International Civil Aviation Organization

MIDANPIRG Air Traffic Management Sub-Group

Third Meeting (ATM SG/3)
(Cairo, Egypt, 22 – 25 May 2017)

Agenda Item 3: Global and Regional Developments related to ATM and SAR

MID AIR NAVIGATION REPORT-2017

(Presented by the Secretariat)

SUMMARY

This working paper provides update on the development of the MID Air Navigation Report.

Action by the meeting is at paragraph 3.

REFERENCES

- MIDANPIRG/16 Report

1. INTRODUCTION

1.1 As an important part of the ICAO Air navigation integrated work programme, performance measurement and reporting is an integral aspect of aviation's pursuit for continuous improvement. Measuring performance not only provides an idea of how the entire aviation system is behaving, but it also offers a feedback mechanism for future tactical adjustments or action plans towards the targets contained in the MID Region Air Navigation Strategy.

2. DISCUSSION

MID Region Air Navigation Report-2016

2.1 The meeting may wish to note that the ICAO MID Regional Office initiated the development of the MID Region Air Navigation Report. The objective of the report was to provide an overview of the implementation progress for the Priority 1 ASBU Block 0 Modules (with the associated elements) within the ICAO MID Region during the reporting year 2016. Furthermore, for planning purpose, the Report consolidated the outlook of the Block 0 Modules implementation in the MID States, by 2020.

2.2 The meeting may wish to recall that the MIDANPIRG/16 meeting (Kuwait, 13-16 February 2017) noted with appreciation that the status of the Block 0 ASBU Modules and the ASBU Block 0 implementation outlook for 2020 are well presented in the Report. The meeting valued the information contained in the Outlook for 2020 Section, which provides the status of implementation of the 18 ASBU Block 0 Modules foreseen to be achieved by the end of 2020, in accordance with the planning dates reported by States. This would provide a good basis for the planning of ASBU Block 1 implementation (2019-2025). The meeting prized also the inclusion of a Section related to environmental protection, which reflect the operational improvements implemented/planned to be implemented by States and Users that contributed to the reduction of CO2 emission. The meeting thanked also Bahrain, Jordan and UAE for sharing their success stories/best practices; and encouraged other States to do the same for the next Edition of the Report.

2.3 The MIDANPIRG/16 meeting noted that the progress for the implementation of some priority 1 Block 0 Modules in the MID Region has been acceptable/good; such as B0-ACAS, B0-AMET and B0-DATM. Nevertheless, some States are still facing challenges to implement the majority of the Block 0 Modules. The status of implementation of the ASBU Block 0 Modules also shows that Bahrain, Egypt, Jordan, Kuwait, Qatar, Saudi Arabia and UAE made a good progress in the implementation of the priority 1 ASBU Block 0 Modules.

2.4 Looking into the States' plans for 2020 (outlook), the focus/priority of States is to complete the implementation of B0-APTA, B0-FICE, B0-DATM, B0-AMET, B0-CCO and B0-CDO.

2.5 The MIDANPIRG/16 meeting reviewed and updated the MID Region Air Navigation Report-2016 at **Appendix A** and agreed to the following Conclusion:

CONCLUSION 16/7: MID REGION AIR NAVIGATION REPORT-2016

That, the MID Region Air Navigation Report-2016 is endorsed.

2.6 The MID Air Navigation Report-2016 is available on the ICAO MID Office website at: www.icao.int/mid .

MID Region Air Navigation Report-2017

2.7 The MIDANPIRG meeting agreed that States should provide the ICAO MID Office, with relevant data necessary for the development of the MID Region Air Navigation Report-2017, by 1 November 2017. Accordingly, the meeting agreed to the following Conclusion:

CONCLUSION 16/8: MID REGION AIR NAVIGATION REPORT-2017

That, MID States be urged to:

a) develop/update their National ASBU Implementation Plan, ensuring the alignment with and support to the MID Region Air Navigation Strategy (MID Doc 002); and

*b) provide the ICAO MID Office, with relevant data necessary for the development of the MID Region Air Navigation Report-2017, by **1 November 2017**.*

Regional Performance Dashboards

2.8 The meeting may wish to recall that ICAO introduced in 2014 the Regional Performance Dashboards to provide a glance of both Safety and Air Navigation Capacity and Efficiency strategic objectives, using a set of indicators and targets based on the regional implementation of the Global Aviation Safety Plan (GASP) and the Global Air Navigation Plan (GANP). The Dashboards show the globally agreed indicators and targets related to the global priorities and their status at the regional level.

2.9 The meeting may wish to note that the MIDANPIRG/15 meeting, through Conclusion 15/19, agreed that the performance dashboards be expanded to include all the MID Region-specific indicators and targets included in the MID Region Air Navigation Strategy. As a follow-up action, the ICAO MID Office developed the MID Region Air Navigation Report to provide an overview of the implementation progress for the Priority 1 ASBU Block 0 Modules (with the associated elements) during the reporting year 2016. The meeting may wish to note that the development of the online dashboard is linked also to the eANP online platform (in particular for the management/monitoring of Volume III); therefore, it should be closely coordinated with ICAO HQ.

3. ACTION BY THE MEETING

3.1 The meeting is invited to urge States to provide the ICAO MID Office, with relevant data necessary for the development of the MID Region Air Navigation Report-2017, by 1 November 2017.

MID Region

AIR NAVIGATION REPORT

2016 EDITION

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Coordinated Approach to Air Navigation Planning and Implementation

Air transport today plays a major role in driving sustainable economic and social development. It directly and indirectly supports the employment of 58.1 million people, contributes over $2.4 trillion to global Gross Domestic Product (GDP), and carries over 3.3 billion passengers and $6.4 trillion worth of cargo annually.

A fully harmonized global air navigation system built on modern performance-based procedures and technologies is a solution to the concerns of limited air traffic capacity and unnecessary gas emissions being deposited in the atmosphere.

The GANP represents a rolling, 15-year strategic methodology which leverages existing technologies and anticipates future developments based on State/ industry agreed operational objectives. The Global Air Navigation Plan's Aviation System Block Upgrades (ASBU) methodology is a programmatic and flexible global system's engineering approach that allows all Member States to advance their Air Navigation capacities based on their specific operational requirements. The Block Upgrades will enable aviation to realize the global harmonization, increased capacity, and improved environmental efficiency that modern air traffic growth now demands in every region around the world.

The GANP's Block Upgrades are organized in six-year time increments starting in 2013 and continuing through 2031 and beyond. The GANP ASBU planning approach also addresses airspace user needs, regulatory requirements and the needs of Air Navigation Service Providers and Airports. This ensures a single source for comprehensive planning. This structured approach provides a basis for sound investment strategies and will generate commitment from States, equipment manufacturers, operators and service providers.

The resultant framework is intended primarily to ensure that the aviation system will be maintained and enhanced, that ATM improvement programmes are effectively harmonized, and that barriers to future aviation efficiency and environmental gains can be removed at a reasonable cost. In this sense, the adoption of the ASBU methodology significantly clarifies how the ANSP and airspace users should plan for future equipage.

Although the GANP has a worldwide perspective, it is not intended that all Block Modules be required to be applied in every State and Region. Many of the Block Upgrade Modules contained in the GANP are specialized packages that should be applied only where the specific operational requirement exists or corresponding benefits can be realistically projected. The inherent flexibility in the ASBU methodology allows States to implement Modules based on their specific operational requirements. Using the GANP, Regional and State planners should identify those Modules which provide any needed operational improvements. Although the Block Upgrades do not dictate when or where a particular Module is to be implemented, this may change in the future should uneven progress hinder the passage of aircraft from one region of airspace to another.

The regular review of implementation progress and the analysis of potential impediments will ultimately ensure the harmonious transition from one region to another following major traffic flows, as well as ease the continuous evolution towards the GANP's performance targets.

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1. INTRODUCTION

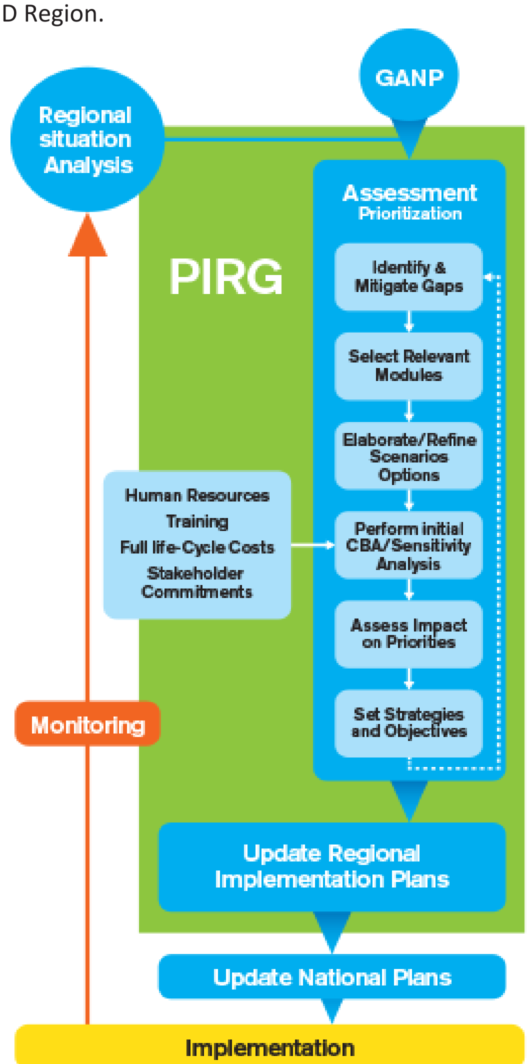
1.1 Objectives

The MID Region Air Navigation Report presents an overview of the planning and implementation progress for the Priority 1 ASBU Block 0 Modules (and its detailed elements) within the ICAO MID Region during the reporting year 2016.

The implementation status data covers the 15 ICAO MID States.

GANP states that the regional national planning process should be aligned and used to identify those Modules which best provide solutions to the operational needs identified. Depending on implementation parameters such as the complexity of the operating environment, the constraints and the resources available, regional and national implementation plans will be developed in alignment with the GANP. Such planning requires interaction between stakeholders including regulators, users of the aviation system, the air navigation service providers (ANSPs), aerodrome operators and supply industry, in order to obtain commitments to implementation.

Accordingly, deployments on a global, regional and sub-regional basis and ultimately at State level should be considered as an integral part of the global and regional planning process through the Planning and Implementation Regional Groups (i.e. MIDANPIRG). The PIRG process will further ensure that all required supporting procedures, regulatory approvals and training capabilities are set in place. These supporting requirements will be reflected in regional online Air Navigation Plan (MID eANPs) developed by MIDANPIRG, ensuring strategic transparency, coordinated progress and certainty of investment. In this way, deployment arrangements including applicability dates can also be agreed and collectively applied by all stakeholders involved in the Region. The MID Region Air Navigation Report which contains all information on the implementation process of the Priority 1 ASBU Modules of the MID Region Air Navigation Strategy (MID Doc 002) is the key document for MIDANPIRG and its Subsidiary Bodies to monitor and analyze the implementation within the MID Region.



Regional Planning

1.2 Background

Following the discussions and recommendations from the Twelfth Air Navigation Conference (AN-Conf/12), the Fourth Edition of the Global Air Navigation Plan (GANP) based on the Aviation Systems Block Upgrades (ASBU) approach was endorsed by the 38th Assembly of ICAO in October 2013. The Assembly Resolution 38-02 which agreed, amongst others, to call upon States, planning and implementation regional groups (PIRGs), and the aviation industry to provide timely information to ICAO (and to each other) regarding the implementation status of the GANP, including the lessons learned from the implementation of its provisions and to invite PIRGs to use ICAO standardized tools or adequate regional tools to monitor and (in collaboration with ICAO) analyze the implementation status of air navigation systems.

The Fourth meeting of the MIDANPIRG Steering Group (MSG/4) which was held in Cairo, Egypt from 24 to 26 November 2014 endorsed the MID Region Air Navigation Strategy. The Strategy was later endorsed by MIDANPIRG/15 and published as MID Doc 002. The Strategy includes 11 priority 1 Block 0 Modules and their associated performance indicators and targets.
MIDANPIRG and its Subsidiary Bodies (in particular ANSIG) monitor the progress and the status of implementation of the ASBU Block 0 Modules in the MID Region.

The MID Region Air Navigation Report is an integral part of the air navigation planning and implementation process in the MID Region.

1.3 Scope

This MID Air Navigation Report addresses the implementation status of the priority 1 ASBU Block 0 Modules for the year 2016.

The Report covers the fifteen (15) ICAO MID States:

Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia, Sudan, Syria, United Arab Emirates and Yemen.

ICAO MID Region

1.4 Collection of data

The necessary data for the MID Air Navigation Report was collected mainly through the MIDANPIRG Subsidiary Bodies and the MID eANP Volume III.

Where the required data was not provided, it is indicated in the Report by color coding (Missing Data).

1.5 Structure of the Report

Section 1 (Introduction) presents the objective and background of the report as well as the scope covered and method of data collection.

Section 2 lists the priority 1 ASBU Block 0 Modules in the MID Region and presents the status of their implementation in graphical and numeric form.

Section 3 presents the ASBU Block 0 implementation outlook for 2020 in the MID Region.

Section 4 provides an update on global developments related to the environmental protection, status of State's CO_2 action plans and the operational improvements that had been/would be implemented in the MID Region.

Section 5 includes few success stories related to the implementation of ASBU Block 0 Modules, as well as their associated operational improvements and environmental benefits.

Section 6 concludes the Report by providing a brief analysis on the status of implementation of the different priority 1 ASBU Block 0 Modules.

Appendix A provides detailed status of the implementation of Priority 1 Block 0 Modules and their associated Elements for the MID States.

Appendix B illustrates the detailed status of implementation of ASBU Block 0 Modules in the MID States by 2020.

2. STATUS OF IMPLEMENTATION

The ICAO Block Upgrades refer to the target availability timelines for a group of operational improvements (technologies and procedures) that will eventually realize a fully-harmonized global Air Navigation System. The technologies and procedures for each Block have been organized into unique Modules which have been determined and cross-referenced based on the specific Performance Improvement Area to which they relate.

Block 0 Modules are characterized by operational improvements which have already been developed and implemented in many parts of the world. It therefore has a near-term implementation period of 2013–2018, whereby 2013 refers to the availability of all components of its particular performance modules and 2018 refers to the target implementation deadline. ICAO has been working with its Member States to help each determine exactly which capabilities they should have in place based on their unique operational requirements.

This chapter of the report gives an overview of the status of implementation for each of the Priority 1 ASBU Block 0 Modules for the MID States. The status of implementation of each Module versus its target(s) is also provided for each priority 1 ASBU Block 0 Module.

The following color scheme is used for illustrating the status of implementation:

Legend
Completed
Partially Completed (50%+)
Partially Completed/Late (50%-)
Not Started/Not Implemented
Not Applicable
Missing Data

Note – Missing data is excluded in the calculation of the average regional status of implementation.

2.1 MID Region ASBU Block 0 Modules Prioritization

This report covers eleven (out of eighteen) ASBU Block 0 Modules that have been determined by MIDANPIRG/MSG as priority 1 for the MID Region (MID Doc 002 Edition June 2015, refers).

