International Civil Aviation Organization

MIDANPIRG ATM/SAR/AIS Sub-Group

Twelfth Meeting (ATM/SAR/AIS SG/12)
(Cairo, Egypt, 21 - 24 November 2011)

Agenda Item 4: Improvement of the ATM Operations in the MID Region

20 NM LONGITUDINAL SEPARATION

(Presented by the Secretariat)

SUMMARY

This paper presents a summary of the activities related to the implementation of 20NM Longitudinal Separation and the IFPS project in the MID Region.

Action by the meeting is at paragraph 3.

REFERENCES

- BFRI W G/2 Report
- MIDANPIRG/12 Report

1. INTRODUCTION

1.1 The MIDANPIRG/12 meeting, held in Amman, 9-13 October 2010 was attended by a total of seventy six (76) participants, which included experts from twelve (12) States (Bahrain, Egypt, Iraq, Iran (Islamic Republic of), Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia and U.A.E.) and four (4) International Organizations (CANSO, IATA, IFALPA and Jeppesen)..

1.2 The Second Meeting of the Baghdad FIR RVSM Implementation Working Group was convened at the ICAO MID Regional Office in Cairo, from13 to 15 December 2010, and was attended by a total of thirty one (31) participants from seven (7) States (Bahrain, Iraq, Jordan, Kuwait, Saudi Arabia, Syria and Turkey) and one (1) Organization (IATA).

2. DISCUSSION

2.1 MIDANPIRG/12 meeting was apprised on the link between ATFM and IFPS, in this regard MIDANPIRG/12 meeting noted that as a follow-up to MIDANPIRG/10 Conclusion 10/18: *Establishment of an Integrated Initial FPL Processing System (IFPS) in the MID Region*, where it was noted that Bahrain has finished the initial IFPS study which was based on Bahrain data and FDPS. It was indicated that it is necessary that all MID States need to participate for the completion of the final study. The meeting further noted that only five (5) States assigned their focal points for the IFPS and agreed that States which had not assigned focal points to do so as soon as possible and provide Bahrain with the necessary data to support the completion of the final study.

2.2 MIDANPIRG/12 meeting noted that, in accordance with MIDANPIRG/11 Conclusion 11/61, MIDANPIRG requested that the feasibility study related to IFPS be finalised before any commitment to go ahead with the project. The study would require the contribution of all States. However, it was noted with concern that Bahrain has not yet received any input from States, in order to finalise the study. It was further noted that the feasibility study should identify the Short Term, Medium Term and Long Term lines of action, based on the needs and requirements of MID States.

2.3 MIDANPIRG/12 meeting was apprised of the difficulties that Bahrain is facing to accommodate the traffic growth and the airspace congestion. The meeting noted that Bahrain has already taken certain measures to face this problem, including the implementation of the Functional Airspace Block (FAB) concept and associated re-sectorization. In this regard, new Sectors have been implemented by Bahrain since 4 June 2009 with a new Central Sector encompassing the FAB which was identified in the middle of Bahrain FIR. However, the meeting noted that Bahrain is supporting the MID IFPS project, which would further improve the situation.

2.4 MIDANPIRG/12 meeting also noted that Egypt is facing some problems especially with the adjacent regions and that Egypt believes that the implementation of the MID IFPS project would to a large extent solve these problems.

2.5 The meeting may wish to note that the ICAO MID Regional Office received inquiry regarding the progress of the study for the implementation of the IFPS project. Accordingly Bahrain may wish to provide more details.

2.6 MIDANPIRG/12 meeting noted that UAE’s did not support the establishment of ATFM and IFPS in the MID Region. It was also recalled that UAE and IATA were of the view that all possible solutions should be explored/exhausted before deciding to implement ATFM in the MID Region. In particular, improvements in the field of Communication, Navigation and Surveillance as well as the reduction of the spacing requirement, the implementation of Flexible Use of Airspace (FUA) would increase the capacity of airspace in the MID Region.

2.7 MIDANPIRG/12 was apprised on the situation in Bahrain and UAE. Both states are desperately looking to reduce the longitudinal separation minimum from 30NM to 20NM with all concerned FIRs. This will bring the benefits to both ANS providers and aircraft operators in the form of route capacity enhancement, workload reductions for air traffic controllers, greater efficiency resulting in the provision of more optimum cruise levels for aircraft, and savings to aircraft operators in fuel burn costs and will reduce the carbon emission.

