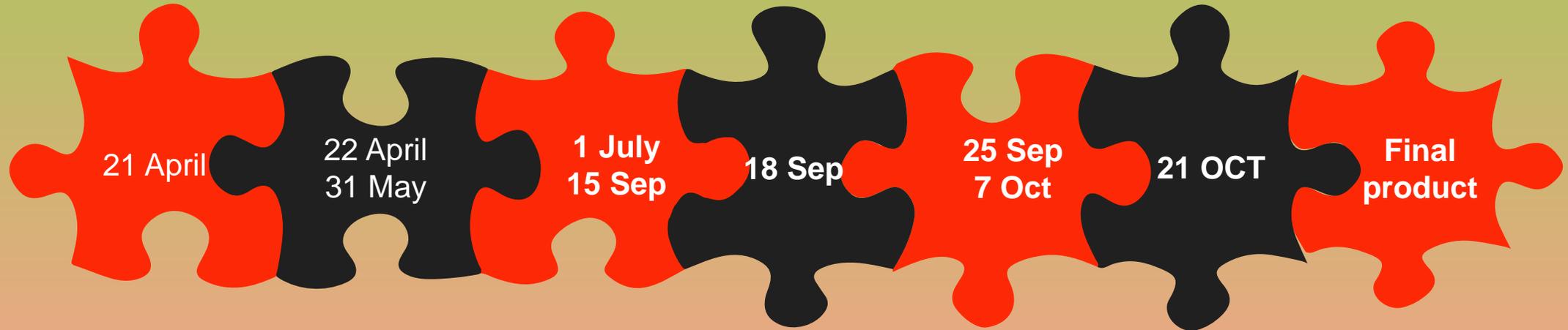It is required to establish sector capacity as stated in the recent ICAO audit

SOLUTION

Also it is clearly required as per

ICAO, doc. 9882, Manual on air traffic management system requirements, (2008)

Timeline

21 April

22 April
31 May

1 July
15 Sep

18 Sep

25 Sep
7 Oct

21 OCT

Final product

Initial phase

Create projected temporary organization structure, task matrix, Risk register and Daily log

Gathering all stored data

Traffic data near miss cases study (safety report).
Number of staff, sectors.
Sector capacity methodology.

Gathering live data

Preparation for life data collection (briefing ops staff, forms, plans, survey)