Module Code	Module Title	Priority	Monitoring		Remarks
			Main	Supporting	
***Performance Improvement Areas (PIA) 1*: Airport Operations**					
B0-APTA	Optimization of Approach Procedures including vertical guidance	1	PBN SG	ATM SG, AIM SG, CNS SG	
B0-WAKE	Increased Runway Throughput through Optimized Wake Turbulence Separation	2			
B0-RSEQ	Improve Traffic flow through Runway Sequencing (AMAN/DMAN)	2			
B0-SURF	Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)	1	ANSIG	CNS SG	Coordination with RGS WG
B0-ACDM	Improved Airport Operations through Airport-CDM	1	ANSIG	CNS SG, AIM SG, ATM SG	Coordination with RGS WG
***Performance Improvement Areas (PIA) 2* Globally Interoperable Systems and Data Through Globally Interoperable System Wide Information Management**					
B0-FICE	Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration	1	CNS SG	ATM SG	
B0-DATM	Service Improvement through Digital Aeronautical Information Management	1	AIM SG	-	
B0-AMET	Meteorological information supporting enhanced operational efficiency and safety	1	MET SG	-	
***Performance Improvement Areas (PIA) 3* Optimum Capacity and Flexible Flights – Through Global Collaborative ATM**					
B0-FRTO	Improved Operations through Enhanced En-Route Trajectories	1	ATM SG		
B0-NOPS	Improved Flow Performance through Planning based on a Network-Wide view	1			
B0-ASUR	Initial capability for ground surveillance	2			
B0-ASEP	Air Traffic Situational Awareness (ATSA)	2			
B0-OPFL	Improved access to optimum flight levels through climb/descent procedures using ADS-B	2			
B0-ACAS	ACAS Improvements	1	CNS SG		
B0-SNET	Increased Effectiveness of Ground-Based Safety Nets	2			
***Performance Improvement Areas (PIA) 4* Efficient Flight Path – Through Trajectory-based Operations**					
B0-CDO	Improved Flexibility and Efficiency in Descent Profiles (CDO)	1	PBN SG		
B0-TBO	Improved Safety and Efficiency through the initial application of Data Link En-Route	2	ATM SG	CNS SG	
B0-CCO	Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)	1	PBN SG		

2.2 ASBU Implementation Status in the MID Region

2.2.1 B0-APTA

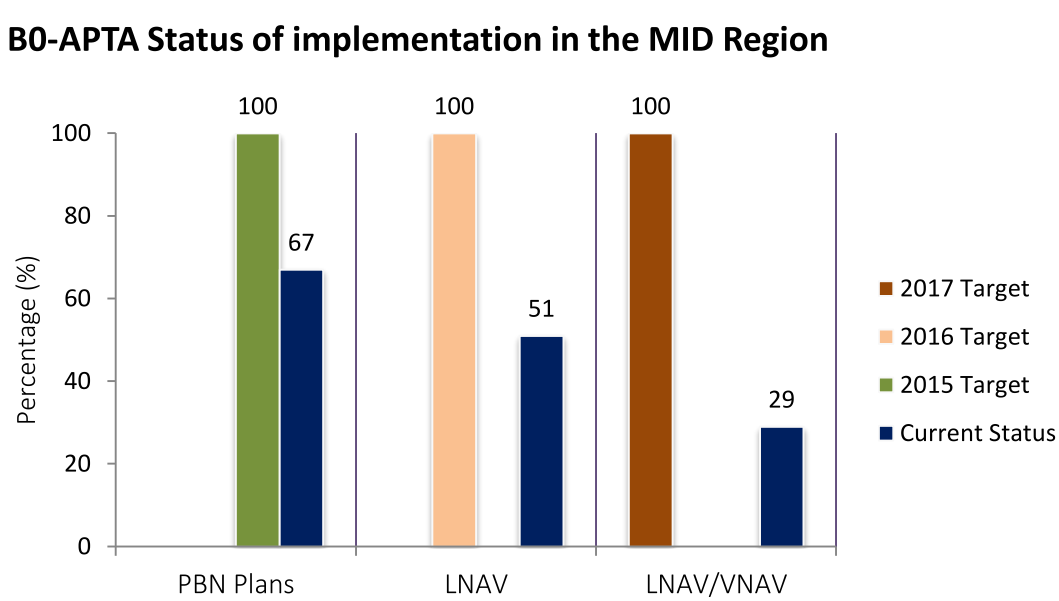
2.2.1.1 B0-APTA Elements and Performance Targets

The use of performance-based navigation (PBN) and ground-based augmentation system (GBAS) landing system (GLS) procedures will enhance the reliability and predictability of approaches to runways, thus increasing safety, accessibility and efficiency. This is possible through the application of Basic global navigation satellite system (GNSS), Baro vertical navigation (VNAV), satellite-based augmentation system (SBAS) and GLS. The flexibility inherent in PBN approach design can be exploited to increase runway capacity.

B0 – APTA: Optimization of Approach Procedures including vertical guidance			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
States' PBN Implementation Plans	All States	Indicator: % of States that provided updated PBN implementation Plan Supporting metric: Number of States that provided updated PBN implementation Plan	80 % by Dec. 2014 100% by Dec. 2015
LNAV	All RWYs Ends at International Aerodromes	Indicator: % of runway ends at international aerodromes with RNAV(GNSS) Approach Procedures (LNAV) Supporting metric: Number of runway ends at international aerodromes with RNAV (GNSS) Approach Procedures (LNAV)	All runway ends at Int'l Aerodromes, either as the primary approach or as a back-up for precision approaches by Dec. 2016
LNAV/VNAV	All RWYs Ends at International Aerodromes	Indicator: % of runways ends at international aerodromes provided with Baro-VNAV approach procedures (LNAV/VNAV) Supporting metric: Number of runways ends at international aerodromes provided with Baro-VNAV approach procedures (LNAV/VNAV)	All runway ends at Int'l Aerodromes, either as the primary approach or as a back-up for precision approaches by Dec. 2017

2.2.1.2 B0-APTA Status of Implementation

The following chart provides the regional status of implementation of B0-APTA against the performance targets agreed in the MID Air Navigation Strategy:

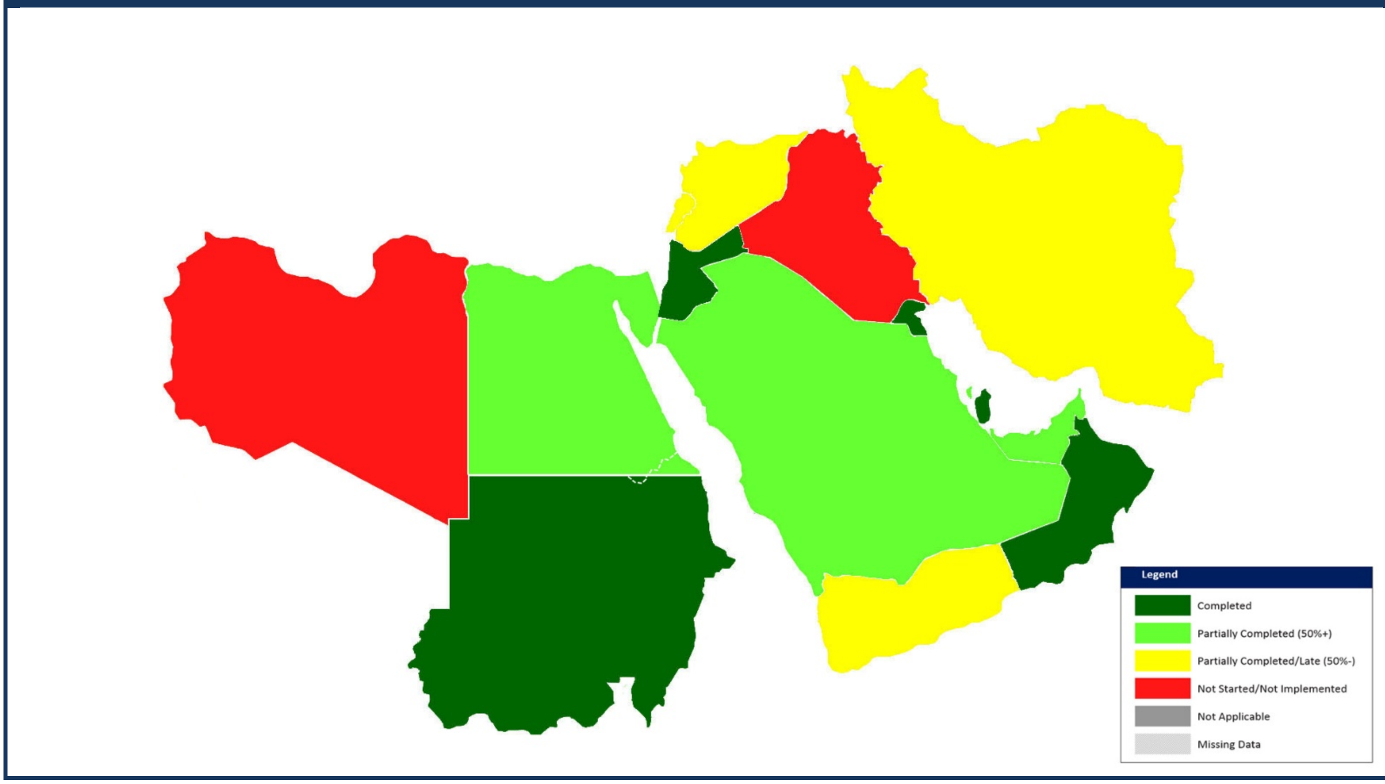


The Table and map below provide the status of implementation of B0-APTA in each of the MID States:

Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-APTA	PBN Plan															
	LNAV															
	LNAV/VNAV															

The progress for B0-APTA is slow (with approximately 40% implementation). Nevertheless, if we consider the status of implementation of PBN RWYs, which is considered at the global level, the status of implementation is approximately 52% (acceptable).

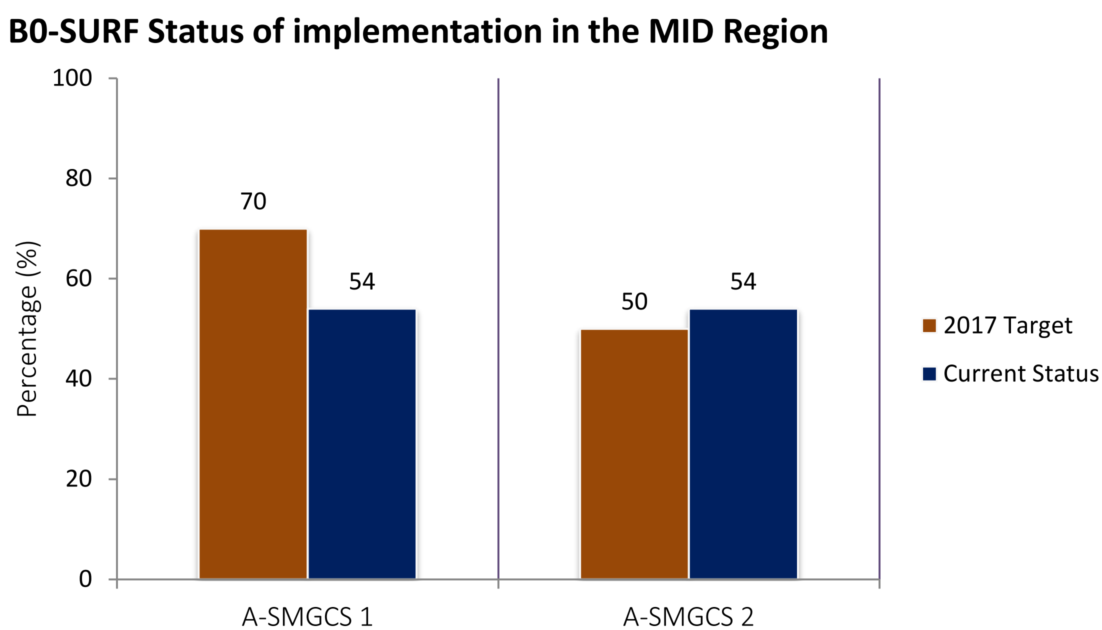
B0-APTA Status of implementation in the MID Region



2.2.2 B0-SURF

Basic A-SMGCS provides surveillance and alerting of movements of both aircraft and vehicles on the aerodrome thus improving runway/aerodrome safety. ADS-B information is used when available (ADS-B APT).

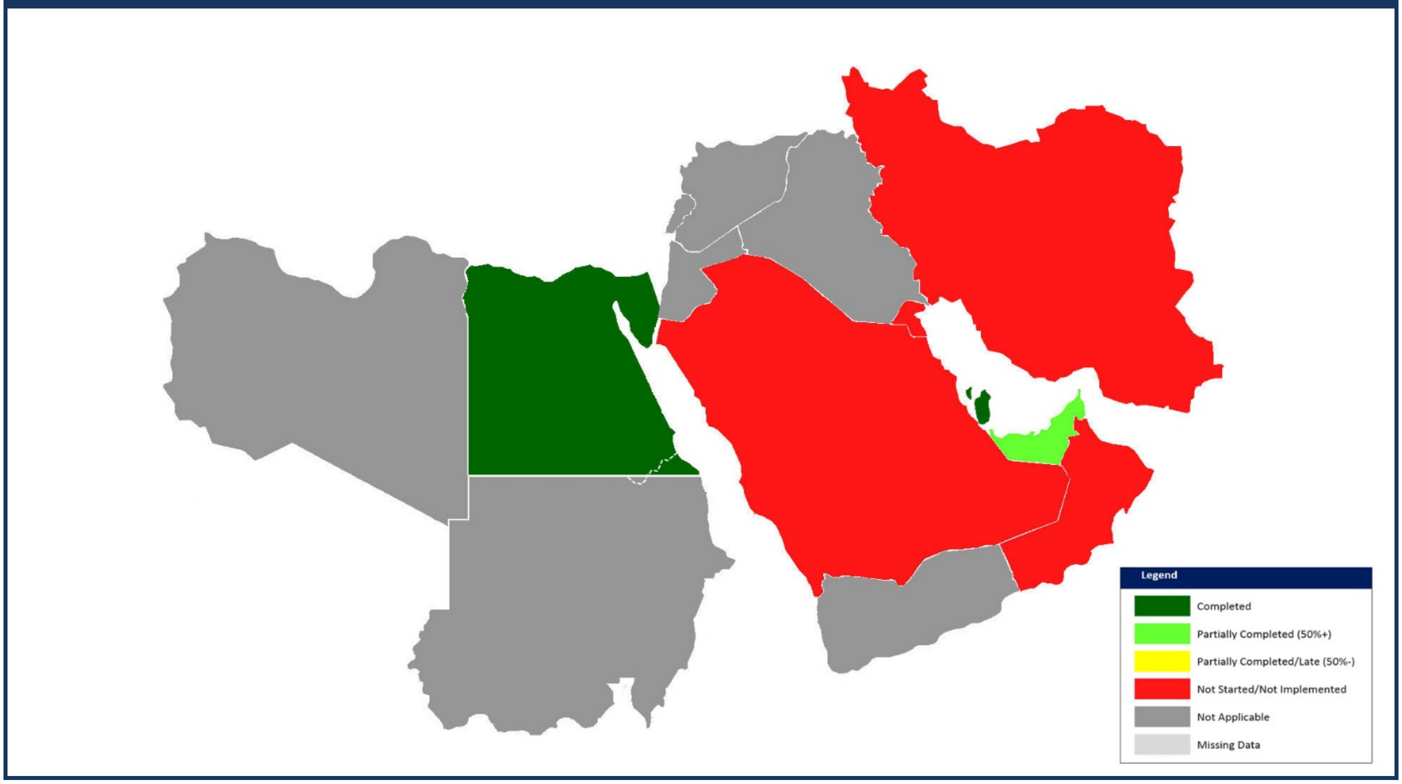
B0-SURF: Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
A-SMGCS Level 1	OBBI, HECA, OIII, OKBK, OOMS, OTBD, OTHH, OEDF, OEJN, OERK, OMDB, OMAA, OMDW	Indicator: % of applicable international aerodromes having implemented A-SMGCS Level 1 Supporting Metric: Number of applicable international aerodromes having implemented A-SMGCS Level 1	70% by Dec. 2017
A-SMGCS Level 2	OBBI, HECA, OIII, OKBK, OOMS, OTBD, OTHH, OEJN, OERK, OMDB, OMAA, OMDW	Indicator: % of applicable international aerodromes having implemented A-SMGCS Level 2 Supporting Metric: Number of applicable international aerodromes having implemented A-SMGCS Level 2	50% by Dec. 2017



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-SURF	A-SMGCS Level 1															
	A-SMGCS Level 2															

The progress for B0-SURF is <u>acceptable</u> (with approximately 54% implementation). B0-SURF is not applicable for 7 States.

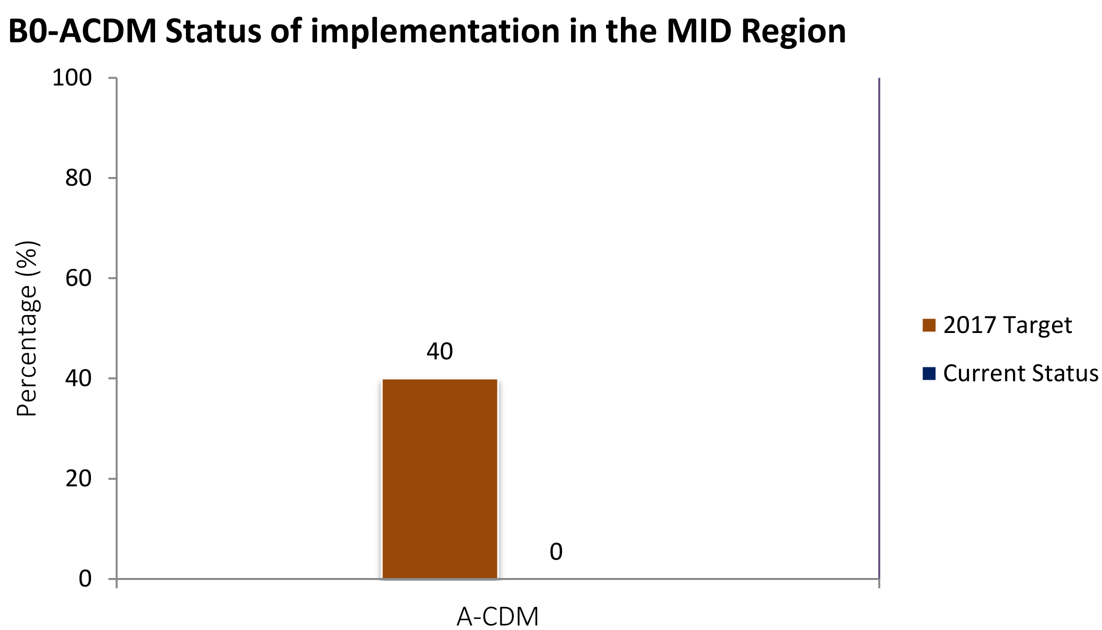
B0-SURF Status of implementation in the MID Region



2.2.3 B0-ACDM

To implement collaborative applications that will allow the sharing of surface operations data among the different stakeholders on the airport. This will improve surface traffic management reducing delays on movement and manoeuvering areas and enhance safety, efficiency and situational awareness.