2.8 MIDANPIRG/12 was informed that the current agreements between MID Region States dictate that the minimum longitudinal spacing between aircraft at the same level is either 30NM via Saudi Arabia, Jordan, Syria and Lebanon, or is 40NM via Kuwait and Iraq with no official agreement, while Bahrain, Oman and U.A.E use 10NM minimum at the interfaces, except for traffic routing via COPPI Bahrain which requires 5 minutes separation.

2.9 MIDANPIRG/12 emphasized the need to implement a reduced longitudinal separation in a harmonized manner. Accordingly, the meeting was apprised on the agreement between Bahrain, Jordan, Saudi Arabia and Syria for the implementation of 20 NM longitudinal separation on a constant or increasing orientation starting on AIRAC 29 July 2010 on trial basis. Accordingly the MID Regional Office sent a State Letter, for the confirmation on the agreement.

2.10 MIDANPIRG/12 meeting urged all MID States to implement 20 NM longitudinal separation, and further develop plans for further reduction of longitudinal separation from 20 NM to 5 NM to be included in the Regional PFFs.

2.11 The meeting may wish to note that as part of the process of LOAs update, the BFRI WG/2 meeting addressed the issue of implementation of 20 NM longitudinal separation. In this respect, the meeting was apprised of the difficulties that Bahrain and Turkey are facing to accommodate the traffic growth and the airspace congestion.

2.12 The meeting may further wish to note that 20 NM longitudinal separation has recently been implemented between Bahrain, Kuwait, Iraq and Turkey. Bahrain requested that further reduction in longitudinal separation to 10 NM would be required in order to cater for the projected increase of Traffic.

2.13 The meeting may wish to note that there have been a number of reported events relating to the A 380 either on Departure or the En-route phase of flight where the following aircraft has been 1000 or 2000 ft below and within 20 NM has encountered turbulence.

2.14 Based on the above, the meeting may wish to note that a further reduction in the Longitudinal separation to 10NM would require MID States to develop procedures for their Air Traffic Controllers to exercise extreme caution when clearing Medium Category aircraft to climb behind an A380 taking into consideration of the ICAO guidance material provided for use as at **Appendix A** to this working paper.

2.15 The meeting may wish to note that in preparation for the 12th Air Navigation Conference in November 2012, ICAO HQ has initiated a review of the Air Navigation Plan, where the revised Global Plan will address, in addition to the Communications, Navigation, Surveillance (CNS), Aeronautical Information Management (AIM), and Avionics Roadmaps, the Aviation System Block Upgrade initiative that will take into account Air Navigation Service Providers (ANSP's), Regulators and user needs. In this respect ICAO has identified certain operational improvements as at **Appendix B** to this working paper as being the base line level of implementation necessary for the next steps.

2.16 The meeting may wish to refer to the resolution on continuing ICAO policies and practices related to operational improvements and environmental protection adopted at the 37th session of the assembly, currently ICAO is engaged in the measurement at global level, of the environment benefits as a result of improvement to the air navigation system. Assisted by IATA, CANSO EUROCONTROL and other international organizations, ICAO developed the ICAO Fuel Savings Estimated Tool (IFSET) and guidance material to help States, in globally endorsed method their fuel savings resulting from national or regional improvement.

2.17 The meeting is informed that an ATM Measurement Task Force (ATM/M TF) will be established and it will be reporting to the CNS/ATM/IC Sub-Group, which is mandated, inter-alia, to monitor the MID Region Performance Metrics and analyze the environmental benefits resulting from the improvements to the air navigation systems. As a first step, it is proposed that the ATM/M TF should be focusing on the following proposed three target projects/operational improvements:

- ☐ improved Airport Accessibility;
- ☐ improved operations through enhanced En-Route trajectories; and
- ☐ improved flexibility and efficiency in Decent Profiles (PBN/CDO).

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) to note the information contained in this paper;

b) provide an update to progress of the IFPS study;

c) utilize the Guidance material on wake vortex to the A380 Aircraft; and

d) advise of any objections for the reduction Longitudinal Separation to 10 NM.

APPENDIX A

GUIDANCE ON A380-800 WAKE VORTEX ASPECTS

1. INTRODUCTION

1.1 This guidance is based on the current outcome of work by an ad hoc group of experts under the auspices of the United States Federal Aviation Administration, the European Organisation for the Safety of Air Navigation (Eurocontrol), the Joint Aviation Authorities and the manufacturer. Work is continuing, and it is anticipated that the group will undertake additional studies with a view to further refinement of this guidance on the basis of operational experience. A review by the ad hoc group of the current wake turbulence categorization scheme is also foreseen.