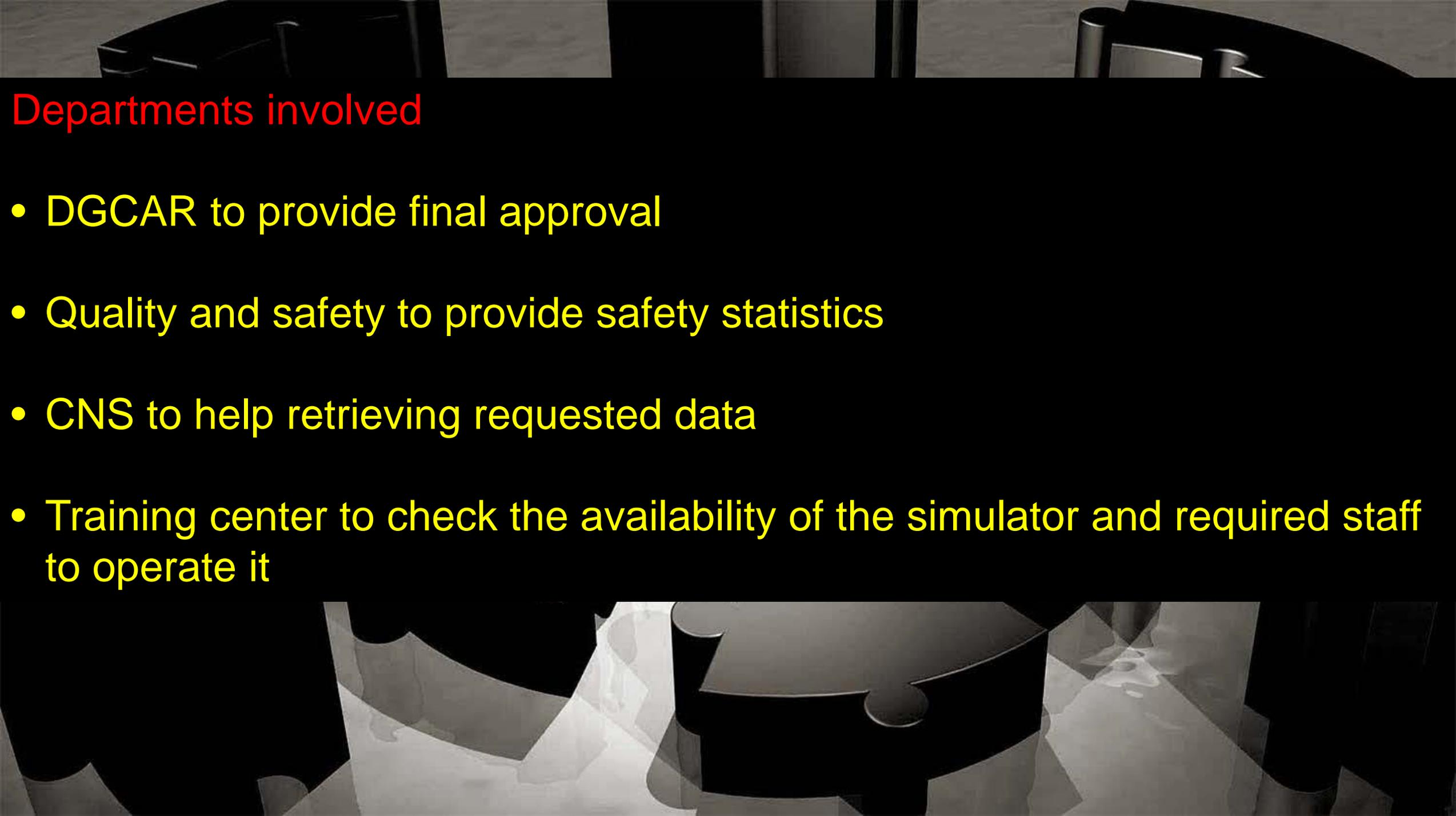**Analyzing and comparing all data**

Collecting and analyzing on site live data and comparing it with stored data

Simulating data

Simulate heavy traffic, abnormal situations and emergency in simulator room.

Adjustments & DGCAR approval

Dissemination of the final document and ready to be implemented by November

Departments involved

- DGCAR to provide final approval

- Quality and safety to provide safety statistics

- CNS to help retrieving requested data

- Training center to check the availability of the simulator and required staff to operate it

What data are needed ?

Performance data

Flight time , Flight details , Voice communications ground to air or ground to ground , in each sector.

Complexity data

Speed , vectoring , climb , decent headings in each sector

Safety efficiency

STCA , MTCD , MSAW frequency in each sector

Economic efficiency

Sector length ,queue , flow control and environmental emissions.

How to calculate the work load

Using a formula
A special formula for each sector set depending on the different data collected

Number of movements
The number of traffic in each sector

Number of transmissions to air / ground stations
Taking into consideration the complexity of each sector and the required coordination tasks and responsibility.

Calculating the normal / abnormal situations and emergencies in that sector
Retrieving the previous records and incidents occurred in each sector and the normal flow of traffic or abnormal situations like weather deviations or special military exercise.

Positions settings

Live Observations July 1 - August 23 2021				
CYCLE 1	CYCLE 2	Eid break	CYCLE 3	CYCLE 4
2 observers 4 ATCOs				2 observers 4 ATCOs
North West Alpha Bravo	**North West Alpha Bravo**		**Central South Middle**	**Central South Middle**
10-12 Morning 21-23 Evening 3-5 night			10-12 Morning 21-23 Evening 3-5 night	

First Group

2 cycle 4 ATCO's   2 CAPAN,s

Shift/ position	West	North	Alpha	Bravo
D/1st cycle	1	1		
D		1	1	1
E	1		1	1
E	1	1		
N		1	1	1
N	1		1	1
D /2nd cycle	1	1		
D		1	1	1
E	1		1	1
E	1	1		
N		1	1	1
N	1		1	1
Total Hours	8	8	8	8

Second Group

2 cycle 4 ATCO's   2 CAPAN,s

Shift/ position	Central	Middle	South
D/1st cycle	1	1	1
D	1	1	1
E	1	1	1
E	1	1	1
N	1	1	1
N	1	1	1
D /2nd cycle	1	1	1
D	1	1	1
E	1	1	1
E	1	1	1
N	1	1	1
N	1	1	1
D	1	1	1
Total Hours	12	12	12

What is the Capacity analyzers (CAPAN) role ?

