



International Civil Aviation Organization

**Second Meeting of the Air Traffic Management
Performance Measurement Task Force**

(APM TF/2)

(Cairo, Egypt, 10 –12 November 2014)

**Agenda Item 2: Global and Regional developments related to operational improvements
and environmental benefits**

GLOBAL DEVELOPMENTS RELATED TO OPERATIONAL IMPROVEMENTS

(Presented by the Secretariat)

SUMMARY

This paper presents the global developments related to the environmental benefits accrued from the implementation of operational improvements.

Action by the meeting is at paragraph 3.

REFERENCES

- GANP ICAO Doc 9750
- 38th ICAO General Assembly
- ICAO State Letter Ref AN 1/17 14/56 dated 10 September 2014

1. INTRODUCTION

1.1 The meeting may wish to note that Environmental Protection, to minimize the adverse environmental effects of civil aviation activities, is one of the five strategic objectives of ICAO for the triennium 2014-2016 ICAO.

1.2 For economic and efficiency reasons, the commercial aviation industry has already developed and implemented many techniques to reduce fuel usage. There has been steady progress in making aircraft and airline operations more fuel efficient, but it takes time to introduce technological improvements in aircraft/engine design and for those improvements to spread through the fleet. Changes to operating procedures or improvements to infrastructure may therefore offer significant and more immediate ways of improving efficiency operational opportunities and techniques can be considered only in the context of airport and air traffic constraints, operational requirements, and individual operator circumstances on a given flight.

1.3 Many operational opportunities require collaboration and cooperation among all civil aviation stakeholders. All stakeholders should consider the environmental impact of all potential changes to equipment, procedures, regulations and practices to ensure the most fuel-efficient operation, while maintaining safety, reliability and cost-effectiveness.

1.4 In general the environment issues are addressed by the ICAO Committee on Aviation Environmental Protection (CAEP). However, the ATM Performance Measurements Task Force (APM TF) is tasked to estimate the environmental benefits accrued from the implementation of ATM operational improvements in the MID Region.

2. DISCUSSION

2.1 The meeting may wish to recall that the 38th ICAO General Assembly, Montreal, Canada, 24 September - October 2013, agreed to Resolutions A38-17 and A38-18 *Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change*, which supersede Resolutions A37-18 and A37-19.

2.2 The 38th Assembly endorsed the fourth Edition of the ICAO Global Air Navigation Plan (GANP, Doc 9750), which represents a rolling fifteen-year strategy to guide complementary and sector-wide air transport improvements over the period 2013 to 2028.

2.3 The 38th Assembly called upon States, Planning and Implementation Regional Groups (PIRGs), and the aviation industry to:

- utilize the guidance provided in the GANP for planning and implementation activities which establish priorities, targets and indicators consistent with globally-harmonized objectives, taking into account operational needs; and
- 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.

2.4 The 38th Assembly urged States:

- to take into consideration the GANP guidelines as an efficient operational measure for environmental protection; and
- that are developing new generation plans for their own air navigation modernization to coordinate with ICAO and align their plans so as to ensure global compatibility and harmonization.

2.5 The GNAP includes the Aviation System Block Upgrades (ASBU) global framework, developed by ICAO, to ensure that aviation safety 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 reasonable cost.

2.6 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. ICAO has produced the systems engineering for its Member States so that they need only consider and adopt the Modules appropriate to their operational need.

2.7 The meeting may wish to note that ICAO recognized the difficulty faced by many States in assessing the environmental benefits of their investments in operational measures to improve fuel efficiency. Accordingly, ICAO, in collaboration with subject matter experts and other international organizations, has developed the ICAO Fuel Savings Estimation Tool (IFSET).

2.8 IFSET helps to harmonize State fuel-savings assessments consistent with more advanced models already approved by the CAEP. It will estimate the difference in fuel mass consumed by comparing a pre-implementation (i.e. baseline) case against a post-implementation case (i.e. after operational improvements).

2.9 IFSET was rolled out to ICAO Member States through a series of workshops during 2012. It was developed not to replace the use of detailed measurements or modelling tools regarding fuel savings, but rather to assist those States without the facility to estimate the benefits from operational improvements in a straightforward and harmonized manner. It is to be highlighted that during the First meeting of the ATM Measurements Task Force (ATMM TF/1), Cairo, Egypt, 8-9 September 2013, participants had the opportunity to practice the IFSET and estimate the amount of fuel saved for their identified operational improvements. IFSET is available on ICAO website through the following link: <http://www.icao.int/environmental-protection/Pages/Tools.asp>

2.10 In line with the above, ICAO developed the Operational Opportunities to Reduce Fuel Burn and Emissions Manual (ICAO Doc 10013) and the Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes Manual (ICAO Doc 10031).