1.2 The Airbus A380-800, with a maximum take-off mass in the order of 560 000 kg, will be the largest passenger aircraft ever to enter into revenue service. The aircraft is in the HEAVY wake turbulence category and the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) apply. However, as vortices generated by the A380-800 are more substantial than for other aircraft in the HEAVY wake turbulence category, this guidance recommends an increase in relation to the wake turbulence separation minima published in the PANS-ATM. This is intended to ensure that aircraft operating near an A380-800 do not encounter wake vortices of a greater magnitude than are generated by other aircraft in the HEAVY wake turbulence category. States are strongly encouraged to implement this guidance pending an amendment to the PANS-ATM.

Note. — For ease of reference, related PANS-ATM provisions are indicated below.

2. INDICATION OF AIRCRAFT TYPE
(PANS-ATM 4.9.2 and Appendix 2)

2.1 For A380-800 aircraft the letter "J" should be entered into the space allocated to wake turbulence under Item 9 of the ICAO flight plan.

2.2 For A380-800 aircraft the expression "SUPER" should be included immediately after the aircraft call sign in the initial radiotelephony contact between such aircraft and ATS units.

3. NON-RADAR WAKE TURBULENCE LONGITUDINAL SEPARATION MINIMA
(PANS-ATM 5.8.2, 5.8.3, 5.8.4 AND 5.8.5)

3.1 **Arriving aircraft**

3.1.1 The following non-radar separation minima should be applied to aircraft landing behind an A380-800 aircraft:

a) MEDIUM aircraft behind an A380-800 aircraft — 3 minutes; and

b) LIGHT aircraft behind an A380-800 aircraft — 4 minutes.

3.2 Departing aircraft

3.2.1 A minimum separation of 3 minutes should be applied for a LIGHT or MEDIUM aircraft and 2 minutes for a non-A380-800 HEAVY aircraft taking off behind an A380-800 aircraft when the aircraft are using:

a) the same runway;

b) parallel runways separated by less than 760 m (2 500 ft);

c) crossing runways if the projected flight path of the second aircraft will cross the projected flight path of the first aircraft at the same altitude or less than 300 m (1 000 ft) below;

d) parallel runways separated by 760 m (2 500 ft) or more, if the projected flight path of the second aircraft will cross the projected flight path of the first aircraft at the same altitude or less than 300 m (1 000 ft) below.

3.2.2 A separation minimum of 4 minutes should be applied for a LIGHT or MEDIUM aircraft when taking off behind an A380-800 aircraft from:

a) an intermediate part of the same runway; or

b) an intermediate part of a parallel runway separated by less than 760 m (2 500 ft).

3.3 Displaced landing threshold

3.3.1 A separation minimum of 3 minutes should be applied between a LIGHT or MEDIUM aircraft and an A380-800 aircraft when operating on a runway with a displaced landing threshold when:

a) a departing LIGHT or MEDIUM aircraft follows an A380-800 aircraft arrival; or

b) an arriving LIGHT or MEDIUM aircraft follows an A380-800 aircraft departure if the projected flight paths are expected to cross.

3.4 Opposite direction

3.4.1 A separation minimum of 3 minutes should be applied between a LIGHT or MEDIUM aircraft and an A380-800 aircraft when the A380-800 aircraft is making a low or missed approach and the LIGHT or MEDIUM aircraft is:

a) utilizing an opposite-direction runway for take-off; or

b) landing on the same runway in the opposite direction, or on a parallel opposite-direction runway separated by less than 760 m (2 500 ft).

4. RADAR WAKE TURBULENCE SEPARATION MINIMA
(PANS-ATM 8.7.4.4 and 8.7.4.4.1)

4.1 The following wake turbulence radar separation minima should be applied to aircraft in the approach and departure phases of flight in the circumstances given in 4.2.

Preceding aircraft	*Succeeding aircraft*	*Wake turbulence radar separation minima*
A380-800	A380-800	7.4 km (4.0 NM)
A380-800	Non-A380-800 HEAVY	11.1 km (6.0 NM)
A380-800	MEDIUM	14.8 km (8.0 NM)
A380-800	LIGHT	18.5 km (10.0 NM)

Note.— Although no wake constraint for the A380-800 as a succeeding aircraft was recommended by the ad hoc group, the guidance above indicates a wake turbulence separation minimum of 7.4 km (4.0 NM) between two A380-800 aircraft, as this is the minimum between two HEAVY aircraft prescribed by the PANS-ATM. The recommendation of the ad hoc group will be taken into account during the development of a proposal for amendment to the PANS-ATM.

