

Doc 10018



Report of the Assessment of Market-based Measures

Approved by the Secretary General
and published under his authority

First Edition — 2013

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AMENDMENTS

Amendments are announced in the supplements to the *Catalogue of ICAO Publications*; the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

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Acknowledgement

The quantitative and qualitative assessment of a global market-based measure (MBM) scheme, as contained in this report, would not have been possible without the significant levels of support and engagement of the MBM experts, nominated by States and international organizations. The ICAO Secretariat wishes to thank the experts who have shared their knowledge and devoted their time by participating in numerous meetings and conference calls and providing substantial inputs. We are truly grateful for their collective insight, which helped undertake this research on the potential global MBM scheme options for international aviation, in responding to the requests of the 37th Session of the ICAO Assembly and the ICAO Council. We believe this report will assist in decision-making and further work on MBMs towards defining global solutions for a sustainable aviation future.

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EXECUTIVE SUMMARY

Market-based measures (MBMs), as a potential means for limiting or reducing CO₂ emissions from international aviation, have been under consideration by the International Civil Aviation Organization (ICAO) for the last decade. With a view to better understanding such measures, ICAO has undertaken a number of studies since 2001 which resulted in the preparation of guidance material on MBMs. Under the policy framework adopted by the 37th Session of the Assembly in 2010, as contained in Assembly Resolution A37-19: *Consolidated statement of continuing ICAO policies and practices related to environmental protection — Climate change*, MBMs became a part of a basket of measures that States can use to address CO₂ emissions from international aviation, and further work in this area was requested.

In particular, the Assembly requested “the Council, with the support of member States and international organizations, to continue to explore the feasibility of a global MBM scheme by undertaking further studies on the technical aspects, environmental benefits, economic impacts and the modalities of such a scheme, taking into account the outcome of the negotiations under the UNFCCC and other international developments, as appropriate, and report the progress for consideration by the 38th Session of the ICAO Assembly” (paragraph 18 of Resolution A37-19).

In early 2012, six potential options for a global MBM scheme were identified, and the criteria by which they would be evaluated were elaborated on, building upon the MBM guiding principles (Annex to A37-19). In June 2012, the ICAO Council, at its seventh meeting of the 196th Session, narrowed the MBM options to three (global mandatory offsetting, global mandatory offsetting with revenue, and global emissions trading) and requested further quantitative and qualitative assessment of these options be undertaken.

This report provides an overview of the results of the quantitative and qualitative assessment of the options for a global MBM scheme, undertaken during 2012 and 2013 by the ICAO Secretariat with the support of MBM experts nominated by Member States and international organizations.

Quantitative assessment

The quantitative assessment in 2012, which is referred to as the “core study” in this report, was supplemented by a quantitative assessment in 2013 (referred to as the “supplementary study”). The supplementary study used the updated traffic forecasts and emissions trends prepared in 2013 by the ICAO Council’s Committee on Aviation Environmental Protection (CAEP) to further assess the global impacts of MBMs on international aviation.

In the core study undertaken in 2012, the cost of introducing an MBM scheme was found to be relatively small. Under a scenario of keeping net carbon emissions from 2020 at the same level, MBMs would need to reduce or offset 464 Mt of CO₂ in 2036, as a result of the emissions increase from 2020 to 2036. In the case where 100 per cent of the costs of an MBM scheme would be passed on to customers through increases in the price of tickets, the quantitative assessment showed that:

- *Traffic impact:* While an MBM scheme provides the environmental benefit of offsetting 464 Mt of CO₂ in 2036, international aviation traffic under a scheme would grow 107 per cent from 2020 to 2036; however, without the scheme the traffic level would have grown 110 per cent;

- *Profit impact:* Profits for the international aviation sector in 2036 would be \$33.3 billion¹ under the scenario with an MBM scheme which would be \$0.4 billion lower than the profit level without the scheme; and
- *Cost impact:* The cost of an MBM scheme in 2036 would be approximately \$10 per seat for a flight of 10 000 to 12 000 kilometres and \$1.5 per seat on a flight of 900 to 1 900 kilometres.

The supplementary study in 2013 confirmed the results of the core study: an MBM scheme could achieve the environmental target of stabilizing CO₂ emissions at a relatively low economic cost. In the supplementary study, the traffic level in 2036 under an MBM scheme would be up to 1 per cent lower than the traffic level without the scheme; and the cost of an MBM scheme as a proportion of total revenue would be up to 1 per cent, in the worst-case scenario studied.

The core study in 2012 also assessed the impacts of MBMs, taking into account the additional evaluation criterion “Ability to accommodate the special circumstances and respective capabilities [SCRC] of developing countries”, as requested by the Council at its 196th Session². Three different approaches were used to assess impacts on developing countries: evaluation of six geographic regions; differences between least developed countries (LDCs) and non-LDCs; and using two parameters defining level of development: per capita income and international aviation activity in terms of available seat kilometre (ASK) by departing flights from individual countries.