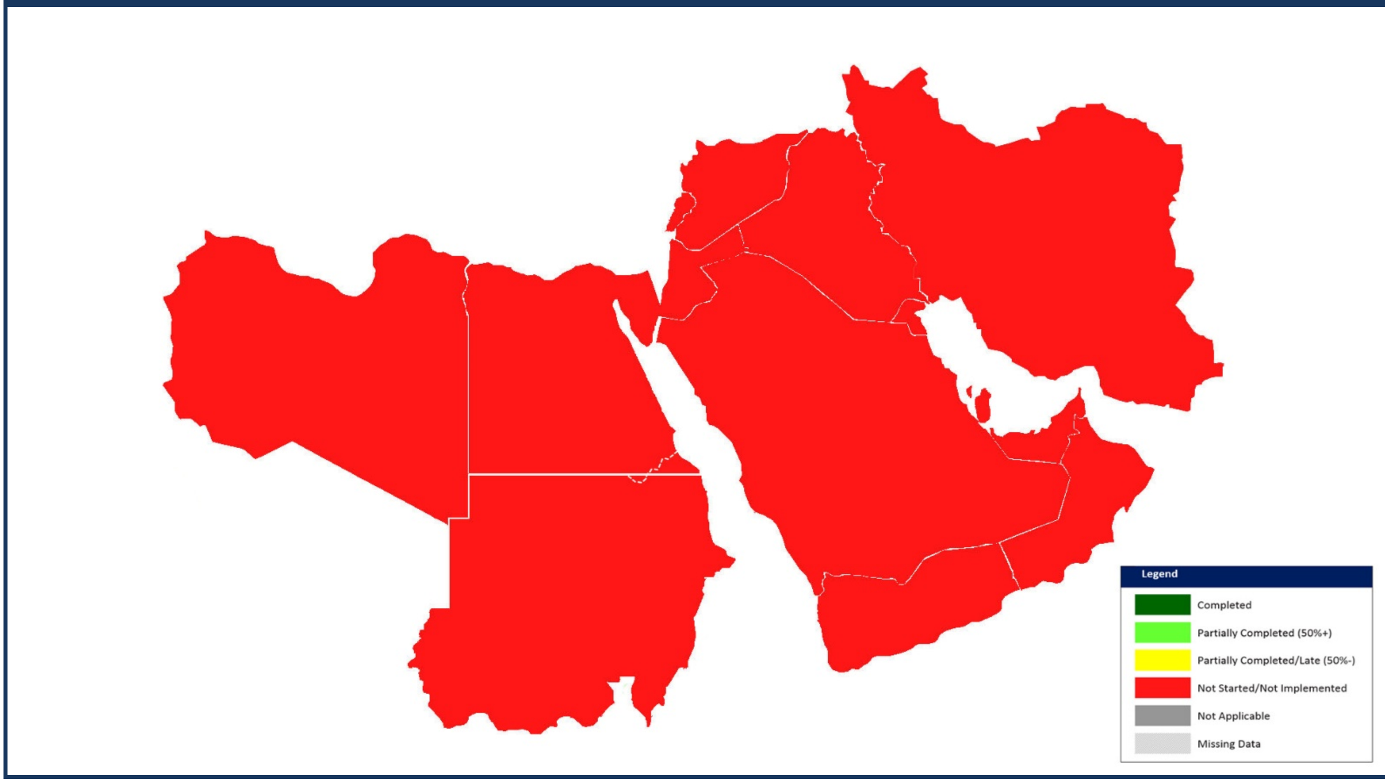
B0 – ACDM: Improved Airport Operations through Airport-CDM			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
A-CDM	OBBI, HECA, OIII, OKBK, OOMS, OTBD, OTHH, OEJN, OERK, OMDB, OMAA, OMDW	Indicator: % of applicable international aerodromes having implemented improved airport operations through airport-CDM Supporting metric: Number of applicable international aerodromes having implemented improved airport operations through airport-CDM	40% by Dec. 2017



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-ACDM	A-CDM															

B0-ACDM has not yet been fully implemented by any MID State. Nevertheless, implementation is ongoing in some States.

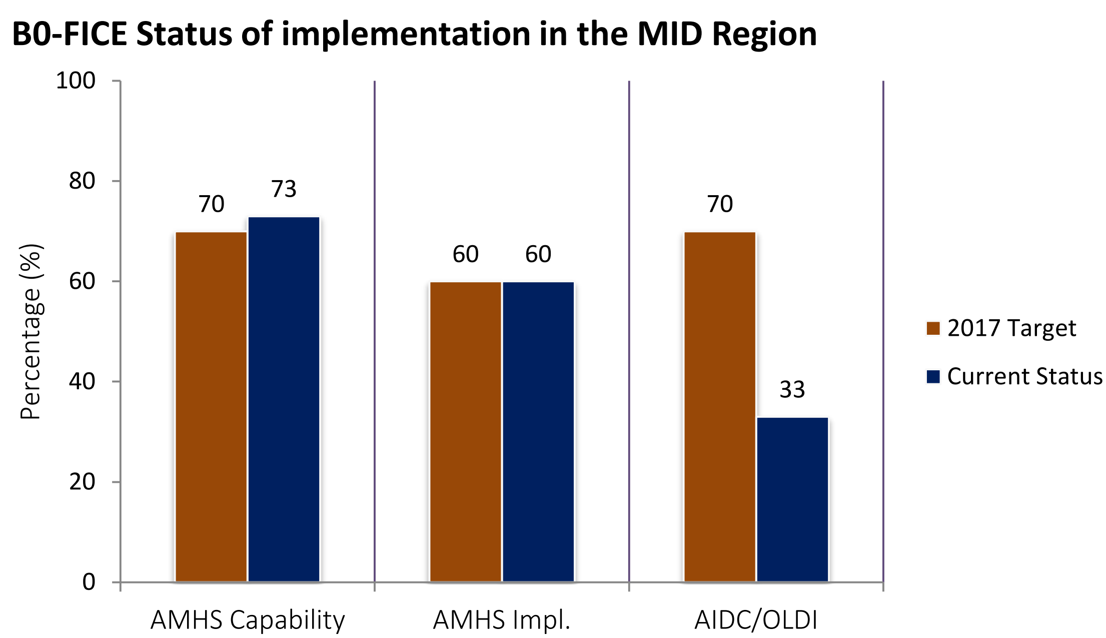
B0-ACDM Status of implementation in the MID Region



2.2.4 B0-FICE

To improve coordination between air traffic service units (ATSUs) by using ATS Interfacility Data Communication (AIDC) defined by the ICAO *Manual of Air Traffic Services Data Link Applications* (Doc 9694). The transfer of communication in a data link environment improves the efficiency of this process particularly for oceanic ATSUs.

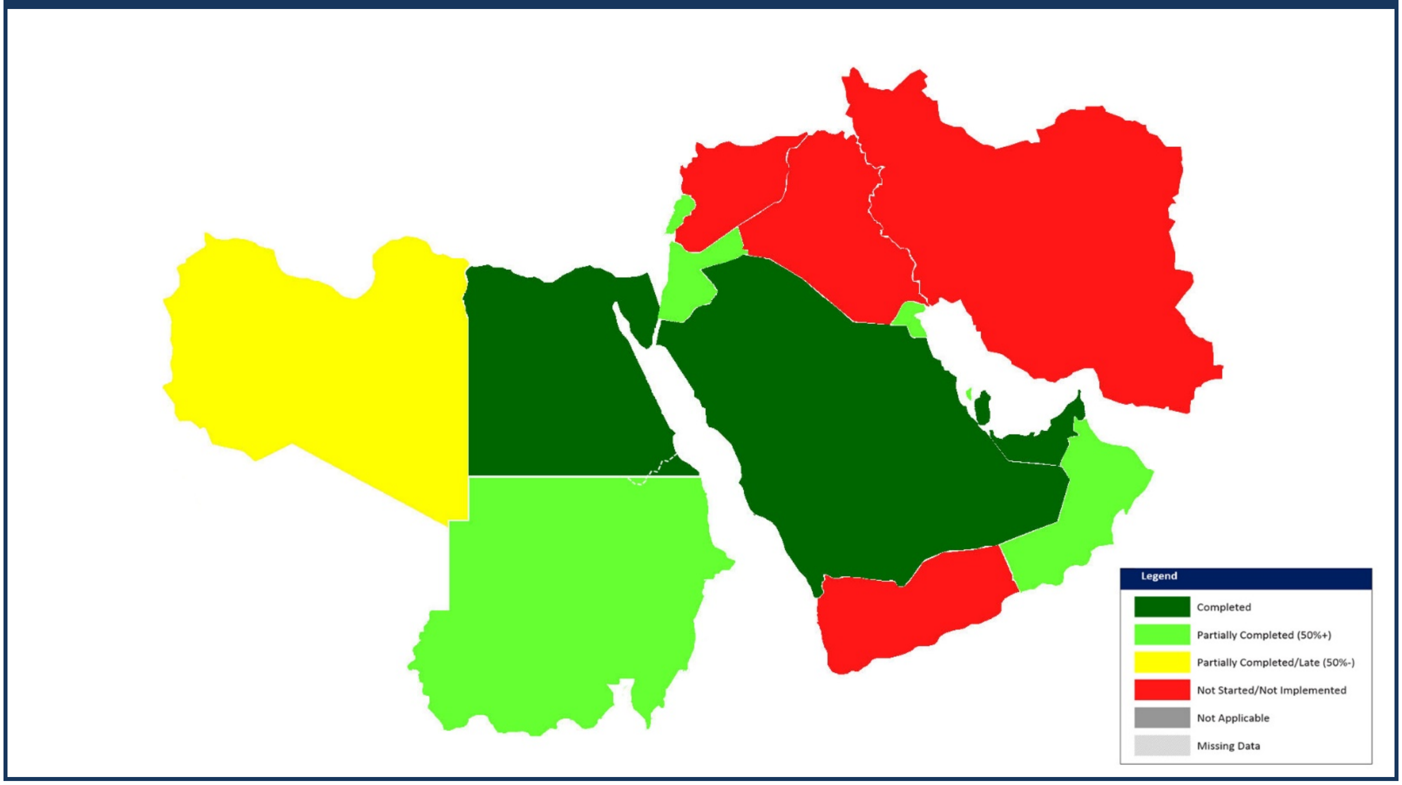
B0 – FICE: Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
AMHS capability	All States	Indicator: % of States with AMHS capability Supporting metric: Number of States with AMHS capability	70% of States with AMHS capability by Dec. 2017
AMHS implementation /interconnection	All States	Indicator: % of States with AMHS implemented (interconnected with other States AMHS) Supporting metric: Number of States with AMHS implemented (interconnections with other States AMHS)	60% of States with AMHS interconnected by Dec. 2017
Implementation of AIDC/OLDI between adjacent ACCs	All ACCs	Indicator: % of FIRs within which all applicable ACCs have implemented at least one interface to use AIDC/OLDI with neighboring ACCs Supporting metric: Number of AIDC/OLDI interconnections implemented between adjacent ACCs	70% by Dec. 2017



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-FICE	AMHS capability															
	AMHS impl. /interconnection															
	Implementation of AIDC/OLDI between adjacent ACCs															

The progress for B0-FICE is <u>acceptable</u> (with approximately 55% implementation).

B0-FICE Status of implementation in the MID Region

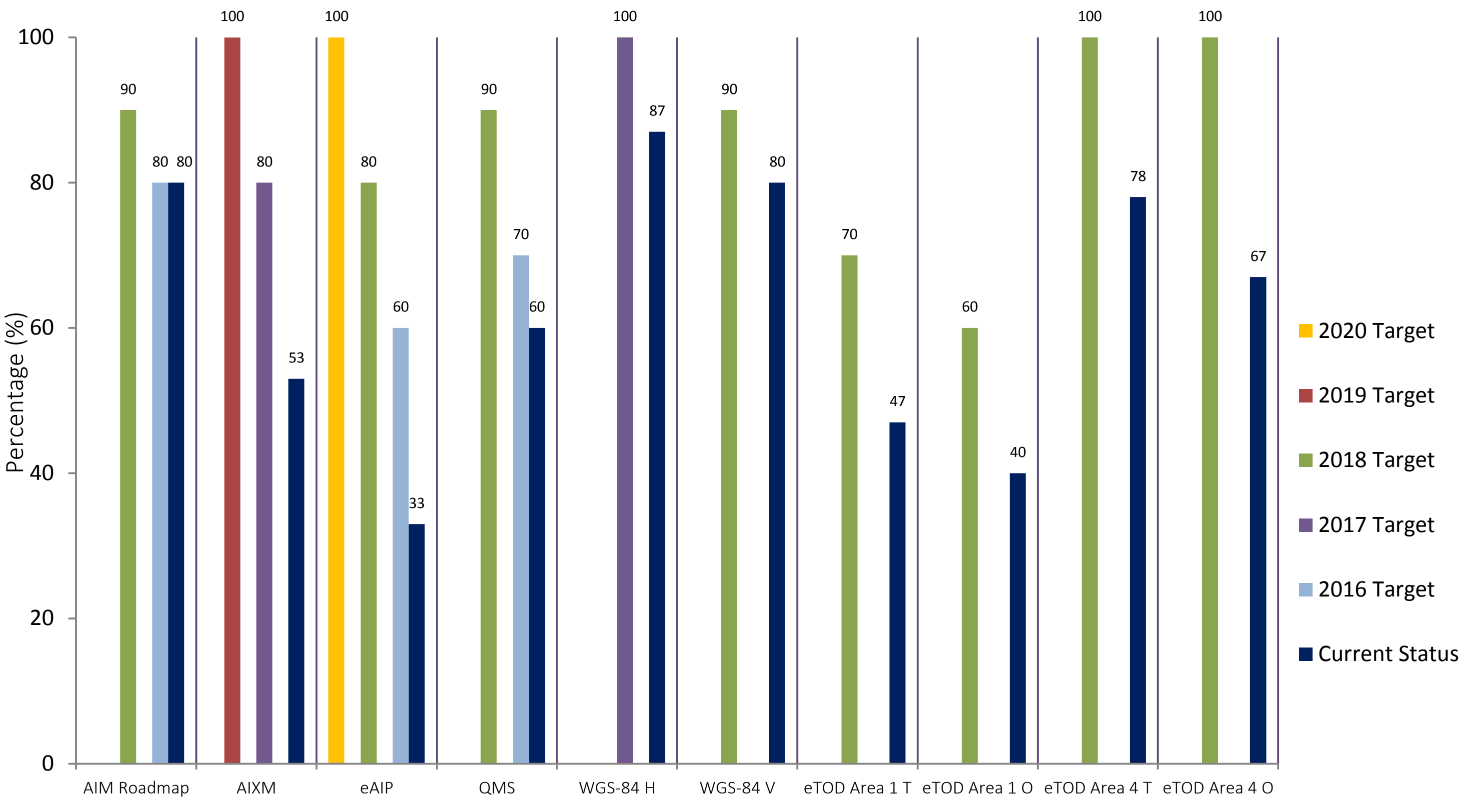


2.2.5 B0-DATM

The initial introduction of digital processing and management of information, through aeronautical information service (AIS)/aeronautical information management (AIM) implementation, use of aeronautical information exchange model (AIXM), migration to electronic aeronautical information publication (AIP) and better quality and availability of data.

