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Thirty-second session

Bonn, 31 May to 9 June 2010

Item 7 (a) of the provisional agenda

Methodological issues under the Convention

Emissions from fuel used for international aviation and maritime transport

Information relevant to emissions from fuel used for international aviation and maritime transport

Submissions from international organizations

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its thirty-first session, invited the secretariats of the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) to report, at future sessions of the SBSTA, on relevant work on emissions from fuel used for international aviation and maritime transport (FCCC/SBSTA/2009/8, para. 51).
2. The secretariat has received submissions from ICAO and IMO containing information on emissions from fuel used for international aviation and maritime transport. In accordance with the procedure for miscellaneous documents, these submissions are attached and reproduced* in the language in which they were received and without formal editing.

* These submissions have been electronically imported in order to make them available on electronic systems, including the World Wide Web. The secretariat has made every effort to ensure the correct reproduction of the texts as submitted.

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PAPER NO. 1: INTERNATIONAL CIVIL AVIATION ORGANIZATION
**UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
(UNFCCC)**

**The Thirty-second Session of the UNFCCC Subsidiary Body for
Scientific and Technological Advice (SBSTA32)
(31 May to 9 June 2010 – Bonn, Germany)**

**Agenda Item 7 (a)
Emissions from fuel used for international aviation and maritime transport**

**GLOBAL FRAMEWORK ON INTERNATIONAL AVIATION AND CLIMATE CHANGE
(Submission by the International Civil Aviation Organization (ICAO))**

SUMMARY

This paper provides information on ICAO's achievements and its way forward to address GHG emissions from international aviation.

The last ICAO Assembly in September 2007 requested the development of an ICAO Programme of Action on International Aviation and Climate Change. Accordingly, ICAO established a process to develop the Programme of Action and convened the High-level Meeting in October 2009, where it was adopted. It is, in essence, the first and only globally-harmonized agreement from a sector on a goal to address its CO₂ emissions.

In addition, the ICAO Conference on Aviation and Alternative Fuels in November 2009 adopted a global framework on the development and deployment of sustainable alternative fuels for aviation, as an important means of reducing aviation emissions. Air transport is well positioned to become the first sector to use sustainable alternative fuels on a global basis.

ICAO was able to bring its member States together and provided these concrete actions and tangible global results to COP15 as a basis for negotiations on international bunker fuels. There was no legally-binding agreement reached at COP15, and Parties under the UNFCCC and its Kyoto Protocol continue their negotiations on a future global agreement on climate change.

Building upon the recommendations of the High-level Meeting and Alternative Fuels Conference, ICAO continues its work to achieve further progress toward the next ICAO Assembly in September 2010, in particular on three areas: exploration of more ambitious goals; development of a framework for market-based measures; and elaboration on measures to assist States. Policies on international aviation and climate change that are expected to be adopted by the next Assembly will be brought to the attention of COP16 in Mexico.

ICAO has been working actively with its 190 member States and the industry for a global solution to address GHG emissions from international aviation. This is how ICAO can best contribute to the global efforts of addressing climate change and the organization is committed to being part of the solutions by offering "concrete actions and tangible global results".

1. INTRODUCTION

1.1 The 36th Session of the International Civil Aviation Organization (ICAO) Assembly in September 2007 adopted Resolution A36-22: *Consolidated statement of continuing ICAO policies and practices related to environmental protection*. In particular, the Assembly recognized, *inter alia*, “the critical importance of providing continuous leadership to international civil aviation in limiting or reducing its emissions that contribute to global climate change”.

1.2 The Assembly requested that the ICAO Council “facilitate action by States by vigorously developing policy options to limit or reduce the environmental impact of aircraft engine emissions, developing concrete proposals and providing advice as soon as possible to the Conference of the Parties of the UNFCCC, encompassing technical solutions and market-based measures, while taking into account potential implications of such measures for developing as well as developed countries”. In order to achieve this, the Assembly requested the Council to:

- a) “form a new Group on International Aviation and Climate Change ... with technical support provided by the Committee on Aviation Environmental Protection, for the purpose of developing and recommending to the Council an aggressive Programme of Action on International Aviation and Climate Change”; and
- b) “convene at an appropriate time, taking into account the fact that the fifteenth meeting of the Conference of the Parties (COP15) of the UNFCCC will be held in December 2009, a high-level meeting to review the Programme of Action recommended by the Group”.

1.3 Furthermore, the Assembly “recognized the importance of research and development in fuel efficiency and alternative fuels for aviation that will enable international air transport operations with a lower environmental impact”, and encouraged the Council to “promote improved understanding of the potential use, and the related emissions impacts, of alternative aviation fuels”.

2. GROUP ON INTERNATIONAL AVIATION AND CLIMATE CHANGE (GIACC)

2.1 In response to the mandate mentioned in paragraph 1.2 a) above, the Council established the Group on International Aviation and Climate Change (GIACC) comprised of 15 senior government officials reflecting equitable participation from developed and developing States, with technical support provided by the Committee on Aviation Environmental Protection (CAEP). The Group held its fourth and final meeting in May 2009, developed a Programme of Action on International Aviation and Climate Change and submitted it to the Council for its consideration. The Council fully accepted the Programme of Action in June 2009 as a positive development to limit or reduce aviation’s climate impact.

2.2 Areas for further work were identified, including more ambitious medium and long-term goals, the development of a CO₂ Standard, a framework for market-based measures, and exploring of approaches to provide technical assistance in the reporting process for developing States.

3. HIGH-LEVEL MEETING ON INTERNATIONAL AVIATION AND CLIMATE CHANGE

3.1 In response to the mandate mentioned in paragraph 1.2 b) above, the High-level Meeting on International Aviation and Climate Change was convened in October 2009 to review the Programme of Action developed by the GIACC and accepted by the Council. The Meeting was attended by 339 participants representing 73 States (responsible for 94 per cent of the global international aviation traffic) and 26 international organizations.

3.2 The Meeting welcomed the decision of the ICAO Council to fully accept the GIACC's Programme of Action, and reaffirmed ICAO's leading role in matters involving international civil aviation. The Meeting successfully approved a Declaration as well as Recommendations regarding further work by the ICAO Council on international aviation and climate change.

3.3 In November 2009, the ICAO Council fully accepted the outcome of the High-level Meeting, including its Declaration and Recommendations approved by the Meeting. All documents related to the High-level Meeting, including its Declaration and Recommendations (provided respectively in **Appendices A and B**) are available (<http://www.icao.int/Highlevel2009/>).

3.4 In summary, ICAO and its member States:

- a) agreed on a global annual average fuel efficiency improvement of 2 per cent for the medium-term (up to 2020) and an aspirational global annual fuel efficiency improvement of 2 per cent for the long-term (up to 2050);
- b) recognized that these goals are unlikely to deliver the level of reduction necessary to stabilize and subsequently reduce aviation's absolute emissions contribution to climate change, and that more ambitious goals will need to be considered to deliver a sustainable path for aviation;
- c) declared that ICAO and its member States, along with relevant organizations will keep working together to undertake further work on medium and long-term goals, including exploring the feasibility of more ambitious goals, including carbon-neutral growth and emissions reductions, for consideration by the 37th Session of the ICAO Assembly;
- d) agreed on the development of a global CO₂ Standard for aircraft;
- e) strongly encouraged wider discussions on the development of alternative fuel technologies and the promotion of the use of sustainable alternative fuels in aviation;
- f) agreed to facilitate the implementation of operational changes and the improvement of air traffic management and airport systems aiming to reduce emissions from international aviation;
- g) agreed that ICAO will establish a process to expeditiously develop a framework for market-based measures in international aviation;
- h) agreed to further elaborate on measures to assist developing States as well as facilitate access to financial resources, technology transfer and capacity building;

- i) in order to monitor progress towards reaching the goals, States are encouraged to submit their action plans, outlining their respective policies and actions, and annual reporting of data on their aviation fuel consumptions to ICAO; and
- j) agreed that ICAO will regularly report CO₂ emissions from international aviation to the UNFCCC, as part of its contribution to assessing progress made in the implementation of actions in the sector.

3.5 The above strike a balance between the views of all member States and represent their collective will and determination to act in a coherent and cooperative manner to address international aviation and climate change. It is also a demonstration of the seriousness with which ICAO takes its responsibilities towards environmental protection.

3.6 It should be pointed out that the global annual 2 per cent fuel efficiency goal up to 2020 is a very challenging goal for the sector. This is the first time that any sector comes forward with a global sector-wide target for sustained fuel efficiency improvements. Achieving this goal will require significant resources and investments from States and the air transport industry and will involve improvements in all aspects of the aviation sector.

3.7 In relation to the regular reporting of CO₂ emissions from international aviation by ICAO to the UNFCCC (see paragraph 3.4 j) above), it should be noted that, together with data on aviation fuel consumptions to be reported by its member States (see paragraph 3.4 i) above), ICAO continues to conduct a robust environmental trends assessment through its modelling capabilities that enable the Organization to accurately estimate global CO₂ emissions from international aviation (see paragraph 4 below) and monitor the progress made in the implementation of actions in the sector.

3.8 The agreement on the development and submission of action plans to reduce international aviation emissions by member States to ICAO (see paragraph 3.3 i) above) is another area, where ICAO could benefit from discussions under the UNFCCC on the use of nationally appropriate mitigation actions (NAMAs) that deal with emissions from all other domestic sectors.

4. SUPPORTING ACTIVITIES BY CAEP

4.1 The Committee on Aviation Environmental Protection (CAEP) established in 1983 is a technical committee of the ICAO Council that has 23 members and 13 observers. Approximately 400 experts are involved in the activities of CAEP that are of a highly technical nature.

4.2 In parallel with the development of the Programme of Action, CAEP continued to make progress on establishing medium and long-term fuel burn goals relating to technological development of airframe and engines, as well as those goals relating to operational measures such as the improvement of air traffic management. Utilizing the Independent Experts (IE) processes under CAEP, the projections on technological and operational improvements were incorporated into the environmental trends assessment for timeframes extending to 2016, 2026 and 2036 using the prediction models. In response to the request from GIACC, an assessment was also performed up to year 2050. The preliminary assessment result was provided to GIACC and the High-level Meeting for their deliberations.

4.3 CAEP endorsed the use of the “Commercial Aircraft System Fuel Efficiency Metric (CASFE = Fuel Mass Consumed / Payload × Distance)” as the fuel efficiency metric for the environmental trends assessment and agreed on further refinement of the metric by taking into account aviation alternative fuels. Information was provided to GIACC and High-level Meeting in this regard.