2.11 ICAO Doc 10013 identifies and reviews various operational opportunities and techniques for minimizing fuel consumption, and therefore emissions, in civil aviation operations. It is based on the premise that the most effective way to minimize aircraft emissions is to minimize the amount of fuel used in operating each flight. This manual updates and replaces information previously provided in ICAO Circular 303 — *Operational Opportunities to Minimize Fuel Use and Reduce Emissions published in 2004*. This document contains information on current practices that are followed by aircraft operators, airport operators, air navigation services providers (ANSPs), other industry organizations and States, which are intended to minimize fuel use and reduce emissions from civil air transport. The manual is therefore aimed at airlines, airport operators, air traffic management and air traffic control service providers, airworthiness authorities, environmental agencies and other government bodies and interested parties.

2.12 The objectives of ICAO Doc 10013 are to:

- a) document industry experience and the benefits, in terms of emissions, resulting from optimizing the use of current aircraft and infrastructure, and the related benefits of infrastructure improvements;
- b) identify improvements that could result in measurable fuel savings; and
- c) demonstrate that a more efficient use of infrastructure is an effective means of reducing civil aviation emissions and therefore promote enhanced use of the capabilities inherent in existing aircraft, ground service equipment and infrastructure.

2.13 On the other hand, the purpose of the ICAO Doc 10031 is to provide States, airport operators, air navigation service providers (ANSPs) and other stakeholders with environmental assessment guidance to support sound and informed decision making when analyzing proposed air traffic management (ATM) operational changes. High-level principles related to the quantification of changes in aviation-related environmental impacts associated with air navigation service changes are collected in order to ensure a consistent approach to the analysis of the changes, while minimizing the risk of common assessment errors. This provides a framework within which specific, detailed assessment methodologies can be developed that meet local requirements, while facilitating global compatibility of results. It is also intended to assist with recognizing any environmental benefits associated with operational changes. While the guidance is intended to be applied broadly, it also highlights areas of priority that may need to be considered at the local level.

2.14 The ICAO Doc 10031 includes high-level principles extracted from the environmental assessment best practices of air navigation service providers, State governments and other advisory bodies. These high-level principles are not intended to override existing or future State-specific guidance, but can be used to support their development, or evolution.

2.15 The meeting may wish to note that, in 2013, a high-level analysis of the potential environmental benefits from seven ASBU Block 0 modules was undertaken by the CAEP, which estimated that up to 4 million tonnes of fuel savings could be achieved from planned Block 0 module implementation.

2.16 In view to support a comprehensive ASBU Block 0 global environmental analysis currently underway by CAEP, a questionnaire was circulated through ICAO State Letter Ref AN 1/17 14/56 dated 10 September 2014 at **Appendix A** to this working paper, requesting States to submit the completed questionnaire by **31 December 2014**.

2.17 The questionnaire is divided into questions per ASBU Performance Improvement Area. For each module, the operational improvement is detailed along with questions designed to obtain the information required related to possible fuel savings to advance the work described above.

2.18 It is to be highlighted that the global environmental benefits are published in the annual ICAO Air Navigation Report, which could be accessed through the following link: <http://www.icao.int/airnavigation/pages/Air-Navigation-Report.aspx>. However, the environmental benefits accrued from the implementation of operational improvements in the MID Region are published in the MID Region Air Navigation Environmental Report (the first Report was endorsed by MIDANPIRG/14 meeting, Jeddah, Saudi Arabia, 15-19 December 2013).

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) encourage States and Users to use the guidelines provided in ICAO Doc 10013 and Doc 10031, when planning for the implementation of operational improvements;
- b) urge States to use the IFSET for the estimation of the saved CO2 emissions from the implemented operational improvements; and
- c) encourage States to completed the questionnaire at **Appendix A** to this working paper, and submit it to ICAO by **31 December 2014**.