B0 – DATM: Service Improvement through Digital Aeronautical Information Management			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
National AIM Implementation Plan/Roadmap	All States	Indicator: % of States that have National AIM Implementation Plan/Roadmap Supporting Metric: Number of States that have National AIM Implementation Plan/Roadmap	80% by Dec. 2016 90% by Dec. 2018
AIXM	All States	Indicator: % of States that have implemented an AIXM-based AIS database Supporting Metric: Number of States that have implemented an AIXM-based AIS database	60% by Dec. 2015 80% by Dec. 2017 100% by Dec. 2019
eAIP	All States	Indicator: % of States that have implemented an IAID driven AIP Production (eAIP) Supporting Metric: Number of States that have implemented an IAID driven AIP Production (eAIP)	60% by Dec. 2016 80% by Dec. 2018 100% by Dec. 2020
QMS	All States	Indicator: % of States that have implemented QMS for AIS/AIM Supporting Metric: Number of States that have implemented QMS for AIS/AIM	70% by Dec. 2016 90% by Dec. 2018
WGS-84	All States	Indicator: % of States that have implemented WGS-84 for horizontal plan (ENR, Terminal, AD) Supporting Metric: Number of States that have implemented WGS-84 for horizontal plan (ENR, Terminal, AD) Indicator: % of States that have implemented WGS-84 Geoid Undulation Supporting Metric: Number of States that have implemented WGS-84 Geoid Undulation	Horizontal: 100% by Dec. 2017 Vertical: 90% by Dec. 2018
eTOD	All States	Indicator: % of States that have implemented required Terrain datasets Supporting Metric: Number of States that have implemented required Terrain datasets Indicator: % of States that have implemented required Obstacle datasets Supporting Metric: Number of States that have implemented required Obstacle datasets	Area 1 : Terrain: 50% by Dec. 2015, 70% by Dec. 2018 Obstacles: 40% by Dec. 2015, 60% by Dec. 2018 Area 4: Terrain: 50% by Dec. 2015, 100% by Dec. 2018 Obstacles: 50% by Dec. 2015, 100% by Dec. 2018
Digital NOTAM*	All States	Indicator: % of States that have included the implementation of Digital NOTAM into their National Plan for the transition from AIS to AIM Supporting Metric: Number of States that have included the implementation of Digital NOTAM into their National Plan for the transition from AIS to AIM	80% by Dec. 2016 90% by Dec. 2018

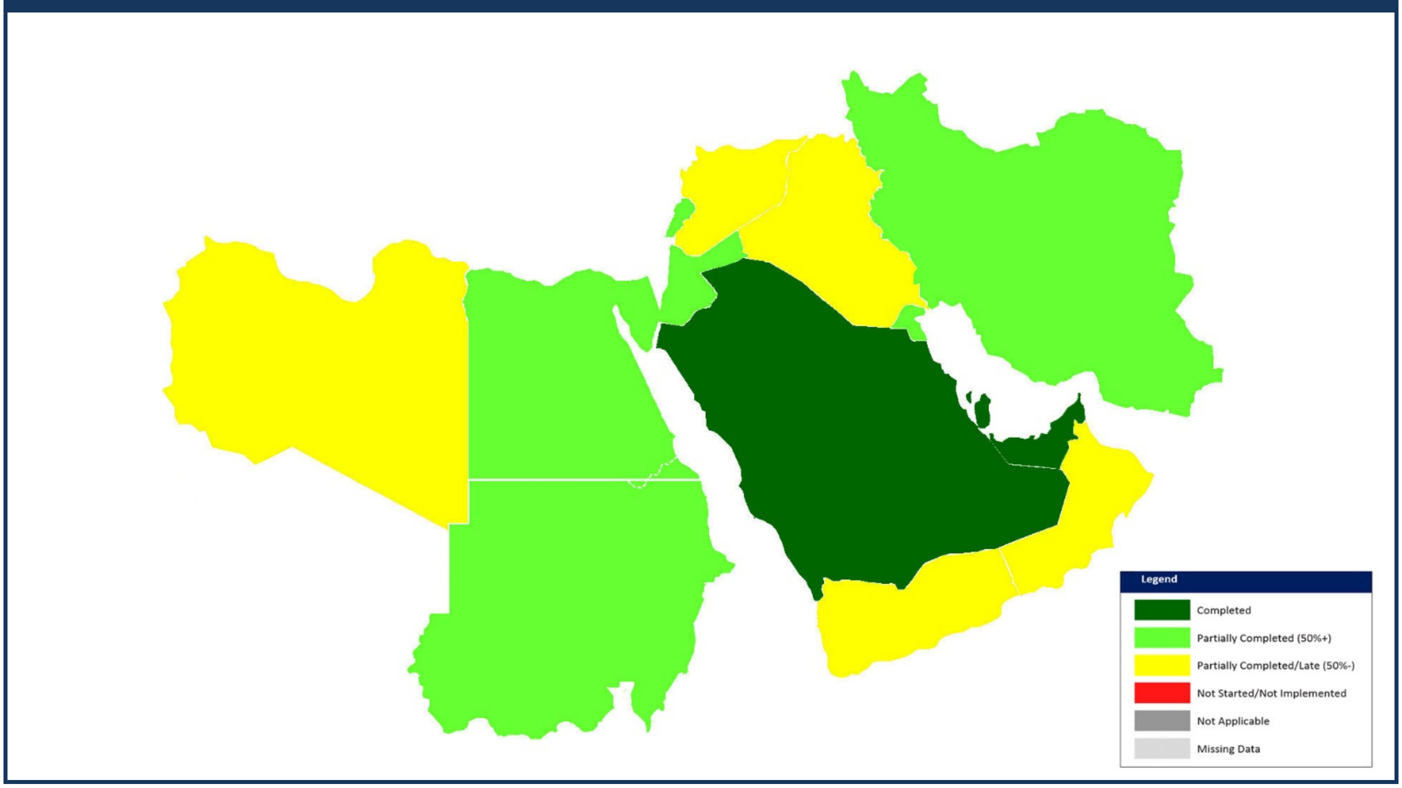
B0-DATM Status of implementation in the MID Region



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-DATM	National AIM Roadmap															
	AIXM															
	eAIP															
	QMS															
	WGS-84 – H															
	WGS-84 – V															
	eTOD Area 1 Terrain															
	eTOD Area 1 Obstacles															
	eTOD Area 4 Terrain															
	eTOD Area 4 Obstacles															

The progress for B0-DATM is acceptable (with approximately 63% implementation). eTOD Area 4 is not applicable in 6 States.

B0-DATM Status of implementation in the MID Region



2.2.6 B0-AMET

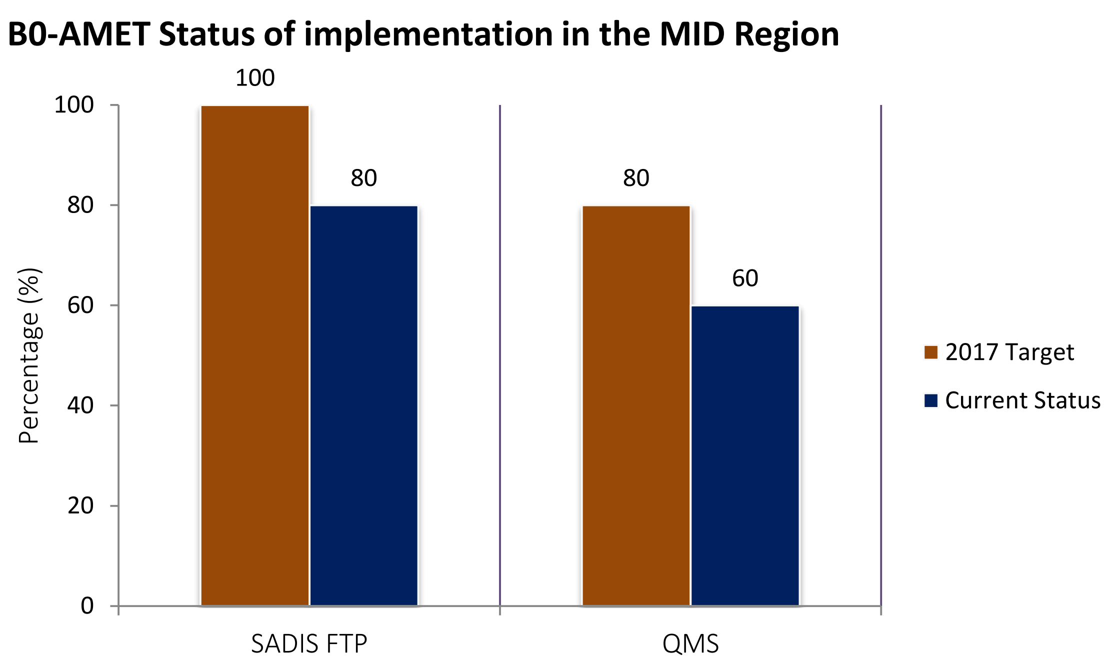
Global, regional and local meteorological information:

a) forecasts provided by world area forecast centres (WAFC), volcanic ash advisory centres (VAAC) and tropical cyclone advisory centres (TCAC);

b) aerodrome warnings to give concise information of meteorological conditions that could adversely affect all aircraft at an aerodrome including wind shear; and

c) SIGMETs to provide information on occurrence or expected occurrence of specific en-route weather phenomena which may affect the safety of aircraft operations and other operational meteorological (OPMET) information, including METAR/SPECI and TAF, to provide routine and special observations and forecasts of meteorological conditions occurring or expected to occur at the aerodrome.

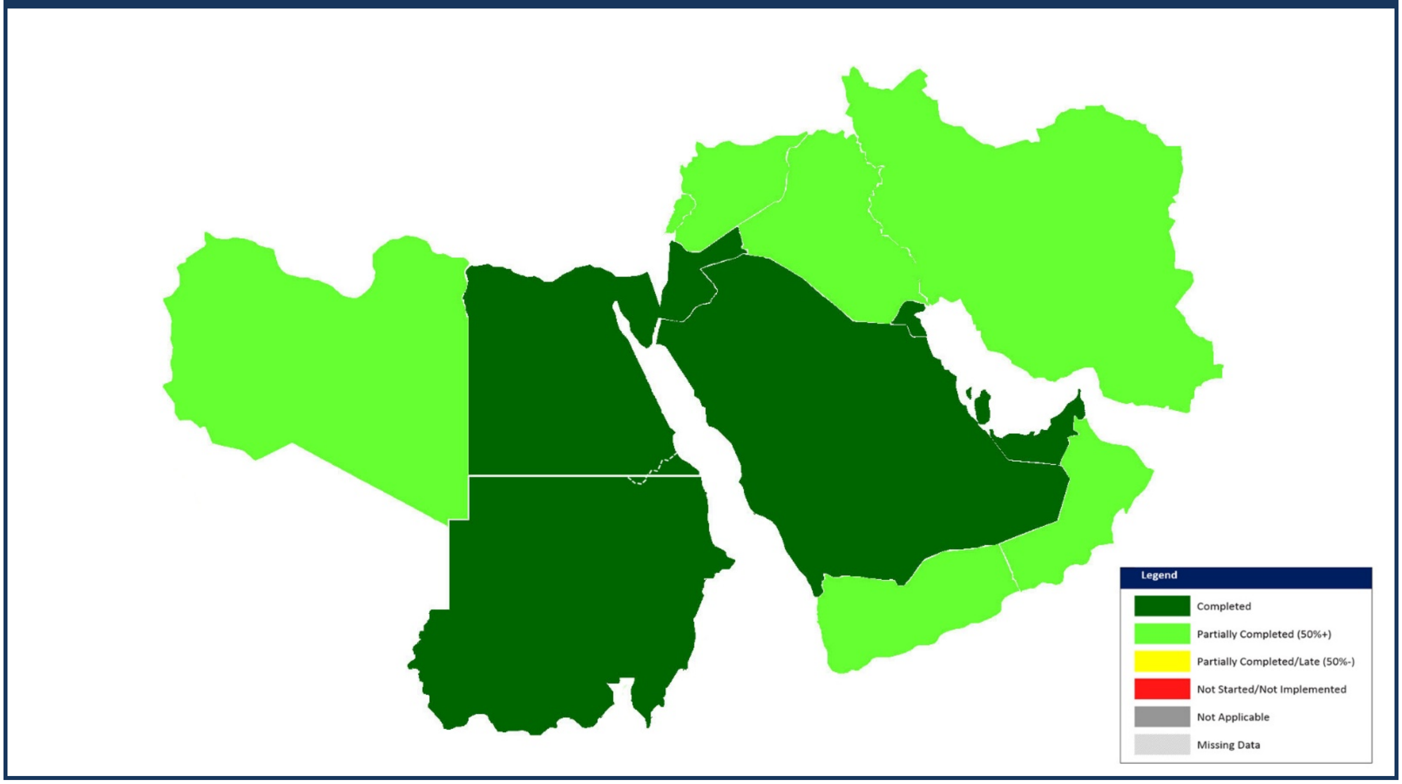
B0 – AMET: Meteorological information supporting enhanced operational efficiency and safety			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
SADIS FTP	All States	Indicator: % of States having implemented SADIS FTP service Supporting metric: number of States having implemented SADIS 2G satellite broadcast or Secure SADIS FTP service	90% by Dec. 2015 100% by Dec. 2017
QMS	All States	Indicator: % of States having implemented QMS for MET Supporting metric: number of States having implemented QMS for MET	60% by Dec. 2015 80% by Dec. 2017



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-AMET	SADIS 2G/Secure SADIS FTP															
	QMS															

The progress for B0-AMET is acceptable (with approximately 70% implementation).

B0-AMET Status of implementation in the MID Region

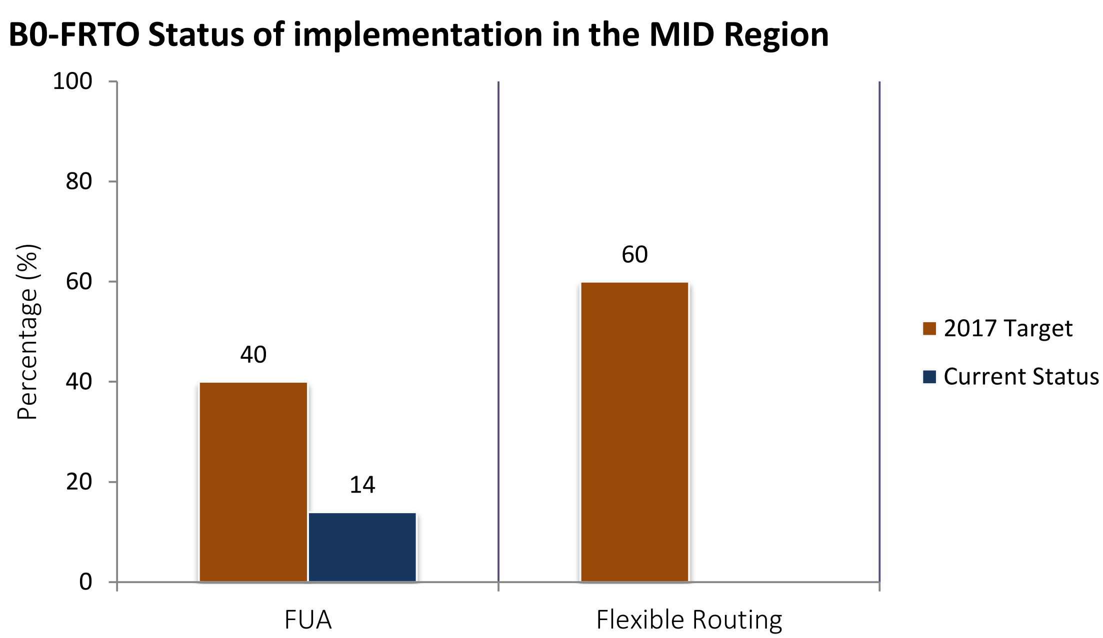


2.2.7 B0-FRTO

To allow the use of airspace which would otherwise be segregated (i.e. special use airspace) along with flexible routing adjusted for specific traffic patterns. This will allow greater routing possibilities, reducing potential congestion on trunk routes and busy crossing points, resulting in reduced flight length and fuel burn.

