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Eleventh session

Bonn, 25 October - 5 November 1999

Item 9 (c) of the provisional agenda

## METHODOLOGICAL ISSUES

### EMISSIONS RESULTING FROM FUEL USED FOR INTERNATIONAL TRANSPORTATION

#### Submissions from Parties

#### Note by the secretariat

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its tenth session, decided to continue its work in accordance with decision 2/CP.3, paragraph 4, and to consider the IPCC *Special Report on Aviation and the Global Atmosphere*, at its eleventh session. It invited Parties to submit their views on these issues to the secretariat by 16 August 1999. At the same session, it noted the informal paper "Methods used to collect data and to estimate and report emissions from international bunker fuels" made available to Parties by the secretariat during the session. The SBSTA requested Parties to provide comments on that paper to the secretariat by 16 August 1999 (FCCC/SBSTA/1999/6, para. 46 (c) and (f)).
2. The secretariat has received seven such submissions from Parties. In addition, the International Civil Aviation Organization secretariat commented on the informal paper "Methods used to collect data and to estimate and report emissions from international bunker fuels". 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.
3. The secretariat has also received a joint submission from the European Federation for Transport and the Environment, the Aviation Environment Federation, the Right Prices for Air Travel Campaign, DNR, GermanWatch and Friends of the Earth Netherlands. It is the practice of the secretariat not to reproduce documents from non-governmental organizations.

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\* In order to make these submissions available on electronic systems, including the World Wide Web, these contributions have been electronically imported, scanned and/or retyped. The secretariat has made every effort to ensure the correct reproduction of the texts as submitted.

**FCCC/SBSTA/1999/MISC.8**

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However, Parties may wish to request copies of this submission directly from the European Federation for Transport and the Environment Boulevard de Waterloo 34, B-1000 Brussels, Belgium, telephone +32-2-502 9909, fax +32-2-502 9908, e-mail t+e@arcadis.be or view it at the Aviation Environment Federation web site <http://www.aef.org.uk>.

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PAPER NO. 1: AUSTRALIA

**METHODOLOGICAL ISSUES – EMISSIONS RESULTING FROM  
FUEL USED FOR INTERNATIONAL TRANSPORTATION**

Decision 2/CP.3 recalls that,

... under the Revised 1996 Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change, emissions based upon fuel sold to ships or aircraft engaged in international transport should not be included in national totals, but reported separately; and urges the Subsidiary Body for Scientific and Technological Advice to further elaborate on the inclusion of these emissions in the overall greenhouse gas inventories of Parties.

The Revised 1996 IPCC Inventory Guidelines require Parties to record disaggregated international bunker fuel emissions from aviation and maritime activities and not include these in national totals. The Guidelines define international aviation versus domestic activity and provide methods for calculating emissions from international transport given data on fuel sold and the number of landing/take off cycles.

As demonstrated in the informal paper circulated at the tenth session of SBSTA in June 1999, 'Methods used to collect data and to estimate and report emissions from international bunker fuels', many Parties are clearly experiencing difficulties in separating international fuel sales or flight statistics from those that are domestic, with consequent significant variation among Parties in the reporting of these emissions.

Accurate reporting of international transport emissions as distinct from those that occur domestically is an important methodological priority. Domestic transport emissions will form part of a national total under the Kyoto Protocol and need to be accurately recorded. Correctly identifying international transport emissions will also be a prerequisite for future discussions on allocation.

While the IPCC inventory Guidelines provide the methodological framework for the reporting of these emissions, priority should be given to applying good practice techniques. The IPCC/OECD/IEA Programme for National Greenhouse Gas Inventories held an expert meeting in April 1999 on Good Practice in Inventory Preparation for Energy, Transportation and Fugitive Emissions. This meeting discussed the estimation of emissions from international transport and intends to provide in its report guidance on the separation of aviation fuel use between domestic and international sectors if separate fuel statistics are not available. In this case, good practice suggests using flight or shipping movement data, the appropriate route and fuel consumption rates from specific aircraft or maritime vessels to estimate emissions.

Australia considers that SBSTA should agree at its next session to give consideration to ways to facilitate the better application of the current provisions for reporting bunker fuel emissions in order to reduce inaccuracies and minimise inconsistencies. SBSTA should invite the IPCC to report on the Good Practice workshop at its twelfth session after acceptance by the IPCC. SBSTA should also consider the need to improve inventory reporting on bunker fuel emissions in the context of ongoing work to revise reporting guidelines for Annex I national communications.

### **Allocation of emissions**

The IPCC Special Report illustrates the spectrum of policy options available for reducing international aviation emissions. However, many of these require different allocation systems in order for Parties to monitor and report on their success. Before new approaches to allocation can be considered it is necessary to first establish a policy framework and then adopt the most suitable method of recording and allocating emissions.

Current practice in line with the Revised 1996 Inventory Guidelines requires Parties to record disaggregated international bunker fuel emissions from aviation and maritime activities in their inventories separately from national totals. Australia considers this is a sufficient interim approach while the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO) investigate a comprehensive policy response to address international aviation and maritime emissions.

Determining allocation at this stage would prejudge the discussion on the best policy framework. SBSTA should instead focus its attention on remedying any difficulties Parties may currently be experiencing in reporting bunker fuel emission under the existing Guidelines, through the use of good practice techniques. Differentiating between international and domestic transport emissions should be the priority.

### **IPCC Special Report on Aviation and the Global Atmosphere**

Australia welcomes the IPCC Special Report on Aviation and the Global Atmosphere which provides us with a comprehensive assessment of the impact of aviation emissions on climate change and ozone and the clear message that aviation is a significant source of greenhouse gas emissions. It illustrates characteristic global warming effects which appear to be concentrated in the northern hemisphere along heavy traffic routes. It also demonstrates the wide range of options that are available to address aviation emissions.

SBSTA needs to give careful consideration to the Special Report at its eleventh session. The report's findings should provide a critical input to work in ICAO to develop responses to aviation emissions.

## **Next steps**

Australia considers that at its eleventh session, SBSTA should:

- request ICAO to examine the findings of the Special Report as part of ICAO's work plan on greenhouse gas emissions from international aviation,
- invite the IPCC to report on outcomes from the expert meeting on Good Practice in Inventory Preparation for Energy, Transportation and Fugitive Emissions and agree to consider these at its twelfth session,
- consider the work plans which are expected to be provided by ICAO and IMO to progress these matters, and
- agree to give consideration to ways to facilitate the better application of the current provisions for reporting bunker fuel emissions, in order to reduce inaccuracies and minimise inconsistencies.