The assessment demonstrated that the differences between MBM impacts by regions or groups of States were marginal. For example, the MBM impacts on traffic demand in the six regions, were generally consistent with the global average of a 1.2 per cent reduction. The change in operating result (profit) brought about by an MBM scheme was relatively consistent between regions, varying from 1.0 per cent to 1.3 per cent; this was generally consistent with the global average of 1.1 per cent. The comparison of LDCs and non-LDCs showed a similar pattern to that of the six regions in terms of the consistency with the global results. However, LDCs were not as affected as non-LDCs by MBMs. Impacts on traffic levels and profits were smaller in LDCs, although reductions in CO₂ were also smaller. No differences between groups using development parameters were noted.

Qualitative assessment

The qualitative assessment focused on the design features of the three options for a global MBM scheme, by identifying and elaborating on the implications of different design choices. Any MBM scheme is designed to achieve a clear **environmental objective**, which can be established with a baseline or cap on emissions levels. The **distribution of the environmental objective** among participants establishes individual obligations, which collectively respect the environmental objective. Both Member States and aircraft operators would have important roles to play in a global MBM scheme. It will be important to distinguish between the compliance obligations placed on the **participants** of a scheme and on implementation responsibilities, such as administration and enforcement at national or international levels.

Compliance obligations could generally be tracked through a registry, which at a minimum, records the environmental objective of a scheme, the emissions of each participant, the obligation of each participant to surrender **emissions units** and the tracking of emissions units to ensure participants’ obligations are respected. A robust **monitoring, reporting and verification (MRV)** system is key to any MBM scheme, as it ensures that one unit of emissions emitted and recorded in one jurisdiction is directly comparable to a unit in another jurisdiction; this also protects fair market competition and avoids market distortion.

1. All dollar values in the core study use 2006 USD.

2. Council Decision 196/7.

The three main differences in the design features of the options for a global MBM scheme (offsetting and emissions trading) were identified: use of different emissions units; differences in the allocation of obligations to individual participants; and different accounting requirements to ensure compliance.

These design differences were translated into different administrative steps, impacting the complexity for implementing the three options. A global mandatory offsetting could be less complex since existing emissions units can be used and tracked through a simple registry. A global mandatory offsetting complemented by a revenue generation mechanism could be more complex due to the need to determine how revenue will be collected and used. A global emissions trading scheme could increase complexity and have higher upfront costs due to the need to administer specific aviation allowances. However, it should offer more flexibility for participants due to the creation of emissions units, which can be traded in the marketplace.

Feasibility of a global MBM scheme

The overall results of the qualitative and quantitative assessment of the three options for a global MBM scheme demonstrated that they were technically feasible and have the capacity to contribute to achieving ICAO's environmental goals.

GLOSSARY

AERO-MS. Aviation Emissions and evaluation of Reduction Options — Modelling System. The model was developed by the Netherlands government as a policy testing tool for quantifying the environmental and economic consequences of a wide range of measures to reduce global aircraft engine emissions, including regulatory, financial and operational measures.

APMT-Economics. Aviation Portfolio Management Tool — Economics. A software tool developed by the United States Federal Aviation Administration, in collaboration with Transport Canada and the United States National Aeronautics and Space Administration (NASA). It has been developed as a part of the Aviation Environmental Tools Suite to allow for thorough assessment of the environmental effects and impacts of aviation.

Allocation. The initial distribution of allowances to accountable entities for a compliance period. This allocation could, for example, be based on historical emissions or a performance standard and level of production; it could be made for free or through an auctioning process or both.

Allowances. An allowance is a tradable emission permit that can be used for compliance purposes in an emission trading system (ETS). Each allowance represents the emission of pollution once.

Auctioning. Method for distribution of obligations under an MBM scheme. In the context of an MBM scheme, it applies to emission trading where allowances below the cap are fully or partly auctioned rather than provided to participants for free.

Available tonne kilometres (ATK). Available (offered) capacity for passengers and cargo expressed in metric tonnes, multiplied by the distance flown.

Benchmarking. Method for distribution of obligations under an MBM scheme. It establishes a reference level based on efficiency such as emissions per unit of output, e.g. CO₂/RTK.

CAEP. Committee on Aviation Environmental Protection.

Certified emission reductions (CERs). A Kyoto Protocol unit equal to one metric tonne of CO₂ equivalent. CERs are issued for emission reductions from clean development mechanism (CDM) project activities.

CO₂. Carbon dioxide, a naturally occurring gas that is also a by-product of burning fossil fuels and biomass, and other industrial processes. Carbon dioxide is the reference gas against which the global warming potential of other greenhouse gases is measured.

Emissions unit. For the purposes of this report, the compliance instruments, otherwise referred to as “credit”, “offset credit”, “offset” or “allowance” are called emissions units. One emissions unit equals one tonne of CO₂.