4.4 The eighth meeting of CAEP (CAEP/8) in February 2010 finalized the technical work on the quantification of future CO₂ emissions trends and fuel efficiency improvements of the global aviation system for the period 2006 through 2050. The result shows that fuel consumption, which translates directly to CO₂ emissions, is expected to grow from a baseline of 187 Mt in 2006 to between 461Mt and 541 Mt in 2036. This represents absolute growth of between 2.5 and 2.9 times over the period or an annual average growth rate of between 3 and 3.5 per cent. For the 2050 results, an annual average growth rate of between 2.9 per cent and 3.4 per cent is predicted, although on a per flight basis, fuel efficiency is expected to improve over the period. This means that in absolute terms, an emissions “gap” could exist relative to 2006 or earlier that would require a form of intervention in order to achieve sustainability.

4.5 CAEP has also continued its technical work on ICAO’s comprehensive mitigation strategy that includes technological, operational and market-based measures. In this regard, CAEP/8 reviewed analyses of various scenarios of increased NO_x stringency options, and agreed on a new NO_x Standard which improves on the current Standard by -5% and -15% for small engines and by -15% for large engines with an effective date of 31 December 2013. In line with the recommendation by GIACC and the High-level Meeting, CAEP/8 also agreed on a timetable for the development of a CO₂ Standard for commercial aircraft, aimed at having a Standard for consideration at CAEP/9 in 2013, a milestone that would establish the first global fuel-efficiency Standard for any industry sector.

4.6 CAEP/8 also reviewed the substantial work undertaken on the update of ICAO Circular 303 - *Operational Opportunities to Minimize Fuel Use and Reduce Emissions*, which identifies and reviews various operational opportunities and techniques for minimizing fuel consumption and hence CO₂ emissions in civil aviation operations. Several chapters have been updated and finalization of the remaining work is expected in the next triennium.

4.7 On the subject of market-based measures to reduce aviation CO₂ emissions, CAEP/8 developed a study on linking open emissions trading systems involving aviation. With the implementation of different emissions trading schemes throughout the world, the increased harmonization of features and processes may facilitate the linkage of such schemes, thus enabling the creation of a global scheme. CAEP/8 also developed a study on the potential for carbon offsetting to mitigate the impact of aviation on climate change, recognizing its potential for implementation in the short term.

5. AVIATION AND ALTERNATIVE FUELS

5.1 In response to the mandate mentioned in paragraph 1.3 above, ICAO organized a Workshop on Aviation and Alternative Fuels in February 2009 to explore potential options, challenges to development and deployment as well as initiatives to promote international cooperation in sustainable alternative fuels for aviation. The workshop featured 39 presentations from policy makers, regulatory and certification authorities, international airlines, NGO’s, aerospace and fuel industry representatives and served as a preparatory event for the Conference on Aviation and Alternative Fuels (CAAF) in November 2009. All of the presentation materials are available on the workshop website (<http://www.icao.int/WAAF2009/>).

5.2 There was general agreement following the Workshop that aviation alternative fuels can be a win-win solution for reducing aviation’s dependence on fossil fuels and a key element to help reduce the impact of aviation on climate change. It was also noted that alternative fuels should be part of a comprehensive aviation energy strategy that includes technological, operational and market-based measures.

5.3 ICAO held CAAF in November 2009 (<http://www.icao.int/CAAF2009/>) as an important step towards promoting improved understanding of the potential use and emission effects of sustainable alternative fuels and to facilitate their development and deployment. The Conference endorsed the use of sustainable alternative fuels for aviation, particularly the use of drop-in fuels in the short to medium-term, as an important means of reducing aviation emissions.

5.4 Additionally, the Conference noted that the introduction of sustainable alternative fuels for aviation will help address not only environmental issues, but also those of economics, and supply security. There is currently very limited availability of qualified alternative fuels for aviation, while it has been demonstrated that sustainable alternative fuels for use in global aviation can be produced from a wide variety of feedstocks, suggesting that many regions are candidate production locations. Those alternative fuels may offer reduced lifecycle CO₂ emissions compared to conventional aviation fuels.

5.5 The Declaration and Recommendations approved by the Conference affirmed the commitment of States and industry to develop, deploy and use sustainable alternative fuels to reduce aviation's emissions. To facilitate, on a global basis, the promotion and harmonization of initiatives that encourage and support the development of sustainable alternative fuels for aviation, the Conference established an ICAO Global Framework for Aviation Alternative Fuels. The Global Framework is a web-based living document (<http://www.icao.int/icao/en/env/AlternativeFuels/>) and updated whenever new information is provided by member States and international organizations. The Declaration and Global Framework are provided respectively in **Appendices C and D**.

6. **BEYOND COP15**

6.1 ICAO was able to bring its 190 member States together and adopt the Programme of Action on International Aviation and Climate Change - the first and only globally-harmonized agreement from a sector on a goal to address its CO₂ emissions, which was provided to COP15. However, due to the complex negotiating process that took place in COP15, this substantial agreement was not considered as a basis for negotiations on international bunker fuels and no specific decision was taken on how to address GHG emissions from international aviation.

6.2 In light of this outcome, ICAO, in consonance with the request from its constituency, has continued to make further progress on the recommendations of the High-level Meeting and Alternative Fuels Conference, toward the development of proposals for more ambitious policies on international aviation and climate change, to be considered by the next ICAO Assembly in September 2010.

6.3 To facilitate the progress, ICAO has established a process and initiated the preparation of the Assembly Resolution on international aviation and climate change for presentation to the next Assembly. Three main areas where further progress could be achieved are:

- a) exploring the feasibility of more ambitious goals including carbon-neutral growth of the sector and long-term emissions reductions, moving beyond the global commitment of a 2 per cent annual fuel efficiency improvement up to 2050;
- b) developing a framework for market-based measures in international aviation; and
- c) elaborating on measures to assist States, in particular developing States, to gain access to financial resources, technology transfer and capacity building, taking into account the special needs and circumstances of all member States.

6.4 ICAO also started the discussion on the need to address the potential impacts of climate change on international operations and related infrastructure. Rising sea levels will threaten land

facilities, including airports and fuel storage areas, while changes in or unexpected weather patterns may substantially affect aviation operations.

6.5 On this note, ICAO would like to express its concern regarding proposals on levies for international bunker fuels as part of the on-going discussions of the High-level Advisory Group on Climate Change Financing, which was established to respond to the Copenhagen Accord by studying the contribution of potential sources of revenue “including alternative sources of finance” to meet the goals of mobilizing USD 100 billion a year by 2020.

6.6 If the international aviation sector is singled out as the source of revenue, this is likely to result in a shortage of resources to facilitate mitigation/adaptation activities by the international aviation sector itself, and in a disproportionate contribution of resources from the international aviation sector as compared to other economic sectors. Furthermore, such a treatment could hinder the implementation of the globally-harmonized agreement that has been developed by ICAO.

7. CONCLUSIONS

7.1 There are clear distinctions between the mandates of ICAO and UNFCCC. ICAO addresses GHG emissions from international aviation, which is of a global nature as it crosses the boundaries of many countries, while the UNFCCC and its Kyoto Protocol address GHG emissions from all domestic sources.

7.2 As a specialized agency responsible for the highest possible degree of uniformity and harmonization among its 190 member States and stakeholders on international aviation matters, ICAO has been working actively for a global solution to address GHG emissions from the international aviation sector. The High-level Meeting convened by ICAO reached the first and only globally-harmonized agreement from a sector on a goal to address its CO₂ emissions. A Global Framework for Aviation and Alternative Fuels has also been established.

7.3 ICAO will continue to exercise its leadership in all matters related to international aviation, including the limitation or reduction of GHG emissions, which shall be addressed under a globally harmonized framework, with all member States and the air transport industry working further through ICAO. Policies on international aviation and climate change that are expected to be adopted by the next ICAO Assembly will be subsequently presented to COP16 in Mexico.

APPENDIX A

Declaration by the High-level Meeting

The High-Level Meeting on International Aviation and Climate Change, convened by the International Civil Aviation Organization (ICAO) at its Headquarters in Montreal on 7 to 9 October 2009 was attended by Ministers and other high-level officials representing 73 States (responsible for 94 per cent of the global international aviation traffic¹) and 26 international organizations:

Whereas the 36th Session of the ICAO Assembly requested the Council to convene a high-level meeting to review the Programme of Action on International Aviation and Climate Change recommended by the Group on International Aviation and Climate Change, taking into account that the fifteenth meeting of the Conference of the Parties (COP15) of the United Nations Framework Convention on Climate Change (UNFCCC) will be held in December 2009;

Welcoming the Decision of the ICAO Council to fully accept the Programme of Action on International Aviation and Climate Change, which includes global aspirational goals in the form of fuel efficiency, a basket of measures and the means to measure progress, as an important first step in the work of Member States at ICAO to address greenhouse gas (GHG) emissions from international aviation;

Reaffirming ICAO as the lead United Nations agency in matters involving international civil aviation, and *emphasizing* ICAO's commitment to provide continuous leadership in addressing international civil aviation matters related to the environment;

Acknowledging the principles and provisions on common but differentiated responsibilities and respective capabilities, and with developed countries taking the lead under the UNFCCC and the Kyoto Protocol;

Also acknowledging the principles of non-discrimination and equal and fair opportunities to develop international aviation set forth in the Chicago Convention;

Reemphasizing the vital role which international aviation plays in global economic and social development and the need to ensure that international aviation continues to develop in a sustainable manner;

Acknowledging that international aviation emissions, currently accounting for less than 2 per cent of total global CO₂ emissions, are projected to grow as a result of the continued development of the sector;

Recognizing that the international aviation sector must play its part to confront the global challenge of climate change, including by contributing to the reduction of global GHG emissions;

Noting the scientific view that the increase in global average temperature above pre-industrial levels ought not to exceed 2°C;

Noting the continuous efforts of the sector to minimise aviation's impact on climate change and the improvement in fuel efficiency achieved over the last 40 years, resulting in aircraft today that are 70 per cent more fuel efficient per passenger kilometre;

Affirming that addressing GHG emissions from international aviation requires the active engagement and co-operation of States and the industry, and noting the collective commitments announced by ACI, CANSO, IATA and ICCAIA on behalf of the international air transport industry to continuously improve CO₂ efficiency by an average of 1.5 per cent per annum from 2009 until 2020, to achieve carbon neutral growth from 2020 and reducing its carbon emissions by 50 per cent by 2050 compared to 2005 levels;

¹ expressed in Revenue Passenger Kilometre.