Australia considers that at its twelfth session, SBSTA should:

- examine the outcomes from the IPCC expert meeting on Good Practice in Inventory Preparation for Energy, Transportation and Fugitive Emissions

**COMMENTS ON THE INFORMAL PAPER: 'METHODS USED TO COLLECT DATA AND TO ESTIMATE AND REPORT EMISSIONS FROM INTERNATIONAL BUNKER FUELS'**

Australia welcomes the opportunity to comment on this informal paper which addresses the methods for reporting international transportation emissions. This paper provides a useful compilation of methodologies used by parties in relation to international transport and among other things, illustrates the difficulties many Parties are experiencing in separating international fuel sales or flight statistics from those that are domestic, with consequent significant variation among Parties in the reporting of these emissions.

It is not clear to us what might follow this analytical work by the secretariat, but we assume that comments provided by Parties will be accommodated.

**General comments**

1. While the paper's mandate was to use second national communications as a basis, Australia considers that because Parties' annual greenhouse gas inventories provide a more complete source of information on data collection procedures and methodologies, the use of inventories rather than the space-constrained national communications might be used for this paper wherever possible. Several useful references in the paper are already clearly drawn from inventories. It may be useful to recognise where information is drawn from inventories and to also note in the paper that the level of detail provided especially on international transportation emissions is greater in inventories as compared with national communications.
2. It would also be appropriate for the paper to recognise the work of the IPCC/OECD/IEA Programme for National Greenhouse Gas Inventories on Good Practice in Inventory Preparation, in particular the expert meeting held in April 1999 on Energy, Transportation and Fugitive Emissions. This meeting discussed the estimation of emissions from international transport and intends to provide in its report, among other things, guidance on the separation of aviation fuel use between domestic and international sectors if separate fuel statistics are not available.
3. Given that the authors' mandate in relation to the issue of allocation was to examine the availability of data, the discussion in section 9 of the paper goes well beyond this requirement and indeed enters into policy discussions that may be inappropriate at this stage. This section should be constrained to examining current data availability and perhaps the data collection that might be necessary in the future for the various allocations options. The subjective discussion on the relative merits of the eight allocation options should be deleted. In particular, the section describing some Parties' preferred allocation options is not appropriate for this paper. The final section (9.1.3), which suggests a couple of mitigation policies, should be replaced with text explaining that the SBSTA has tasked ICAO and IMO with carrying out a comprehensive examination of ways to limit or reduce greenhouse gas emissions from international transport. In addition, if the



discussion on the aviation industry is necessary, it should be informed by the IPCC Special Report on Aviation and the Global Atmosphere.

4. The paper could also note that definitions within organisations such as ICAO of 'international' and 'national' are not the same as those used in the IPCC inventory guidelines, and so data collected by these may not be directly comparable for the preparations of inventories. This is relevant in particular for section 5.1.1.

Any such changes to the text should also be reflected in the summary.

5. While the paper presents several important findings and is a useful summary, it would benefit from careful review and editing to avoid repetition and improve expression. The structure could also usefully be revisited to bring together common themes in a logical fashion and again reduce duplication.

### **Specific comments**

Australia would like to provide supplementary details on methods used for collecting data and estimating emissions of international transportation in Australia's National Greenhouse Gas Inventory (NGGI).

1. Page 18, Table 4.4  
1<sup>st</sup> row (Australia) add 'SO<sub>2</sub>' to the fourth column (Greenhouse gases included in reporting).  
(Reference: 1996 National Greenhouse Gas Inventory (NGGI), page 112)
2. Page 24, Table 5.1.4, insert new row:  
Country: 'Australia';  
Marine definition: 'emissions from international passenger and freight movement by sea-going ships of all flags, using marine bunker fuel purchased in Australia';  
Aviation definition: 'emissions from international air freight and passenger movement using fuel purchased in Australia';  
Revision of definition planned: 'No';  
Cooperation: 'No'.  
(Reference: 1996 NGGI Workbook 3.1, pages 4,5)
3. Page 31, Table 5.2.4, insert new row:  
Country: 'Australia';  
Emission estimation methods: 'For CO<sub>2</sub>, emissions are calculated by multiplying the quantity of fuel consumed by the emission factor and the proportion of fuel completely oxidised (assumed complete). For Aviation, data on yearly avtur consumption by international aircraft is converted from energy (pJ) to mass (mg). Total yearly LTO cycles are multiplied by emission factors to produce emissions for the LTO mode for CH<sub>4</sub>, N<sub>2</sub>O, NO<sub>x</sub>, CO and NMVOC. The fuel consumption and emission from cruise mode are calculated by subtracting fuel consumption during LTO from total fuel consumption. Fuel consumption is then multiplied by emission factors for each of the

gases. LTO and cruise mode emission are then added to produce emission of CH<sub>4</sub>, N<sub>2</sub>O, NO<sub>x</sub>, CO and NMVOC from international aircraft. For maritime emissions, all are calculated as for non-CO<sub>2</sub> gases from aviation.

Emission factors for CO<sub>2</sub> aviation and marine emissions are calculated by the Australian Bureau for Agriculture and Resource Economics. Non-CO<sub>2</sub> aviation emission factors are from the USEPA and IPCC. Non-CO<sub>2</sub> emission factors for marine emissions are based on steady state testing for 60 engines on 50 vessels (from Lloyd's Register of Shipping, 1990).'

IPCC Guidelines followed: 'Yes. The aviation estimation is more advanced than the IPCC approach.'

(Reference: 1996 NGGI, Workbook 3.1, Table 8A)

4. Page 34, Paragraph 5, insert sentence:  
Australian marine and aviation fuel sales statistics differentiate between domestic and international consumption, simplifying the estimation of international versus domestic transport emissions.
  
5. Page 36, Table 6.1, insert new row:  
Country: 'Australia';  
What is reported: 'Data on yearly avtur consumption for international aircraft and also data on ADO, IDF and natural gas consumed by international shipping. Annual LTO cycles are also supplied';  
Agencies: 'Fuel consumption statistics from Australian Bureau for Agriculture and Resource Economics. The annual LTO cycles are supplied by 'AvStats', from the Department of Transport and Regional Services.'

PAPER NO. 2: FINLAND

(On behalf of the European Community and its member States)

**VIEWS ON THE IPCC SPECIAL REPORT ON AVIATION AND  
THE GLOBAL ATMOSPHERE**

**VIEWS ON WORK OF THE SBSTA IN ACCORDANCE WITH  
DECISION 2/CP.3 PARAGRAPH 4,**

**AND**

**COMMENTS ON THE SECRETARIAT'S INFORMAL PAPER "METHODS USED  
TO COLLECT DATA AND TO ESTIMATE AND REPORT EMISSIONS FROM  
INTERNATIONAL BUNKER FUELS"**

Finland, on behalf of the European Community and its Member States, submits the following views in response to the request by SBSTA at its tenth session (document FCCC/SBSTA/1999/L.8) for such views (i) on matters related to the IPCC Special Report on Aviation, (ii) on the work of the SBSTA, in accordance with decision 2/CP.3 paragraph 4 and (iii) on the Secretariats informal paper "Methods used to Collect Data, Estimate and Report Emissions from International Bunker Fuels".