Collecting data by filling up the CAPAN list

To file the form once done in the file for collection

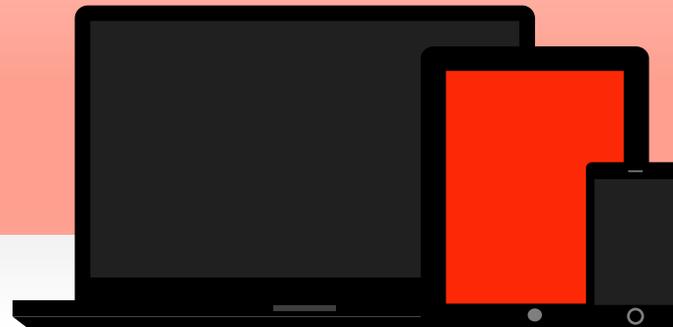Making sure to be on time and to start the study in the correct observation time

Never hesitate in contacting the project work stream leaders (ANY TIME) to clarify any doubts.

Reporting any matters or improving ideas to the project work stream leaders

Accuracy of data

Capacity assessment equations (Brazilian methodology)

$$N = \frac{\varphi.T}{n.\tau m}$$

N the number of aircrafts that can be controlled simultaneously by a single ATCO

φ ATCO availability factor

T average flight time

n number of communications

τm mean duration of each message

Date: / /2021   Time : Until : UTC   Sector:
observation number: Controller:

CAA

Task	Code	Count	Total
SSR code	1		
Ident	2		
ATC clearance	3		
Level requirement	4		
Time requirement	5		
Level clearance	6		
Re-routing	7		
Speed instructions	8		
Vectoring	9		
Routine Request	10		
Non-Routine Request	11		
Internal communications	12		
External communications	13		
Special military operations	14		
Handover to a RADAR environment unit	15		
Handover to a non-RADAR environment unit.	16		
Receiving a flight plan	17		
Traffic information	18		
Repeated transmissions	19		

Done by:

Notes:

How ?

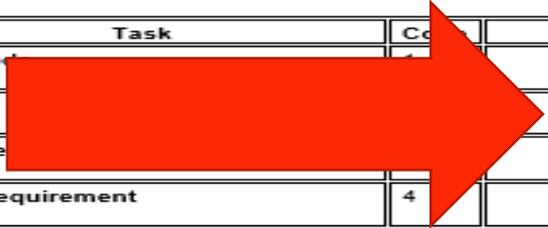## CAPAN observation form

We made the list as simple as possible by filling few details and the CAPAN is ready to go.
Putting a strike in each box

Date: / /2021 Time : Until : UTC Sector:
observation number: Controller:

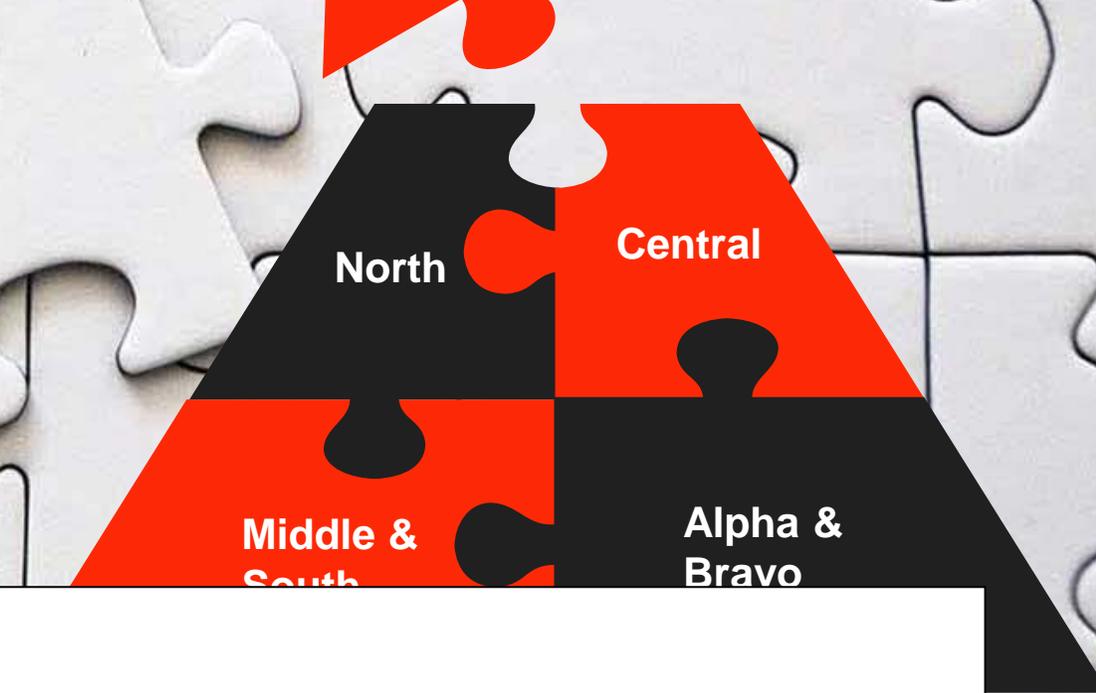| Task	Code	Count	Total
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Done by:
Notes:

Muscat ACC sector capacity project

Date: / /2021 Time : Until : UTC Sector:
observation number: Controller:

Task	Code	Count	Total
SSR code	1	‖‖‖ ‖‖‖ ‖‖‖ ‖‖‖ ‖‖‖ III	23
Ident	2	‖‖‖ ‖‖‖ ‖‖‖ ‖‖‖ ‖‖‖ IIII	29
ATC clearance	3		

Done by:

Notes:

North

Central

Middle & South

Alpha & Bravo

Task	Code	Description
SSR code	1	Call sign squawk.
Ident	2	Ident between RADAR-to-RADAR sectors/FIRs.
ATC clearance	3	The full ATC clearance on initial contact.
Level requirement	4	Climb FL 330 cross GEPOT. Decent F240 cross TAPRA.
Time requirement	5	Requirements cross RASKI time 0140.
Level clearance	6	Climb/ Decent/ re-cleared / Maintain.
Re-routing	7	Clearance amendment/ re-routing / diverting etc.
Speed instructions	8	Increase /decrease /maintain IAS or MACH.
Vectoring	9	Turn right / left heading due traffic for spacing for sequence.
Routine Request	10	Request made by either the pilot or controller: able FL/Direct.
Non-Routine Request	11	Permissions, message rely, Pilot requests (weather runway in use) etc.
Internal communications	12	Sector to sector, Tech, Met etc. within Muscat ACC
External communications	13	All units outside Muscat ACC including neighboring centers.
Special military operations	14	Due regard operations, IFR pick up from ships, RAFO and other military operations.
Handover to a RADAR unit	15	Transfer to RADAR units "call sign ABC contact 123.45".
Handover to a non-RADAR unit.	16	Transfer to non-RADAR units "call sign ABC contact 123.45 RADAR services terminated".
Receiving a flight plan	17	Traffic entering without flight plan.
Traffic information	18	Distance, type, Direction and speed.
Repeated transmissions	19	The repeat of transmission due frequencies (say again)
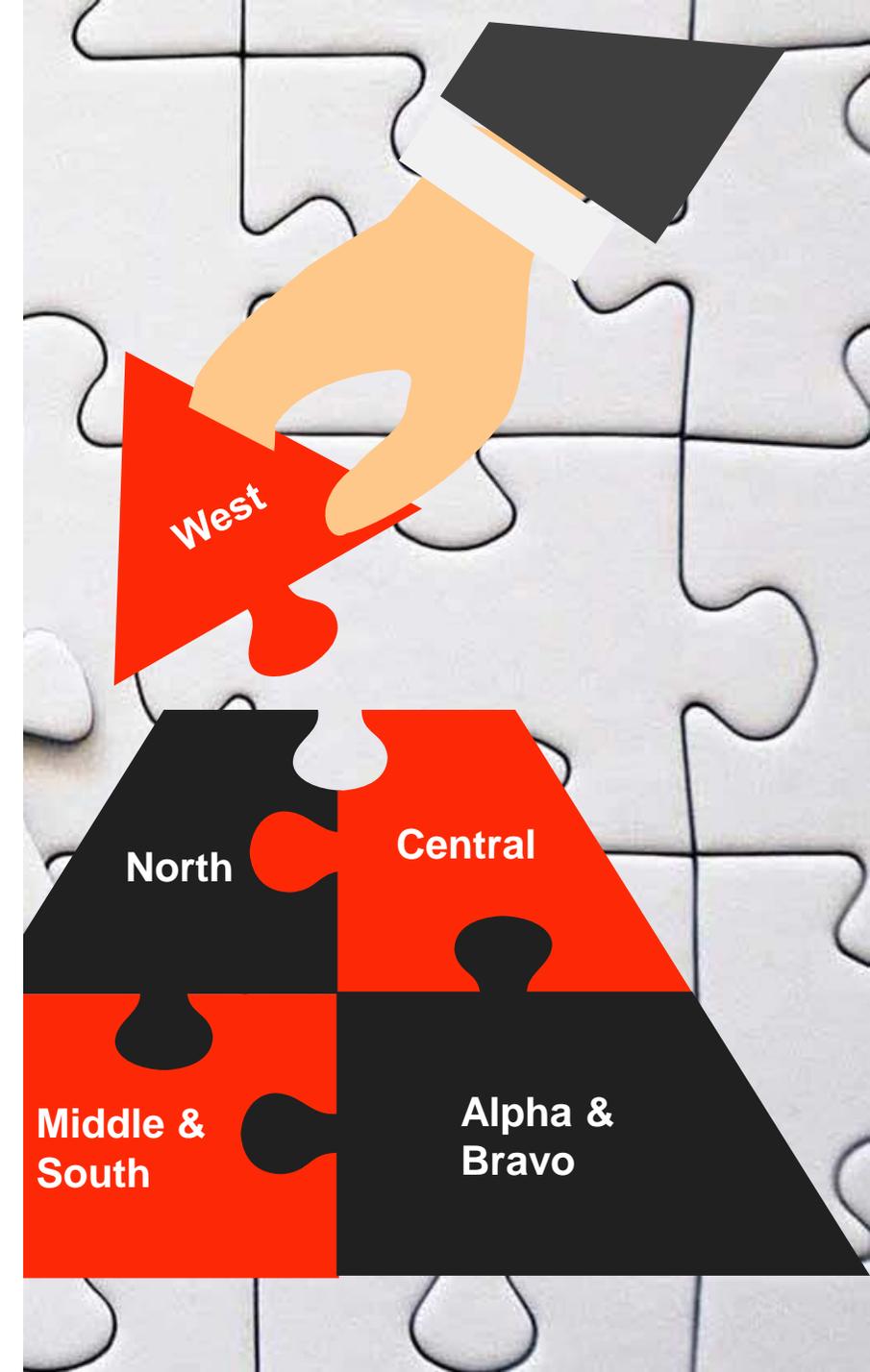
SECTOR CAPACITY PROJECT

