

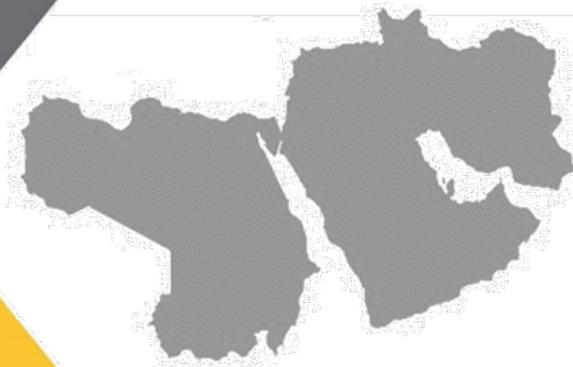


MIDANPIRG/18



RASG-MID/8

VIRTUAL MEETINGS



15-22 February 2021

MIDANPIRG/18 and RASG-MID/8 Virtual Meetings

(15 - 22 February 2020)



ICAOMID



MIDANPIRG/18, Agenda item 5.2.6: Specific Air Navigation issues

ATM: FWC2022

Presented by the secretariat



FWC2022: Operational Plan and Roadmap

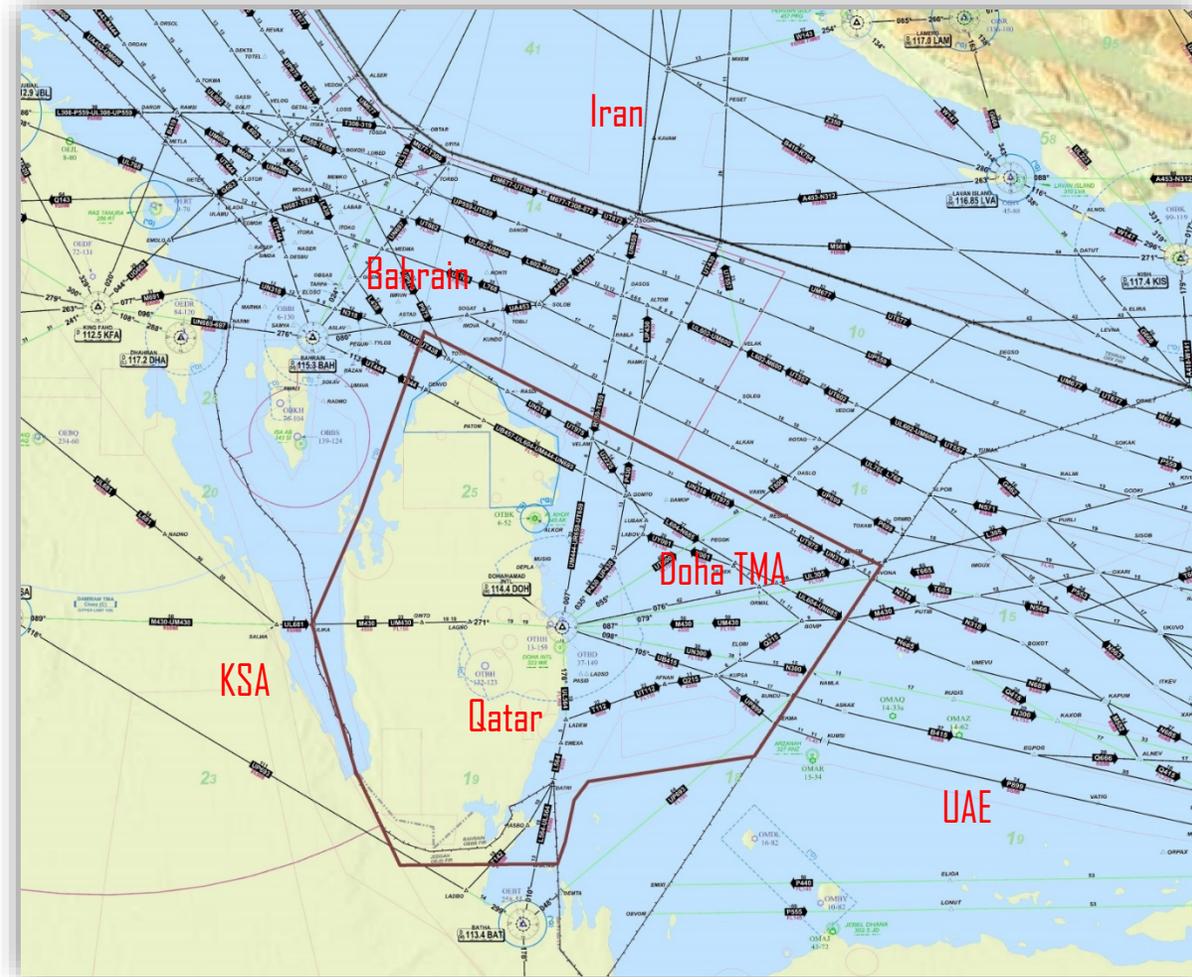
- Update on Qatar FWC2022 Operational Plan and Roadmap provided by FWC2022 TF Chairperson.