**i) Views on the IPCC Special Report on Aviation and the Global Atmosphere**

The EU appreciates the initiative taken by ICAO to ask the IPCC for the preparation of a special report on aviation and the global atmosphere. We thank the IPCC for the valuable work that has been carried out and are sure that the substantive report done in co-operation with different stakeholders will constitute an important base for all future considerations and negotiations with respect to aviation, its impacts on the atmosphere and potential mitigation options.

Although considerable uncertainties still exist and the need for future research remains, the report clearly points out the growing contribution of aviation to global climate change. The implementation of the overall greenhouse gas reductions, as agreed in the Kyoto Protocol, will result in a decrease of -5,2 % of Annex I GHG emissions in the first commitment period compared to 1990 levels. Emissions from international aviation are not subject to this commitment. However, the IPCC projection for total aviation emissions from 1992 to 2010 shows an increase of fuel use of 3 % annually. If compared to 1990 Annex I GHG emissions, this would contribute as much to total warming as an increase of 1990 Annex I GHG emissions by +4,6 %, of which about half would be due to international aviation. Hence the overall greenhouse gas reductions, as agreed in the Kyoto protocol, will be offset by up to 50 % due to the projected increase of emissions from international aviation.

The report offers an excellent overview of the scientific state of the art regarding impacts on the global atmosphere. Findings include the following: the overall greenhouse impact from

the aviation sector is a factor of about 2-4 larger than the impact of CO<sub>2</sub> alone; there is an effect of aviation on climate through cirrus cloudiness; and the impact of supersonic aircraft is about 5 times larger than of subsonic aircraft. Further research needs exist, and the report contains a relevant list of issues for future work. In this context there is a need to pay more attention to mitigation options as well. Efforts should be intensified to reduce the uncertainty of some results of the report.

One of the most important message from the report is that improvements in aircraft and engine technology and in the efficiency of the air traffic system will bring environmental benefits, but will not fully offset the effects of the increased emissions resulting from projected growth in aviation. Hence, policy options to limit or reduce greenhouse gas emissions are necessary. In this context, it can be noted that further discussion on instruments like aviation fuel levies and on emissions trading and on other mitigation options is necessary. Amongst others, a socio-economic analysis of the growing demand for aviation is also needed and it could provide some insight on, among other things, the role of worldwide tourism. The EU also invites the IPCC to include new scientific work on aviation in its Third Assessment Report.

In the view of the findings of the IPCC Special Report, the EU sees an urgent need to further develop policies and measures in the field of aviation, in cooperation with ICAO. Comments on the related work plan are presented under item ii) of this submission. Further more, the EU refers to its support for the proposal by Switzerland that COP 5 should consider the IPCC Special Report on Aviation and adopt a related decision.

#### **ii) Views on work of the SBSTA in accordance with decision 2/CP.3 paragraph 4**

Through paragraph 4 (FCCC/SBSTA/1999/L.8, para.6) the SBSTA is urged to elaborate further on inclusion of emissions based upon fuel sold to ships or aircraft engaged in international transport in the overall greenhouse gas inventories of Parties. To continue the work on this issue, the EU would like to present the following views.

The EU urges ICAO to accelerate and treat as a matter of priority its examination of market-based options, as decided on its 32nd Assembly. The EU calls upon both ICAO and IMO to respond, where possible by COP 5, to the invitation of the SBSTA to present their work plans and to make progress reports. The plans should make clear how they intend to operationalise their responsibility for international bunker emissions, in accordance with Article 2.2 of the Kyoto Protocol, and to take into account the overall GHG emission reduction target of the Protocol.

The EU suggests that decisions within ICAO and IMO on policies and measures should be taken urgently (in the General Assembly of 2001 of ICAO and at General Assembly as soon as possible before 2005 for IMO), in order to make clear how they intend to operationalise their responsibility for international bunker emissions, according to Art 2.2 of the Kyoto Protocol, taking into account the overall GHG emission reduction target of the Kyoto Protocol.

Furthermore, the EU calls upon all ICAO and IMO Parties to intensify their work on policies and measures, including internationally coordinated instruments, such as taxes and other market-based options, and to report on their activities in their national communications.

The EU believes that any decision on the inclusion of emissions from international bunker fuels in the national inventories of Parties (i.e. on allocation) should enter into force during the second commitment period, because such a decision would require a change in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, which shall be applied in the first commitment period pursuant to Article 5 of the Kyoto Protocol and Decision 2/CP.3. Therefore, Parties should continue to report these emissions separately from national totals in the first commitment period.

The EU believes that the issue of the inclusion of emissions from international bunker fuels in national inventories of Parties should be solved in time for negotiations for the second commitment period, i.e. before 2005. In order to have a reasonable choice of options by 2005, the assessment of options addressed in this submission should be done as soon as possible.

Based on the conclusions of SBSTA 4, the EU sees the following twin-track approach (main options I and II) noting that different options could be pursued for aviation and marine bunker fuels.

*I No inclusion of emissions from international bunker fuels in the national inventories of Parties (option 1 in document FCCC/SBSTA/1996/9/Add.1) as in the current situation.*

Limitation or reduction of these emissions would be under the general responsibility of the international community (as acknowledged in FCCC/SBSTA/1996/20, para55), to be pursued through ICAO and IMO.

The EU may consider option I (no allocation) further, if ICAO and IMO make demonstrable progress, taking into account the overall emission reduction target of the Kyoto Protocol, in accordance with the timetables and mitigation plans set out above.

*II Inclusion of emissions from international bunker fuels in the national inventory of the Party (options 3, 4, 5 and 6 in FCCC/SBSTA/1996/9/Add.1 and Add.2)*

This approach may increase the incentives to take action at the international level. It would lead to considerable changes in emission levels at least for some Annex I Parties. Therefore, it would have to be taken into account in agreeing on future commitments for Annex I Parties for the second and future commitment periods.

With regard to the allocation options (options 3, 4, 5, and 6 in FCCC/SBSTA/1996/9/Add.I and Add. 2), the SBSTA should compare and discuss these with a view to being in a position to reach agreement on one option by 2005. In that context, the EU presents the following initial views.