B0 – FRTO: Improved Operations through Enhanced En-Route Trajectories			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
Flexible use of airspace (FUA)	All States	Indicator: % of States that have implemented FUA Supporting metric*: number of States that have implemented FUA	40% by Dec. 2017
Flexible routing	All States	Indicator: % of required Routes that are not implemented due military restrictions (segregated areas) Supporting metric 1: total number of ATS Routes in the Mid Region Supporting metric 2*: number of required Routes that are not implemented due military restrictions (segregated areas)	60% by Dec. 2017

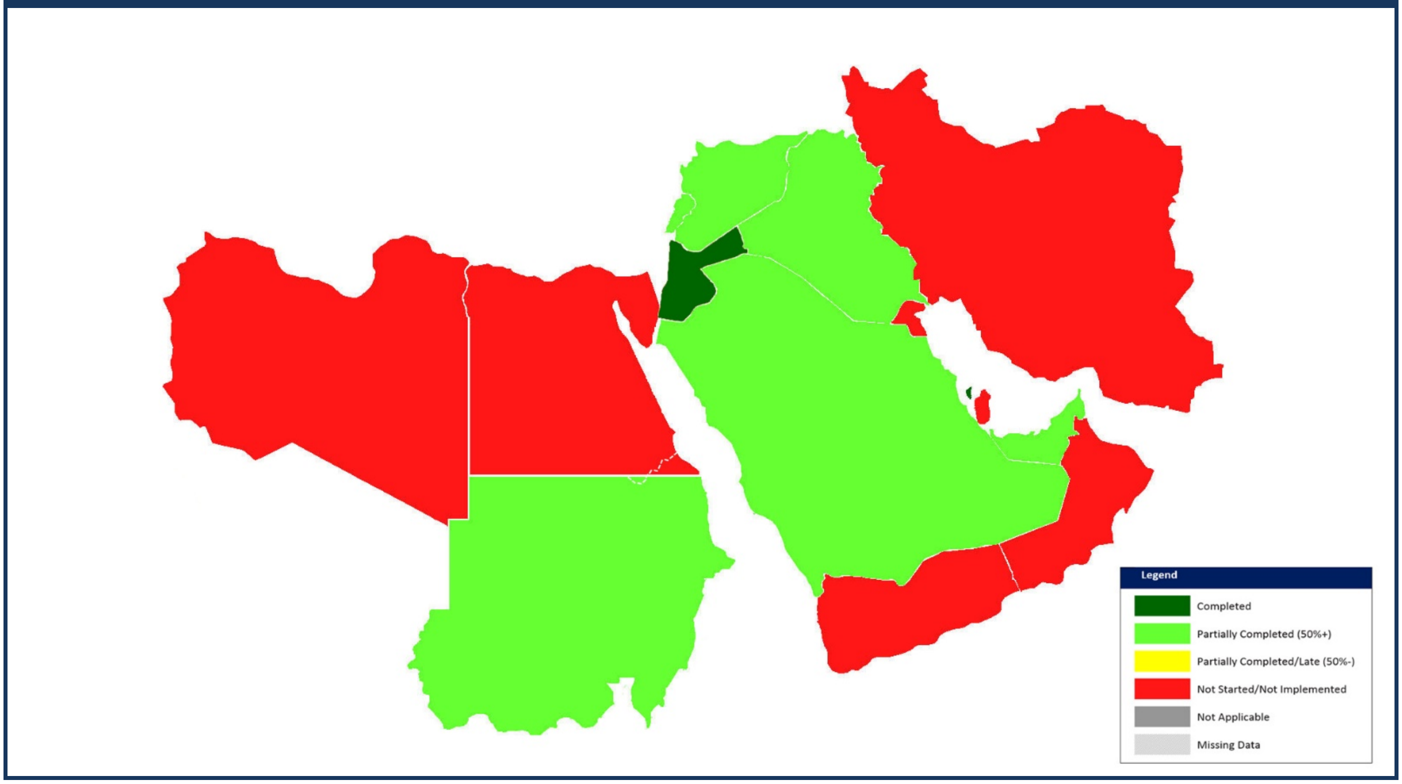
* *Implementation should be based on the published aeronautical information*



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-FRTO	Flexible use of airspace (FUA)															
	Flexible routing															

The progress for B0-FRTO (FUA) is very slow (with approximately 14% implementation). The element “Flexible Routing” could not be monitored because of the lack of data.

B0-FRTO (FUA) Status of implementation in the MID Region



2.2.8 B0-NOPS

Air Traffic Flow Management (ATFM) is used to manage the flow of traffic in a way that minimizes delay and maximizes the use of the entire airspace. ATFM can regulate traffic flows involving departure slots, smooth flows and manage rates of entry into airspace along traffic axes, manage arrival time at waypoints or Flight Information Region (FIR)/sector boundaries and re-route traffic to avoid saturated areas. ATFM may also be used to address system disruptions including crisis caused by human or natural phenomena.

Experience clearly shows the benefits related to managing flows consistently and collaboratively over an area of a sufficient geographical size to take into account sufficiently well the network effects. The concept for ATFM and demand and capacity balancing (DCB) should be further exploited wherever possible. System improvements are also about better procedures in these domains, and creating instruments to allow collaboration among the different actors**.**

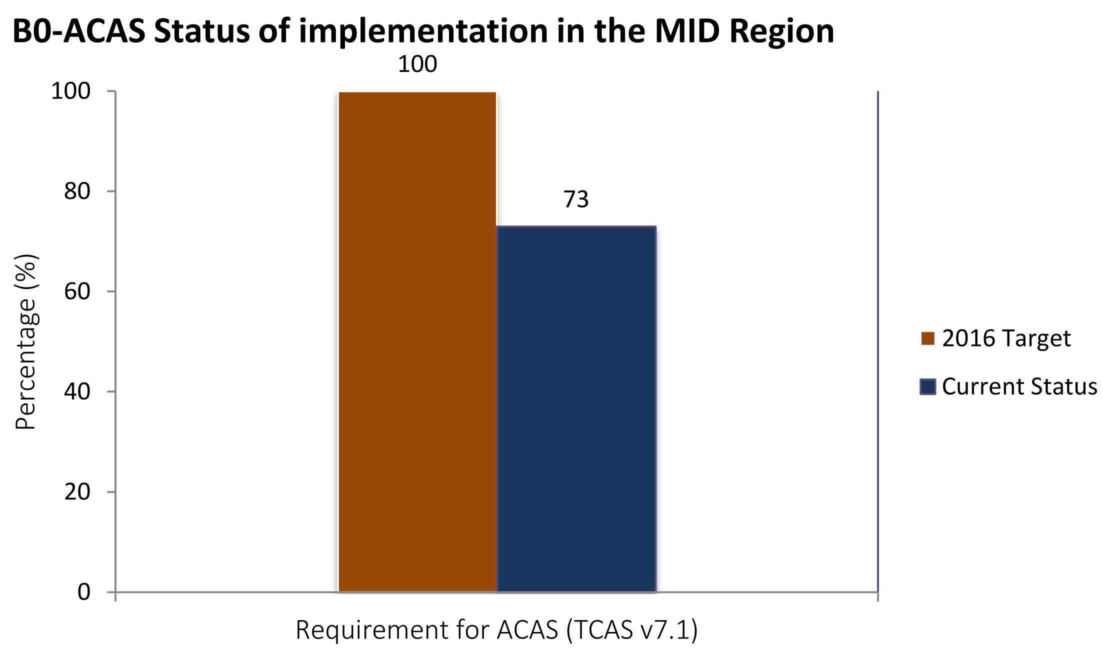
B0 – NOPS: Improved Flow Performance through Planning based on a Network-Wide view			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
ATFM Measures implemented in collaborative manner	All States	Indicator: % of States that have established a mechanism for the implementation of ATFM Measures based on collaborative decision Supporting metric: number of States that have established a mechanism for the implementation of ATFM Measures based on collaborative decision	100% by Dec. 2017

Note – B0-NOPS could not be monitored because the elements and associated performance indicators and targets have not yet been agreed upon and are under development.

2.2.9 B0-ACAS

To provide short-term improvements to existing airborne collision avoidance systems (ACAS) to reduce nuisance alerts while maintaining existing levels of safety. This will reduce trajectory deviations and increase safety in cases where there is a breakdown of separation.

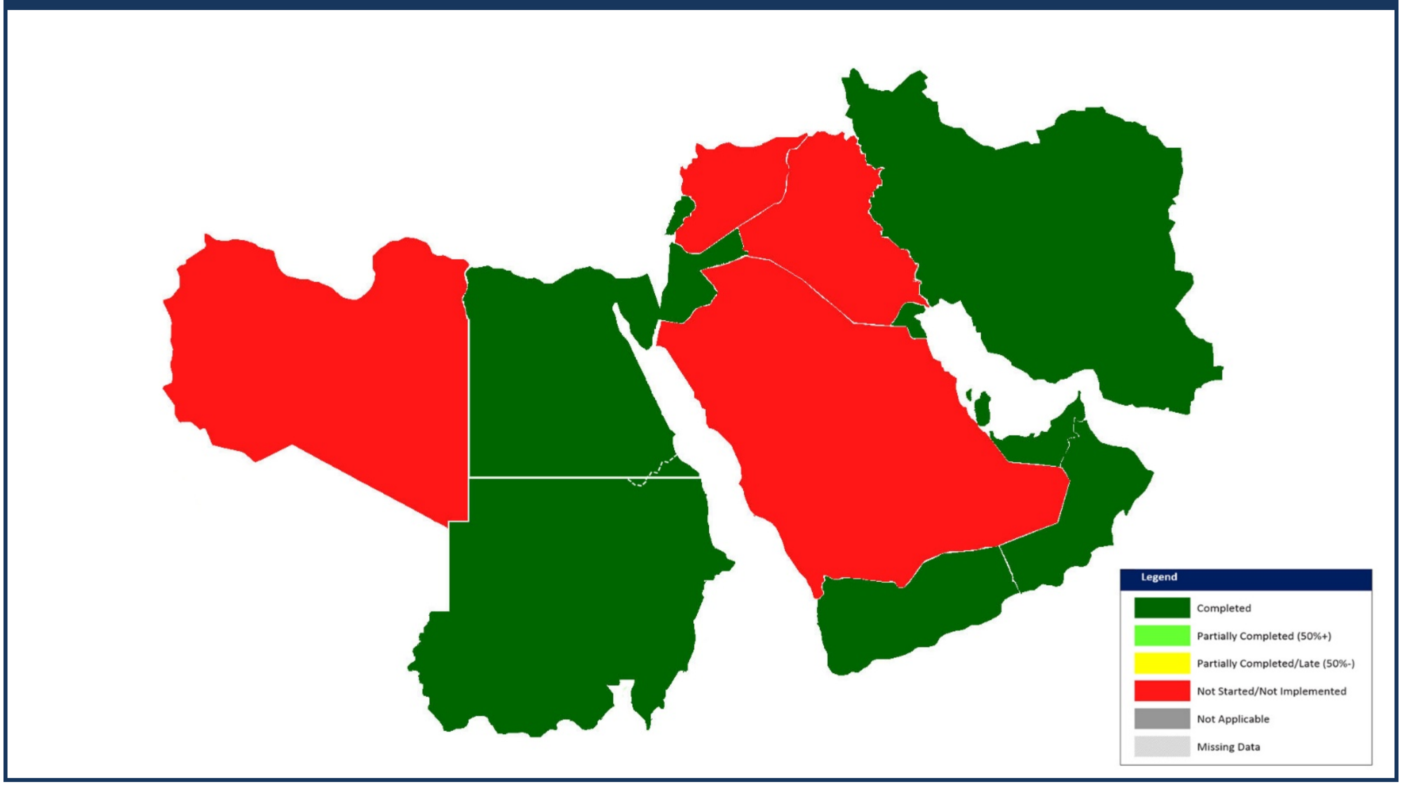
B0 – ACAS: ACAS Improvements			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
Avionics (TCAS V7.1)	All States	Indicator: % of States requiring carriage of ACAS (TCAS v 7.1) for aircraft with a max certificated take-off mass greater than 5.7 tons Supporting metric: Number of States requiring carriage of ACAS (TCAS v 7.1) for aircraft with a max certificated take-off mass greater than 5.7 tons	80% by Dec. 2015 100% by Dec. 2016



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-ACAS	ACAS (TCAS V7.1)															

The progress for B0-ACAS is <u>acceptable</u> (with approximately 73% implementation).

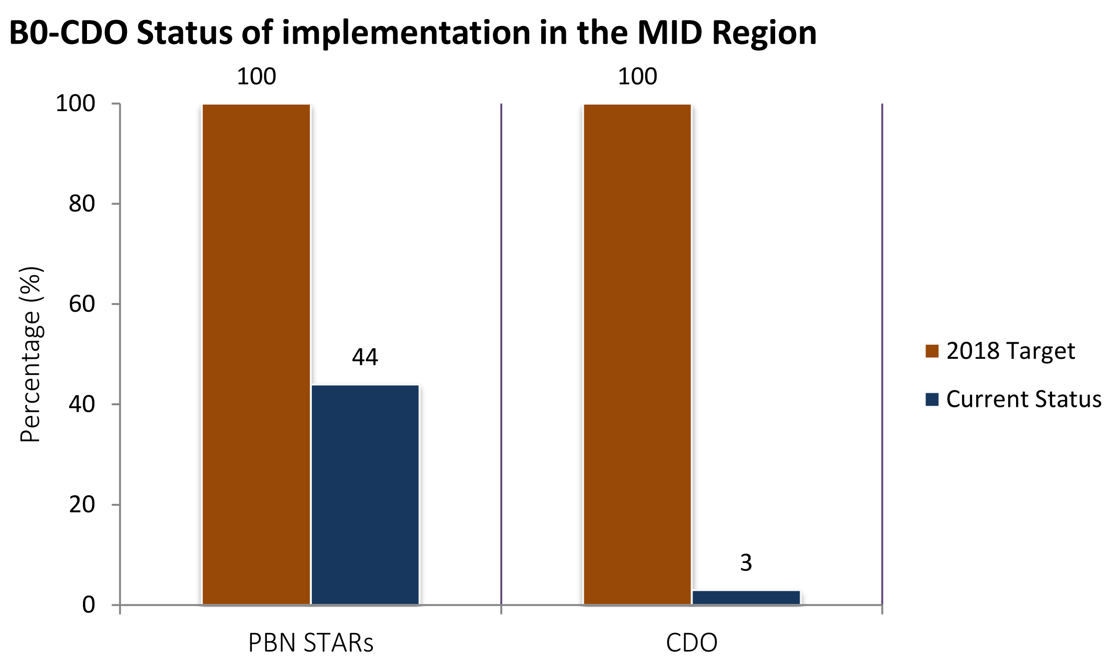
B0-ACAS Status of implementation in the MID Region



2.2.10 B0-CDO

To use performance-based airspace and arrival procedures allowing aircraft to fly their optimum profile using continuous descent operations (CDOs). This will optimize throughput, allow fuel efficient descent profiles and increase capacity in terminal areas.

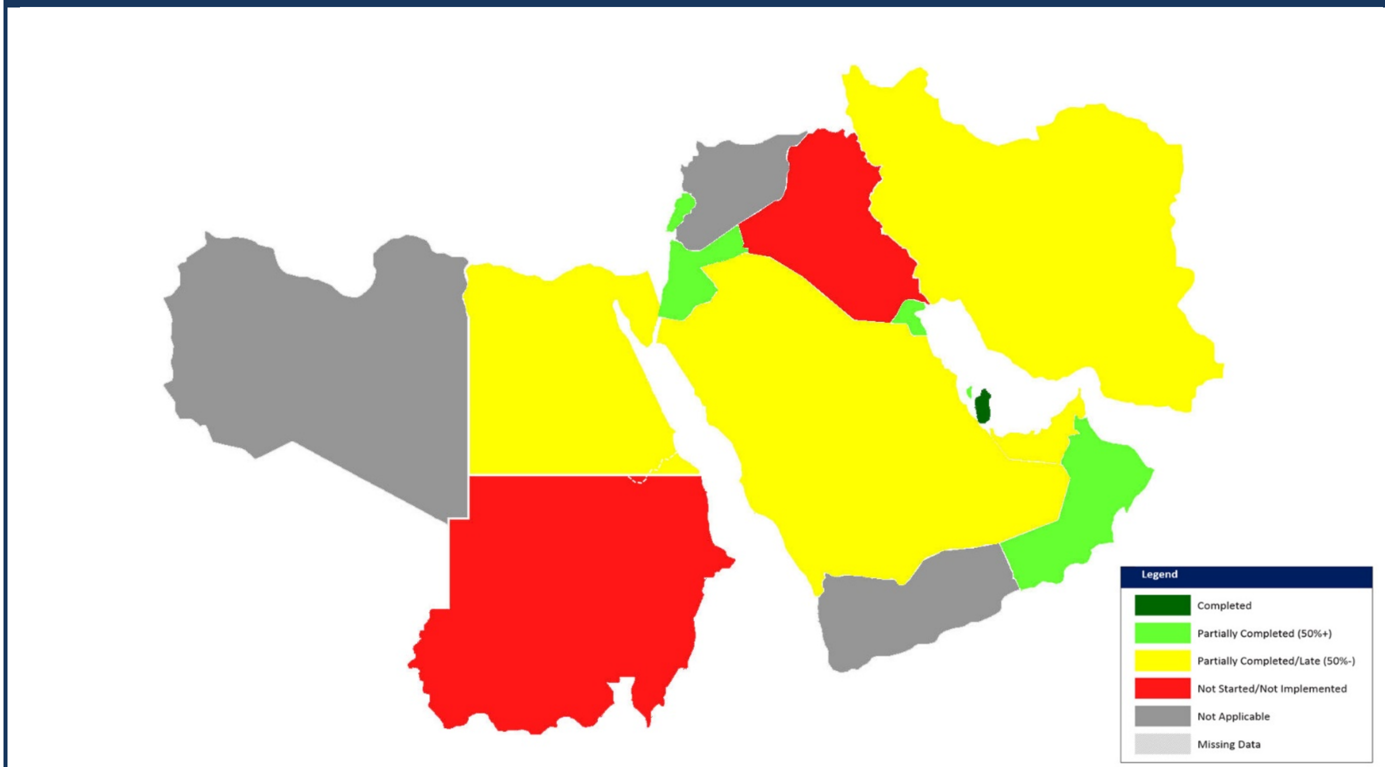
B0 – CDO: Improved Flexibility and Efficiency in Descent Profiles (CDO)			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
PBN STARs	In accordance with States' implementation Plans: (OBBI, HESN, HESH, HEMA, HEGN, HELX, OIIE, OISS, OIKB, OIMM, OIFM, ORER, ORNI, OJAM, OJAI, OJAQ, OKBK, OLBA, OOMS, OOSA, OTHH, OEJN, OEMA, OEDF, OERK, HSNN, HSOB, HSSS, HSPN, OMAA, OMAD, OMDB, OMDW, OMSJ)	Indicator: % of International Aerodromes/TMA with PBN STAR implemented as required. Supporting Metric: Number of International Aerodromes/TMAs with PBN STAR implemented as required.	100% by Dec. 2016 for the identified Aerodromes/TMAs 100% by Dec. 2018 for all the International Aerodromes/TMAs
International aerodromes/TMAs with CDO	In accordance with States' implementation Plans: (OBBI, HESH, HEMA, HEGN, OIIE, OIKB, OIFM, OJAI, OJAQ, OKBK, OLBA, OOMS, OTHH, OEJN, OEMA, OEDF, OERK, HSSS, HSPN, OMAA, OMDB, OMDW, OMSJ)	Indicator: % of International Aerodromes/TMA with CDO implemented as required. Supporting Metric: Number of International Aerodromes/TMAs with CDO implemented as required.	100% by Dec. 2018 for the identified Aerodromes/TMAs



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-CDO	PBN STARs															
	International aerodromes/TMAs with CDO															

The progress for B0-CDO is very slow (with approximately 23% implementation).