CAPACITY ADJUSTMENT FACTORS – SECTOR_____

Taxonomy levels						
High Negative Impact	Medium Negative Impact	Low Negative Impact	No impact/ Not Applicable	Low Positive Impact	Medium Positive Impact	High Positive Impact
-3%	-2%	-1%	0%	+1%	+2%	+3%

Item No.	Category	Description	Adjustment						
			-3%	-2%	-1%	0%	+1%	+2%	+3%
1	Airways structure	The amount of crossing/bidirectional airways	x						
2	Sector operations complexity	The amount of crossing traffic	x						
3	Sector size and volume	Traffic volume because of the sector size/volume		x					
4	Traffic structure Climbing/descending traffic	Sequencing tasks/Climb or descend requirements	x						
5	Coordination	OLDI and telephone lines availability / Number of required coordinations						x	
6	Military operations and special use of airspace	Tactical flights requesting IFR/Due regard/Military VFR transits				x			
7	Quality of the voice communications	Frequency coverage/Quality of VHF frequencies/CPDLC availability					x		
8	Available controlled airspace	Airspace classes/ Active P/D/R zones		x					
9	Traffic planning tasks	Oceanic & non-RDR separation planning / Paper strips			x				
10									
	TOTAL ADJUSTMENT PER CATEGORY IN %		-9	-4	-1		+1	+2	
	TOTAL ADJUSTMENT IN %		-11						

Date_____

ATCO's Role

In order to insure the accuracy and the credibility of the gathered data

Always use intercom to pass messages to other sector although it is an operational requirement please insure doing it.(gentle reminder)

Use full ATC clearance when issuing one

Try to use standard phraseologies in order to be efficient and use minimum transmissions

Supervisor role

Plan the positions according to the study requirements

☑

The project will be suspended temporary during Eid for leave planning

It's a study requirement that CAPANS monitor the same controllers and CAPANS cant monitor themselves

July roaster has been published with the following :
- **1supervisor**
- **10ATCO's**
- **1 stand by**
- **2 CAPAN's**
- **Please note: in case of shortage CAPANS can be used for 2 hours outside the study hours**