Recognizing the different circumstances among States in their capacity to respond to the challenges associated with climate change and the need to provide necessary support, in particular to developing countries and States having particular needs;

Recognizing that the aspirational goal of 2 per cent annual fuel efficiency improvement is unlikely to deliver the level of reduction necessary to stabilize and then reduce aviation's absolute emissions contribution to climate change, and that goals of more ambition will need to be considered to deliver a sustainable path for aviation;

Declares that:

1. The HLM endorses the ICAO Programme of Action on International Aviation and Climate Change as accepted by the ICAO Council;

2. In pursuing the implementation of the ICAO Programme of Action on International Aviation and Climate Change, States and relevant organizations will work through ICAO to achieve a global annual average fuel efficiency improvement of 2 per cent over the medium term until 2020 and an aspirational global fuel efficiency improvement rate of 2 per cent per annum in the long term from 2021 to 2050, calculated on the basis of volume of fuel used per revenue tonne kilometre performed;

3. Taking into account the relevant outcomes of the 15th Conference of the Parties to the United Nations Framework Convention on Climate Change, and recognizing that this declaration shall not prejudice the outcome of those negotiations, ICAO and its Member States, with relevant organizations will also keep working together in undertaking further work on medium and long-term goals, including exploring the feasibility of goals of more ambition including carbon-neutral growth and emissions reductions, taking into account the collective commitments announced by ACI, CANSO, IATA and ICCAIA on behalf of the international air transport industry, the special circumstances and respective capabilities of developing countries and the sustainable growth of the international aviation industry, for consideration by the 37th Session of the ICAO Assembly;

4. Such fuel efficiency improvements or other aspirational emission reduction goals would not attribute specific obligations to individual States. The different circumstances, respective capabilities and contribution of developing and developed States to the concentration of aviation GHG emissions in the atmosphere will determine how each State may contribute to achieving the global aspirational goals;

5. ICAO will establish a process to develop a framework for market based measures in international aviation, taking into account the conclusions of the High-level Meeting and outcome of the UNFCCC COP 15 and bearing in mind relevant ICAO Assembly resolutions and the appendices with a view to complete this process expeditiously;

6. ICAO will regularly report CO₂ emissions from international aviation to the UNFCCC, as part of its contribution to assessing progress made in the implementation actions in the sector based on information approved by its Member States;

7. States are encouraged to submit their action plans, outlining their respective policies and actions, and annual reporting on international aviation CO₂ emissions to ICAO;

8. ICAO and its Member States will strongly encourage wider discussions on the development of alternative fuel technologies and the promotion of the use of sustainable alternative fuels, including biofuels, in aviation in accordance with national circumstances.

APPENDIX B

Recommendations by the High-level Meeting

In addition to the recommendations from the GIACC as accepted by the Council, the High-level Meeting on International Aviation and Climate Change recommended, in order to progress the work leading to the upcoming 37th Session of the ICAO Assembly in 2010 and beyond, that the ICAO Council:

1. *Work* expeditiously together with the industry to foster the development and implementation of more energy efficient aircraft technologies and sustainable alternative fuels for aviation;
2. *Seek to develop* a global CO₂ Standard for new aircraft types consistent with CAEP recommendations;
3. *Continue* to maintain and update knowledge of the interdependency between noise and emissions in the development and implementation of measures to address GHG emissions from international aviation;
4. *Continue* to work with relevant organizations on the scientific understanding and on measures to limit the non-CO₂ climate impacts of aviation;
5. *Intensify* its efforts in further development of Standards and Recommended Practices for technological and operational measures to reduce international aviation emissions, with the support and expertise from technical panels and committees of ICAO, in consultation with other relevant organizations, in particular on the development of new guidance on operational measures to reduce international aviation emissions;
6. *Commit*, in cooperation with the industry, to facilitate the implementation of operational changes and the improvement of air traffic management and airport systems aiming to reduce emissions from international aviation sector;
7. *Further elaborate* on measures to assist developing States as well as to facilitate access to financial resources, technology transfer and capacity building including possible application of flexible mechanisms under UNFCCC, such as the Clean Development Mechanism (CDM), to international aviation;
8. *Encourage* States and international organizations to actively participate in the Conference on Aviation and Alternative Fuels in Rio de Janeiro in November 2009 (CAAF2009) to share their efforts and strategies to promote such measures, and bring its results to COP15;
9. *Identify* appropriate standard methodologies and a mechanism to measure/estimate, monitor and verify global GHG emissions from international aviation, and States support the work of ICAO on measuring progress through the reporting of annual data on traffic and fuel consumption;
10. *Request* States to continue to support the efforts of ICAO on enhancing the reliability of measuring/estimating global GHG emissions from international aviation;
11. *Consider* a de-minimis exception for States which do not have substantial international aviation activity levels, in the submission of action plans and regular reports on aviation CO₂ emissions to ICAO;

12. *Consider*, with due priority, the allocation of resources for environment-related activities under the next ICAO Regular Programme budget and analyse the possibility of establishing voluntary contributions;
13. *Explore* the relevance of the GIACC's fuel efficiency metric to international business aviation;
14. *Explore* approaches for providing technical and financial assistance in the reporting process to developing countries; and
15. *Invite* the international air transport industry to further elaborate the implementation framework and strategies for the collective commitment of the international air transport industry.

APPENDIX C

Declaration by the Conference on Aviation and Alternative Fuels Rio de Janeiro, Brazil, 18 November 2009

Welcoming the Decision of the ICAO Council to fully accept the Programme of Action on International Aviation and Climate Change, which includes global aspirational goals in the form of fuel efficiency, a basket of measures and the means to measure progress, as an important first step in the work of the Member States of ICAO to address greenhouse gas (GHG) emissions from international aviation;

Whereas the High-Level Meeting on International Aviation and Climate Change recommended inter alia that States and international organizations actively participate in the Conference on Aviation and Alternative Fuels to share their efforts and strategies to promote such work, and to update the 15th meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP15) in December 2009;

Noting that the introduction of sustainable alternative fuels for aviation will help to address issues of environment, economics, and supply security;

Noting the very limited availability of qualified alternative fuels for aviation;

Noting that sustainable alternative fuels for aircraft can be produced from a wide variety of feedstocks for use in global aviation, suggesting that many regions are candidate production locations;

Acknowledging that sustainable alternative fuels for aviation may offer reduced lifecycle CO₂ emissions compared to the lifecycle of conventional aviation fuels;

Acknowledging that sustainable alternative fuels for aviation may also offer benefits to surface and local air quality;

Acknowledging that the technology exists to produce substitute, sustainable fuels for aviation that take into consideration world's food security, energy and sustainable development needs;

Recognizing that the production of sustainable alternative fuels for aviation could promote new economic opportunities;

Recognizing the need for a common definition of sustainability requirements at the international level;

Recognizing that aviation is a highly technology driven industry that is responsive to the development and introduction of new technologies;

Recognizing that industry has successfully demonstrated the technological feasibility of using sustainable alternative jet fuel blends in flight tests without affecting safety;

Welcoming the progress achieved through regional initiatives as a result of the cooperation among the major aviation sustainable alternative fuel stakeholders;

Welcoming the activities of the Commercial Aviation Alternative Fuels Initiative (CAAFI), initiated by the United States and the Sustainable Way for Alternative Fuels and Energy in Aviation (SWAFEA), initiated by the European Commission;

Recognizing that sustainably-produced fuel derived from sugarcane is already being used in piston engine aircraft in Brazil;

Welcoming the pace at which new alternative fuels for aviation are being qualified and in particular, the qualification of aviation jet fuels containing synthesized hydrocarbons;

Recognizing that the ICAO Council will further elaborate on measures to assist developing States as well as to facilitate access to financial resources, technology transfer and capacity building including possible application of flexible mechanisms under UNFCCC, such as the Clean Development Mechanism (CDM), to international aviation;

Recognizing the urgent need for measures to facilitate access to financial resources, technology exchange, and capacity building specific to aviation alternative fuels;

Acknowledging that the demand for sustainable fuels extends beyond international aviation, but that aircraft have unique fuel specification requirements;

Recognizing the need to encourage supply chain stakeholders to ensure that sustainable alternative fuels are made available to aviation;

Acknowledging that with sufficient incentive and supply, international aviation could deliver a substantial CO₂ reduction benefit from the use of sustainable alternative fuels for aircraft; and

Recognizing that due to its small network of fuel distribution points and its predictable demand international aviation is well suited to becoming a global first adopter of sustainable alternative fuels.

Declares that:

1. ICAO and its Member States endorse the use of sustainable alternative fuels for aviation, particularly the use of drop-in fuels in the short to mid-term, as an important means of reducing aviation emissions;
2. ICAO establish a Global Framework for Aviation Alternative Fuels (GFAAF) on aviation and sustainable alternative fuels to communicate what individual and shared efforts expect to achieve with sustainable alternative fuels for aviation in the future for consideration by the 37th Session of the ICAO Assembly. The GFAAF will be continually updated;
3. Member States and stakeholders work together through ICAO and other relevant international bodies, to exchange information and best practices, and in particular to reach a common definition of sustainability requirements for alternative fuels;
4. Member States are encouraged to work together expeditiously with the industry to foster the research, development, deployment and usage of sustainable alternative fuels for aviation;
5. Funding efforts that support the study and development of sustainable alternative fuels and other measures to reduce GHG emissions, in addition to the funding for research and technology programmes to further improve the efficiency of air transport, be maintained or improved;
6. Member States are encouraged to establish policies that support the use of sustainable alternative aviation fuels, ensure that such fuels are available to aviation and avoid unwanted or negative side effects, which could compromise the environmental benefits of alternative fuels;
7. ICAO Council should further elaborate on measures to assist developing States as well as to facilitate access to financial resources, technology transfer and capacity building;

8. There is an urgent need for measures to facilitate access to financial resources, technology exchange, and capacity building specific to sustainable aviation alternative fuels;
9. ICAO takes the necessary steps with the aim of considering a framework for financing infrastructure development projects dedicated to sustainable aviation alternative fuels and incentives to overcome initial market hurdles;
10. ICAO continue to facilitate efforts to develop a lifecycle analysis framework for comparing the relative GHG emissions from sustainable alternative fuels to the lifecycle of conventional fuels for aviation; and
11. ICAO and its Member States should strongly encourage wider discussions on the development of alternative fuel technologies and support the use of sustainable alternative fuels, including biofuels, in aviation in accordance with national circumstances.

APPENDIX D

Global Framework for Aviation Alternative Fuels

(<http://www.icao.int/icao/en/env/AlternativeFuels/> as of 7 May 2010)

1. FOREWARD

- a) Sustainable alternative fuels show promise of being an intrinsic part of an approach toward reducing the carbon footprint of aviation. As such, it is important to consolidate information about the many initiatives already underway to facilitate and accelerate the development and deployment of sustainable alternative fuels for aviation over the short, medium, and long term.
- b) The purpose of the Global Framework for Aviation Alternative Fuels is to showcase existing activities and communicate what the international community expects to achieve in the area of aviation sustainable alternative fuels.
- c) The Global Framework is envisaged as a living document, highlighting the work already accomplished and describing the objectives of future activities. An online version of the Framework will be updated, as new information becomes available, illustrating the status of key objectives and providing background and reference materials for relevant activities.
- d) The initial Global Framework was approved during the final day of the first ICAO Conference on Aviation and Alternative Fuels (CAAF/09) for communication to COP15 on the accomplished and projected activities related to the development and use of sustainable alternative aviation fuels as a part of the ICAO strategy for addressing international aviation's contribution to climate change.