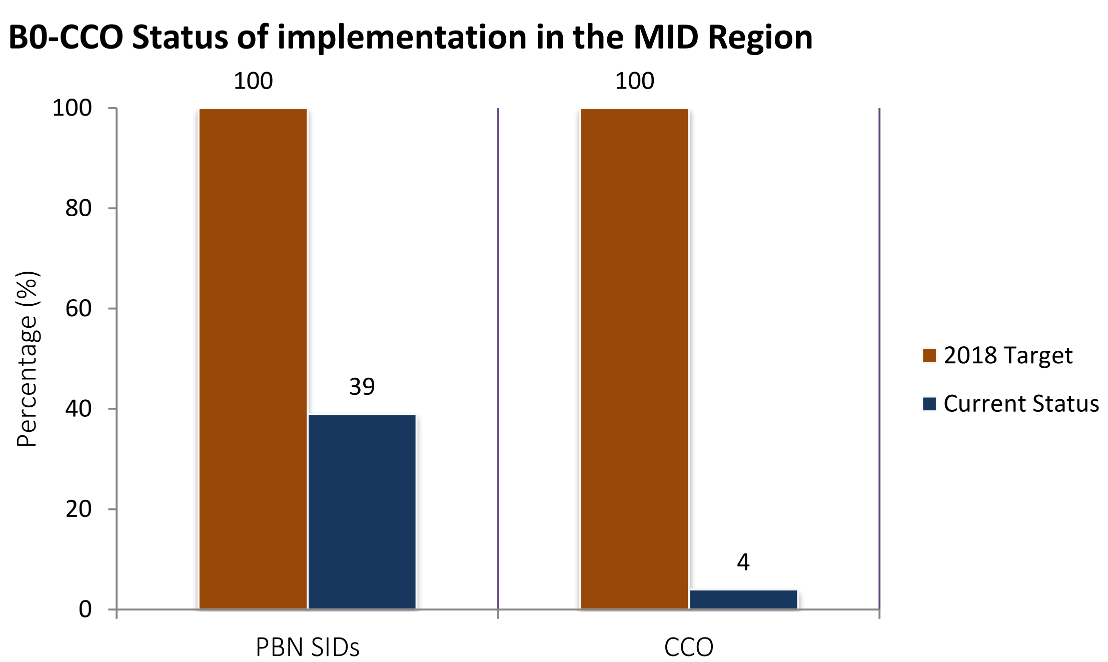
B0-CDO Status of implementation in the MID Region



2.2.11 B0-CCO

To implement continuous climb operations in conjunction with performance-based navigation (PBN) to provide opportunities to optimize throughput, improve flexibility, enable fuel-efficient climb profiles and increase capacity at congested terminal areas.

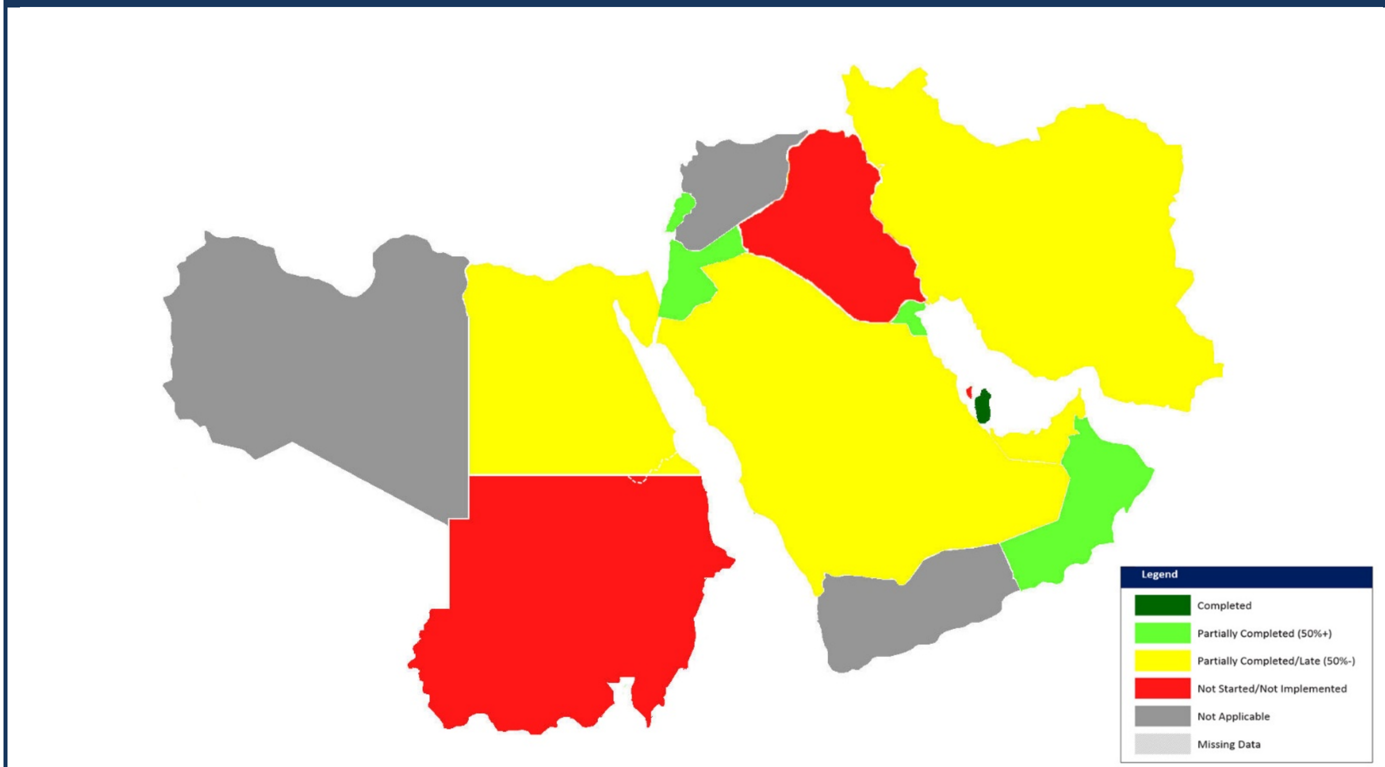
B0 – CCO: Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
PBN SIDs	in accordance with States' implementation Plans: OBBI, HESN, HESH, HEMA, HEGN, HELX, OIIE, OISS, OIKB, OIMM, OIFM, ORER, ORNI, OJAM, OJAI, OJAQ, OKBK, OLBA, OOMS, OOSA, OTHH, OEJN, OEMA, OEDF, OERK, HSNN, HSOB, HSSS, HSPN, OMAA, OMAD, OMDB, OMDW, OMSJ	Indicator: % of International Aerodromes/TMA with PBN SID implemented as required. Supporting Metric: Number of International Aerodromes/ TMAs with PBN SID implemented as required.	100% by Dec. 2016 for the identified Aerodromes/TMAs 100% by Dec. 2018 for all the International Aerodromes/TMAs
International aerodromes/TMAs with CCO	in accordance with States' implementation Plans: OBBI, HESN, HESH, HEMA, HEGN, HELX, OIIE, OISS, OIKB, OIMM, OIFM, ORER, ORNI, OJAM, OJAI, OJAQ, OKBK, OLBA, OOMS, OOSA, OTHH, OEJN, OEMA, OEDF, OERK, HSNN, HSOB, HSSS, HSPN, OMAA, OMAD, OMDB, OMDW, OMSJ	Indicator: % of International Aerodromes/TMA with CCO implemented as required. Supporting Metric: Number of International Aerodromes/TMAs with CCO implemented as required.	100% by Dec. 2018 for the identified Aerodromes/TMAs



Module	Elements	Bahrain	Egypt	Iran	Iraq	Jordan	Kuwait	Lebanon	Libya	Oman	Qatar	Saudi Arabia	Sudan	Syria	UAE	Yemen
B0-CCO	PBN SIDs															
	Intl ADs/TMAs with CCO															

The progress for B0-CCO is very slow (with approximately 21% implementation).

B0-CCO Status of implementation in the MID Region



3. ASBU BLOCK 0 IMPLEMENTATION OUTLOOK FOR 2020

3.1 Status of Implementation-2020

This section consolidates the outlook of the Block 0 Modules implementation in the MID States, by 2020. The table below presents the status of implementation of the 18 ASBU Block 0 Modules foreseen to be achieved by the end of 2020, in accordance with the planning dates reported by States in the ICAO MID Region. This would provide a good basis/prerequisite for the planning of ASBU Block 1 implementation (2019-2025).

Detailed status of implementation of the 18 ASBU Block 0 Modules foreseen to be achieved by the end of 2020, for each State is provided at **Appendix B**.

The following color scheme is used for the projection of the outlook status:

Legend

- Good (75%+)
- Acceptable (50%-75%)
- Slow (25%-50%)
- Very Slow (25%-)
- Missing Data

Module	Current Status of implementation (approximate rate)	Projected Status of implementation by 2020* (approximate rate)
B0-APTA	33%	**96%**
B0-WAKE	(Priority 2)	**71%**
B0-RSEQ	(Priority 2)	**55%**
B0-SURF	46%	**67%**
B0-ACDM	0%	**50%**
B0-FICE	55%	**83%**
B0-DATM	61%	**87%**
B0-AMET	70%	**92%**
B0-FRTO	14%	**71%**
B0-NOPS	(Priority 2)	**46%**
B0-ASUR	(Priority 2)	**70%**
B0-ASEP	(Priority 2)	**69%**
B0-OPFL	(Priority 2)	**60%**
B0-ACAS	73%	**100%**
B0-SNET	(Priority 2)	**92%**
B0-CDO	10%	**67%**
B0-TBO	(Priority 2)	**44%**
B0-CCO	19%	**63%**

Note – projected status for 2020 is calculated based on information received from 12 States (out of 15).

4. ENVIRONMENTAL PROTECTION

4.1 Global Developments related to Environmental Protection

Environmental Protection represents one of the ICAO strategic objectives. Significant advances have been made in reducing the amount of noise and emissions produced by international civil aviation. For example, significant technological progress has resulted in aircraft produced today being approximately 75 per cent quieter and 80 per cent more fuel efficient per passenger kilometer than in the 1960s.

The international aviation consumed approximately 142 million metric tons (Mt) of fuel in 2010. By 2040, it is expected that despite an anticipated increase of 4.2 times in international air traffic, fuel consumption is projected to increase by only 2.8 to 3.9 times over the same period.

The 39th ICAO General Assembly, Montreal, Canada, 27 September – 6 October 2016, agreed on the Assembly Resolution A39-1, A39-2 and A39-3 related to the Environmental Protection which superseded A38-17 and A38-18:

A39-1 Consolidated statement of continuing ICAO policies and practices related to environmental protection – General provisions, noise and local air quality

A39-2 Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change

A39-3 Consolidated statement of continuing ICAO policies and practices related to environmental protection – Global Market-based Measure (MBM) Scheme

4.2 State's action plan on CO2 emission

The ICAO Assembly 38 (24 September to 4 October 2013) endorsed the Resolution 38-18 Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate Change which encouraged States to voluntarily prepare and submit action plans on CO2 emission reduction to ICAO. An ambitious work programme was further laid down for capacity building and assistance to States in the development and implementation of their action plans to reduce emissions, which States were initially invited to submit by the 37th Session of the ICAO Assembly in October 2010.

ICAO Assembly 39 (Montreal, Canada, 27 September – 6 October 2016) encouraged States, through Assembly Resolution 39-2 Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change, to submit voluntary action plans outlining respective policies and actions, and annual reporting on international aviation CO2 emissions to ICAO.

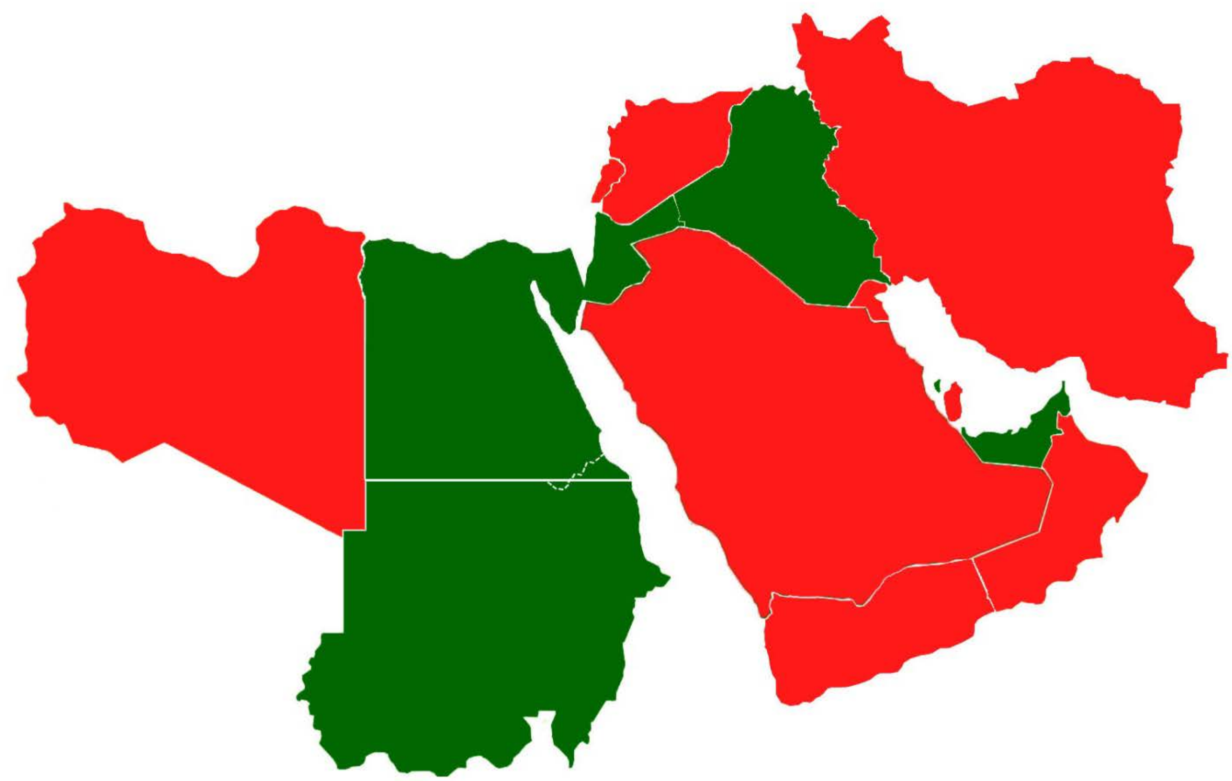
The MIDANPIRG/14 meeting (Jeddah, Saudi Arabia, 15 - 19 December 2013) encouraged States to develop/update their Action Plans for CO2 emissions and submit them to ICAO through the APER website on the ICAO Portal or the ICAO MID Regional Office.

An action plan is a means for States to communicate to ICAO information on activities to address CO2 emissions from international aviation. The level of information contained in an action plan should be sufficient to demonstrate the effectiveness of actions and to enable ICAO to measure progress towards meeting the global goals set by Assembly Resolution A38-18. Action plans give States the ability to: establish partnerships; promote cooperation and capacity building; facilitate technology transfer; and provide assistance.