Flat percentage of emissions. Method for distribution of obligations under an MBM scheme. Under this method, all participants reduce emissions by a fixed percentage of their individual totals, e.g. 15 per cent below 2013 total emissions. This approach requires percentages to be continuously calibrated to meet the environmental objective.

Grandfathering. Method for distribution of obligations under an MBM scheme, in which allowances are allocated to participants based on historical emissions.

Greenhouse gases (GHGs). The atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Less prevalent, but very powerful GHGs are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

Market-based measures. Sometimes referred to as market instruments, MBMs provide financial incentives and disincentives to regulated entities towards desired behaviour, e.g. lowering emissions. These measures can be implemented to reduce damage to the environment.

Open emissions trading. An emissions trading system where allowances can be traded in and outside the given scheme or sector. For example, within an emissions trading scheme for aviation, participants would be allowed to buy allowances from sectors outside the aviation emissions trading scheme.

Operating costs. The operating costs in the models used for this study include labour costs, landing fees, financing costs, fuel and maintenance costs.

Revenue tonne kilometres (RTK). Utilized (sold) capacity for passengers and cargo expressed in metric tonnes, multiplied by the distance flown.

Scenario A (low aircraft technology and moderate operational improvement). In addition to including the improvements associated with the migration to the latest operational initiatives, e.g. those planned in NextGen and SESAR, this scenario includes fuel burn improvements of 0.96 per cent per annum for all aircraft entering the fleet after 2010 and prior to 2015, and 0.57 per cent per annum for all aircraft entering the fleet beginning in 2015 and prior to 2050. It also includes additional fleet-wide moderate operational improvements by region.

Scenario B (optimistic aircraft technology and operational improvement). In addition to including the improvements associated with the migration to the latest operational initiatives, e.g. those planned in NextGen and SESAR, this scenario includes an optimistic fuel burn improvement of 1.5 per cent per annum for all aircraft entering the fleet after 2010 out to 2050. It also includes additional fleet-wide independent experts' (IE) operational improvements by route group. This scenario goes beyond the improvements based on industry-based recommendations.

Surrendering. Submitting allowances for emissions by the accountable entity in order to fulfil the obligations under the emissions trading scheme.

Chapter 1

INTRODUCTION

1.1 PURPOSE OF REPORT

1.1.1 After the adoption of Assembly Resolution A37-19 “*Consolidated statement of continuing ICAO policies and practices related to environmental protection - Climate change*”¹ by the 37th Session of the Assembly in 2010, the International Civil Aviation Organization (ICAO) initiated work on tasks requested by the Assembly in order to address the effects of international aviation on climate change and continuously progress towards a sustainable aviation future.

1.1.2 In particular, the Assembly requested the ICAO Council: “with the support of member States and international organizations, to continue to explore the feasibility of a global MBM scheme by undertaking further studies on the technical aspects, environmental benefits, economic impacts and the modalities of such a scheme, taking into account the outcome of the negotiations under the UNFCCC and other international developments, as appropriate, and report the progress for consideration by the 38th Session of the ICAO Assembly”.

1.1.3 This report provides an overview of the results of the quantitative and qualitative assessment related to the feasibility of a global MBM scheme, undertaken during 2012 and 2013 by the ICAO Secretariat with the support of the MBM experts nominated by Member States and international organizations. It is a technical assessment of the economic and CO₂ impacts of three options for a global MBM scheme (global mandatory offsetting, global mandatory offsetting with revenue, and global emissions trading). It also summarizes various design features for a global MBM scheme, which were qualitatively developed and assessed. It is intended to be informative and support broader policy decisions on a global MBM scheme to address mounting CO₂ emissions from international aviation.

1.1.4 The quantitative assessment used modelling tools while the qualitative assessment relied on extensive research and the knowledge and experience of MBM experts. To undertake a more detailed assessment of a global MBM scheme, greater definition of design features (e.g. participants, obligations, etc.) will be required.

1.2 BACKGROUND

1.2.1 The research into options for a global MBM scheme involving international aviation began in 2011, with an initial literature review of planned and existing MBMs, in particular those related to aviation. The primary focus of this research in 2011 was to “review the *de minimis* threshold to MBMs ... taking into account specific circumstances of States and potential impacts on the aviation industry and markets, and with regard to the guiding principles listed in the Annex, by the end of 2011” as requested by the Assembly (paragraph 16 of A37-19).

1.2.2 Following the results of the *de minimis* study, the MBM experts nominated by Member States and international organizations, assisted the Secretariat in further identification of possible MBM options, as well as the elaboration of the criteria by which they would be evaluated, building upon the guiding principles adopted by the 37th Assembly (Annex to A37-19). As a result of this work, six options for a global MBM scheme were identified.

1. ICAO Assembly Resolution A37-19: Consolidated statement of continuing ICAO policies and practices related to environmental protection—Climate change (http://legacy.icao.int/env/A37_Res19_en.pdf).