State of Qatar Airspace and FWC 2022

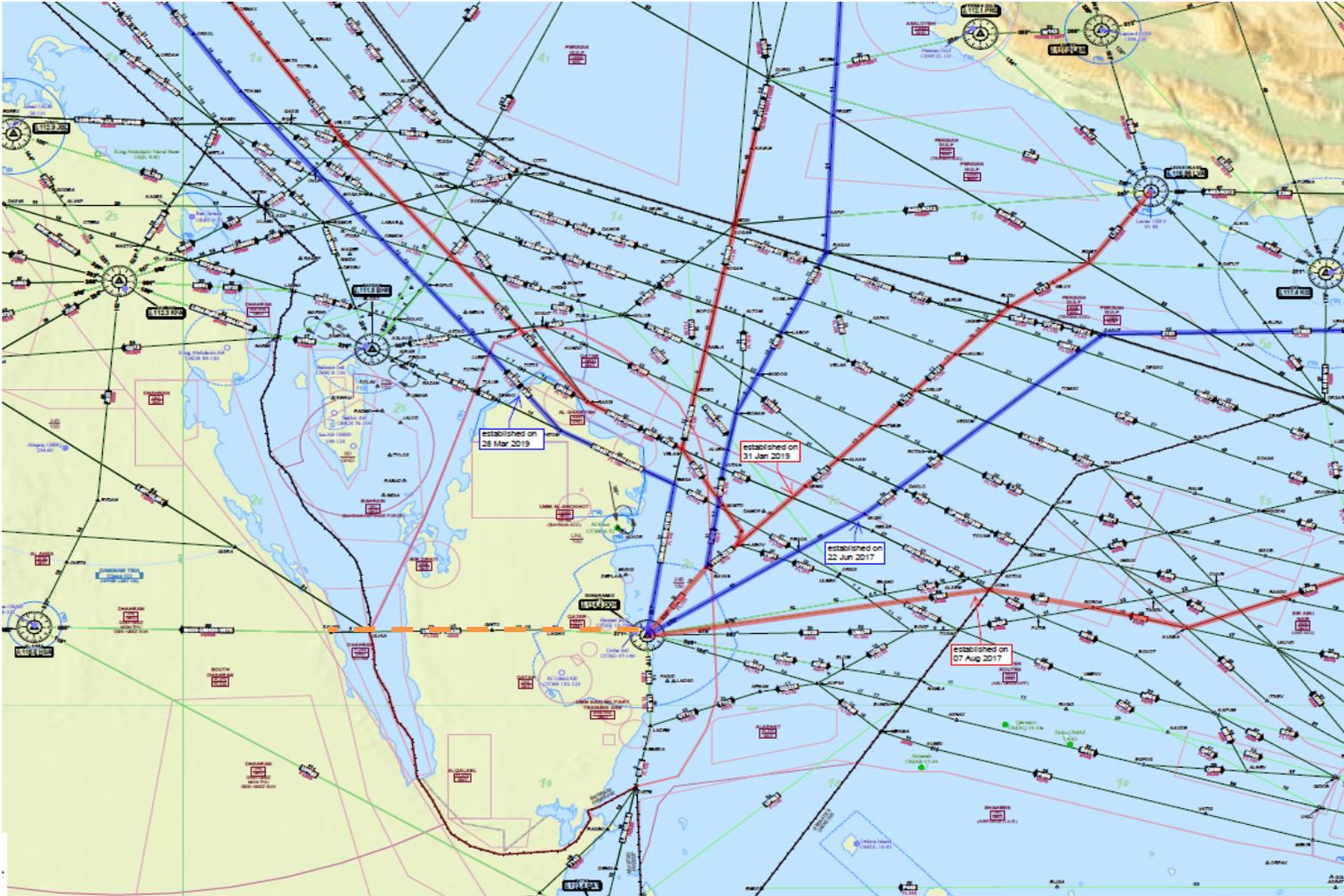
Current Airspace



Airspace Route Structure



Qatar Current Route Structure



FIFA World Cup 2022™



**FIFA WORLD CUP
Qatar2022**

“To provide safe, secure, functional, reliable, accessible and seamless mobility for all participating groups during the 2022 FIFA World Cup Qatar™ and associated events”

First FIFA World Cup in the Middle East Region.

First in history where all 64 games with 32 teams are played in small geographical area

- only 55kms between most distant stadiums

FIFA World Cup 2022™

FIFA Tournament Time Demand Model (TTDM) forecasts indicate that upwards of 1.3 million people could visit Qatar during the Tournament with approximately 500,000 visitors in the country on the busiest days.

The opening match of the Tournament will be held on 21st November 2022 and will conclude with the final on 18th December 2022.