The Status of the provision of Action Plans on CO2 emission in the MID Region is as follows:

State	Action Plan	State	Action Plan
Bahrain	June 2015	**Oman**	-
Egypt	July 2016	**Qatar**	-
Iran	-	**Saudi Arabia**	-
Iraq	June 2012	**Sudan**	January 2015
Jordan	September 2013	**Syria**	-
Kuwait	-	**UAE**	June 2012
Lebanon	-	**Yemen**	-
Libya	-		

Status of State's CO2 Action Plan



4.3 Implementation of operational improvements

The Operational improvements are a key strategy that can be applied to deliver tangible reductions in aircraft fuel consumption and consequently environmental benefits. The Global Air Navigation Plan (Doc 9750) and the Operational Opportunities to Minimize Fuel Use and Reduce Emissions (Circular 303) are among several documents providing guidance regarding operational improvements being implemented to improve efficiency of the ATM System.

Implementation of operational improvements will generally have benefits in areas such as improved airport and airspace capacity, shorter cruise, climb and descend times through the use of more optimized routes and an increase of unimpeded taxi times. These improvements have the potential to reduce fuel burn and lower levels of pollutants.

The implementation of ASBU Bloc 0 will lead to enhanced efficiency and savings in aircraft fuel burn. These savings will result in environmental benefits in terms of reduced CO2 emissions.

Some of the operational improvements that had been implemented in the MID Region and those which are planned to be implemented are listed in the Tables below:

Implemented Operational Improvements
• Vast improvements in the regional ATS route network and the implementation of RNAV routes through close cooperation between neighboring States (Bahrain, Egypt, Iran, Iraq, Jordan, Libya and UAE) • Establishment of new PBN SIDs and STARs (Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia and UAE) • CCO/CDO implementation (Bahrain and Qatar) • Implementation of LNAV/VNAV (Egypt, Iran, Jordan, Kuwait, Oman, Qatar, Jordan and UAE) • Implementation of A-SMGCS (Bahrain, Egypt, Qatar and UAE) • FUA implementation (Bahrain and Jordan) • Implementation of Arrival Manager (AMAN) (Bahrain and UAE) • Implementation of Departure Flow Manager (DFLOW) Web Interface (UAE) • Improvement of airside structure including enhancing aprons, taxiways (rapid exit taxiways, etc.) (Bahrain) • Implementation of Single-engine taxi operation (Bahrain, Qatar, UAE) • Improving situational awareness using modernized aeronautical and MET information management systems (Bahrain, Qatar, Saudi Arabia and UAE) • Modernization of CNS/ATM infrastructure and equipment (Oman, Qatar, Saudi Arabia, UAE)

Planned Operational Improvements
• Further improvements of the regional ATS route network and the implementation of RNAV1 routes • Establishment of new PBN SIDs and STARs • CCO/CDO implementation • Implementation of LNAV/VNAV • Implementation of A-SMGCS (Iran and Saudi Arabia) • FUA implementation (Egypt, Iran, Jordan, Saudi Arabia, Sudan and UAE) • Implementation of RNP AR approach (UAE) • Further Modernization of CNS/ATM infrastructure and equipment (Iran, Kuwait, Saudi Arabia, Sudan)

4.4 Aviation Noise Management

Aircraft noise is the most significant cause of adverse community reaction related to the operation and expansion of airports. This is expected to remain the case in most regions of the world for the foreseeable future. Public pressure against existing operations and the development of new infrastructure could have a negative influence on the future growth of the aviation industry.

Reducing or limiting the effect of aircraft noise on people and the communities they live in is one of ICAO's environmental goals. However, the forecast growth in aviation will result in an increase in the number of people impacted by such significant aircraft noise. This may lead to an increasing community opposition to future airport development and growth.

The Balanced Approach needs to be implemented with equal emphasis given to all of its four elements; reduction of noise at source, land use planning, noise abatement operational procedures and operational restrictions. Because local conditions need to be taken into account, the implementation will continue to be on an airport-by-airport basis.

The airport authority should work closely with those authorities responsible for land-use management to educate them regarding the noise impact of aviation operations. ICAO Contracting States should provide a leadership role by encouraging local and regional authorities to implement land-use planning and management around airports through appropriate early action and cooperative mechanisms between interested stakeholders, such as coordination committees.

In the MID Region, 3 out of 66 International Airports (5%) (HECA, HEGN and HESH) are equipped with noise monitoring system. However 19 International Airports (29%) have considered noise abatement procedures/restrictions in AIPs (OBBI, HECA, OIFM, OISS, OIII, ORMM, ORER, ORNI, OJAM, OKBK, OLBA, HLLB, HLLS, HLLT, OEJN, HSSS, OMAD, OMDB and OMFJ).

5. SUCCESS STORIES/BEST PRACTICES

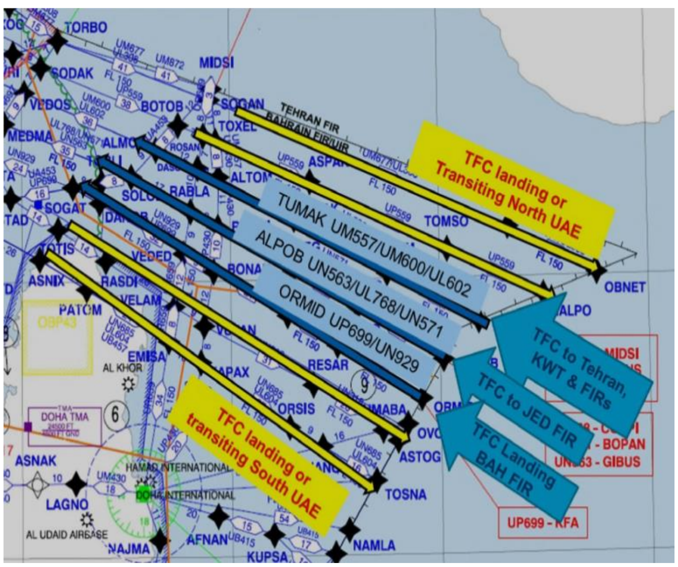
5.1 BAHRAIN

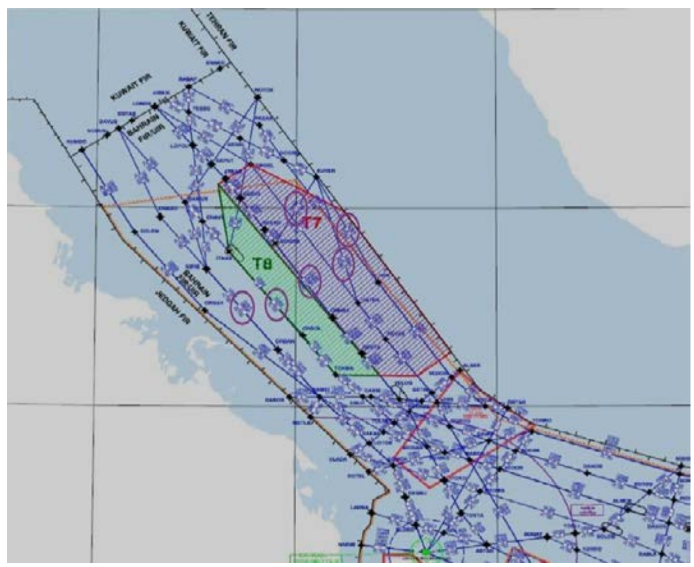
I. Bahrain FIR RNAV1 New Route Structure (Implemented since 2013)

Bahrain has introduced a set of new RNAV1 routes and entry/exit points providing routings closer to users preferences, the restructured routes were designed for specific traffic flow patterns, greater routing possibilities, and reduced congestions through trunk routes/busy crossing points, resulting in reduced flight track miles, reduced fuel combustion and reduced CO2 emissions.

In addition, the reduction of traffic convergence within Bahrain Central sector (one of the most complex and busiest sectors in the MID Region), traffic flow from the Kuwait FIR can now transit and/or land into UAE FIR without requiring as much intervention against traffic transiting from Jeddah FIR and vice versa, resulting in majority aircraft within Bahrain FIR reaching optimum cruising levels without interventions, thus a significant reduction of CO2 emissions and further environmental benefits.

In addition to the above, as a result of the implementation of the FIR route restructure, in the dynamic tactical use of military airspace context, about 220 aircraft per day fly on airways (UL602, UT602, UM444 & UL443) exiting the FIR via point ROTOX and about 110 aircraft per day fly on airways (UT677, UT975 & UT438) entering the FIR via point KUVER, are benefiting from approximate savings of about 2% of fuel burn and saving up to 3,000kgs of CO2 emissions per 10-hours intercontinental flights.





Bahrain FIR New Rote Restructure (May 2013)

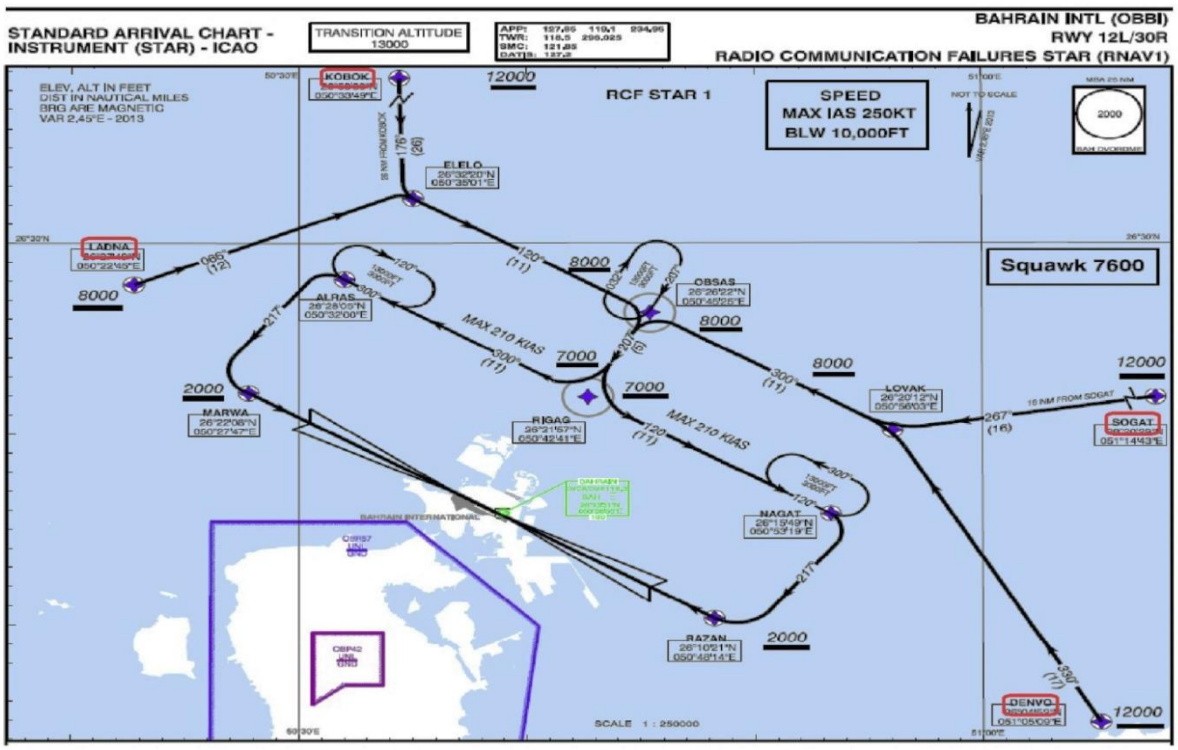
II. Bahrain TMA CDO operations, (implemented since March 2015)

The following savings are an example of an approximate result of 75% CDO Implementation within Bahrain TMA, the CDO operations within the Bahrain TMA are constrained with the adjacent airspaces close proximity, complexity and limitations;

The example is based on the ASBU Working document, Module B0-CDO, Appendix B, Cost Benefit Analysis;

- CDOs LADNA 1, KOBOK 1, SOGAT 1 and DENVO 1 STARs (RNAV1) for runway 12L/30R, implemented since March 2015, and in use full time at Bahrain;
- About 150 - 160 aircraft per day fly LADNA 1, KOBOK 1, SOGAT 1 and DENVO 1 STARs representing approximately 80% of all jet arrivals into Bahrain, 80% per cent reduction in radio transmissions; and
- Significant fuel savings – average 125 pounds per flight, 150 flights/day * 125 pounds per flight * 365 days = 6.85 million pounds/year; and
- More than 1 million gallons/year saved = more than 20.5 million pounds of CO2 emission avoided.

Due to the limited space in this document, the Radio Communication Failures STARs chart is used to demonstrate the combined chart of LADNA 1, KOBOK 1, SOGAT 1 and DENVO 1 (RNAV1) STARs;



Bahrain runway 12L/30R Radio Communication Failures STARs (RNAV1) Chart

III. Bahrain installation of ASMGCS (Installed and operational in 2016)

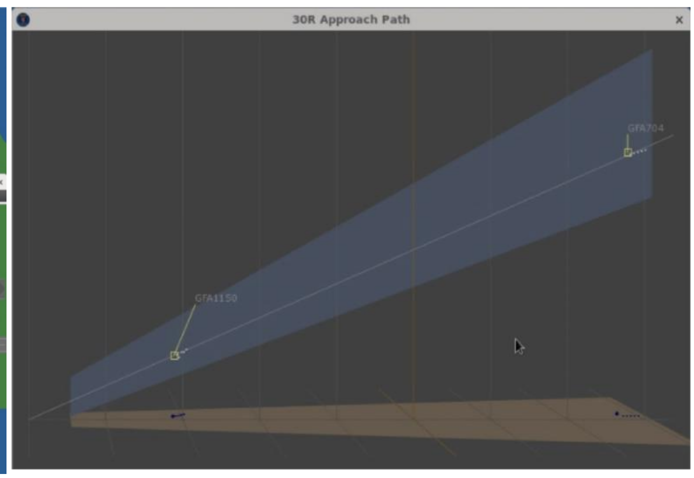
The following environmental savings are some examples of the results of installing and implementing ASMGCS at Bahrain International Airport.

The aviation fuel burn during Low Visibility Procedures awaiting taxi clearances together with the fuel burn at the departure holding points awaiting release causes the excessive emissions of carbon dioxide and harmful environmental emissions. The installation of the (ASMGCS) at Bahrain International Airport has resulted in a significant reduction of CO2 emissions and other environmental benefits.

Based on a medium WVC aircraft type, such as the Boeing 737-400, and an average saving of 5% in taxi time at airports with 350,000 movements per annum, this would result in approximate savings of:

- 1,470,000 kg fuel burn,
- 4,630,000 kg CO2, and
- 1,230 kg SO2.

In addition, monitoring and using the ASMGCS by the approach units for a better situational awareness has resulted in a reduction of sequencing gaps of arriving traffic, thus, greater traffic utilization and coordination with the tower units for better departures startup times together with reduced taxi times management at the airport. Planned (under study) CAT II operations will take further advantages of this system.



5.2 JORDAN

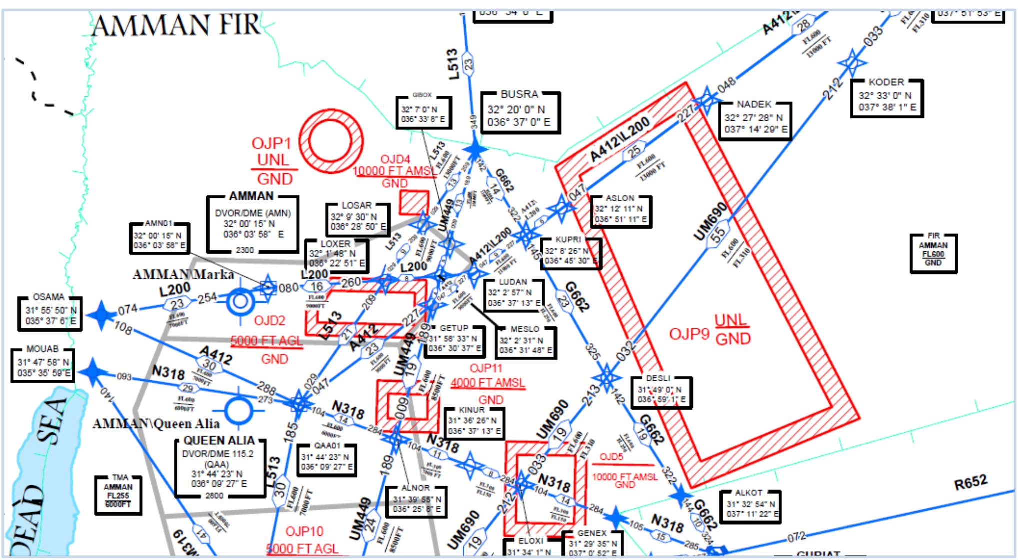
I. FRTO Implementation

Flexible Use of Airspace (FUA) concept was the major outcome of the coordination with Military Authorities, the process of coordinating of all events and activities with the military were indicating adoption for the main principle of FUA within Amman FIR.