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منظمة الطيران
المدني الدولي

国际民用
航空组织

Ref.: AN 1/17 – 14/56

10 September 2014

Subject: ASBU Block 0 implementation questionnaire

Action required: Submit completed questionnaire to ICAO by 31 December 2014

Sir/Madam,

The fourth edition of the ICAO Global Air Navigation Plan (GANP, Doc 9750) represents a rolling fifteen-year strategy to guide complementary and sector-wide air transport improvements over the period 2013 to 2028. The GANP addresses required solutions by introducing a consensus-driven Aviation System Block Upgrade (ASBU) methodology.

In 2013, a high-level analysis of the potential environmental benefits from seven ASBU Block 0 modules was undertaken by the ICAO Committee on Aviation Environmental Protection (CAEP) which estimated that up to 4 million tonnes of fuel savings could be achieved from planned Block 0 module implementation. I am grateful for the positive State response to the 2013 survey on the implementation of ASBU Block 0, the results of which were published in the 2014 Air Navigation Report available at: <http://www.icao.int/airnavigation/pages/Air-Navigation-Report.aspx>.

The attached questionnaire will support a comprehensive ASBU Block 0 global environmental analysis currently underway by CAEP. The questionnaire is divided into questions per ASBU Performance Improvement Area, with each module with possible fuel savings individually targeted. For each module, the module's operational improvement is detailed along with questions designed to obtain the information required to advance the work described above.

The questionnaire is intended only to collect information on planned future actions in line with your current plans; your replies do not imply a firm commitment on your part to implement those actions.

Accept, Sir/Madam, the assurances of my highest consideration.

Raymond Benjamin
Secretary General

Enclosure:

CAEP ASBU Block 0 Implementation Questionnaire

ATTACHMENT to State letter AN 1/17 - 14/56

Name:

State/Organization:

Email Address:

Performance Improvement Area 1: Airport Operations				
B0-APTA	B0-WAKE	B0-RSEQ	B0-SURF	B0-ACDM

Block 0-APTA: *Optimization of Approach Procedures including vertical guidance*

Operational Improvements:

- a) Performance-based navigation (PBN) approaches: Radius to fix
- b) Reduced missed approaches and diversions due to lowered approach minima

Questions

		Current	2018 (additional)
1	List of airports* with implementation of radius to fix final approach.		
2	What percentage of operations in your State/region fly this procedure?		
3	List of airports* in your State/region with PBN final approaches implementation in order to provide improved access through improved minima (leading to a reduction in missed approaches/diversions).		
4	What percentage of operations benefit from a reduction in missed approaches at the aerodromes identified in question 3?		
5	How many commercial service airports in your State/Region do not have at least one Instrument Landing System (ILS) installed?		
6	What percentage of commercial operations in your State/region occur at the airports included in your response to question 5?		

*Please list international aerodromes published in the ICAO regional air navigation plans using their ICAO code.

Block 0-WAKE: Increased Runway Throughput through Optimized Wake Turbulence Separation

Operational Improvements:

- a) Wake vortex separation standard re-categorisation (RECAT)
- b) Reduced wake vortex separation for closely spaced parallel runways ((CSPRs)

Questions

1	At which airports* in your State/region do you plan to implement RECAT prior to the end of 2018?	
2	What percentage of arrival and departure traffic would benefit from reduced wake vortex separation?	
3	Which airports* in your State/region have closely spaced parallel runways (CSPRs) with a non-aligned landing and departure zone (i.e. the wake of departures impacts the arrivals as the landing zone is in front of the departure zone)?	
4	Do these airports plan to implement reduced wake vortex separations on the CSPRs prior to the end of 2018?	

Block 0-RSEQ: Improved Runway Traffic Flow through Sequencing (AMAN/DMAN)

Operational Improvements:

- a) Arrival manager (AMAN)
- b) Departure Manager (DMAN)

Questions

		Current	2018 (list additional)
1	List of airports* in your State/region operating an AMAN?		
2	List of airports* in your State/region operating an DMAN?		

*Please list international aerodromes published in the ICAO regional air navigation plans using their ICAO code.

Block 0-SURF: *Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)*

Operational Improvement:

- a) Advanced Surface Movement Guidance Control System (A-SMGCS) Level 1 and 2

Questions

1	Which airports* in your State currently have implemented A-SMGCS level 1 and 2?	
2	Estimate the percentage of aircraft movements which are operating with A-SMGCS in your State/organization?	
3	Which additional airports* in your State/organization will implement A-SMGCS Level 1 and 2 in 2018?	
4	What percentage of aircraft movements do you estimate will be operating with A-SMGCS in your State in 2018?	