FIFA World Cup 2022™

Hamad International airport (HIA) and Doha International Airport (DIA) will be utilised for the Tournament.

The runway capacity will be 100 total movements per hour for a 3-runway system (HIA & DIA).

The forecast normal daily rate in November 2022 will be 950 movements.

The anticipated daily movement rate for D-2 and D-1 will be up to 2000 movements within the Doha TMA.

Other traffic peaks will be experienced during the knockout phase and for the day of the Final (18th December 2022)



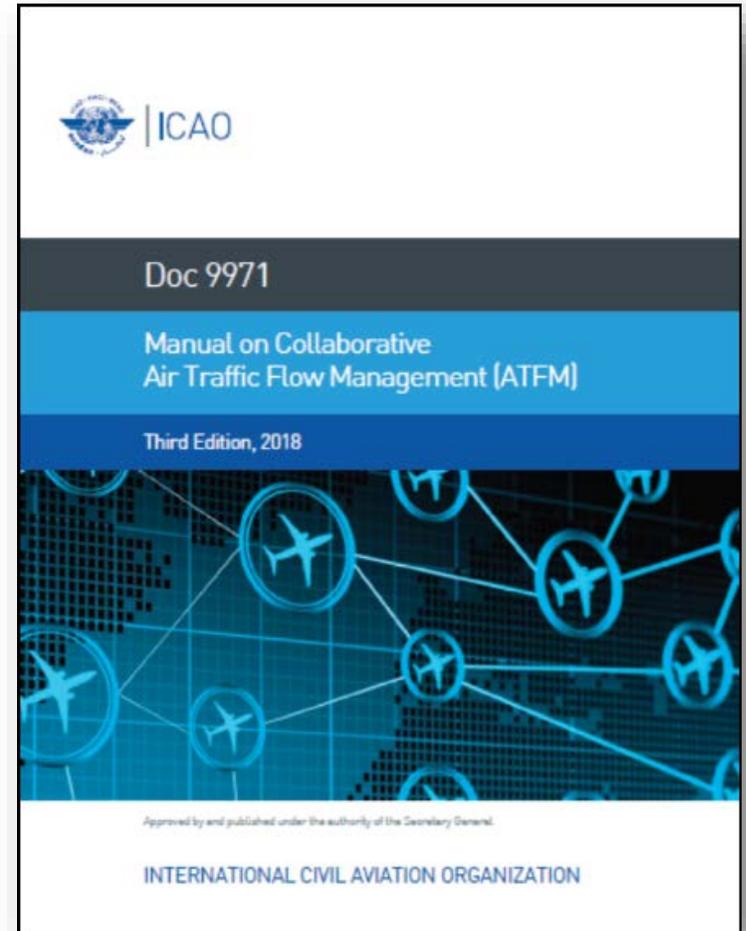
MIDEAST Impact

- Expected significant increases in traffic movements before, during and after FWC.
- Inter-State movements will increase significantly.
- Requirements for potential temporary airspace and/or route flow changes.
- Air Traffic Flow Management (ATFM) required.