The study will be commenced between the following trimmings:
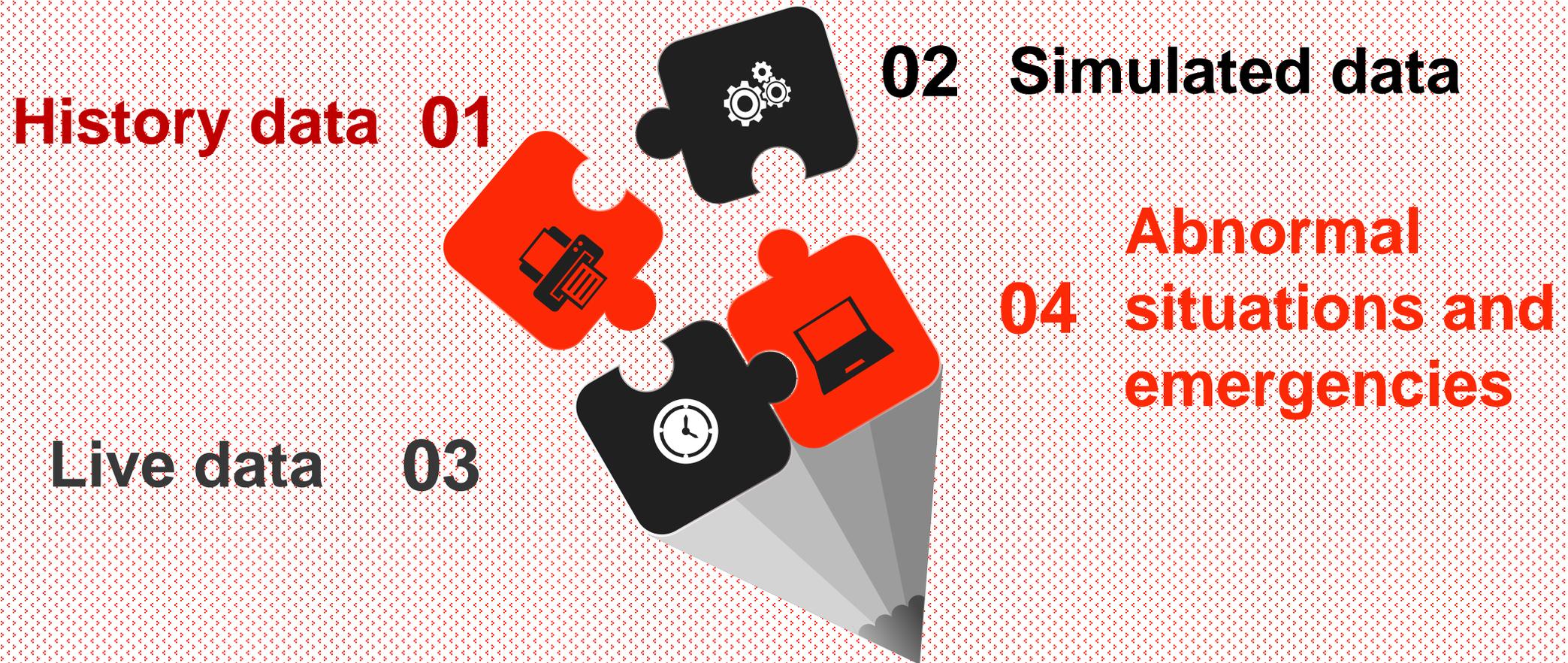- **Morning 10-12am**
- **Evening 9-11pm**
- **Night   3-5am**

Analyzing and comparing data

🕐 **Live data**	⏳ **History data**
⚙ **Simulated data**	📷 **Other non observed data**

An accurate picture of the traffic with out the current low traffic situation (COVID-19)

Analyzing all data

History data **01**

02 **Simulated data**

**Abnormal
04 situations and
emergencies**

Live data **03**

A study of all the data acquired for a minimum of 3 months will ensure the success of the study

What are the benefits of sector capacity ?

01 Flexibility (ATM)

different sectors configurations can be used depending on expected traffic flow the sector can be divided horizontally or vertically, split into three or more sectors

02 Optimal use of personnel (HR)

sectors can be merged after traffic levels have decreased. This gives the management options to handle the traffic with less controllers as opposed to the strategy where all possible sectors are manned at all times regardless of traffic levels.

03 Increase of overall efficiency (Flow management)

when looking at air traffic control from a global perspective, the widespread use of ATM sector management helps to better handle the "bottlenecks" of air traffic flow, thus reducing delays, costs and emissions.

04 Safe ATS provision (SAFTEY)

appropriate sector configuration ensures optimal controller workload preventing overload and distraction caused by too low traffic levels.

The study can be used as a reference or guide line for future studies or for future planning for more sectors