The EU shares the analysis in para. 34 of FCCC/SBSTA/1999/INF.4 that it might take Parties three to five years to put in place adequate systems to collect and report information in a

consistent manner on emissions from international bunker fuels for options 4 (*inclusion in the national inventory of the Party according to the nationality of the transport company, or to the country where the ship or aircraft is registered, or the country of the operator*), 5 (*inclusion in the national inventory of the party according to the country of departure or destination of the ship or aircraft*) or 6 (*inclusion in the national inventory of the Party according to the country of departure or destination of passenger or cargo*) in document FCCC/SBSTA/1996/9/Add.1. If one of these options is to be pursued, the necessary methodological work would have to be initiated very soon. The EU would like to request the Secretariat to give recommendations on solving the problems identified in the informal paper "Methods used to Collect Data, Estimate and Report Emissions from International Bunker Fuels (for instance, clarification on definitions or build-up of relevant databases).

...

In addition, the EU suggests that the issue of control options (such as internationally coordinated instruments, inter alia taxes) in these areas should also be addressed in the further work regarding best practices in policies and measures in consultation with Working Group 5 (Market-Based Options) of the ICAO Committee on Environment Protection, which is already pursuing this matter, and with the MEPC of IMO, which is already conducting a study on greenhouse gas emissions from ships.

The EU also believes it necessary to explore ways to further strengthen the exchange of information between ICAO, IMO and SBSTA. In addition, the EU requests that the Secretariat give recommendations on the possibility of forming a joint working group of the FCCC (SBSTA/SBI) with ICAO (CAEP) as well as with IMO (MEPC) as a means to strengthen the exchange of information between these bodies and the co-operation at the working level.

**iii) Comments on the Secretariat's informal paper "Methods used to Collect Data, Estimate and Report Emissions from International Bunker Fuels".**

The EU welcomes the efforts of the Secretariat with regard to data provision and reporting on international bunker fuels. The report is an important step in the work on bunker fuels and could help Parties to elaborate further on the allocation issue. The answers to the questionnaire with respect to the allocation and some answers still missing could be added. The EU calls upon the Secretariat to provide this additional information. Furthermore the EU requests the secretariat to provide recommendations to solve the problems identified in the questionnaire.

The EU points out that the questionnaire did not request information with regard to recalculations or estimates of base year emissions. The EU believes that it is essential to make such estimates in order to improve methodologies. The EU also believes that more specific guidance should be given, especially when developing the different allocation options.

The EU is of the view that the current methodologies in the Greenhouse Gas Inventory Reference Manual generally provide a good framework for estimating and reporting the emissions from aviation and maritime activities. The main difficulties and uncertainties arise with respect to the differentiation between the domestic and international level. Additional

information is needed on data requirements of different allocation options, on data quality and uncertainties.

The EU recalls Decision 4/CP.1, para. 1f where the mandate to address allocation was given to the SBSTA. The SBSTA discussed this issue in 1996 on the basis of documents FCCC/SBSTA/9/Add.1 and Add.2, which provided eight options. It concluded that options 1, 3, 4, 5 and 6 should be the basis for further work and that with the respect to option 1 (non-allocation) the responsibilities of the international community to address issues related to international bunker fuels should be recognised (FCCC/SBSTA/1996/20, para.55). The EU holds that the allocation study should cover all remaining allocation options in order to clarify what type of data should be reported under these options, how these data could be collected and how long it would take to set up such a system. The EU requests ICAO and IMO to help the Parties to assess the data availability and requirements for all these options.

Additionally, we would like to note that existing default emission factors in the Revised 1996 IPCC Guidelines are currently adequate to estimate emissions of non-CO<sub>2</sub> gases and that national methods using well characterised activity data by fuel and engine type and emission factors should be used whenever possible.

PAPER NO. 3: JAPAN

**JAPANESE VIEWS ON DECISION 2/CP.3, PARA. 4.**

According to Article 2.2 of the Kyoto Protocol, the Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization (ICAO) and the International Marine Organization (IMO), respectively. Both ICAO and IMO have been studying options to reduce or limit emissions from bunker fuels. The outcome of their work will be reported to the next ICAO Assembly in fall 2001 and the 44th session of the Marine Environment Protection Committee (MEPC) of IMO in March 2000, respectively.

As pointed out in document FCCC/SBSTA/1999/INF.4, allocation of responsibility for emissions from international bunker fuels to Parties closely relates to issues on inventory and control measures. Therefore, appropriate allocation should be considered from the viewpoint of equity and rationality, taking into account the work of ICAO and IMO on control measures.

We should avoid prejudicing the outcome of the ongoing work of ICAO and IMO on control and reduction measures by having a prior discussion on allocation under UNFCCC. However, to promote the work of ICAO and IMO, it is necessary to identify outstanding issues concerning the allocation of emissions from international bunker fuels through, for example, expert meetings including the representatives from ICAO and IMO under the framework of UNFCCC process, and to discuss at SBSTA on what advice to be given to ICAO and IMO.



PAPER NO. 4: NEW ZEALAND

**NEW ZEALAND SUBMISSION ON INTERNATIONAL BUNKER FUELS  
(ADDRESSING DECISION 2/CP.3, PARAGRAPH 4, THE IPCC SPECIAL  
REPORT ON AVIATION AND THE GLOBAL ATMOSPHERE, AND THE  
INFORMAL PAPER “METHODS USED TO COLLECT DATA AND TO  
ESTIMATE AND REPORT EMISSIONS FROM INTERNATIONAL  
BUNKER FUELS”)**

New Zealand welcomes the information provided in the IPCC Special Report on Aviation and the Global Atmosphere. We note, in particular, that the IPCC has estimated that the radiative forcing by aircraft is about 3.5% of total radiative forcing of all anthropogenic activities, and that some emissions from aircraft that occur at high altitudes have a greater effect on the climate than the same emissions at lower altitudes. We also note the important role of the International Civil Aviation Authority (ICAO) with respect to developing standards and recommended practices regarding all aspects of international aviation.

We note from the secretariat’s informal paper on “Methods used to collect data and to estimate and report emissions from international bunker fuels” that the current approach, as outlined in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories for reporting emissions from international bunker fuels (separated into aviation and marine) as memo items (i.e. they are reported but not included in the national total) is followed by many, but not all, Annex I Parties. Although many Parties are using this approach, different methodologies, with different assumptions and definitions, are being applied to arrive at emissions estimates. We further note that guidelines for the reporting of greenhouse gas inventories by non-Annex I Parties (as included in decision 10/CP.2) also provide for the application of methodologies agreed by the COP (i.e. IPCC methodologies) and the separate reporting of emissions from bunker fuels.