Proposed Action Plan

- **Traffic impact on MIDEAST Airspace - ongoing**
 - ⇒ Forecast FWC traffic sample provided by Qatar to MIDRMA
 - ⇒ Assessment for RVSM (FL290-FL410 only)
 - ⇒ Assessment for lower levels required – ongoing discussions

- **ATFM to be introduced - by late 2021**
 - ⇒ To be aligned with MID Region ATFM CONOPS
 - ⇒ Regional framework (Multi-Nodal) and policies
 - ⇒ State organization and regulations
 - ⇒ Essential collaboration with neighbors



Proposed Action Plan

- **Review of Letters of Agreement (LoA)**
 - ⇒ Discussion to align with Qatar's Doha TMA Airspace re-design
 - ⇒ Discussion based upon specific requirements for FWC 2022

- **Capacity Studies** - *by April 2021*
 - ⇒ Conducted for both airport runways and Qatar airspace
 - ⇒ Based upon re-design airspace plan due February 2022
 - ⇒ Impact assessment for FWC 2022 traffic to be conducted

- **Flexible Use of Airspace (FUA)** - *by February 2022*
 - ⇒ Aligned with re-designed airspace structures implementation
 - ⇒ Establishment of an Airspace Management Cell (AMC)



Thank You!



FWC2022: Airspace assessment

- Following to the MIDANPIRG Decisions 17/24: Assessment of the MID Region RVSM airspace structure based on the expected traffic movement from 1 November to 31 December 2022:

That,

the MIDRMA assess the MID Region RVSM airspace structure based on the expected traffic movement during FWC2022 to identify peak periods, Hotspots, Bottlenecks, etc. based on the FPL/traffic data provided by Qatar.

- The MSG/7 meeting noted that with the current tool/software (MIDRAS) and based on the forecasted traffic movements provided by Qatar, the MIDRMA would be able to assess only the technical risk, while the processing of the operational risk would need the LHD reports, which could not be available beforehand.
- Following to that the MID Office organized a virtual meeting in participation of Qatar, FWC2022 TF Chairman, MIDRMA and the MIDRAS Developer; the meeting agreed to develop a tool using Artificial Intelligence to provide scenarios for probable LHDs during the period of the event, based on the expected (forecasted) traffic movements. To be used for developing the RVSM Airspace Assessment to meet with the requirements of the mandate.
- The developer provided a Performa Invoice, including details on the deliverables, Timelines and financial aspect, as in **Appendix A**

FWC2022: RVSM Airspace assessment

Why	To assess the airspace structure based on the expected traffic movement during FWC2022 to identify peak periods, Hotspots, Bottle necks, etc.
What	Assessment of the airspace structure based on the expected traffic movement to from 1 November to 31 December 2022
Who	MIDRMA
When	Mar 2021

DRAFT MIDANPIRG DECISION 18/xx: ASSESSMENT OF THE MID REGION RVSM AIRSPACE STRUCTURE BASED ON THE EXPECTED TRAFFIC MOVEMENT FROM 1 NOVEMBER TO 31 DECEMBER 2022

That, the MIDRMA assess the MID Region RVSM airspace structure based on the expected traffic movement during FWC2022, to identify peak periods, Hotspots, Bottlenecks, etc. based on the FPL/traffic data provided by Qatar, and probable LHD reports provided by the MIDRAS software developer.

FWC2022: Plan of Actions

- The action plan is amended accordingly, as in **Appendix B**

ACTION BY THE MEETING

The meeting is invited to:

- a) endorse MIDANPIRG Draft Decision 18/xx as in Slide 17; and
- b) note the progress made developing the FWC2022 Operational Plan and Roadmap.





Project Proposal
to the
Middle East Regional Monitoring Agency

Prediction of Large Height Deviation in
RVSM Airspace

Submitted To:
Middle East Regional Monitoring Agency of the ICAO
Bahrain

Consultant:
Dr Sameer ALAM, SINGAPORE

Sunday, 13 December 2020

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A. INTRODUCTION

This document provides the proposal for the services requested by the Middle East Regional Monitoring Agency of the International Civil Aviation Organization.

B. BACKGROUND

FIFA World cup 2022 will be hosted by State of Qatar from 21 Nov 2022 to 18 Dec 2022. With a reported 1.7 million people visiting Qatar, the civil aviation authority has estimated an expected 2000 daily air movements- from 7 days before the finals to 2 days after. This will lead to a significant increase in the en-route airspace with impact on the airspace safety and on collision risk specifically.