4.2 The minima set out in 4.1 should be applied when:

a) an aircraft is operating directly behind an A380-800 aircraft at the same altitude or less than 300 m (1 000 ft) below; or

b) both aircraft are using the same runway, or parallel runways separated by less than 760 m; or

c) an aircraft is crossing behind an A380-800 aircraft, at the same altitude or less than 300 m (1 000 ft) below.

APPENDIX B

OPERATIONAL ENHANCEMENTS
Status of implementation in the MID Region
(Version6/ROs)
Attachment to IOM 17/4-11-12 dated 4 August 2011

Operational improvement & Performance monitoring-Metrics 1	Availability of necessary procedures Air/Ground 2	Availability of necessary technology Air/Ground 3	Availability of Regulatory approvals 4	Development of business case 5	Conduct of Operational trials 6	Status of implementation/ Challenges, if any 7	Way forward to expedite implementation 8
Improved Airport Accessibility **Performance monitoring** Metrics: 1. Number of runways ends with vertical guidance. 2. Movement rate at airports during LVP operations. 3. Number of flight disruptions 4. CO2 savings. 5. Ratio of vertically-guided to total procedures. 6. Ratio of circling to total procedures	The PBN Manual, GNSS Manual, Annex 10 and PANS-OPS Volume I .The WGS-84 Manual provides guidance on surveying and data handling requirements. The Manual on Testing of Radio Navigation Aids (Doc 8071), Volume II — Testing of Satellite-based Radio Navigation Systems provides guidance on the testing of GNSS. The Quality Assurance Manual for Flight Procedure Design (Doc 9906), Volume 5 – Flight Validation of Instrument Flight	PBN approach procedures can be flown with basic IFR GNSS avionics. These may be integrated with Baro VNAV functionality to support vertical guidance to LNAV/VNAV minima. In States with defined SBAS service areas, aircraft with SBAS avionics can fly approaches with vertical guidance to LPV minima**.** A GBAS station can support vertically guided Cat I approaches to all runways. Aircraft	Ops approval hand book and PBN Model regulations have been published	Guidance for the Development of CBA and Business case is available. Aircraft operators and ANSPs can quantify the benefits of lower minima by using historical aerodrome weather observations and modelling airport accessibility with existing and new minima. Each aircraft operator can then assess benefits against the cost of any required avionics upgrade. If an operator equips such that all approaches can be	Many States started developing GPS-based RNAV approach procedures. The United States commissioned WAAS (SBAS) in 2003, and EGNOS in early 2011. International air carriers have not adopted SBAS. SBAS is more attractive to regional and other domestic air carriers, as well as general	MID States Started the implementation and the benefits are becoming more obvious SBAS is not supported in the MID Region since most of the airspace users are International air carriers States still require further support on the implementation	Support the PBN/GNSS Task Force. More Go Team visits to help States for implementation

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	Procedures provides the required guidance for PBN procedures.	require TSO C161/162 avionics to fly GBAS approaches.		made with vertical guidance, that operator can reduce training costs. .	aviation aircraft.		
Increased Runway Throughput through Wake Vortex Separation **Element 1-** Revision of Current ICAO Wake Separation Standards. **Element 2-** Increasing Aerodrome Arrival Operational Capacity. **Element 3-** Increasing Aerodrome Departure Operational Capacity **Performance monitoring** Metrics: 1**.** Increased number of arrival/departure operations/hr achieved	Wake Vortex Separation will be implemented mainly via changes to ANSP wake mitigation procedures and associated wake vortex separation standards. All the three elements require no changes to the aircrew's procedures.	Element 1. No need for additional aircraft technology/additional aircrew certifications. ANSPs may develop a decision support tool to aid in the application of the new set of 6 category ICAO wake separates being produced by Element 1. The Element 2 and Element 3 These products vary on their dependency to newly applied technology.	Element 1: A set of changes to the ICAO wake separation standards and supporting documentation is needed and **currently under ICAO's ANB review**. Element 2: These products are U.S. aerodrome specific. Element 3: The WIDAO has	This module is procedural with some technological applications. Costs of implementing the Elements are low and include the cost for data analysis, procedure development, procedure approval and implementation, modification of ANSP automation data bases, modification of existing ANSP controller decision support tools and in the case of WTMD, the addition of a personal computer level system and interfaces to weather information inputs. No aircraft	Element 1: Not applicable. Awaiting ICAO approval. Element 2: The FAA Order 7110.308 procedure use has been approved for 7 U.S. aerodromes Element 3: The WIDAO relaxation of wake separation constraints at CDG (first and second sets of constraints) were approved in November 2008 and March 2009	Not Implemented as most of MID airports have low volume of traffic with exception of DXB.	Will consider in future MIDANPIRG Work Programme.