Jordan has complied with the airspace requirements as a policy and formed a joint civil and military coordination committee in 2006, which formulates the National ASM policy and carries out the necessary strategic planning work, taking into account National and International airspace Users' requirements. A Letter of Agreement (LoA) has been signed with the military authorities, identifying the area of responsibility and coordination process between civil and military.

At the pre-tactical level, an Airspace Management Cell (AMC) has been established earlier as a joint Civil/Military ASM to conduct all the activities as a cooperative effort and the Civil Aviation Regulatory Commission (CARC) has nominated focal points for this purpose.

A Conditional Route (CDR) had been established since 2011 called UM690, constituting short cut route crossing over military airspace as a permanently plan able CDR, and published in Jordan AIP ever since. CDR are also implemented within QAIA TMA as potential temporary reservations (e.g. TRA or TSA), with opening/closure conditions resulting from associated military activities. Jordan recognizes that, with these actions taken, Flexible Use of Airspace is adopted and implemented within Amman FIR.



5.3 UNITED ARAB EMIRATES

I. Arrival Manager (AMAN)

UAE economy is continuing its growth and the aviation industry is contributing more than 14% to the GDP of the country. The growth in the number of air traffic movements to Dubai International Airport in general and Emirates Airlines in particular is continuing to be on the rise since the year 2005. This was causing some imbalance between the capacity and demand at certain time periods of the day. The type of hub operation of Emirates Airlines and flydubai fueled into this. This caused an increase in airborne holding and delays. The issue alarmed the managements of UAE General Civil Aviation Authority (GCAA) and Dubai ANS (dans) to find short, mid and long term solutions to address the issue. The Arrival Manager (AMAN) is one of such initiative that is in operational use for Dubai International Airport since March 2013.

AMAN is an arrival sequencing support tool. It supports Air Traffic Controllers to take operational decisions for optimized arrivals sequencing based on aircraft performance, wind data and surveillance position reports. About 40% of arriving traffic to Dubai International Airport is conceding delays. The initial implementation of the AMAN had two activities running in parallel. The trial run of AMAN in the Area control Centre (ACC) with live traffic carried out by GCAA and the redesign of arrival procedures to the Terminal Area (TMA) carried out by dans. These activities helped the Air Traffic Controllers to gain knowledge about the system and procedures, at the same time increased the system trust and confidence between the managements of both organisations. This was a catalyst for the implementation of AMAN. The result was encouraging and this gave the management further confidence to introduce more enhancements such as grouping of traffic based on Wake Turbulence Category (WTC) and APO to squeeze the last bit of space available in the final approach. The table below indicates the average delay conceded by each category of aircraft before and after implementing AMAN.

	Before AMAN	After AMAN	
Category (WTC)	December 2012	August 2013	October 2016
Heavy	0:08:39	0:07:15	0:06:30
Medium	0:05:38	0:06:03	0:05:10
Super Heavy	0:09:13	0:07:43	0:06:19

Table 1-Average of reduction in overall delay

- **Quantitative benefits of AMAN implementation:**

1. *Consistency in inbound flow resulting in increased runway throughput:*

The performance of Air Traffic Controllers vary from one individual to another in stressful situations. This had some negative impact in achieving maximum arrivals in an hour.

AMAN brought in consistency in arrival rates by supporting Air Traffic Controllers in decision making at ACC and APP ATSUs. This increased the runway throughput. The table below is a comparison of hourly arrival rates before and after AMAN implementation, i.e. how many occasions the hourly arrival was less than 28 or more than 28 per hour.

	Before AMAN	After AMAN	
Arrival Rates	December 2012 (Count of Occasions)	August 2013 (Count of Occasions)	October 2016 (Count of Occasions)
28 or less	677	662	511
More than 28	67	82	233

Table 2-Increase in hourly arrivals

2. *Reduction in Holding Delay and low level vectoring*

Airborne holding of traffic in holding patterns at high altitudes is more effective economically and environmentally in oppose to the vectoring of traffic at lower levels. The airborne holdings cannot be fully eliminated due to surges in demand. AMAN helped to reduce the holding time per aircraft as well as distribute holding delays evenly among traffic from all directions rather than penalizing traffic from a certain direction. Another important gain is the elimination of low level vectoring in the TMA. The table below indicates the average holding delay based on aircraft category before and after AMAN implementation.

	Before AMAN	After AMAN	
Category	December 2012	August 2013	October 2016
Heavy	0:13:16	0:10:59	0:09:19
Medium	0:10:49	0:10:41	0:09:55
Super Heavy	0:12:46	0:10:11	0:09:13

Table 3-Reduction in average airborne holding delays

The picture below illustrates the distribution of delay before and after AMAN:

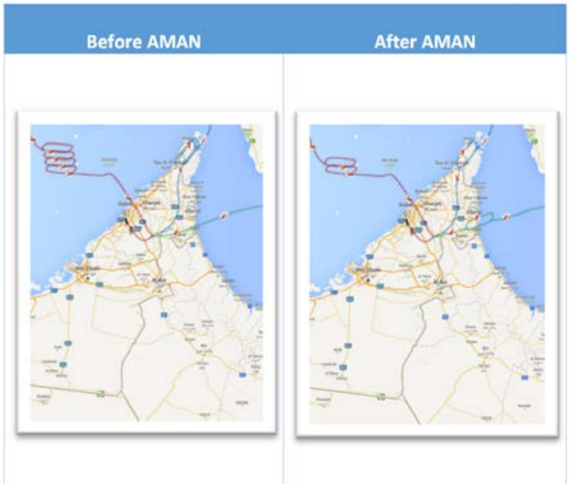


Table 4-AMAN distribution of delays

3. Environmental improvements

New inventions and developments have always been part of dynamic communities so is their impact on planet Earth. The ultimate aim has to be sustainable developments without harming the environment. To this end, the implementation of AMAN has brought in considerable reduction in fuel burn and CO2 emissions. The calculations based on the figures in Table 1 and Table 3 produces the results as listed in the table below for the month of October 2016.

Category	Count of flight in Hold	Minutes saving	Fuel Burn/Minute	Fuel Savings	CO2 Savings
Heavy	1415	2830 minutes	92 KG	260 MT	819 MT
Medium	1723	3446 minutes	46 KG	159 MT	500 MT
Super Heavy	589	1178 minutes	115 KG	135 MT	425 MT

Table 5 - Fuel and CO2 savings - October 2016

- **Qualitative benefits of AMAN implementation:**

1. Improved ATCO Planning and higher Predictability for ATSUs

High predictability contributes to accurate planning and accurate planning optimizes the air traffic service provision. This is one of the benefits brought in by AMAN. AMAN displays to the Air Traffic Controller a Time to Lose (TTL) or a Time to Gain (TTG) considering the demand at the runway. The controller at ACC only have to follow these times. AMAN displays the arrival sequence at Approach facility, as early as 1 hour before arrival, enabling the ATCO to plan for the sequence accordingly.
An example of a TTL display is given below.

Table 6 - TTL display at ACC

2. Automated calculation of EAT

An additional benefit brought by AMAN to the ACC ATCO with regards to traffic in the holding pattern is the display of Estimated Approach Time (EAT). This was manually calculated by ATCO before AMAN increasing workload for the ATCOs. This proves the reduction in ATCO workload as well as the EATs became more accurate with the implementation of AMAN as it is an automatic process. The ATCOs are now able to communicate accurate to the pilot. This helps the pilot in planning the approach procedures.

3. Improved ground handling

One of the contributors to congestion in the air is the the non-availability of parking stands or ground handling resources. Accurate sharing of landing times greatly improves this situation. AMAN shares estimated time for landing traffic up to one hour before arrival with an accuracy of +/-5 minutes.

II. Departure Flow Manager (DFLOW) Web Interface

Departure flow management system (DFLOW) is a part of the UAE GCAA ATM system used for the allocation of Departure Slot Times (DST). The DSTs are shared with ATSUs and airspace users by way of web interface. The system is operationally used since April 2015.

The requirement for this system was formulated by the National Airspace Advisory Committee (NASAC) Working Group 12 (WG12). NASAC is a committee founded and chaired by UAE GCAA consisting of decision makers from UAE ANSPs, Airport Authorities, Airspace users and the UAE Military.

The key requirements are the following:

No	Requirements	Implementation
1	Availability of departure slots in advance	CTOTs are available up to 6 hours before EOBT, subject to FPL availability
2	Transparency in allocation process	Entire CTOT allocations are displayed to all authorized users by way of web interface
3	Minimal role for Control Tower in departure slots allocation process	CTOT allocations are purely based on ATS Messages

Table 7 - DFLOW Key Requirements

- **Quantitative benefits of DFLOW implementation:**

1. Increased compliance to DSTs

The early availability of DSTs and the ability of ATSUs and Airspace Users to manage their DSTs increased the adherence to allocated DSTs. Meeting DST is a huge challenge for airports and airline operations as the compliance window is +/- 2 minutes. The 87% compliance is a true achievement facilitated by the DFLOW web interface despite the traffic growth rate of 6%.

	Before DFLOW Web Interface	After DFLOW Web Interface
Difference between DST and ATD	December 2014	November 2016
On time departure (+/- 2 minutes to DST)	84%	87%
Non-compliance to DST	16%	13%

Table 8 - Compliance to DST

2. Reduction in ground delays

The new method of managing and sharing DST information has facilitated the distribution of delay evenly without increasing delay with the growth of traffic.

	Before DFLOW Web Interface	After DFLOW Web Interface
Ground Delay	December 2014	November 2016
Less than 30 minutes delay	78%	85%
More than 30 minutes delay	22%	15%

Table 9 - Ground Delay

3. Reduction ground delays

The new method of managing and sharing DST information has made the ATSUs and airline operations to prioritize their departures using the web interface. This has significantly reduced the need for voice coordination.

	Before DFLOW Web Interface	After DFLOW Web Interface
Telephone Calls	December 2014	November 2016
Average number of telephone calls per day from ATSU or Airline Operations to Flow Operator	109	23

Table 10 - Voice Coordination

- **Qualitative benefits of DFLOW implementation:**

1. *The DST allocations are displayed though the web interface. All eligible users are able to view all slot allocations.*

2. *ATSUs and Airspace Users are able to manage their priorities themselves using the web interface.*

III. First System Activation (FSA) messages

Aviation is a complex system and the key to its efficiency depends on various stakeholders working together in a holistic manner. As a first step toward this vision, EUROCONTROL and UAE GCAA entered into a real-time flight data sharing agreement in October 2015.

Every day, there are approximately five hundred flights operated between European airspace and the Middle East. The majority of these flights are originating from or destined to the UAE. Adding to this scenario is the flights from the Asia Pacific region overflying the Emirates FIR to Europe and North America. Accurate information about these flights are still a challenge. Surely, a flight plan will be there for these flights, but further updates such as a delay or a departure information may not be transmitted in good time, or lost in the legacy AFTN or not transmitted at all. It happens often that these flights are unknown to the receiving units until a boundary estimate is received from the transferring unit. This is narrowing the opportunities for accurate predictions resulting in inefficient planning.

The First System Activation (FSA) messages will help to reduce these issues. The FSA messages by UAE GCAA enriches EUROCONTROL's planning and prediction tool and provides accurate information to NMOC that help smoothening of uneven traffic surges at times from these regions. Before starting the FSA messages from the UAE, the planning carried out by EUROCONTROL for the above flights were with a window of +/- 30 minutes based on assumptions. With FSA messages this window is much smaller in size due to the availability and accuracy of the information. The ultimate result of this initiative is the multifaceted efficiency gains for all involved stakeholders from departure to destination. These efficiency gains increases safety and passenger comfort.

The pictures below shows the departure and destination airports that are part of UAE GCAA FSA messages. On an average, 192 flights are accurately predicted by EUROCONTROL NMOC and planned for accordingly.

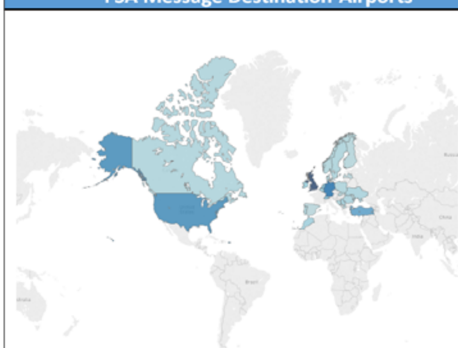
FSA Message Destination Airports	FSA Message Departure Airports
	
Average Daily Traffic Count	**Average Daily FSA Count**
196	192

Table 11- FSA Message Airports & Daily Counts

6. CONCLUSION

The progress for the implementation of some priority 1 Block 0 Modules in the MID Region has been acceptable/good; such as B0-ACAS, B0-AMET and B0-DATM. Nevertheless, some States are still facing challenges to implement the majority of the Block 0 Modules.

The status of implementation of the ASBU Block 0 Modules also shows that Bahrain, Egypt, Jordan, Kuwait, Qatar, Saudi Arabia and UAE made a good progress in the implementation of the priority 1 ASBU Block 0 Modules.

Looking into the States' plans for 2020 (outlook), the focus/priority of States is to complete the implementation of B0-APTA, B0-FICE, B0-DATM, B0-AMET, B0-CCO and B0-CDO.

APPENDIX A: STATUS OF ASBU BLOCK 0 MODULES

	B0-APTA				B0-SURF			B0-ACDM	B0-FICE				B0-DATM											B0-AMET			B0-FRTO			B0-NOPS	B0-ACAS	B0-CDO			B0-CCO		
State	PBN Plan	LNAV	LNAV/ NAV	TOTAL	A-SMGCS 1	A-SMGCS 2	TOTAL	TOTAL	AMHS Cap	AMHS Imp.	AIDC/OLDI	TOTAL	AIM Plans	AIXM	eAIP	QMS	WGS-84 H	WGS-84 V	eTOD area 1 T	eTOD area 1 O	eTOD area 4 T	eTOD area 4 O	TOTAL	SADIS 2G/FTP	QMS	TOTAL	FUA	Flex Routing	TOTAL	TOTAL	TOTAL	PBN STARs	CDO	TOTAL	PBN SIDs	CCO	TOTAL
Bahrain																																					
Egypt																																					
Iran																																					
Iraq																																					
Jordan																																					
Kuwait																																					
Lebanon																																					
Libya																														TBD							
Oman																																					
Qatar																																					
Saudi Arabia																																					
Sudan																																					
Syria																																					
UAE																																					
Yemen																																					

APPENDIX B: ASBU BLOCK 0 STATUS OF IMPLEMENTATION OUTLOOK 2020

State	B0-APTA	B0-WAKE	B0-RSEQ	B0-SURF	B0-ACDM	B0-FICE	B0-DATM	B0-AMET	B0-FRTO	B0-NOPS	B0-ASUR	B0-ASEP	B0-OPFL	B0-ACAS	B0-SNET	B0-CDO	B0-TBO	B0-CCO
Bahrain	FI	N/A	PI	FI	PI	FI	FI	FI	PI	PI	FI	PI	N/A	FI	FI	FI	PI	FI
Egypt	FI	FI	N/A	FI	PI	FI	FI	FI	FI	FI	FI	N/A	N/A	FI	FI	PI	N/A	PI
Iran	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	N/A	FI
Iraq	PI	N/A	N/A	N/A	NI	FI	FI	PI	PI	NI	NI	NI	N/A	FI	FI	NI	NI	NI
Jordan	FI	N/A	NI	NI	PI	PI	PI	FI	NI	NI	FI	N/A	N/A	FI	FI	PI	NI	PI
Kuwait	FI	PI	PI	PI	PI	PI	PI	FI	PI	PI	PI	PI	PI	FI	PI	PI	PI	PI
Lebanon	FI	N/A	NI	N/A	PI	PI	FI	PI	PI	NI	NI	FI	NI	FI	FI	PI	PI	NI
Libya	Missing	Missing	Missing	N/A	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing
Oman	FI	FI	FI	PI	PI	FI	FI	FI	FI	FI	PI	FI	N/A	FI	FI	PI	N/A	PI
Qatar	FI	NI	FI	FI	PI	FI	FI	FI	FI	PI	FI	N/A	N/A	FI	FI	FI	PI	FI
Saudi Arabia	FI	N/A	PI	PI	PI	FI	FI	FI	FI	N/A	FI	FI	FI	FI	FI	FI	FI	FI
Sudan	FI	PI	PI	N/A	PI	PI	PI	FI	PI	PI	PI	PI	PI	FI	PI	PI	PI	PI
Syria	Missing	Missing	Missing	N/A	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing
UAE	FI	FI	PI	PI	PI	FI	FI	FI	FI	PI	FI	Missing	N/A	FI	FI	FI	PI	FI
Yemen	Missing	Missing	Missing	N/A	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	FI	Missing	Missing	Missing	Missing

Legend

- FI: Fully Implemented
- PI: Partially Implemented
- NI: Not Implemented
- N/A: Not Applicable
- Missing Data

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