Block 0-ACDM: *Improved Airport Operations through Airport-CDM*

Operational Improvement:

- a) Airport Collaborative Decision Making

Questions

1	Which airports* in your State currently have implemented A-CDM?	
2	Which airports* in your State plan to implement A-CDM prior to 2018?	

*Please list international aerodromes published in the ICAO regional air navigation plans using their ICAO code.

Performance Improvement Area 2: Global Interoperable Systems and Data		
B0-FICE		B0-DAIM

Block 0-FICE: *Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration*

Operational Improvement:

- a) ATS inter-facility data communication(AIDC)

Description:

This module is to improve coordination between air traffic service units (ATSUs) by using ATS inter-facility data communication (AIDC). The transfer of communication in a data link environment improves the efficiency of this process particularly for oceanic ATSUs.

Questions

1	Has your State/ANSP implemented, or does it plan to implement, the FICE module (AIDC) prior to 2018?	
2	Will the implementation of AIDC result in reduced separation standards that can be applied between Air Traffic Service Units?	
3	Will the application of reduced separation result in the offering of more efficient flight levels to aircraft?	
4	To what percentage of aircraft could a potential more efficient level be offered?	
5	Has any estimation been undertaken of potential fuel-saving benefits that could be achieved as a result of the ability to offer aircraft more efficient flight levels due to the reduced separation being applied?	

Block 0-DAIM: *Service Improvement through Digital Aeronautical Information Management***Operational Improvement:**

- a) Digital NOTAM

Description:

The initial introduction of digital processing and management of information, through aeronautical information service (AIS) / aeronautical information management (AIM) implementation.

Questions

1	In your State, what percentage of aeronautical information, based on paper publications and NOTAMs, have moved from traditional provision of paper to electronic support?	
2	What percentage of operations in your State/region currently benefit from improved pre-flight briefing and from dynamic in-flight profile changes due to digital NOTAMs?	
3	Has any estimation been undertaken of the potential fuel saving benefits that could be achieved from dynamic in-flight profile changes due to the benefits identified in question 2?	
4	What percentage of aeronautical information, based on paper publications and NOTAMs, do you estimate in your State/Organization will have moved from traditional provision of paper to electronic AIP in 2018?	
5	What percentage of operations in your State/region do you estimate would benefit from improved pre-flight briefing and from dynamic in-flight profile changes due to digital NOTAMs in 2018?	

Performance Improvement Area 3: Optimum Capacity and Flexible Flights		
B0-FRTO	B0-NOPS	B0-ASUR

Block 0-FRTO: *Improved Operations through Enhanced En-Route Trajectories*

Operational Improvements:

- a) Flexible Use of Airspace (FUA)
- b) Flexible Routes

Questions

1	Is FUA currently implemented in your State/region (please specify the geographical extent in terms of FIR) ?	
2	Is there a plan to implement or increase FUA in your State/region (please specify the geographical extent in terms of FIR) prior to 2018?	
3	How many track miles annually do you currently save as a result of FUA implementation or changes to validity periods for restricted airspace? What percentage of operations does this represent annually?	
4	How many track miles annually do you expect to save in 2018 as a result of FUA implementation or changes to validity periods for restricted airspace? What percentage of operations does this represent annually?	
5	Are flex routes (non-fixed) currently used in your State/region (please specify the geographical extent in terms of FIR or city pairs)?	
6	What is the estimated percentage of annual movements in your State/region (please specify) that currently fly on flex routes?	
7	Is there a plan to implement flex routes in your State/region (please specify the geographical extent in terms of FIR or city pairs) by 2018?	
8	What is the percentage of annual movements in your State/region (please specify) that it is estimated will fly on flex routes in 2018?	

Block 0-NOPS: Improved Flow Performance through Planning based on a Network-Wide view**Operational Improvement:**

- a) Air Traffic Flow management (ATFM)

Questions

1	Is strategic traffic flow management currently used to manage runway/airspace slot allocation in your State/region? At all airports/airspace? Please specify where.	
2	How many flights are subject to the ATFM process?	
3	How much en-route delay did the ATFM measures save in 2013?	
4	How much airport arrival delay did the ATFM measures save in 2013?	
5	Will strategic traffic flow management be used to manage runway/airspace slot allocation in your State/region by the end of 2018? At all airports/airspace? Please specify where?	
6	How many flights will be subject to the ATFM process?	
7	How much en-route delay is it estimated that the ATFM measures will save in 2018?	
8	How much airport arrival delay is it estimated that the ATFM measures will save in 2018?	