2. WHY SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION ARE IMPORTANT

- a) Engineering improvements, technology enhancements, and advanced operations (including efficiency improvements in air traffic management) all have a role to play to reduce aviation fuel use and associated carbon emissions. Significant progress has been made in establishing technology goals for reducing aircraft greenhouse gas emissions. On a per-flight basis, efficiency is expected to improve continuously through 2050 and beyond. ICAO is spearheading efforts to promote and harmonize worldwide initiatives for operational practices that result in reducing aviation's contributions to anthropogenic emissions. However, even under the most aggressive technology forecast scenarios, the anticipated gain in efficiency from technological and operational measures does not offset the overall emissions generated by the expected growth in traffic. The gap between air transport emissions growth reduced by efficiency improvements and a chosen lower level of emissions represents a "mitigation gap" that must be closed using other strategies.

- b) A promising approach toward closing the GHG emissions mitigation gap is the development and use of sustainable alternative fuels for aviation. Today such fuels are not available in sufficient quantities to meet the overall fuel demand for commercial aviation. Sustainable drop-in alternative fuels produced from biomass or renewable oils offer the potential to reduce life-cycle greenhouse gas emissions and therefore reduce aviation's contribution to global climate change. They could be an important tool in the efforts to close the mitigation gap while allowing the sector to respond to growing demand. Using these fuels may also offer reduced emissions of particulate matter, lessening aviation's impact on air quality, as the result of the significantly lower fuel sulphur content.
- c) Finally, as aviation is heavily dependent over a short- and medium-term horizon on drop-in liquid fuels, the development and use of sustainable alternative fuels will play an active role in improving the overall resource allocation and security of supply, stabilize fuel prices.

3. **THE OBJECTIVES OF USING SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION**

- a) Development of sustainable alternative fuels for aviation is an essential component of future aircraft fuel supply. ICAO has undertaken efforts to promote improved understanding of the potential use and emission effects of sustainable alternative fuels. It was noted in the ICAO alternative fuels workshop (Montreal, 10-12 February 2009) that aviation fuels could be a win-win solution for reducing aviation's dependence on fossil fuels and a key element to help reduce the impact of aviation on climate change. Given sufficient demand or incentive, significant supplies of jet fuel that offer a significant reduction in life-cycle CO₂ emissions could be available in the mid-term. Certification of alternative fuels for use in aviation is already underway.

4. **ICAO'S ROLE IN SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION**

- a) ICAO is facilitating on a global basis the promotion and harmonization of initiatives that encourage and support the development of sustainable alternative fuels for international aviation. The following summarize the key activities in which ICAO will be engaged in to promote this objective:

Activity A: Providing fora for education and outreach on sustainable alternative fuels for aviation;

Activity B: Providing fora for facilitating the exchange of information on financing and incentives for sustainable alternative fuels for aviation programmes working with the relevant UN and regional financial entities;

Activity C: Facilitating development of standardized definitions, methodologies and processes to support the development of sustainable alternative fuels for aviation, taking into consideration the work that has been done so far in this area; and

Activity D: Supporting a platform for access to research roadmaps and programmes.

5. SUMMARY OF ACCOMPLISHMENTS ON SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION

2008 - Accomplishments

Tests and Demonstrations

- Airbus flew its A380 test aircraft with one of its four engines running on a 40% blend of Gas To Liquid (GTL) fuel with conventional jet fuel on 1 February 2008
- Virgin Atlantic flew a Boeing 747-400 on 23 February 2008 with one engine operating on a 20% biofuel mix produced from babassu oil and coconut oil
- Air New Zealand flew a Boeing 747-400 with one engine on 50% jatropha derived Hydrotreated Renewable Jet (HRJ) biofuel and 50% kerosene on 30 December 2008

2009 - Accomplishments

Educational Forums/Outreach

- ICAO Workshop on Aviation and Alternative Fuels 10 to 12 February 2009
- Annual US/CAAFI Meeting 30 September to 1 October 2009

Fuel certification/Qualification

- ASTM D-7566 (Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons) approved September 1, 2009, first new jet fuel approval in 20 years

Tests and Demonstrations

- Continental Airlines flew a Boeing 737-800 with one engine using 50% jet fuel and 50% algae and jatropha mix on 7 January 2009
- JAL flew a 50% HRJ bio-fuel (derived from camelina, jatropha and algae) and 50% kerosene mix on a Boeing 747-300 on 30 January 2009
- Qatar Airways performed the first revenue flight with alternative fuel on October 12th, 2009. An A340-600 flew from London to Doha with its four engines running with a 48.5% blend of GTL with conventional jet fuel
- KLM flew a 50% HRJ bio-fuel (derived from camelina) and 50% conventional Jet A1 mix on a Boeing 747-400 on 23 November 2009

Policies, Methods and Processes

- European Union requirement lifecycle greenhouse gas emission savings from the use of biofuels shall be at least 35%
- ICAO High-Level Meeting on Aviation and Climate Change 7 to 9 October 2009
- Conclusions and Recommendations from CAAF 2009 (16 to 18 November 2009) on
 1. Environmental sustainability and interdependencies
 2. Technological feasibility and economic reasonableness
 3. Measures to support development and use
 4. Production and infrastructure.
- CAAF2009 declaration and global framework in conjunction with the outcomes of the High-Level Meeting on International Aviation and Climate Change (HLM-ENV) presented as the ICAO input to COP15 (7 to 18 December 2009)

2009 – Accomplishments (continued)

Standardized Definitions and Processes

- CAAF/09 adopted the Fuel Readiness Level (FRL), developed by CAAFI, as a best practice;
- CAAF/09 defined: drop-in jet fuel blend, drop-in neat jet fuel;
- CAAF/09 recommended the use of life cycle analysis as the appropriate means for comparing the relative emissions from alternative jet fuels to conventional jet fuel;
- CAAF/09 endorsed the use of the existing industry qualification and certification processes as the appropriate means for approving a new alternative jet fuel;
- CAAF/09 took efforts to ensure the consideration of aviation alternative fuels within relevant international, regional and State efforts to develop sustainability criteria for all alternative fuels; and
- Roundtable on Sustainable Biofuels (RSB) published version 1.0 of Principles and Criteria for Sustainable Biofuel Production on 14 November 2009

Key ICAO activities related to sustainable alternative fuels for aviation in 2009

Activity A – Educational Forums / Outreach

- Workshop on Aviation and Alternative Fuels;
- Conference on Aviation and Alternative Fuels;
- Articles in ICAO Journal Vol. 64, numbers 1 and 5
- ICAO High-Level Meeting on Aviation and Climate Change encouraged wider discussions on the development of alternative fuel technologies and the promotion of the use of sustainable alternative fuels, including biofuels, in aviation in accordance with national circumstances;
- ICAO High-Level Meeting on Aviation and Climate Change encouraged States and international organizations to share their efforts and strategies to promote alternative fuels for aviation, and to bring the results of CAAF/09 to COP15;

Activity B – Facilitating Exchange of Information on Financing and Incentives

- Initial discussions between ICAO and the World and Inter-American Development Banks regarding the financing of sustainable alternative fuel programmes for aviation.

Activity C – Standardized Definitions and Processes

- CAAF/09 adopted the Fuel Readiness Level (FRL), developed by CAAFI, as a best practice to govern communication of technology maturity as a pre-condition to qualification, production and, deployment readiness, including potentially different maturity levels of the fuel production chain, for example, feedstock, conversion technology and fuel qualification;
- CAAF/09 defined: drop-in jet fuel blend, drop-in neat jet fuel;
- CAAF/09 recommended the use of life cycle analysis as the appropriate means for comparing the relative emissions from alternative jet fuels to conventional jet fuel;
- CAAF/09 endorsed the use of the existing industry qualification and certification processes as the appropriate means for approving a new alternative jet fuel;
- CAAF/09 took efforts to ensure the consideration of aviation alternative fuels within relevant international, regional and State efforts to develop sustainability criteria for all alternative fuels;

Activity D – Platform for Access to Research Roadmaps and Programmes

- Plans and objectives presented during CAAF/09 were integrated into an ICAO Global Framework for Aviation Alternative Fuels.

6. **SUMMARY OF FUTURE OBJECTIVES ON SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION**

2010 – Accomplishments

Policies, Methods and Processes

- Sustainable Bioenergy Research Project (SBRP) launched to demonstrate the commercial viability of using integrated saltwater agriculture to provide biofuels for aviation
- Work initiated by British Airways and Solena Group to establish a European sustainable jet fuel plant derived from waste biomass to power part of the BA fleet
- The Defense Logistics Agency's Defense Energy Support Center (DESC) and Air Transport Association of America, Inc., (ATA) signed an agreement to encourage the development and deployment of commercially viable, environmentally friendly, alternative aviation fuels. The intent of the strategic alliance is to use their combined purchasing power to attract alternative fuel suppliers to the aviation market.
- ...

2010 – Projected Activities

Educational Forums/Outreach

- Annual US/CAAFI Meeting
- ...

Fuel certification/Qualification

- US/CAAFI anticipates HRJ qualification as a 50/50 blend with petroleum jet fuel
- ...

Policies, Methods and Processes

- ICAO 37th Assembly Meeting in September 2010
 - Programme for sustainable alternative fuels for aviation is presented for consideration
- ...

Key ICAO activities related to sustainable alternative fuels for aviation in 2010

Activity A – Educational Fora / Outreach

- ICAO Environmental Colloquium
- ICAO Environmental Report
- Articles in ICAO Journal Vol. 65

Activity B – Facilitating Exchange of Information on Financing and Incentives

- ICAO continues to facilitate access to financing for sustainable alternative fuels for aviation programmes.

Activity C – Standardized Definitions and Processes

- ICAO and its Contracting States continue efforts to develop a common lifecycle analysis framework for comparing the relative emissions from alternative fuels to conventional fuels for aviation working within national and international framework;
- ICAO continues to facilitate aviation's participation in ongoing efforts to develop a common definition of sustainability criteria for biofuels

Activity D – Platform for Access to Research Roadmaps and Programmes

- ICAO Global Framework for Aviation Alternative Fuels updated as required.