A key component of collision risk is risk due to Large Height Deviation. A RVSM large height deviation (LHD) is defined as any vertical deviation of 90 metres/300 feet or more from the flight level expected to be occupied by the flight. The deviation may be the result of human error, equipment malfunction or environmental factors such as turbulence.

LHD contributes to mid-air collision risk as an aircraft can occupy space unexpected by a controller (Figure 1). Not knowing that the space is occupied, the controller may clear another aircraft to that location, which may cause a mid-air collision.

Therefore, in order to assess the RVSM airspace Collision Risk, in the increased traffic scenario, the modelling of LHD is a key requirement.

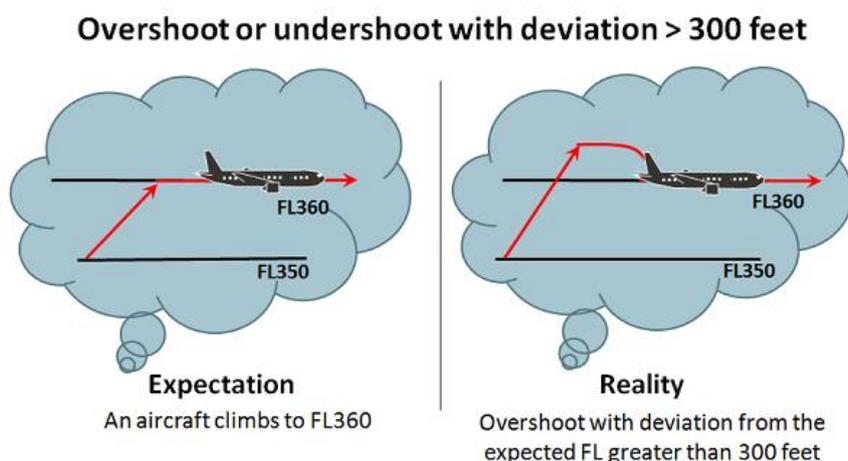


Figure 1: An Example of Large Height Deviation

C. OBJECTIVES

The project aims at developing an Artificial Intelligence based methodology for the analysis, assessment and prediction of Large Height Deviations (LHDs) with the purpose of increasing the level of safety in MIDRMA RVSM airspace.

D. METHODOLOGY

Figure 2 illustrate the methodology for analysis and prediction of LHDs. This includes Data pre-processing of historic Traffic data and LHD reports, training and developing machine learning models which then uses test data for prediction of LHD for future traffic scenarios.