Regarding 10/CP.3 paragraph 4, for SBSTA to further elaborate on the inclusion of emissions from international transport in the overall greenhouse gas emissions of Parties, New Zealand regards it as an important first step that reporting of these emissions needs to be improved. We note that the questionnaire, which formed the basis of the secretariat’s informal report, was circulated to Annex I Parties only, and that of these Parties, only 15 responded. Both Annex I Parties and non-Annex I Parties have responsibilities to report complete greenhouse gas inventories as per the respective guidelines approved by the COP for this purpose. All Parties should be encouraged to report international bunker fuel emissions as part of standard inventory reporting (but kept separate from the national total). In our view, the common reporting format for Annex I Party greenhouse gas inventories, adopted by SBSTA10 as a draft decision for COP5, should help elicit a standardisation of approach.

The issue of greenhouse gas emissions from international bunker fuels is one which affects all Parties. New Zealand regards it as premature to allocate responsibility for greenhouse gas emissions from international bunker fuels. As a matter of principle we believe this is a circumstance where it is unlikely that addressing the problem at the national level will be more effective than pursuing other means. Individual national Governments have few, if any,

policy tools that can influence emissions associated with international bunker fuels. This is in contrast to emissions from domestic aviation and marine transport where national governments (and member states within regional economic integration organisations) have a broader range of policy tools by which they can influence emissions.

All Parties should strive to improve their reporting of emissions from international bunker fuels. At the same time, given the overall significance of these emissions, it would be appropriate for Parties to advocate within ICAO and IMO to advance the work those international organisations are doing to address the issue of greenhouse gas emissions from international bunker fuels.

PAPER NO. 5: NORWAY

**EMISSIONS RESULTING FROM FUEL USED FOR  
INTERNATIONAL TRANSPORTATION**

At SBSTA 10, and according to the document FCCC/SBSTA/1999/L.8, Parties were requested to provide comments on the informal paper "Methods used to collect data and to estimate and report emissions from international bunker fuels". Parties were also invited to submit views on the inclusion of emissions based on fuel sold to ships or aircraft engaged in international transport in the overall greenhouse gas inventories of Parties and the consideration of the IPCC Special report on Aviation and the Global Atmosphere at SBSTA 11. We hereby submit the Norwegian comments and views on these issues.

**Comments on the informal paper "Methods used to collect data and to estimate and report emissions from international bunker fuels"**

Norway would primarily like to thank the Secretariat for having conducted this study. We find the draft report informative and helpful in regard to making future reporting of emission from bunker fuels consistent among Parties, as well as in the discussion of how to allocate emissions originating from international bunker fuels. The report identifies inconsistencies among Parties regarding their reporting of emissions originating from international as well as national bunker fuels. In our view more specific reporting guidelines are needed for these emissions. In our opinion, it is important to distinguish between emissions from aircraft in landing or takeoff cycles (LTO) and cruise. This could also be expressed in emissions occurring above and below 1000 meters of altitude, since this is required for reporting emissions to the Convention on Long Range Transboundary Air Pollution (LRTAP). We find this point missing in the report. We think the report should include information on how the Parties report aircraft emissions according to this distribution, since this is valuable information with regard to the effects of the emissions (according to the IPCC Special report on Aviation), as well as in the context of allocation. Furthermore, the Parties could be asked to distinguish between emissions originating from subsonic and supersonic aircraft, respectively.

**Inclusion of emissions based on fuel sold to ships or aircraft engaged in international transport in the overall greenhouse gas inventories of Parties**

Norway finds it very important to establish systems to include emissions from international bunkers in the total greenhouse gas emission inventories by Parties. The IPCC Special report on aviation has shown that emissions from aircraft in particular, have shown a strong upward trend over the latest years and this trend is expected to continue in the coming years in a non-intervention scenario. Hence from an environmental point of view it is important that these emissions are addressed in the Parties' commitments under the Kyoto Protocol for the next commitment periods.

The difficult question is of course, how to include these emissions. The SBSTA has elaborated eight different allocation options, which are defined in document

FCCC/SBSTA/1996/9/Add.1. In Article 2.2 of the Kyoto Protocol, it is stated that Parties included in Annex 1 shall pursue limitation or reduction of emissions of greenhouse gases from aviation and marine bunker fuels, working through ICAO and IMO. Information provided by ICAO and IMO on statistical data on bunker fuels sales and emissions will be very valuable as background material when making a decision on allocation, however the decision must be made by the Parties. The choice of option for allocation of emissions is closely connected to how these emissions will be addressed in the future commitments. Hence, it is premature to take a definite stand on which option to choose. SBSTA should continue to consider several different options in parallel although the number of options might be reduced. We will at this point express our preliminary views on the different options.

In our opinion, important criteria in this regard are to select an allocation option which (1) gives an incentive to the Parties to implement measures to reduce the emissions and (2) makes it possible to introduce effective policy instruments. Other criteria for making the choice should be the availability of necessary data, the polluter-pays principle as well as the risk of shifting competition among Parties.

Option 1: The first option is no allocation, as in the current situation. As mentioned above, Norway would not find this option fully appropriate in the longer term.

Option 2: This option is to allocate bunker sales and associated emissions to Parties in proportion to their national emissions. This option will not give individual Parties appropriate incentives to reduce the emissions from international bunker fuels in particular, and as for option 1 we does not find option 2 fully appropriate in the long term.

Option 3: This option constitutes of allocation to Parties according to the country where the bunker fuels is sold. From a statistical point of view, this may be a feasible option, since the Parties in general know these figures. This can also be seen from the document "Methods used to collect data and to estimate and report emissions from international bunker fuels". In this study, 15 Parties provided answers on which of the eight allocation options best fit their country's available data for future reporting of international bunker fuel emissions. More than half of the Parties asked preferred this option, since it was considered as a quite simple method regarding data requirements. This option will also create incentives for Parties to implement measures to reduce emissions. On the other hand, this option does not necessarily ensure that the polluter-pays principle is respected, since the ships in particular may bunker in other countries where no measures are taken. The option may also result in a shift in competition, since it will make it favourable to bunker in countries that are not Parties of the Kyoto Protocol. We see a need to elaborate possible consequences of this option further, including with respect to possible shifts in trading and bunkering patterns.

Option 4: This option is allocation to Parties according to the nationality of the transporting country, the company where the aircraft is registered, or the country of the operator. Today, several companies are owned by more than one country, so this option would be very difficult to use of that reason. For Norway for instance, it would be difficult to calculate the emissions, since we have a large foreign marine fleet, and most of them are sailing under a

foreign flag. For the time being we don't have data on the fuel used in the Norwegian fleet, which are sufficiently accurate to allow a confident estimate of the emissions. In a truly international market, ownership and registration may rapidly shift from one country to another and allocation according to these principles would add elements of instability and unpredictability to the system. Hence, we do not see the need for further consideration of this option at this stage.