- ICAO future work programme on sustainable alternative fuels for aviation decided by the 37th Assembly.

2011 - Projected Activities

Educational Forums/Outreach

- SWAFEA International Conference
- Annual US/CAAFI Meeting
- ...

Fuel Certification/Qualification

- US/CAAFI anticipates neat Fischer-Tropsch (FT) fuel certification
- ...

Policies, Methods and Processes

- CAAF 2011
- Conclusion of the SWAFEA study for the European Commission
- ...

2012 - Projected Activities

Educational Forums/Outreach

- Annual US/CAAFI Meeting
- ...

Fuel Certification/Qualification

- US/CAAFI anticipates Fermented Renewable Jet (FRJ) blend research report
- US/CAAFI anticipates Pyrolytic Renewable Jet (PRJ) blend research report
- ...

Policies, Methods and Processes

- Alpha-Bird program complete
- ...

2013 – Projected Activities

Educational Forums/Outreach

- WAAF2013
- Annual US/CAAFI Meeting
- ...

Fuel Certification/Qualification

- US/CAAFI anticipates neat HRJ certification
- US/CAAFI anticipates FRJ blend certification
- US/CAAFI anticipates PRJ blend certification
- ...

Policies, Methods and Processes

- ICAO 38th Assembly
- ...

2014 - Projected Activities

Policies, Methods and Processes

- British Airways and Solena Group plan to establish a European sustainable jet fuel plant derived from waste biomass to power part of the BA fleet
- ...

2016 - Projected Activities

Policies, Methods and Processes

- US/Consortium for Continuous Low Energy, Emissions, and Noise (CLEEN) goal that 20% of jet fuel available for purchase by United States commercial airlines and cargo carriers be alternative fuels
- ...

2017 – Projected Activities

Policies, Methods and Processes

- European Union requirement lifecycle greenhouse gas emission savings from the use of biofuels shall be at least 50%
- ...

2018 – Projected Activities

Policies, Methods and Processes

- European Union requirement lifecycle greenhouse gas emission savings from the use of biofuels shall be at least 60%
- ...

2020 - Projected Activities

Policies, Methods and Processes

- European Union target of 10% use of renewable energy sources in transport
- IEA predicts global oil production peak
- ...

PAPER NO. 2: INTERNATIONAL MARITIME ORGANIZATION

**Submission by the International Maritime Organization
to the thirty-second session of UNFCCC's Subsidiary Body for
Scientific and Technological Advice (SBSTA 32)**

Agenda item 7(a)

Emissions from fuel used by international aviation and maritime transport

**Outcome of the sixtieth session of IMO's Marine Environment Protection Committee Further
progress made on technical, operational and market-based measures**

SUMMARY

IMO's Marine Environment Protection Committee met for its sixtieth session (MEPC 60) in March 2010 with control of greenhouse gas emissions from ships as the paramount issue on its agenda. More than 800 delegates from 94 Member States, five United Nations bodies, six intergovernmental organizations and 43 non-governmental organizations with consultative status with IMO participated at the session.

The Committee held extensive discussions on making mandatory, the technical and operational measures that were agreed as voluntary at its last session, and established the basic concepts and developed draft regulatory text as possible amendments to MARPOL Annex VI. The Committee concluded that more work was needed, in particular on ship size, target dates and reduction rates in relation to the Energy Efficiency Design Index for new ships, and agreed to establish an intersessional meeting of its Working Group on Energy Efficiency Measures for Ships, which will report back to the Committee's next session (MEPC 61) in September/October 2010.

With regard to market-based mechanisms (MBM) for international maritime transport, the Committee had before it ten different proposals and agreed to establish an Expert Group to undertake a feasibility study and impact assessment of the different proposals in line with the work plan agreed at its last session – the Expert Group will also report to MEPC 61. The scope of the study/assessment is to identify for each proposed MBM, the reduction potential on GHG emissions from international shipping, its impact on world trade and the shipping industry, and the maritime sector in general, giving priority to the maritime sectors in developing countries.

1 IMO's Marine Environment Protection Committee met for its sixtieth session (MEPC 60) in London from 22 to 26 March 2010 where, yet again, control of greenhouse gas (GHG) emissions and improvement in energy efficiency for ships engaged in international trade was the dominant issue on its agenda.

2 In his opening speech the Secretary-General, commenting on the outcome of the United Nations Conference on Climate Change held in Copenhagen, Denmark in December 2009 (COP 15/CMP 5) stated: "like many others, I had viewed it with mixed feelings: with concern that the objective pursued, following the 2007 Bali Conference, of a legally binding instrument, had not been achieved; with measured satisfaction that, through the Accord tabled at the end of the deliberations, a step in the right direction had been taken enabling progress to be made towards a legally binding instrument; and with hope that, following new rounds of consultations to be held post-Copenhagen, the required consensus on action needed to be taken to save planet Earth would be reached at the next COP Conference." He went on to say that, the Organization and the international maritime community stood ready to build on the momentum created in the lead up to and in Copenhagen by contributing further to the attainment of the objectives set through the 2006 IMO GHG Work Plan, namely the putting in place of a comprehensive regulatory regime aimed at limiting or reducing greenhouse gas emissions from international maritime transport.

3 While the outcome of COP 15 had given the Organization more time to make real progress in its work, the Secretary-General reasoned, it had also created an increased obligation on IMO to intensify its efforts not only to do its duty *vis-à-vis* the environment but also to be able to present to COP 16, concrete results as evidence of its determination to play its part in the world efforts to stem climate change and global warming. Such action on the part of the Organization would also demonstrate its capability to satisfactorily address shipping-related environmental issues, as it had successfully done over the years through the diversity of measures it had taken to prevent and control pollution of the seas from oil and other vessel-generated sources and, most recently, decisive actions to prevent air pollution from ships.

2010 – Another crucial year in the GHG debate

4 At the start of its GHG debate, the Committee noted a range of views and contributions on how the outcome of the Copenhagen Conference should be assessed and how it might influence its work. The Committee noted that there seemed to be no disagreement among the world community that IMO is the appropriate international body to develop and enact regulations for international shipping. Although no formal decision from Copenhagen confirmed the role of IMO, the informal consultations at the Conference and most of the comments provided in a number of submissions by Members to the session pointed in the same direction - IMO is the appropriate body and should act on that understanding. The fact that Copenhagen did not deliver the full agreement the world community needs to combat climate change and ocean acidification, made the task of the Committee even more urgent and 2010 provided a good opportunity to further advance the work on a robust, comprehensive and efficient control regime for ship emissions. IMO had to do its part and should continue its work, building on the agreements reached and time lines set both within IMO and the UNFCCC. As it was expressed by one delegate; IMO and the Committee should accelerate the GHG work with caution.

5 The Committee recalled that it had made significant progress at its last session in July 2009 on all three building blocks in the Organization's GHG work; on technical and operational reduction measures, and on possible market-based mechanisms. Following thorough considerations and meticulous work, the Committee had produced a set of robust and efficient measures to improve fuel efficiency in ships and four MEPC Circulars on technical and operational measures were agreed for circulation (for more information see paragraphs 6 – 9 and annex). Having held an in-depth debate where all aspects

were carefully deliberated, a work plan for further consideration of the market-based measures, culminating in 2011, had also been agreed.

Mandatory technical and operational measures

6 MEPC 60 considered a proposal by the Governments of Japan, Norway and the United States to make mandatory the technical and operational measures that were agreed for voluntary use and trial application at its last session. The Committee agreed by majority that the measures should be mandatory and that Annex VI of IMO's MARPOL Convention (International Convention for the Prevention of Pollution from Ships) was the proper legal instrument. By applying the tacit amendment procedure enshrined in the Convention, the measures could come into force and be applied worldwide sixteen months after their adoption, while developing a new freestanding instrument would require an explicit acceptance procedure that could take years before making an impact on the emissions.

7 The most important technical measure is the Energy Efficiency Design Index for new ships (EEDI) that would require a minimum energy efficiency level per capacity mile for different ship segments (type and size), with the level being tightened incrementally every five years in pace with technological development. The EEDI is developed for the larger segments of the world merchant fleet representing about 87% of the emission potential. On the operational side, a mandatory management tool for energy efficient ship operation (SEEMP) has been developed to assist the shipping industry in achieving cost-effective efficiency improvements in their operations. More detailed information on the EEDI and the SEEMP may be found in the annex to this document.

8 The Committee established a working group on energy efficiency measures for ships and instructed it to further develop the regulatory text with the view to finalise it and agree on its circulation at the session. The group held extensive discussions and agreed on the basic concept and a draft regulatory text for mandatory application of the EEDI and the SEEMP was prepared. However, due to time constraints, the group could not completely finalize the draft text as it had still to determine the application threshold (ship size), application dates and reduction rates for the requirement of the "attained EEDI \leq required EEDI".

9 Taking into account the need for further improvement of the draft legal text for mandatory requirements, and for development of relevant associated documents (e.g. guidelines for verification of the EEDI and development of the ship specific SEEMP), MEPC 60 agreed by majority that further work was needed and should continue expeditiously. Moreover, the Committee agreed by majority to hold an intersessional working group meeting from 28 June to 2 July on further development of the regulatory text for the mandatory energy efficiency measures for ships with a view to their approval as amendments to MARPOL Annex VI at MEPC 61 (September/October 2010) and adoption at MEPC 62 (July 2011).

10 With regard to the issue of whether amendment to MARPOL Annex VI to add provisions on energy efficiency/reduction of GHG emissions would be consistent with legal requirements, IMO's Legal Office provided the opinion that a sound substantial relationship had been established between the proposal and the current Annex VI and that there is no legal barrier to the Parties to the 1997 MARPOL Protocol (Annex VI) agreeing to expand the scope of the Annex as proposed. The Legal Office had also examined the 1969 Vienna Convention on the Law of Treaties for provisions that might be helpful in determining the issue. That Convention does not have any provision which prevents Parties from amending a treaty to expand its scope in a way that is acceptable to the Parties concerned. Such questions were therefore left for the Parties themselves to determine.

11 Seven delegations could not agree to make the technical and operational measures mandatory under MARPOL Annex VI and argued that such measures should be voluntary for ships flying the flag of

developing countries in line with the principle of common but differentiated responsibility and respective capability (CBDR) under the UNFCCC, and reserved their positions.

Need for capacity building

12 In relation to making the technical and operational measures mandatory, the Committee agreed that the possible need for capacity building for developing countries should be assessed. Its Vice-Chairman was requested, in consultation with the Chairman and assisted by the Secretariat, to undertake a preliminary assessment of capacity-building implications, and report the outcome to MEPC 61 including the possible need for additional action. The Committee further agreed that the assessment should happen in parallel with the continued development of the regulatory text and further development of the measures not to restrict progress.