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using the existing aerodrome runway infrastructure.			undergone extensive review by the French ANSP and regulator.	equipage costs.			
Improve Runway Safety (A-SMGCS) **Performance monitoring** Metric:	Being developed	Being developed	Being developed	Being developed	Being developed	TBD	Will consider in future MIDANPIRG Work Programme
Improved Airport Operations through A-CDM **Performance monitoring** Metric**:** **1.** Efficiency at airports will increase as runways are used at	For surface-CDM to work effectively, the roles and responsibilities of stakeholders become a collaborative decision made together to make the best decisions for the ATM system operations as a whole.	The Surface Decision Support System (SDSS) will need to be implemented allowing for data exchange between stakeholders and providing a framework within which the departure operation can be	There will be a need to develop procedures for aircraft/vehicles that do not participate in the collaboration aspects.	CDQM has been found to provide reduced taxi times, and resultant reduced fuel usage and emissions, while maintaining full use of departure capacity. Additional research and development of the Surface CDM	In order to minimize disruption during construction, JFK decided to use a collaborative effort using departure queue metering. The procedures used	Not implemented as most of MID airports are of low density traffic/require deployment of technology with necessary procedures	Will consider in future MIDANPIRG Work Programme

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their highest capacity while not congesting the taxiways. 2. The environment will benefit from reduced time idling of the aircraft, thus reducing carbon dioxide emissions.	Each airport operation will conduct modelling and testing in order to make the most efficient use of the airport architecture to maintain an appropriate allocation of departure capacity.	proactively managed. Operational capabilities are dependent on how effectively the SDSS interfaces with user data-sharing information**.**		Concept of Operations, CDQM and the Collaborative Departure Scheduling concept is being further developed.	during the construction project worked so well that they were extended after the runway work was completed.		
Improved Traffic Flow through Runway Metering **Performance monitoring** Metrics: 1. Decreased lead time for departure request; decreased time between CFR and departure time; increased tower productivity; and , increased Center TMU productivity. 2. Optimize usage of terminal airspace;	The ICAO Manual on Global Performance DOC 9883) provides guidance on implementing integrated arrival and departure capability. The Time based Flow management (TBFM) and Arrival/Departure management (AMAN/DMAN) efforts provide the systems and operational procedures	The Global ATM Operational Concept (DOC 9854) presents the ICAO vision of an integrated, harmonized, and globally interoperable ATM System. Both TBFM and Arrival/Departure Management (AMAN/DMAN) application and existing technologies can be leveraged, but	This TBFM and AMAN/DMAN implementation will impact ICAO Annex 1, the PANS-ATM document (DOC 4444), Global Air Navigational Plan (DOC 9750) and the Global ATM Operational Concepts (DOC 9584).	Time Base Flow Manager Business Case Analysis Report - Should reduce environmental effects (emission, noise, and fuel burn).		Not implemented as the majority of airports are of low density traffic/ require deployment of technology with necessary procedures	Will consider in future MIDANPIRG Work Programme.

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optimize utilization of runway capacity. 3. Dynamic scheduling;. 4. Aerodrome/terminal demand prediction.	necessary. RNAV/RNP for arrival will also be crucial as well. The Manual on ATM System Requirements (DOC 9882) is relevant.	require site adaptation and maintenance. Both efforts will take incremental steps toward the long term capability described in their respective strategic documents.					
Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration **-AIDC-** **Performance monitoring** Metrics: 1. **R**educed controller workload and increased data integrity 2. Reduced separation can also be used to offer more frequently to aircraft flight levels closer to the flight	Required procedures exist. The experience from other regions can be a useful reference.	Technology is available. It is implemented in Flight Data Processing and could use the ground network standard AFTN-AMHS or ATN. Europe is presently implementing IP Wide Area Networks. There are no specific airborne requirements.	ICAO material is available (PANS-ATM, DOC 4444). Regions should consider the possible mandating of AIDC. Means of compliance are also described in EUROCONTROL standards and EU	Guidance for the Development of CBA and Business case is available.		Some MID States implemented OLDI AIDC is being addressed as part of MIDANPIRG Work Programme MID Region also planning for an MID-IP network	Organize a Seminar on the subject to expedite implementation.