Options 5 and 6: These two options involve allocation to Parties according to the country of departure or destination of an aircraft/vessel or passenger/cargo respectively. Alternatively, the emissions related to the journey of an aircraft/vessel or passenger/cargo could be shared by the country of departure and the country of arrival. If we concentrate on the first part of the options, this would not be any better than option 3 in regard to the polluter-pays principle. In addition, from the report from Veritas commented earlier, we see that the data availability in general is poorer. When we consider the second sentence of the options, these alternatives seem to be the best related to the polluter-pays principle. It will not have any unintended effects as to shift of competition as far as we understand, and the intention of giving an incentive to the Party to implement measures to reduce the emissions is quite clear. However, at the moment the data availability is not sufficient, since most Parties do not know all the movements of especially ships, to and from their country, or the destination of all passengers and cargo. Nevertheless, we believe it will be possible to collect this type of information in the future if this option is selected. ICAO and IMO should also be able help the Parties provide the data. Comparing the two options, we think it would be easier to collect data on destinations of aircraft/vessels than for passenger/cargo, hence we think option 5 is more preferable than option 6. We see merit in studying both these options future.

Option 7: In this option emissions are allocated according to the country of origin of passengers or owner of cargo. This would be a very complicated method as to data requirements. We would thus not consider this option as feasible and do not see the need for further consideration at this stage.

Option 8: According to this option all emissions generated in its national space are allocated to the Party. For the same reason as for option 7, as well as for the reason that this option does not coincide with the polluter-pays principle, Norway does not regard this option as feasible. As for option 7 we do not see the need for further consideration of this option at this stage.

### **Consideration of the IPCC Special Report on Aviation and the Global Atmosphere at SBSTA 11**

In Norway's view the IPCC Special Report on Aviation and the Global Atmosphere is an important scientific and technical basis for further work on this issue within the UNFCCC and the Kyoto Protocol. We see the need for SBSTA 11 to focus on policy and procedural issues and seek agreement on a time schedule for the further work within the Convention bodies, aiming at the inclusion of emissions from international bunker fuels in the Kyoto Protocol. One first step could be to define what sort of data and information is needed from the Parties.

**SPECIFIC NORWEGIAN COMMENTS ON THE INFORMAL PAPER  
"METHODS USED TO COLLECT DATA AND TO ESTIMATE AND  
REPORT EMISSIONS FROM INTERNATIONAL BUNKER FUELS"**

- On the top of page 12 it is written "Greenhouse gas emissions from the marine sector comprise: CO<sub>2</sub>, CO, NO<sub>x</sub>, VOC". We would like to point out that the gases CO, NO<sub>x</sub> and VOC are not greenhouse gases, but precursors, and this should be clarified. The two lists with emissions from the marine sector and from aviation are missing the components CH<sub>4</sub>, N<sub>2</sub>O and SO<sub>x</sub>. According to IPCC Guidelines also these gases should be reported for the marine sector and aviation, thus we think it should be included in the lists.
- It says on page 28 that Norway is one of the countries that report on plans to revise the definition on international versus national emissions for the next national communications of greenhouse emissions. We do not have any plans to change these definitions, so we would like to be omitted from the sentence. We reported this by a mistake.
- On page 29 it is written that it is uncertain whether all LTO cycles for international flights are included in the Norwegian definition of international aviation bunker fuels. In our answer on the questionnaire and in additional information provided (National Communication and annual report on emissions inventory reported to FCCC) we have explained that we define international bunker fuel on the basis of the totality of aircraft fuel sold in the country minus fuel used for national aircraft movements from one airport to another in the country. In other words, emissions from all LTO cycles for international flights are included under international bunker fuels, as required according to IPCC Guidelines.
- In the table on page 38 the institutional arrangements for data collection for national communications are listed for the Parties. For Norway, the routines for marine and aviation are the same for the calculation of greenhouse gas emissions and the final reporting in national communications. The two last sentences for marine bunker fuels should hence be included also for aviation. We would also like to change the sentence: "The emission are estimated by SN on behalf of SFT (...)" to "The emissions are estimated by SN in collaboration with SFT (...)".
- In chapter 7.4, Reporting on greenhouse gases other than CO<sub>2</sub>, on page 42 it is stated that only Finland, Germany and New Zealand consider all the gases CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, NO<sub>x</sub>, CO, NMVOC and SO<sub>x</sub> in their national communication. Norway did also report on all these gases in the national communications. However, the question on this in the questionnaire was: "Which greenhouse gases does your country consider to be important in regard to international marine/aircraft emissions?". To this question we answered CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>x</sub> regarding the marine sector and CO<sub>2</sub> and NO<sub>x</sub> regarding aviation. The information on the gases we actually report, which are not the same issue, could be found in the national inventory we provided as additional information. We would like this to be made clear in the report.

- The title of chapter 9.1.2 is “Preferred options by Parties”, and deals with options to allocate emissions originating from international bunker fuels. We find the title of the chapter misleading, since the question in the questionnaire on this was “Of the eight proposed allocation options stated in FCCC/CP/1997/Add.1 Paragraph 27, which best fit your country’s available data for the future reporting of international marine/aviation bunker fuel emissions in National Communications?” In our opinion, it is not made sufficiently clear in the report that the Parties answered to the question on what option they prefer from data-availability reasons, and not from more policy-oriented reasons.
- On page 51 in chapter 9.1.2 it says “Norway considered option 5 and 6 as difficult or inaccurate”. We did explain why in the questionnaire, and we think this explanation is lacking in the text. In our opinion, the text should include more information on why the Parties preferred the different options. We had e.g. included some information as to why we found option 4 difficult to choose from data-availability. In addition, our answer on what allocation would best fit our available data did contain did differ somewhat for marine and aviation bunker fuels, respectively. This is not made clear in the text.

PAPER NO. 6: SWITZERLAND

**EMISSIONS RESULTING FROM INTERNATIONAL BUNKER FUELS**

In response to the invitation to Parties by SBSTA 10 to submit comments on: i) decision 2/CP.3, paragraph 4; ii) the IPCC Special Report on Aviation and the Global Atmosphere; iii) the Secretariats's informal paper "Methods used to collect data and to estimate and report emissions from international bunker fuels", Switzerland presents the following views.