It will provide essential information for air space restructure

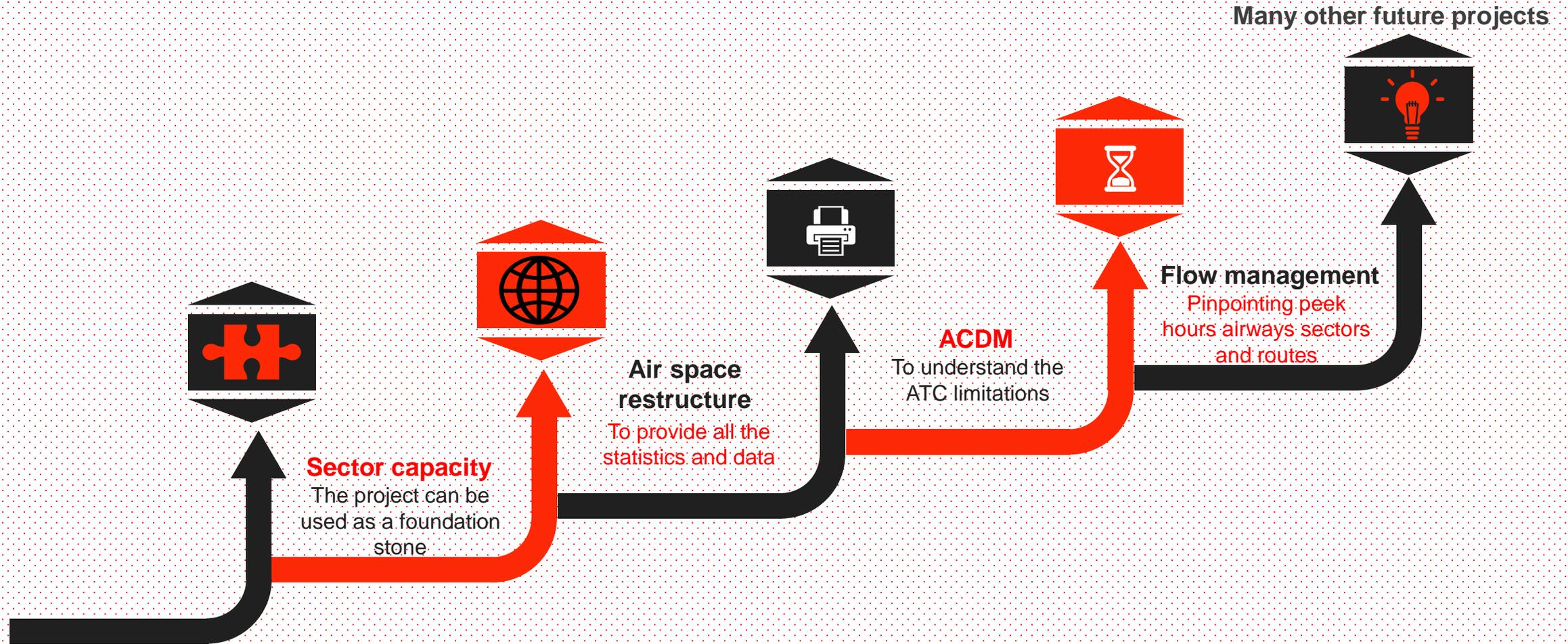Adapt to changes in order to be ready for increased capacity

Utilizing human resources accordingly and have better plans

Escalade in the ICAO audit and address the findings

Utilizing the air space to reduce the overall work load and accommodate more traffic to increase the revenue

What other applications ?