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optimum; 3. Use of standardised interfaces reduces the cost of development, allows controller to apply the same procedures at the boundaries			regulations.				
Service Improvement through Digital Aeronautical Information Management **Performance monitoring** Metrics: 1. Reduction in the number of possible inconsistencies, 2. Reduced costs in terms of data inputs and checks, paper and post, especially when considering the overall data chain, from originators, through AIS, to the end users. 3. Reduced use of	No new procedures for ATC, but a revisited process for AIS. Full benefit requires new procedures for data users in order to retrieve the information digitally. E.g. for Airlines in order to enable the dynamic provision of the digital AIS data in the on-board devices, in particular Electronic Flight Bags.	The AIS data are made available to the AIS service through IT and to external users via either a subscription for an electronic access or physical delivery; the electronic access can be based on internet protocol services. The physical support does not need to be standardised.	No additional need.	The business case for AIXM has been conducted in Europe and in the United States and has shown to be positive. The initial investment necessary for the provision of digital AIS data may be reduced through regional cooperation and it remains low compared with the cost of other ATM systems.		States at different stages of implementation. The implementation of QMS, data quality monitoring and data integrity monitoring is still a challenge for the majority of States. 6 States have developed National Plans for the transition from AIS to AIM.	Mandate the certification of AIM Services. Support and expedite the establishment of the MID Region AIS Database (MIDAD). Provide necessary assistance (necessary funds and expertise) to a number of States in order to expedite the transition

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paper; also, more dynamic information should allow shorter flight trajectories, based on more accurate information about the current status of the airspace structure.						The implementation of Integrated Aeronuatical Information Database is challenging Lack of expertise and financial resources in some States.	
Improved Operations through Enhanced En-Route Trajectories. **Element 1** : Flexible Tracking **Element 2:** CDM for enroute airspace **Elemnt3**: PBN **Element 4;** FUA **Element 5;** Airspace planning **Performance monitoring** Metrics:	Require new procedures which will be implemented initially as unpublished routes, but will become established and published as RNAV routes with increased flexibility. Establishment of National Defense/ATM/User coordination procedures to handle ingress, egress, Department of Defense reclamation,	Equipage with FANS or ATN with VDL-2 is required to enable this operation. A web based portal constantly updated during specified weather, TFM, delays, Reroutes, TMI circumstances will inform stakeholders of impacted routes . Some technology is currently under development and	FANS 1A+, DO-280/DO-290, RTCA 214 standards in the near-term. Requires National Defense, ATM, and civilian operator policy to support comprehensive SUA status information.	FUA will reduce flight time and distance with enhanced awareness, better use of airspace and use of more efficient routes. In the U.S. a study shows maximum savings of dynamic use of SUA of $7.8M (1995 $). In the U.S. the RTCA NextGen Task Force found that in the near term TMA will reduce		MID ATS Route network is being regularly reviewed and improved by the ARN TF and ATM/SAR/AIS SG. New RNAV Routes are being implemented CANSO is leading the development of the Middle East Regional	Organize Seminars on FUA and Civil/Military coordination. Improve the level of attendance of the Military side to the MIDANPIRG activities Alleviate the institutional constraints related to Civil/Military cooperation.

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Increased predictability Increased communication and shared knowledge Reduce delays Reduced flight times Reduced miles flown Reduced emissions	and deviation situations. New RNAV, random and designated RNAV routes through the SUA must be designated. Airspace planning will require RNAV procedures which may enhance the predictability of operations.	will likely be available system wide in the near term. RNAV equipped aircraft is needed. No equipage requirement. Applies to all arriving aircraft where implemented.	ATM and National Defense must standardize how SUA are managed across the NAS. SUA management across the NAS must be automated.	gate arrival delay by 2 to 4 minutes; reduce airborne holding circuits by 90%; also small increases in arrival rates will be possible. RPI benefits of $70M-$100M per year for OEP airports.		Airspace Review (MIDRAR) FUA concept and Civil/Military coordination represent a top priority for the Region.	
Improved Flow Performance through Planning based on a Network-Wide view **Performance monitoring** Metrics: 1. Better utilisation of available capacity, network-wide; 2. Increased predictability of schedules as the ATFM algorithms tend to limit the number of large delays.	Need to expedite the ICAO manual, but US/Europe experience is enough to initiate application in other regions. New procedures are required to link much closer the ATFM with ATS in the case of using miles-in-trail.	At that stage, no specific technology apart from current IT. Some vendors propose light ATFM systems.	Establishing standard ATFM messages in order to ensure common understandin g & behaviour for operators flying in several regions and to ensure exchange ATFM data across	The cost of 1 minute ATFM delay is estimated to 81€ in Europe, and the airborne delay cost is higher. Avoiding significant amounts of airborne delays and properly managing the ATFM delays compensates many times the cost of the service in regions where traffic density is high**.**	The following improvement items are being validated or implemented in Europe . Enhanced Flight Plan Filing Facilitation, - Use of Free Routing for flight in special Airspace volumes, Use of Aircraft Derived Data to enhance ATM ground system	Not yet implemented as current traffic density in MID Region (with few exceptions) does not justify implementation, which is also not supported by users.	Will consider in future MIDANPIRG Work Programme