**I. Decision 2/CP.3, paragraph 4**

In our opinion, the fulfilment of some prerequisites - as those mentioned here beneath under section III - is necessary to the implementation of decision 2/CP.3. Basically, there is a need for an improvement of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines), as well as a better reporting on emissions from bunker fuels. These improvements can be achieved taking into account the experience gained through the in-depth review process of the two first national communications of Annex I Parties, existing information in non-Annex I national communications, and ICAO and IMO expertise.

Decision 2./CP3 paragraph 4 states that "SBSTA should elaborate on the inclusion of bunker fuels emissions in the overall greenhouse gas inventories of Parties". We think that here too, the prerequisite is to adopt a decision on the allocation to Parties of the emissions from international bunker fuels. Progress in that area should be made, and we propose that SBSTA continue the consideration of the allocation issue in its programme of work with the view to adopting a decision at COP 6. Furthermore, ICAO and IMO should be invited to provide their data and expertise in this context.

Finally, there is a clear indication that the inclusion of emissions from bunker fuels in the national inventories concerns all Parties.

**II. The IPCC Special Report on Aviation and the Global Atmosphere**

Switzerland welcomes the IPCC Special Report on aviation and recognises that this report provides valuable scientific and technical information for further action, in particular under the Convention.

Among the findings of the report which demonstrate the need for action in the framework of the Climate Convention and the Kyoto Protocol are :

- Aircraft emit gases and particles altering the concentration of atmospheric greenhouse gases, trigger formation of condensation trails and may increase cirrus cloudiness – all of which contribute to climate change.



- At present, the contribution of aviation to aggregate anthropogenic emissions of CO<sub>2</sub> is 2% (2.4% of total fossil fuel emissions). Given the limited period of time in which aircraft have begun to operate at a large scale, this translates to a little more than 1% of the total anthropogenic increase since 100 years or 1 ppmv CO<sub>2</sub> attributable to aviation in the 1992 atmosphere. In the future the contribution of aviation to the total anthropogenic increase of CO<sub>2</sub>-emissions is projected to grow substantially due to strong growth in demand for air transport services.
- Radiative forcing attributable to aviation is 3.5% of the total radiative forcing by all anthropogenic activities.
- Aviation has grown since 1960 at 9% per year, 2.4 times the average GDP growth rate.
- In the next 50 years, assuming unconstrained demand, passenger traffic is projected to continue to grow at rates in excess of GDP.
- One possibility for the future is the development of a fleet of second generation supersonic, high-speed civil transport aircraft. The radiative forcing of supersonic aircraft is estimated to be about a factor of 5 larger than that of the displaced subsonic aircraft in scenarios considered.

We acknowledge that these elements are well documented. They constitute strong evidence that there is a need for action to mitigate emissions and impacts from aviation.

### **Measures to reduce emissions and impacts**

Actions to reduce emissions from aviation should be undertaken at the national and at the international level. The basic approaches are:

- 1) To introduce more stringent regulations on emissions. In this context, we would like to mention the efforts made by the principal Swiss airports, which have introduced a charge, based on the emissions of the aircraft.
- 2) To improve air traffic management at national and international level, in particular to use satellite and meteorological data to better routing, and to reduce holding.
- 3) To use economic instruments to regulate the demand for air transport, i.a., by eliminating tax privileges on aviation fuels.
- 4) To develop and promote alternatives to air transport for short distances.

Introducing more stringent regulations at national and international level will trigger research and development efforts to improve technology, in particular fuel efficiency and alternative fuel options.

As regards air traffic management, we view this as a good example for no regret measures that could be implemented immediately. There is an urgent need to undertake the appropriate steps at national and international level, as e. g. within ICAO, to optimise routing, flight profiles, taxiing and other operational measures.

Economic instruments, among which taxes and emission trade, have a large potential to improve fuel efficiency and influence demand for air transport. Given the widespread

practical experience with such instruments in other sectors, the very cautious position taken in the Special Report is surprising. If the implications of implementing such measures may not be fully foreseeable, in the Swiss view this does not constitute a strong argument to remain inactive in an area that is of major importance for future emission development. Thus, we advocate an approach that puts these instruments to a test and assesses the economic as well as environmental effects. In order to avoid market distortions and internalise external costs, the existing tax privilege for aviation fuels should be eliminated. Aviation fuel taxes, when introduced in a graduated and co-ordinated manner at regional or global level, will allow for the necessary adaptation process in the air transport industry without running undue risks for investments and operations. The efficiency gains of a taxation scheme (or emission trade), together with the incentives they create for the design and use of transport systems, are a promising way to involve this sector of economy in the overall efforts to protect the global climate.

### **Future actions proposed under the Convention**

We think that this COP 5 should adopt a decision on the future work to be undertaken by the SBSTA on the basis of the recommendations of the Special Report. To that aim, we propose that COP 5 invites ICAO to explore the possibility of organising an expert workshop before SBSTA 12 to consider the Special Report. In our view, such a workshop would benefit from the participation of the Convention, IPCC, as well as the Montreal Protocol. The scope of the workshop would be to consider possible actions to reduce the impacts of aviation emissions on climate and the ozone layer.

### **III. Secretariat's informal paper "Methods used to collect data and to estimate and report emissions from international bunker fuels"**

In our view, the Secretariat's informal paper is very useful in giving an overview of the situation as regards emissions from international bunker fuels in Annex I Parties and points out some issues that need further consideration by SBSTA. Among these issues and remedies, we see :

- for a number of Annex I Parties, improving the national arrangement to collect data on bunker fuels
- improving consistency between IPCC and ICAO definitions of bunker fuels for the aviation sector
- better consideration of marine bunker fuels in the IPCC Guidelines
- improving consistency in the reporting of the national and international shares of bunker fuels
- increased transparency in the use of national methodologies differing from those of the IPCC Guidelines
- improving the reporting on precursors (NO<sub>x</sub>, CO and NMVOC)
- strengthening the collaboration with ICAO and IMO, in particular as regards emissions data.

PAPER NO. 7: UNITED STATES OF AMERICA

**METHODOLOGICAL ISSUES EMISSIONS RESULTING FROM FUEL USED  
FOR INTERNATIONAL TRANSPORTATION**

**DRAFT REPORT: *METHODS USED TO COLLECT DATA AND TO ESTIMATE AND  
REPORT EMISSIONS FROM INTERNATIONAL BUNKER FUELS***

**and**

**CONTINUING WORK UNDER DECISION 2/CP.3**

**and**

**THE IPCC *SPECIAL REPORT ON AVIATION AND THE GLOBAL ATMOSPHERE***

**FCCC/SBSTA/1999/L.8/Paragraphs 3(b) and 6 (as adopted)**

The United States wishes to thank the Secretariat for the opportunity to submit our views on the informal paper, Draft Report: *Methods Used to Collect Data and to Estimate and Report Emissions from International Bunker Fuels*; on continuing work under Decision 2/CP.3; and on the IPCC *Special Report on Aviation and the Global Atmosphere* for consideration by the Parties at the eleventh session. The United States believes the issues raised in these two documents and the implementation of Decision 2/CP.3 are critical to making progress on limitation or reduction of emissions of greenhouse gases from aviation and marine bunker fuels<sup>1</sup> by working through the International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO), respectively, as called for in Article 2.2 of the Kyoto Protocol. We offer the following comments on the two documents and on the process for moving forward under Decision 2/CP.3.