The project is considered as a foundation stone for many projects

Many other future projects

Sector capacity
The project can be used as a foundation stone

Air space restructure
To provide all the statistics and data

ACDM
To understand the ATC limitations

Flow management
Pinpointing peek hours airways sectors and routes

Data must be continually collected and observed to cope with the current increase and ready for any changes.
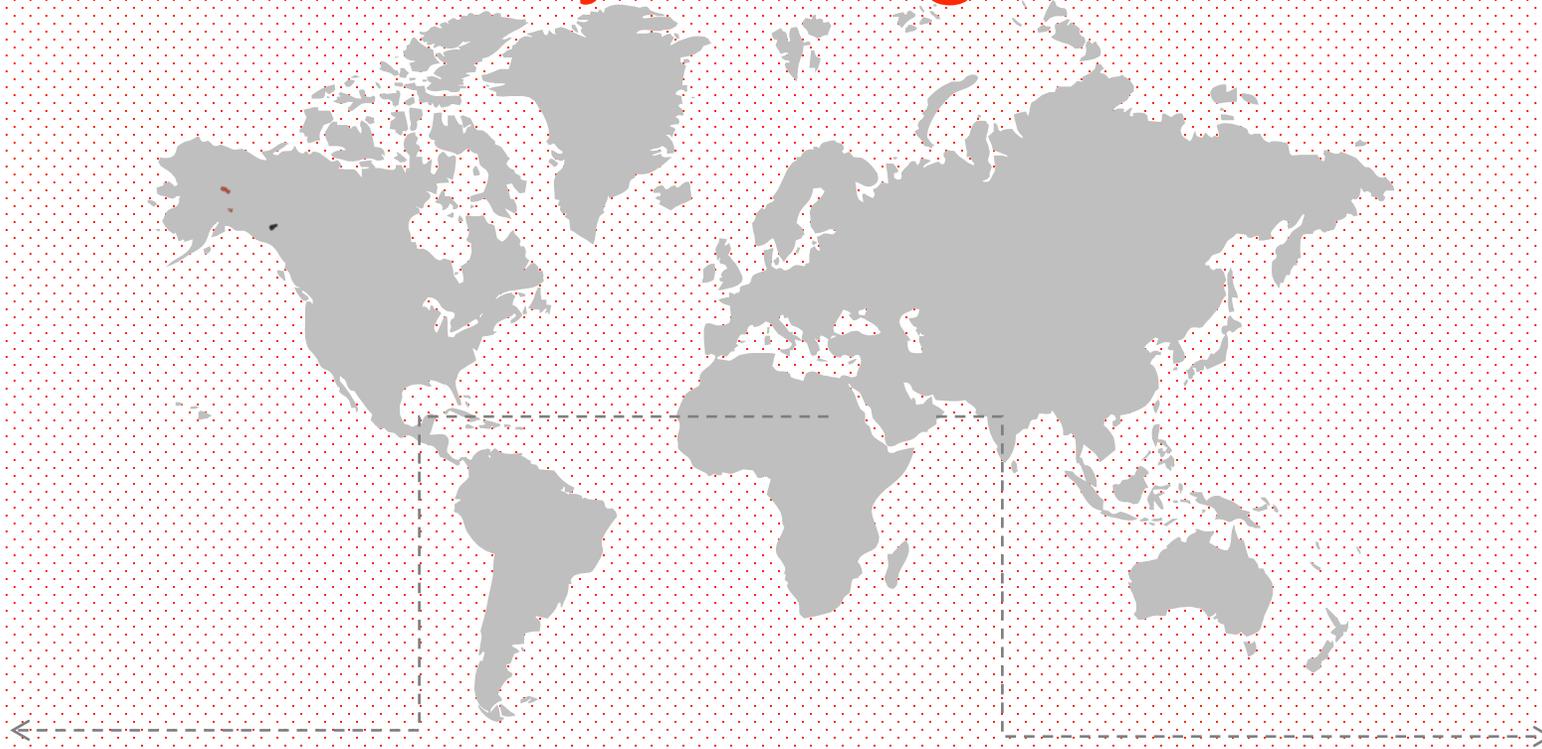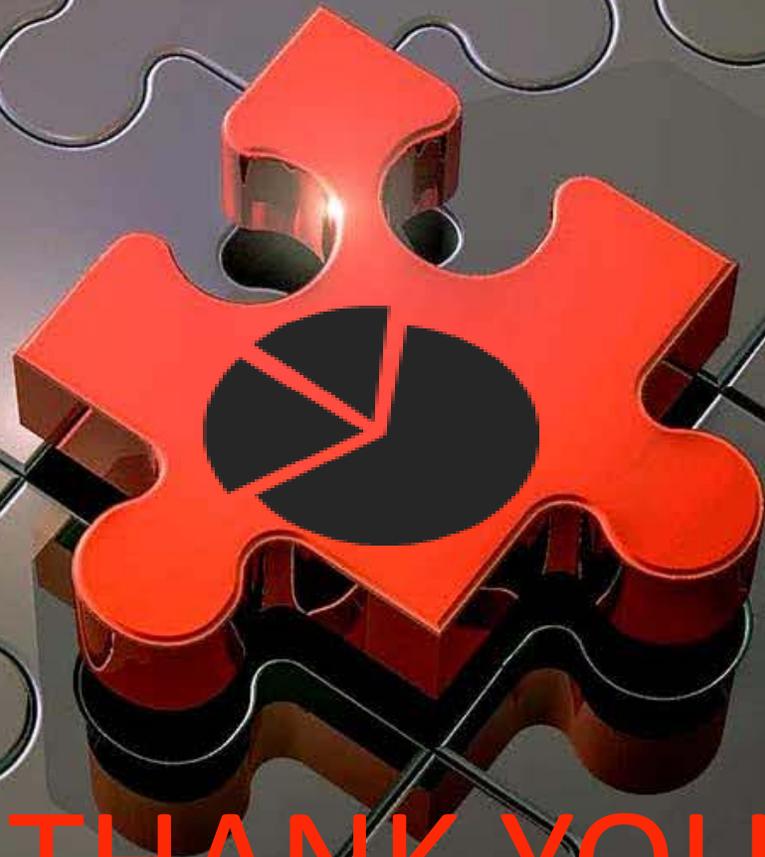
FIFA World Cup Qatar 2022 starting on the 21/11/2022

The study must be revised every two years or incase of any major changes in the airspace

With the contribution of all staff sector capacity should be implanted with a vision covering all aspects

sector capacity

THANK YOU

Presented by Mohammed Al Balushi