Market-based mechanisms

13 Recognizing that technical and operational measures alone would not be sufficient to satisfactorily reduce the amount of GHG emissions from international shipping needed to meet the overall objectives indicated by science (IPCC FAR), and in view of projections that world trade would continue growing; market-based mechanisms (MBM) have been considered by the Committee in line with the work plan agreed at MEPC 55 (October 2006).

14 The Committee recalled that, in addition to identifying a considerable reduction potential, the Second IMO GHG Study 2009 concluded that MBMs were cost-effective policy instruments with a high environmental effectiveness. The Committee, at its last session, having considered a large number of views and contributions on the subject; agreed by overwhelming majority that a MBM was needed as part of a comprehensive package of measures for regulation of GHG emissions from international shipping. MEPC 59 conducted an in-depth discussion on MBMs and in its willingness to further consider this complex issue and fulfil the requests of the IMO Assembly in resolution A.963(23), agreed on a work plan for further consideration of such measures culminating in 2011, also building on discussions and submissions from earlier sessions.

15 Members at the last session were encouraged to submit further detailed outlines of possible MBMs for international shipping to this session. MEPC 60 noted that it had received a large number of documents from which ten distinguishable MBM proposals, or variants of some of the proposals, could be identified. The Committee also noted that the work plan assumed that the outcomes of feasibility studies and impact assessments of the MBM proposals under review would be available to MEPC 61 in the autumn of 2010, thus enabling it to make further progress.

16 In accordance with the work plan for further consideration of market-based measures, the Committee agreed that, it should focus on developing the methodology and criteria for feasibility studies and impact assessments of the proposed mechanisms, giving priority to the overall impact on the maritime sectors of developing countries, while avoiding a debate on the different proposals individually in any detail – a task that was earmarked for the next session – MEPC 61.

Feasibility study and impact assessment of proposed market-based mechanisms

17 Based on a proposal by its Chairman, the Committee agreed that an expert group should be established to undertake the feasibility study and impact assessment of the proposed mechanisms. The Committee agreed on Terms of Reference for the group including the methodology and criteria to be applied and the Secretary-General was requested to establish the group in close consultation with the Chairman. The Committee also agreed that it was imperative to adhere to the work plan and noted that it stated that, “taking into account the outcome of the feasibility studies and impact assessments, the Committee, preferably at MEPC 61 would be in a position to clearly indicate which market-based instrument it should evaluate further”, and agreed to take the necessary steps to comply with that requirement.

18 The MBM proposals under review range from proposals for contribution schemes for all CO₂ emissions from international shipping (to be collected by fuel oil suppliers and transferred to a global fund), or only emissions from ships not meeting the EEDI requirement, via emission trading systems, to schemes based on the actual ship’s efficiency both by design and operation. Among the measures are also proposals for rebate mechanisms and other ways to accommodate the difference in the socioeconomic capability between developing and developed states, as well as other suggestions on how the special needs and circumstances of developing countries can be accommodated. Some of the proposed schemes would reward efficient ships and ship operators by recycling parts of the financial contribution to the most efficient ones based on benchmarking. Other schemes would drive investments in more energy efficient technologies and improvements in operations by setting compulsory efficiency standards for all vessels (new and existing) and the trading of efficiency credits. Several of the proposed mechanisms, the contributions schemes (levy) inherently and the trading schemes through auctioning, would generate funds the greater part of which would be used for climate change purposes in developing countries.

19 The scope of the feasibility study and the impact assessment is to identify for each proposed MBM the reduction potential on GHG emissions from international shipping, as well as its impact on world trade, on the shipping industry and on the maritime sector in general, giving priority to the maritime sectors in developing countries, recognizing the maritime sector’s global efforts to reduce GHG emissions. The study/assessment will also review the practicability of implementing the various options and provide information on how the difference in capability in developing and developed states, as well as the special needs and circumstances of developing countries, can be addressed by the different proposals.

20 The Expert Group will for each of the MBM proposals under review assess the environmental effectiveness, the cost-effectiveness and their potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies. The need for technology transfer to, and capacity building within, developing countries in relation to implementation and enforcement of the MBMs, including the potential to mobilize climate change finance for mitigation and adaptation actions, are also included in the terms of reference for the Expert Group.

21 Moreover, the MBM proposal’s relation with other relevant conventions and international negotiations processes such as the UNFCCC, its Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS, will also be analysed by the experts. Possible additional administrative and legal burdens for National Administrations as a consequence of implementing and enforcing the proposed MBM’s, and their compatibility with the existing enforcement and control provisions under IMO’s legal framework, are further aspects the experts are requested to investigate. Other matters the group will look into are the potential additional workload, economic

burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing each of the proposed MBMs.

22 The Expert Group will submit its report to MEPC 61, which will be held in London in September/October 2010, and the Committee considered it imperative that the final report should contain clear, precise and robust conclusions and factual information. The report should be transparent and objective, and aim at assisting the MEPC to make well-informed decisions but should not make specific recommendations on policy issues, leaving them to the Committee when weighing up the outcome of the study/assessment.

23 Five delegations asserted that, in the absence of a clear outcome of the Copenhagen Conference, further work on market-based mechanisms under IMO should be postponed until after COP 16/CMP 6, to be held in Mexico towards the end of the year, and reserved their positions on the establishment of the Expert Group.

IMO's decision-making process

24 A number of delegations expressed concerns that many of the conclusions reached by the Committee were made by majority and not by consensus, in particular on mandatory energy efficiency measures and their possible inclusion in MARPOL Annex VI. Other delegations observed that the Committee should continue, as it always had, to make every effort to reach consensus whenever possible. However, when it was not possible and the matter was of utmost urgency, as in the world community's concerted effort to stem climate change, the Rules of Procedure should be respected not to restrict progress. The Committee recalled Rule 35 of its Rules of Procedures on the functions of its Chairman, whereby he shall direct the discussion and ensure observance of the Rules of Procedure, accord the right to speak, put questions to vote and announce decisions resulting from voting.

25 The Committee noted with interest an intervention by the Secretary-General where he addressed the issue of the basis on which decisions were made in the Organization as he considered it a very important matter. He reasoned that those who had been associated with the Organization for a long time would be fully familiar with the efforts it always had made to strive to achieve consensus. He went on to say:

“Decisions made by consensus in this Organization stand good chances to be widely and effectively implemented. For the need and for the sake of succeeding in making decisions by consensus, sometimes it takes considerable time, and this has from time to time given rise to people to criticise this Organization for being slow and by implication, inefficient.

In IMO, we dislike taking vote. Vote is divisive and one would ask what chances of implementation have the technical standard adopted if the decision to introduce that standard has been made on a 51 to 49 % basis. Sometimes, if consensus cannot be achieved, the decision will have to be made in accordance with the Organization's well established and well functioning Rules of Procedure, meaning that decisions are made on a majority basis, which leads to the conclusion that whatever people may think, this is a democratically-based Organization.”

Reduction targets for international shipping

26 The Committee considered whether the international shipping sector should be subject to an explicit emission ceiling (cap) or a reduction target comprising the entire world fleet of merchant vessels. The paramount questions were by which international organization such a cap or reduction target should be established and how it should relate to global targets and the two degrees Celsius target in the Copenhagen Accord. Other questions related to a cap or a target line would include the methodology by which the cap/target is set and maintained as well as the possible connection with other transport modes and how they are regulated internationally.

27 Following an exchange of views, the Committee agreed that the debate on the reduction targets was a vital part of the Organization's GHG work and would need further progress at the next session so it may be closer to a conclusion with the aim to conclude on the matter simultaneously with the culmination of the work plan for further consideration of market-based measures at MEPC 62 in July 2011. Interested delegations were invited to submit further input to the next session to assist the Committee in its work on this issue.

Black carbon emissions from ships and the Arctic

28 The Committee had a brief exchange of views on whether separate actions were needed to reduce shipping impacts in the Arctic region and how this should relate to the general work on prevention of air pollution from ships under MARPOL Annex VI and the Organization's work on control of ships' GHG emissions. The Committee agreed that ship's emissions of black carbon and other particulate matter affecting the Arctic region, needed to be addressed specifically as an integral part of the Organization's work on prevention of air pollution from ships and its contribution to combat climate change and global warming. It agreed also that the matter should be revisited at the next session and invited interested delegations to submit proposals for specific pollution control measures to facilitate progress.

Closing remarks by the Secretary-General

29 In his closing remarks the Secretary-General emphasized that in his intervention on whether MARPOL Annex VI would provide the right legal vehicle for the introduction into IMO's mandatory regulatory regime, of the technical and operational measures the Committee had been elaborating on for some considerable time, he had mentioned that the political aspect of the matter should, along with the technical considerations, be taken into account in the Committee's decision-making process. He added that the Committee should, in the decision-making process, not lose sight of the wider picture, which, under the circumstances, would favour action that was more expeditious than opting for a stand-alone instrument requiring an explicit acceptance procedure.

30 Having received convincing legal advice that it would not be contrary to the legislation governing the issue to go the MARPOL Annex VI route, he appealed to those who, on legal grounds, did not feel comfortable with the proposed solution, to take back home the advice provided by the Legal Office and, in light of its clarity, to reconsider their position – and to reconsider it also, in the light of the political consideration of the matter, the need to avoid unilateral or regional measures; and above all, - “the imperative of not delaying action on which our planet cannot wait for any longer” – no matter how insignificant the contribution and responsibility of shipping in the climate change situation may be, and the impact of any remedial action it may wish to take will be.

31 On the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures, the Secretary-General stated:

“On the matter of the Group of Experts, which your Chairman proposed should conduct a feasibility study and an impact assessment to advise the Committee on which of the various proposed MBMs to choose, you will recall that, in my opening speech, I suggested that the Group should be small in size in order to enhance its effectiveness and should comprise the right persons. Such persons, acting in their personal capacity, will be expected to rise above partisan interests. By putting those of the globe above national and other interests they may otherwise be associated with, they will be acting in the best interests the Committee aims to serve through its position that MBMs are needed to complement the technical and operational measures contemplated to provide IMO’s and the industry’s response to the reduction or limitation of greenhouse gas emissions from international shipping. In this respect, I appreciate your trust in me to proceed with the composition of the Experts’ Group – a matter that I will pursue in consultation with your Chairman and delegates representing the full spectrum of views expressed.”

32 The Committee welcomed unanimously the proposal that the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures would be chaired by its Chairman, Mr. Andreas Chrysostomou of Cyprus.

Conclusions

33 Although international maritime transport is the most energy efficient mode of mass transport and only a modest contributor to worldwide CO₂ emissions (2,7% in 2007), a global approach for further improvements in energy efficiency and emission reduction is needed as sea transport is predicted to continue growing significantly in pace with world trade.