Operational improvement & Performance monitoring-Metrics **1**	**Availability of necessary procedures** **Air/Ground** **2**	**Availability of necessary technology** **Air/Ground** **3**	**Availability of Regulatory approvals** **4**	**Development of business case** **5**	**Conduct of Operational trials** **6**	**Status of implementation/ Challenges, if any** **7**	**Way forward to expedite implementation** **8**
3. Reduced fuel burn; 4. Environment: reduced fuel burn 5 Improved access by avoiding disruption of air traffic in periods of demand higher than capacity; 6. ATFM processes take care of equitable distribution of delays			regions would be an advantage.		performance - - Network Performance Assessment, - Real-time Civil-Military Coordination of Airspace Utilisation, - Flexible Sectorisation		
Improved access to Optimum Flight Levels through Climb/Descent Procedures using ADS-B **Performance monitoring** Metrics: 1. Cost Effectiveness: reduced fuel burn. 2. Environment: reduced emissions. 3. Capacity: improvement in capacity.	Different procedures will be required for each version of In-Trail Procedure (ITP). For oceanic ITP (using ADS-C) refer to GOLD document .Procedure s for IPT using ADS-B have been developed and will soon be available in an ICAO circular – "Safety Assessment for the development of Separation Minima and Procedures for In-Trail Procedure (ITP)	The necessary technology for ITP using ADS-C will be the FANS-1/A package on the aircraft. The corresponding ATSU on the ground will need a data link workstation supporting CPDLC and ADS-C with a conflict probe. The necessary technology for IPT using ADS-B on board the aircraft will be an ACAS	For ITP using ADS-B, the following documents apply: a. AC 20-172 b. TSO C195	Guidance for the Development of CBA and Business case is available. For ITP using ADS-C, total fuel savings in the Oakland FIR have been projected to be approx. $16M per year with a 35% equipage rate. CO2 savings of 51M Kg per annum have been predicted.. For ITP using ADS-B, the business case for one major carrier operating in	Both ITP with ADS-C and ADS-B are a part of trials to be undertaken under the ASPIRE programme. Once the above trials have been completed, it is expected that ITP will become operational	GOLD is adopted in the MID Region ADS-B implementation is also progressing in the Region ITP Not implemented	Will consider in future MIDANPIRG Work Programme

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	using Automatic Dependant Surveillance – Broadcast (ADS-B)	conforming to DO-312. Although CPDLC is not a pre-requisite for ITP using ADS-B, many FIRs will only approve ITP supported by CPDLC. In which case, the aircraft and ATSU will need to support CPDLC.		the South Pacific was as follows: • Per annum savings per aircraft : $202K • Benefit to Cost Ratio : 10.7 • Time to Payback : 3 years • Internal Rate of Return : 68%			
Air Traffic Situational Awareness (ATSA) **ATSA provides a cockpit display of a graphical depiction of traffic to assist the pilot in out-the-window visual acquisition of traffic**: **Performance monitoring** Metric:	Being developed	Being developed	Being developed	Being developed	Being developed	Not implemented	Will consider in Future MIDANPIRG Work Programme