Block 0-ASUR: ADS-B Ground-Based and Satellite-Based Surveillance and MLAT**Operational Improvement:**

- a) Ground and Satellite-based surveillance through ADS-B leading to improved access to optimal flight levels

Questions

1	Is surveillance of en-route aircraft with ground-based ADS-B currently implemented in your State/region (please specify the geographical extent in terms of FIR)?	
2	Approximately what percentage of your State's/region's current operations would you estimate to operate in areas identified in question 1?	
3	Is the implementation of surveillance of en-route aircraft with ground-based ADS-B planned in your State/region by 2018 (please specify the geographical extent in terms of FIR)?	
4	Approximately what percentage of your State's/region's projected 2018 operations would you estimate to be operations that will operate in areas identified in question 3?	

Performance Improvement Area 4: Efficient Flight Path		
B0-CDO	B0-TBO	B0-CCO

Block 0-CDO: *Improved Flexibility and Efficiency in Descent Profiles (CDOs)*

Operational Improvements:

- a) Continuous Descent Operations (CDO)
- b) PBN standard terminal arrival routes (STARs)

Questions

1	How many aerodromes in your State have currently published CDO procedures OR have CDO procedures tactically applied?	
2	What is the estimated percentage of arrival movements in your State that currently operate the CDO procedures OR have CDO procedures tactically applied?	
3	How many airports in your State do you estimate will have published CDO procedures OR have CDO procedures tactically applied in 2018?	
4	What is the estimated percentage of arrival movements in your State that will operate the CDO procedures in 2018 OR will have CDO procedures tactically applied?	
5	How many airports with PBN STARs currently operate in your State and how many do you estimate will do so in 2018?	
6	What is the estimated percentage of yearly traffic movements that currently fly on the published PBN STARs, and what is the estimated number expected to do so in 2018?	
7	For what reason were PBN arrival routes implemented (e.g. reduced track miles / increase capacity)?	

Block 0-TBO: Improved Safety and Efficiency through the initial application of Data Link En-Route**Operational Improvement:**

- a) En-route application of Data link

Questions

1	What proportion of your State's airspace is procedurally controlled, such as airspace in remote or oceanic areas?	
2	Is Data-link in operation in these areas?	
3	If Data-link is not in operation in these areas, is implementation planned prior to 2018?	
4	Is reduced horizontal separation minima planned to be implemented into the airspace identified prior to 2018?	
5	What is the estimated percentage of annual movements in your State that will operate in the area with reduced separation?	
6	Has your State identified any savings in fuel burn through the optimization of flight level due to reduction of horizontal separation?	
7	What percentage of airframes are/will be (by 2018) equipped with FANS 1/A+ avionics?	
8	How much delay is it estimated that CPDLC saved/will save (in 2018)?	

Block 0-CCO: Improved Flexibility and Efficiency in Departure Profiles**Operational Improvements:**

- a) Continuous Climb Operations (CCO)
- b) PBN standard instrument departures (SIDs)

Questions:

1	How many airports in your State have currently published CCO procedures OR have CCO procedures tactically applied (i.e. have an uninterrupted climb profile from take-off to the top of climb)?	
2	What is the estimated percentage of departure movements in your State that currently have an uninterrupted climb profile from take-off to the top of climb?	
3	How many airports in your State do you estimate will have published CCO procedures OR have CCO procedures tactically applied in 2018 (i.e. have an uninterrupted climb profile from take-off to the top of climb)?	
4	What is the estimated percentage of departure movements in your State that will have an uninterrupted climb profile from take-off to the top of climb in 2018?	
5	How many airports with PBN SIDs currently operate in your State and how many do you estimate will do so in 2018?	
6	What is the estimated percentage of yearly traffic movements that currently fly on the published PBN SIDs and what is the estimated number to do so in 2018?	
7	For what reason were PBN departure routes implemented (e.g. reduced track miles/increase capacity/reduce population exposed to noise)?	

This questionnaire can be completed online at <https://portal.icao.int/surveys/En/Lists/QuestionnaireASBU/overview.aspx> or sent in hard copy to:

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