34 IMO has developed a set of robust and efficient technical and operational measures that will serve as performance standards for increased energy efficiency in international shipping and a comprehensive regulatory framework based on the Organization’s extensive experience and well established policies and practices is nearing completion. The framework builds on IMO’s reputable and well tested enforcement and control provisions (Flag and Port State Controls) and includes also aspects such as monitoring, verification and reporting as well as modalities for effective implementation. The Organization’s work on these matters represent a practical approach that may very well serve as an example of how to establish global performance standards on energy efficiency taking into account the current negotiations on issues such as establishment of baselines and the need to make the emission limits tighter over time.

35 With regard to the market-based measures, where IMO is currently working in accordance with a work plan culminating in 2011, IMO and its Member Governments, recognising that the technical and operational measures alone would not be sufficient to satisfactorily reduce the amount of GHG emissions from international shipping in view of projections for world trade and the overall reductions needed to meet the two degrees target, are determined to develop a mechanism that will enable the shipping industry to achieve the eventually agreed reduction target.

36 IMO will continue its endeavours to reduce any environmental impacts from international shipping, a transport industry that is vital to world trade and sustainable development, and keep relevant bodies of the UNFCCC informed of its achievements.

ANNEX

DESCRIPTION OF THE PACKAGE OF TECHNICAL AND OPERATIONAL REDUCTION MEASURES FOR SHIPS AGREED BY MEPC 59

1 The following circulars were issued (17 August 2009) following MEPC 59 and may be found on the IMO website: www.imo.org:

- .1 the EEDI formula was circulated as MEPC.1/Circ.681, Interim Guidelines on the method of calculation of the Energy Efficiency Design Index for new ships (annex 17 to MEPC 59/24);
- .2 the EEDI verification procedure was circulated as MEPC.1/Circ.682, Interim guidelines for voluntary verification of the EEDI (annex 18 to MEPC 59/24);
- .3 the SEEMP was circulated as MEPC.1/Circ.683, Guidance for the development of a SEEMP (annex 19 to MEPC 59/24); and
- .4 the EEOI was circulated as MEPC.1/Circ.684, Guidelines for voluntary use of the ship EEOI (annex 20 to MEPC 59/24).

IMO’s Energy Efficiency Design Index (EEDI)

2 MEPC.1/Circ.681, Interim Guidelines on the method of calculation of the EEDI for new ships was circulated on 17 August 2009.

Background

2.1 The maritime industries have continuously endeavoured to optimize ships’ fuel consumption, e.g., through the development of more efficient engines and propulsion systems, optimized hull designs and larger ships, and thereby achieved a noteworthy reduction in fuel consumption and resulting CO₂ emissions on a capacity basis (tonne-mile). Although ships are the most fuel efficient mode of mass transport, the Second IMO GHG Study 2009 identified a significant potential for further improvements in energy efficiency mainly by the use of already existing technologies. Additional improvements in hull, engine and propeller designs, together with reduction in operational speed, may lead to considerable reductions as illustrated in the figure below.

Potential reductions of CO₂ emissions by using existing technology and practices

DESIGN (New ships)	Saving of CO ₂ /tonne-mile	Combined	Combined
Concept, speed and capability	2% to 50% ⁺	10% to 50% ⁺	25% to 75% ⁺
Hull and superstructure	2% to 20%		
Power and propulsion systems	5% to 15%		
Low-carbon fuels	5% to 15%*		
Renewable energy	1% to 10%		
Exhaust gas CO ₂ reduction	0%		
OPERATION (All ships)			
Fleet management, logistics and incentives	5% to 50% ⁺	10% to 50% ⁺	
Voyage optimization	1% to 10%		
Energy management	1% to 10%		

⁺ Reductions at this level would require reductions of operational speed.

* CO₂ equivalent, based on the use of LNG.

Source: Second IMO GHG Study 2009

Purpose of the EEDI

2.2 IMO's Marine Environment Protection Committee (MEPC) has developed the Energy Efficiency Design Index for new ships (MEPC.1/Circ.681) to create stronger incentives for further improvements in ships' fuel consumption. The purposes of IMO's EEDI are:

- to require a minimum energy efficiency level for new ships;
- to stimulate continued technical development of all the components influencing the fuel efficiency of a ship;
- to separate the technical and design based measures from the operational and commercial measures (they will/may be addressed in other instruments); and
- to enable a comparison of the energy efficiency of individual ships to similar ships of the same size which could have undertaken the same transport work (moved the same cargo).

2.3 The EEDI provides a transparent basis for comparison of the energy efficiency for individual ships and, when made mandatory, will require ship designers and builders to produce intrinsically energy-efficient ships. The reduction levels were considered in detail by MEPC 60 in March 2010 and will be concluded in September/October. An initial reduction of 10 to 30% is possible depending on ship type and size. Once the baseline is set the EEDI value will be tightened incrementally every five years, to keep pace with the technological developments. The EEDI will facilitate shipowners to purchase the most fuel efficient ships for their fleets and charterers and cargo owners in choosing the most energy-efficient ships for their operations.

EEDI coverage

2.4 The EEDI is developed for the larger segments of the world merchant fleet and would cover 87% of emissions from new ships covering the following ship types: oil and gas tankers, bulk carriers, general cargo and container ships, ro-ro carriers (roll-on-roll-off) and passenger ships. However, due to the long economic life of merchant ships, it would take about 20 years to reach this coverage without additional incentives. For ship types not covered by the current formula, suitable formulas will be developed in the near future addressing the largest emitters first.

The EEDI formula

2.5 The EEDI provides a specific figure for an individual ship design, expressed in grams of CO₂ per ship's capacity-mile (a smaller EEDI value means a more energy-efficient ship design) and calculated by the following formula based on the technical design parameters for a given ship:

$$\frac{\left(\prod_{j=1}^M f_j \right) \left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)} \right) + (P_{AE} \cdot C_{FAE} \cdot SFC_{AE}^*) + \left(\left(\prod_{j=1}^M f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AE_{eff}(i)} \right) C_{FAE} \cdot SFC_{AE} \right) - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME} \right)}{f_i \cdot Capacity_{ref} \cdot f_w}$$

That can be illustrated by the following simplified formula:

$$EEDI = \frac{CO_2 \text{ emission}}{\text{transport work}}$$

2.6 The CO₂ emission represents total CO₂ emission from combustion of fuel at design stage, including propulsion and auxiliary engines, taking into account the carbon content of the fuels in question. If shaft generators or innovative mechanical or electrical energy efficient technologies are incorporated on board a ship, these effects are deducted from the total CO₂ emission. If wind or solar energy is used on board a ship, the energy saved by such measures will also be deducted from the total CO₂ emissions, based on actual efficiency of the systems.

2.7 The transport work is calculated by multiplying the ship's capacity as designed (deadweight for cargo ships and gross tonnage for passenger ships) with the ship's design speed measured at the maximum design load condition and at 75% of the rated installed shaft power. Speed is the most essential factor in the formula and may be reduced to achieve the required index.

Status of the EEDI

2.8 The EEDI is circulated for trial purposes to ensure its feasibility and for further improvement of the calculation method, as necessary. The EEDI is expected to be made mandatory for new ships on completion of this improvement work, most probably by 2010.

Future developments

2.9 The current EEDI formula is not suitable for all ship types or all types of propulsion systems, e.g., ships with diesel-electric, turbine or hybrid propulsion systems will need additional correction factors and MEPC will consider the matter in detail at future sessions. For ship types not covered by the current formula, suitable formulas will be developed in the future addressing the largest emitters first.

Conclusions EEDI

2.10 The EEDI will establish a minimum energy efficiency requirement for new ships depending on ship type and size and is a robust mechanism that may be used to increase the energy efficiency of ships stepwise to keep pace with technical developments for many decades to come. The EEDI is a non-prescriptive mechanism that leaves the choice of what technologies to use in a ship design to the stakeholders as long as the required energy-efficiency level is attained enabling the ship designers and builders to use the most cost-efficient solutions.

Voluntary verification of the EEDI

3 MEPC.1/Circ.682, Interim guidelines for voluntary verification of the EEDI was circulated on 17 August 2009.

Background

3.1 The purpose of the interim guidelines on voluntary verification of the EEDI, which was agreed by MEPC 59 as part of the package of technical and operational measures, is to assist verifiers of the EEDI in conducting the verification in a uniform manner. Uniform application of voluntary verification will capitalize on the experience from trials and will assist MEPC in its further consideration of possible mandatory application of the EEDI to new ships. The guidelines will also assist shipowners, shipbuilders as well as engine and equipment manufacturers, and other interested parties, in understanding the procedures of the voluntary EEDI verification.

Verification in two stages

3.2 The attained EEDI should be calculated in accordance with the EEDI Guidelines (MEPC.1/Circ.681). Voluntary EEDI verification should be conducted on two stages: preliminary verification at the design stage, and final verification at the sea trial, before issuance of the final report on the verification of the attained EEDI. The basic flow of the verification process is presented in figure 1.