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Improved Flexibility and Efficiency in Descent Profiles (CDOs) **Element 1**: Continuous Descent Operations **Element 2:** Performance Based Navigation **Performance monitoring** Metrics: 1. reduced fuel burn: 2. reduction in the number of required radio transmissions: 3. Number of unstable approaches, 4. Number of CFIT	Element 1: The ICAO Continuous Descent Operations (CDO) Manual (DOC 9931) provides guidance on all aspects of CDO. . Element 2: The ICAO Performance-based Navigation Manual (ICAO Document 9613) provides general guidance on PBN implementation. .	Element 1: CDO is an aircraft operating technique aided by appropriate airspace and procedure design. This is most readily determined by the onboard FMS. Element 2: PBN requirements will be affected by the CNS/ATM systems. The plan for RNAV or RNP has to be decided in consultation with the airspace user. Some areas need only a simple RNAV, while other areas such as nearby steep terrain or dense air traffic may	Element 1: CDO may be a strategic objective. In addition to a safety assessment, impact of CDO on other air traffic operations should be developed. Element 2: International public standards for PBN are still evolving. There is a need for forward fit and retrofit	Element 1: CDO in Los Angeles TMA benefited 50% reduction in radio transmissions; fuel savings – average 125 pounds per flight; more than 41 million pounds of CO2 avoided. Element 2: The PBN avoids the need to purchase and deploy navigation aids for each new route or instrument procedure. With PBN all airports can have a stabilized instrument approach that will allow	Element 1: Many trials and actual implementation have already occurred globally. Element 2: PBN is being implemented in many parts of the world.	MID Region PBN implementation Plan endorsed by MIDANPIRG. CDO is being addressed within the framework of MIDANPIRG MID State have shown great interest in the CDO. Go Team visit was arranged for pioneer State in the MID region Another MID State requested a Go Team visit to support the CDO implementation	Provide assistance to States. More Go Team visits to the States of the Region. Support the PBN/GNSS TF

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		require the most stringent RNP. .	requirements including GNSS.	aircraft to land into the wind, as opposed to a tail wind landing.			
Improved Safety and Efficiency through the initial application of Data Link En-Route **Element 1**- ADS-C: **Element 2**- CPDLC, FANS1/A: Link Performance monitoring Element 1- Metrics: 1. Increased situational awareness; 2. Better support to SAR. 3. Reduced separations 4. Apply flexible routings Element 2- Metrics: 1.Iincreased situational awareness 2. Reduced occurrences of misunderstandings;	Already available in ICAO documents	Already available in ICAO documents	Already available in RTCA and EUROCAE documents.	Element 1 The business case has proven to be positive due to the benefits that flights can obtain in terms of better flight efficiency Element 2: A detailed business case has been developed in support of the EU Regulation which was positive.	Element 1 Data link is operational at the Maastricht UAC since 2003. Element 2: US: Domestic Airspace: Beginning in 2014 Departure Clearance Services will be deployed using FANS-1/A+. In 2017. In Europe the ATN B1 package is currently being deployed in 32 European Flight Information	An operational trial of ADC-C and CPDLC conducted in Empty Quarter in Saudi Arabia/ MID is characterized as continental with highly developed infrastructure and with low density traffic therefore justification to implement ADS-C & CPDLC is a challenge.	Increase operational trials and getting the support of users.

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3. Solution to stuck mike situations. 4 Reduced communication load					Regions.		
Improved Flexibility and Efficiency in Departure Profiles **Element 1:** Continuous Climb Operations **Element 2:** Performance Based Navigation **Performance monitoring** Metrics: 1. reduced fuel burn: 2. reduction in the number of required radio transmissions: 3. Number of unstable approaches, 4. Number of CFIT	Element 1 ICAO Continuous Climb Operations (CCO) Manual (ICAO Document xxxx) provides guidance on all aspects of CCO. Element 2: The ICAO Performance-based Navigation Manual (ICAO Document 9613) provides general guidance on PBN implementation	Element 1 CCO does not require a specific air or ground technology. It is an aircraft operating technique aided by appropriate airspace and procedure design. Element 2: PBN requirements will be affected by the CNS/ATM systems. The plan for RNAV or RNP has to be decided in consultation with the airspace user. Some areas need only a simple RNAV, while other areas such as nearby steep terrain or	Element 1: CCO may be a strategic objective. In addition to a safety assessment, impact of CCO on other air traffic operations should be developed. Element 2: International public standards for PBN are still evolving. There is a need for forward fit and retrofit	Element 1: CCO benefits are heavily dependent on each specific ATM environment. Nevertheless, the benefit/cost ratio is positive. Element 2: The PBN avoids the need to purchase and deploy navigation aids for each new route or instrument procedure. With PBN all airports can have a stabilized instrument approach that will allow aircraft to land into the wind, as opposed to a tail wind landing.	Element 1: Many trials are ongoing. Element 2: PBN is being implemented in many parts of the world	PBN implementation plans are being developed by the MID Sates MID region PBN implementation Plan was developed and endorsed by MIDANPIRG; however CCO was not included in that Plan and revision will be needed to the PBN Implementation Plan	More support to States Support the PBN/GNSS TF

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		dense air traffic may require the most stringent RNP.	requirements including GNSS.				

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