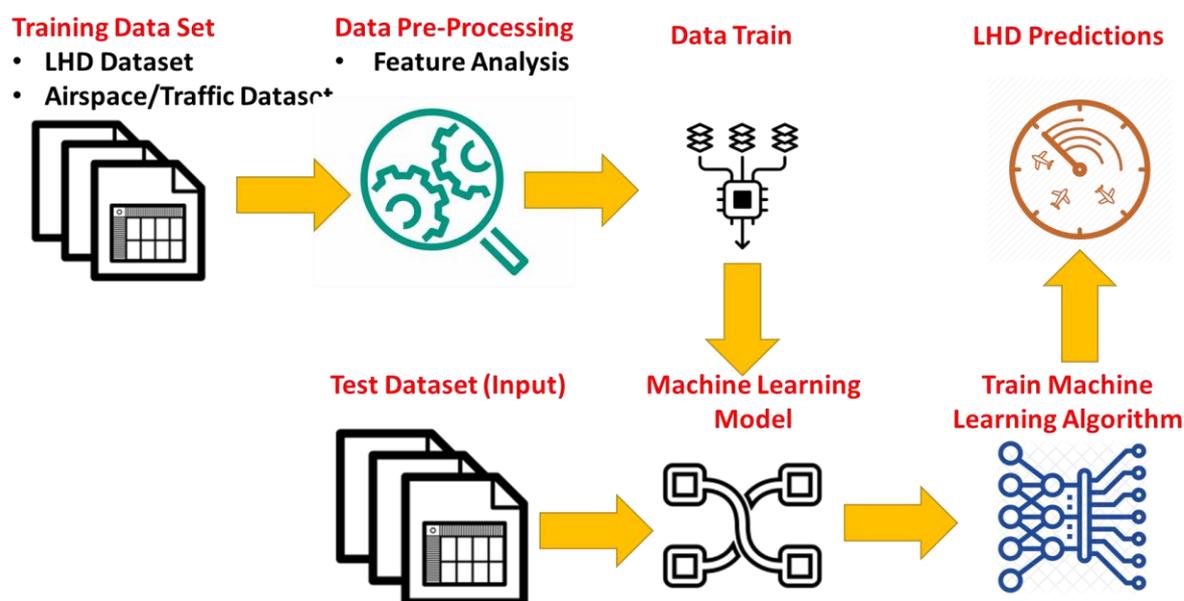


FIGURE 2: Methodology for LHD forecasting

E. PROJECT SCOPE

More specifically the following objectives will be achieved through the project:

1. To analyse and evaluate large height deviations of 300 ft or greater as defined in ICAO Doc 9574, Manual on the implementation of a 300 m (1 000 ft) vertical separation minimum between FL 290 and FL 410 inclusive.

2. To develop an Artificial Intelligence based methodology for the analysis, assessment and prediction of Large Height Deviations (LHDs) with the purpose of increasing the level of safety in MIDRMA RVSM airspace.
3. To identify safety trends based on the analysis of large height deviations (LHD) reports and recommend mitigation actions and submit report on safety assessment results to MIDRMA so as to improve safety in the RVSM airspace of the ICAO MID Regions.

F. IMPORTANT NOTES:

These activities can be further elaborated in terms of data and information collection and processing as follows:

- Historical air traffic data for the year 2020 (Jan-Dec)
- Projected air traffic data for the period of FIFA World Cup (21 Nov 2022 to 18 Dec 2022).
- Large Height Deviation (LHD) Data for the ICAO MIDRMA Member states.

G. PROJECT ACTIVITY TABLE

S. No	Activity	Nature of Work	Duration
1.	Administrative and organizational arrangements	Contractual	One Week
2.	Airspace and Air Traffic Data Collection and Analysis	Data structure and Data Digitalization	One Week
5.	Development of Artificial Intelligence Algorithm for LHD Prediction	Data Engineering and Analytics	Three Weeks
7.	LHD Prediction and Analysis	Data Engineering and Analytics	Two Weeks
8.	Result, Analysis and Report Writing	Data Visualization, Interpretation and report writing	One Week

Notes:

- i. All the activities require large amount of data collection from air navigation service provider. Delay in obtaining the data may cause delay in the development of the report.
- ii. The project will require a local contact at MIDRMA, who will be responsible for data collection and liaising with local authorities.
- iii. Any project travel related cost will be boreed by MIDRMA
- iv. Any project related hardware and software cost will be boreed by MIDRMA

H. PROJECT COST SCHEDULE

Number of Work Weeks	Hours/Week	Consultancy Rate per hour	Total Cost
8	8	USD 400	USD 25,600

- Expected Project Commencement date: **15TH Jan 2021.**
- Date of Delivery of Report: **15TH MARCH 2021.**

I. MEETING AND REPORTING

- Weekly Meeting through Zoom Platform starting 15th Jan 202.

J. SHORT BIO OF CONSULTANT

Dr Sameer Alam is an Associate Professor of Aerospace Engineering at the School of Mechanical and Aerospace Engineering, Nanyang Technological University (NTU Singapore). He is also the Deputy Director of the Air Traffic Management Research Institute and Co-Director of the SAAB-NTU Joint Lab at NTU. He obtained PhD in Computer Sc. (2008) specializing in Artificial Intelligence from University of New South Wales (UNSW), Australia. His post-doctoral research, on developing Artificial Intelligence algorithms for future air traffic concept evaluation, was sponsored by EUROCONTROL (2009-2010) and Air Services Australia (2010-2011).

Dr Alam has over 20 years of R&D experience in the domain of Air Traffic and Airport Operations with various organizations including ICAO, NASA Ames USA, AirServices Australia, CAAS Singapore, Eurocontrol France, Civil Aviation Affairs Bahrain, UNSW Australia, NTU Singapore, and ENAC France. His research interests are in AI-Human Hybrid systems, Machine Learning, Computer Vision and Complex Networks.

His research work has won several competitive awards including seven (7) Best Paper awards in international research conferences, Young Tall Poppy Scientist of the Year Award, Fresh Science award, ANU Science Medal, UNSW Inventor of the Year (finalist) Award. He also served as Technical Advisor to the Middle East Regional Monitoring Agency of the ICAO, Technical Advisor to the Ministry of Transport Bahrain.