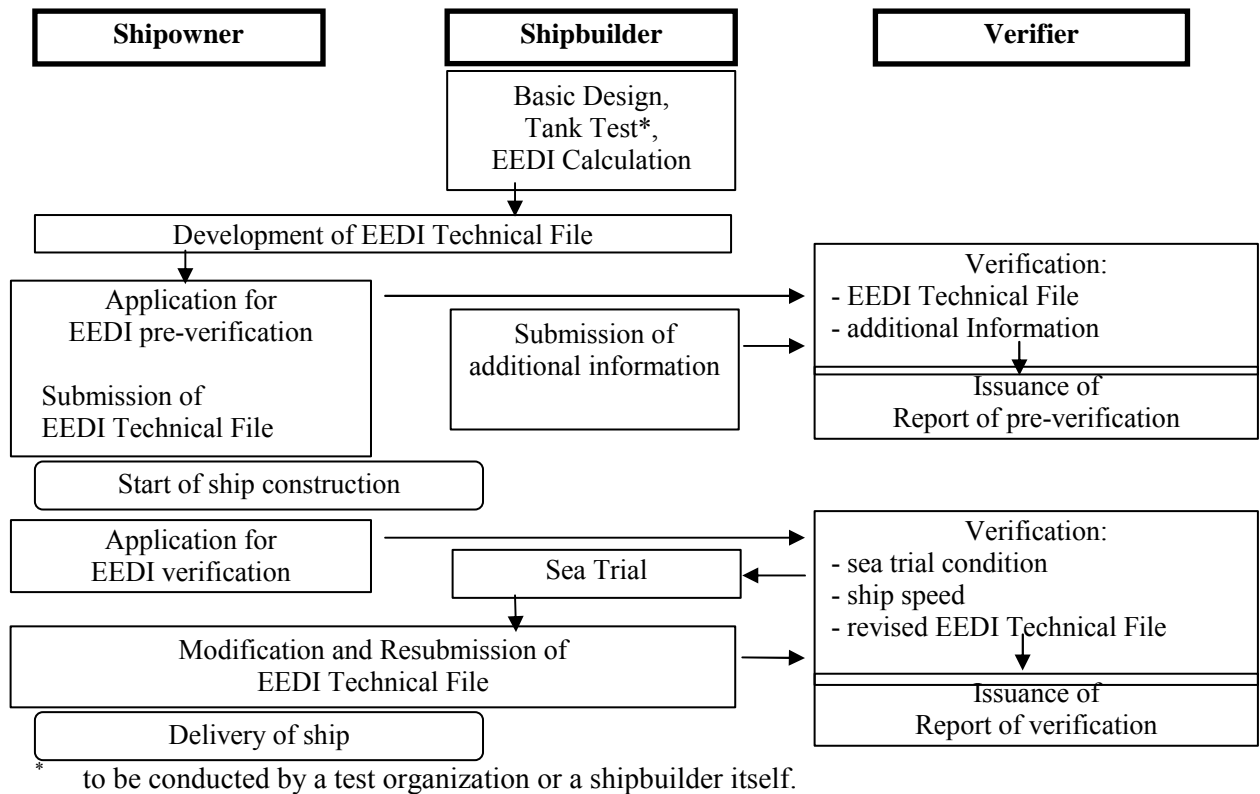


Figure 1 – Basic Flow of Verification Process

Preliminary verification at the design stage

3.3 For the preliminary verification at the design stage, a shipowner should submit to a verifier (e.g., a Maritime Administration or a Classification Society) an application for the verification and an EEDI Technical File containing the necessary information for the verification and other relevant background documents as required by the guidelines.

Final verification of the Attained EEDI at sea trial

3.4 Prior to the sea trial, a shipowner should submit the application for the verification of the EEDI together with the final displacement table and the measured lightweight, as well as other technical information as necessary. The verifier should attend the sea trial and confirm compliance in accordance with the guidelines and the EEDI guidelines.

Issuance of the EEDI verification report

3.5 The verifier should issue the Report on the Preliminary Verification of EEDI after it verified the Attained EEDI at design stage in accordance with the guidelines. Following the sea trial, the verifier should issue the final report on the verification of the attained EEDI after it verified the Attained EEDI at the sea trial in accordance with the guidelines.

Status of the verification guidelines

3.6 The guidelines should be applied on a voluntary basis to new ships for which an application for EEDI verification has been submitted to a verifier. If the EEDI is made mandatory in the future, the guidelines will form part of the regulatory framework governing the scheme.

Guidance for the development of a SEEMP

4 MEPC.1/Circ.683, Guidance for the development of a SEEMP was circulated on 17 August 2009.

Introduction

4.1 The purpose of the Ship Energy Efficiency Management Plan (SEEMP) is to establish a mechanism for a company and/or a ship to improve the energy efficiency of ship operations. Preferably, the ship-specific SEEMP is linked to a broader corporate energy management policy for the company that owns, operates or controls the ship, recognizing that no two shipping companies or shipowners are the same. It should also be recognized that the international fleet of merchant vessels comprises a wide range of ship types and sizes that differ significantly in their design and purpose, and that ships operate under a broad variety of different conditions.

4.2 Sea transport has a justifiable image of conducting its operations in an energy-efficient way, and in a manner that creates little impact on the global environment. It is nevertheless the case that enhancement in efficiencies can reduce fuel consumption, save money, and decrease the environmental impacts from ships. While the yield of individual measures may be small, the collective effect across the entire fleet will be significant. In global terms it should be recognized that operational efficiencies delivered by a large number of ships will make a valuable contribution to reducing global carbon emissions.

Practical approach

4.3 Mandatory management plans are used to regulate a range of ship operations where traditional command and control regulations would not work, and is also the chosen option for reduction of GHG emissions from operation of ships engaged in international trade. To regulate ship operations by traditional prescriptive regulations (as is the customary practice for technical regulations) is not feasible, e.g., to determine the most energy-efficient speed, optimum ship handling practices or the preferred ballast conditions for all ships in a set of regulations could hardly be done and keeping it updated would

not be possible. A management plan is a familiar tool for the shipping industry and provides a flexible mechanism where shipowners and operations can choose the most cost-effective solutions for their ships and their operations.

4.4 The SEEMP provides an approach for monitoring ship and fleet efficiency performance over time and forces the responsible persons and entities at each stage of the plan to consider new technologies and practices when seeking to optimize the performance of the ship. The Second IMO GHG Study 2009 indicates that a 20% reduction on a tonne-mile basis by mainly operational measures is possible and would be cost-effective even with the current fuel prices, and the SEEMP will assist the shipping industry in achieving this potential.

4.5 The circular provides guidance for the development of a SEEMP that should be adjusted to the characteristics and needs of individual companies and ships. The SEEMP is intended to be a management tool to assist a company in managing the ongoing environmental performance of its vessels and, as such, it is recommended that the plan be implemented in a manner which limits any onboard administrative burden to the minimum necessary.

Ship-specific plan

4.6 The SEEMP should be developed as a ship-specific plan by the shipowner, operator or any other party concerned, e.g., the charterer. The SEEMP seeks to improve a ship’s energy efficiency through four steps: *planning, implementation, monitoring, and self-evaluation and improvement*. These components play a critical role in the continuous cycle to improve ship energy management. With each iteration of the cycle, some elements of the SEEMP will necessarily change while others may remain as before.

Guidance on best practices for fuel-efficient operation of ships

4.7 The circular contains guidance on best practices related to voyage performance, optimized ship handling, hull and propulsion system maintenance, the use of waste heat recovery systems, improved fleet management, improved cargo handling and energy management. It also covers areas such as fuel types, compatibility of measures, age and operational service life of a ship as well as trade and sailing area.

A sample form of a SEEMP is presented below for illustrative purposes

Name of Vessel:		GT:	
Vessel Type:		Capacity:	
Date of Development:		Developed by:	
Implementation Period:	From: Until:	Implemented by:	
Planned Date of Next Evaluation:			

1 MEASURES

Energy Efficiency Measures	Implementation (including the starting date)	Responsible Personnel
Weather Routeing	<Example> Contracted with [Service providers] to use their weather routeing system and start using on trial basis as of 1 July 2012.	<Example> The master is responsible for selecting the optimum route based on the information provided by [Service providers].
Speed Optimization	While the design speed (85% MCR) is 19.0 kt, the maximum speed is set at 17.0 kt as of 1 July 2012.	The master is responsible for keeping the ship speed. The log-book entry should be checked every day.

2 MONITORING

- Description of monitoring tools (e.g. the EEOI, or another suitable indicator/tool)

3 GOAL

- Measurable goals

4 EVALUATION

- Procedures of evaluation

The Energy Efficiency Operational Indicator (EEOI)

5 MEPC.1/Circ.684, Guidelines for voluntary use of the ship EEOI was circulated on 17 August 2009.

Introduction

5.1 Although ships are the most fuel efficient mode of mass transport, the Second IMO GHG Study 2009 identified a significant potential for further improvements in energy efficiency by operational measures, such as fleet management, voyage optimization and energy management. The Study estimated that 10 to 50% reductions of CO₂ emissions (on a capacity-mile basis) are possible through the combined use of these measures. Saving energy at the operational stage is presently addressed by the SEEMP where the Energy Efficiency Operational Indicator (EEOI) will be used as the monitoring tool and to establish benchmarks for different ship segments of the world fleet categorized by ship type and size.

Purpose of the EEOI

5.2 MEPC has developed Guidelines for voluntary use of the ship Energy Efficiency Operational Indicator to establish a consistent approach for measuring ships energy-efficiency at each voyage or over a certain period of time, which will assist shipowners and ship operators in the evaluation of the operational performance of their fleet. As the amount of CO₂ emitted from ships is directly related to the consumption of bunker fuel oil, the EEOI can also provide useful information on a ship's performance with regard to fuel efficiency.

5.3 The EEOI enables continued monitoring of individual ships in operation and thereby the results of any changes made to the ship or its operation. The effect of retrofitting a new and more efficient

propeller would be reflected in the EEOI value and the emissions reduction could be quantified. The effect on emissions by changes in operations, such as introduction of just in time planning or a sophisticated weather routing system, will also be shown in the EEOI value.

EEOI coverage

5.4 The EEOI can be applied to almost all ships (new and existing) including passenger ships, however it cannot be applied to ships that are not engaged in transport work, such as service and research vessels, tug boats or FPSOs, as it is the transport work that is the input value together with emissions (fuel consumed x CO₂ factors for different fuel types).

The EEOI formula

5.5 The EEOI provides a specific figure for each voyage. The unit of EEOI depends on the measurement of cargo carried or the transport work done, e.g., tonnes CO₂/(tonnes·nautical miles), tonnes CO₂/(TEU·nautical miles) or tonnes CO₂/(person·nautical miles), etc. The EEOI is calculated by the following formula, in which a smaller EEOI value means a more energy efficient ship:

$$EEOI = \frac{\text{actual CO}_2 \text{ emission}}{\text{performed transport work}}$$

5.6 The actual CO₂ emission represents total CO₂ emission from combustion of fuel on board a ship during each voyage, which is calculated by multiplying total fuel consumption for each type of fuel (distillate fuel, refined fuel or LNG, etc.) with the carbon to CO₂ conversion factor for the fuel(s) in question (fixed value for each type of fuel).

5.7 The performed transport work is calculated by multiplying mass of cargo (tonnes, number of TEU/cars, or number of passengers) with the distance in nautical mile corresponding to the transport work done.

Status of the EEOI

5.8 The EEOI is circulated to encourage shipowners and ship operators to use it on a voluntary basis and to collect information on the outcome and experiences in applying it. The EEOI will be used as a monitoring tool in the SEEMP and to establish benchmarks.

GHG module in GISIS

5.9 To collect EEOI data and make them accessible to Member States and the shipping industry, a GHG module was established in GISIS (IMO’s central database) to enable further research work and the establishment of benchmarks for different ship segments (type and size). A sample data in the GHG module is presented below. When fuel consumption data, cargo quantity and voyage distance are completed, the CO₂ emission and the voyage index will be calculated automatically:

HFO tonnes	LNG (tonnes)	MDO (tonnes)	Cargo unit	Distance (n.miles)	CO ₂ emission	Voyage index
44.46	---	2	475.2	967	145	315
108.78	---	0.8	1051.2	1861	341	174