FWC2022 PLAN OF ACTIONS

Action		Target date	Deliverable	Champion	Supported by	Status / remarks
No.	Description					
1.	Prepare a working paper on the outcome of the FWC2022 to MIDANPIRG/17	30 Mar 2019	WP to MIDANPIRG Combined with ATFM WP	Secretariat	Chairman	Completed
2.	Task the MIDRMA to carry out an airspace assessment for the MID Region based on the anticipated traffic flow during the FWC2022	18 Apr 2019	MIDANPIRG Conclusion	MIDANPIRG	ICAO MID	Completed Conclusion 17/24
3.	Initial FWC2022 Roadmap and Operation plan principles to be presented on FWC2022 TF/4 meeting	22 Sep 2020		Qatar		Completed
4.	Airspace assessment study and tool developer meeting to review the offer and agree on the details	1 Oct 2020	Detailed requirements, deliverables and timelines. Legal and financial responsibilities	Qatar, MIDRMA	ICAO MID	Completed
5.	Provide the forecasted FWC2022 FPL/Traffic data to the MIDRMA using the Traffic Data Sample template	15 Oct 2020	Forecasted FWC2022 FPL/Traffic data for at least 10 days	Qatar	MIDRMA	Completed, Revised version on progress
6.	Assess the potential impact on traffic flows within the RVSM Airspace based on the projected Traffic Data using the current MIDRMA tool capabilities and projected LHD reports	29-Oct-2020 Mar 2021	FWC2022 RVSM Airspace assessment	MIDRMA	Qatar	On-going
7.	Follow up meeting regarding the developer offer for beyond RVSM Airspace Assessment	Nov-2020 Mar 2021	Final decision for Airspace assessment study and tool offer agreement on the offer	Qatar	MIDRMA, ICAO MID	On-going
8.	Present Qatar decision to MIDRMA board meeting, to agree on financial and legal agreements/ arrangements	Nov-2020	Conclusion related to the contract (Developer –MIDRMA– Qatar)	Chairman	MIDRMA	Depending on item #7 Qatar decision
9.	Assess the potential impact on traffic flows beyond the RVSM Airspace based on the projected Traffic Data using the developed MIDRMA tool capabilities	Start: TBD Delivery: 6 months period	FWC2022 beyond RVSM Airspace assessment results	MIDRMA		Depending on item #7 Qatar decision

APPENDIX B

A-2

Action		Target date	Deliverable	Champion	Supported by	Status / remarks
No.	Description					
10.	Present the results of the airspace assessment to the FWC2022 TF/5 meeting	Q2-2020 <u>23 – 24 Mar 2021</u>	WP/PPT	MIDRMA	ICAO MID	On-going
11.	Prepare an initial FWC2022 Roadmap and Operational Plan to be shared with ATFM Core Team that includes all required procedures, action plan, contingency measures, etc.	31 Oct 2020	Initial FWC2022 Roadmap and Operational Plan	Qatar	Core team	On-going <u>Completed</u>
12.	draft FWC2022 Roadmap and Operational Plan to be presented to the ATM SG/6 <u>FWC2022 TF/5</u> meeting	9–12 Nov 2020 <u>23 – 24 Mar 2021</u>	WP/PPT Draft FWC2022 Roadmap and Operational Plan	FWC2022 Chairman		On-going
13.	Enhance the draft FWC2022 Roadmap and Operational Plan <u>to be reviewed by ATM SG/7</u>	15 Dec 2020	Enhanced the draft FWC2022 Roadmap and Operational Plan	Core Team		
14.	Present FWC2022 Roadmap and Operational Plan and progress on Airspace structure assessment to MIDANPIRG/ 48 <u>19</u>	Feb 2021 <u>2022</u>	WP	Chairman	ICAO	
15.	Present the final FWC2022 final Roadmap and Operational Plan and airspace structure assessment to MIDANPIRG/19 meeting	Feb-2022				
16.	Conduct familiarization visit(s) to State(s) or Organizations that would be managing major events	TBD	Familiarization visit(s)	Qatar and Members of FWC2022 TF, as required	FAA EUROCONTR OL CANSO AEROTHAI	

- END -