**I. U.S. COMMENTS ON THE DRAFT REPORT: *Methods used to Collect Data and to Estimate and Report Emissions from International Bunker Fuels***

In general, this draft report provides useful data and analyses to support the proposition that Annex I Parties need to improve the accuracy, consistency, and comparability of their reporting of emissions from international bunker fuels. It effectively highlights the numerous inaccuracies and inconsistencies in reporting by Parties, as well as deficiencies in reporting methodologies, many of which are being addressed in SBSTA and in the good inventory practices workshops efforts. However, the report goes well beyond its mandate and errs significantly when it begins to discuss policy options to reduce emissions, when it provides its own interpretations of the relative importance of different components of emissions from the aviation and marine sectors, and when it attempts to interpret the intentions of the Parties expressed in the Kyoto Protocol and related decisions with regard to allocation of bunker fuel emissions. In part this last error stems from the failure of the report to distinguish between allocation for the purposes of reporting, on the one hand, and allocation for the purposes of compliance with the Kyoto targets on the other. For the purposes of reporting, bunker fuels are currently allocated to Parties based upon the country

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<sup>1</sup> In our comments, to maintain consistency with Article 2.2 of the Kyoto Protocol and Decision 2/CP.3, we will use the term "bunker fuel" to refer only to fuel sold to ships or aircraft engaged in international transport.

where the fuel is sold, but Parties report these emissions separately from national totals in their overall greenhouse gas inventories. With regard to allocation for compliance with targets, the Parties settled this issue in the Kyoto Protocol by their decision not to allocate to national totals, but instead to pursue limitations or reductions of bunker fuels through ICAO and IMO.

We strongly urge the deletion of all sections of the report that go beyond a discussion of methodological issues related to reporting and into policy areas, including allocation.

Specific comments follow:

**1.1 Data and Definitions:** Because of the timing of this report, the DNV authors could not reference the improvements made to the revised guidelines for the preparation of national communications by Annex I Parties at SBSTA 10. We believe that the work done at SBSTA 10, including the adoption of a common reporting format, and the work that is planned for SBSTA 11, could contribute to addressing the problems identified in this report. We recommend the authors review the results of SBSTA 10 and update the report to reflect these actions. In addition, the results from the recent IPCC workshops on good inventory practices included sessions on aviation and maritime emissions and should provide further guidance for improving the reporting from these sectors. The report should take note of these efforts that are already well underway.

Although it is stated that the “differences between the IPCC definitions and those of the ICAO seem to generate some confusion,” the report later suggests that the problem is much broader.

**1.3 Procedures and Arrangements:** Although it is stated that the lack of consistency does not seem to be linked to institutional arrangements, there appears to be considerable opportunity for improved communications among agencies traditionally responsible for emissions from aviation and those directly responsible for climate change and inventory reporting. This point is reinforced in the text at 2.3.2.

**1.4 Priority Given to GHGs Other Than Carbon Dioxide:** The report should avoid making judgments about which gases are important and which are not from a climate change perspective. It should simply state the conclusions from the recent IPCC report (as it does much later in the draft) and also note the widely varying degrees of scientific uncertainty that the report cites for the specific compounds. For example, methane and nitrous oxide (N<sub>2</sub>O) from aircraft engines are not expected to contribute significantly to the global budget of these species.

**2.3 Approach:** Appendices A and B were not included in the draft being reviewed.

**2.4.2 Aviation Sector:** The report notes that the "different types of aircraft of the world in operation are of a limited number," but it is misleading to state that their "emission characteristics are well documented." ICAO maintains a database of LTO certification data, but this has little relevance to cruise operation where most fuel is expended. And aircraft fuel consumption characteristics, for example, are generally considered to be proprietary information by manufacturers.

**2.4 International Bunker Fuels:** Subsection 2.4.2 correctly notes that the aviation sector is comprised of civil aviation and military aviation, and that civil aviation is by far the largest source of aviation bunker fuel emissions. The same observations could and should be made of the maritime sector in Subsection 2.4.1.

**3. Estimating National GHG Inventories:** It would be useful to give readers some idea of the relative contribution of each type of emissions from this sector in order to have a better idea of their relative significance.

**3.2.1 Emission Components:** Water vapor (H<sub>2</sub>O) should be added to the group of emissions (i.e., SO<sub>x</sub> and CO<sub>2</sub>) for which "few factors" are important. "Obtaining sufficient quality data" should not be a "considerable challenge" for CO<sub>2</sub>, which is currently the only important aviation engine exhaust constituent included in the Kyoto Protocol. It is directly proportional to fuel consumption.

**3.2.3.1 GHG from Aviation Fuels:** The definition of greenhouse gas used here is rather loose. The list includes gases that are formally precursors for true greenhouse gases. NO<sub>x</sub> especially is primarily a precursor for ozone, O<sub>3</sub>. However, if the loose definition is accepted, then SO<sub>x</sub> and soot should possibly be added to this list.

Later in this section, it is noted that "NO<sub>x</sub> and CO<sub>2</sub>, both considered main contributors to the greenhouse effect from air traffic, have roughly the same indirect potential." This is misleading because CO<sub>2</sub> directly affects radiative forcing, while the NO<sub>x</sub> effect is indirect through O<sub>3</sub>.

**3.3 IPCC Guidelines and 3.5 Estimating Emissions:** These sections give the wrong impression that using the more detailed Tier 2 methodology could give more accurate answers. In fact, data on number of flights, LTO, and cruise activity could well be inaccurate (e.g., leave out charters, assume perfect routes and no delays, etc.) and may be substantially less accurate than emissions calculated on estimated fuel production -- particularly for CO<sub>2</sub> emissions.

**Table 4.4:** As noted above, not all of the referenced constituents are truly greenhouse gases.

**5.1.4 International Marine/Aviation Bunker Fuels:** Responses to the questionnaire certainly raise questions about methodologies and definitions. For example, Canada's apparent definition of international bunkers for aviation being "fuels sold to foreign registered

planes" is very strange. By extension, with that definition, all Air Canada operations, no matter where in the world they might occur, would be classified as domestic.

**7.2 GHG and Precursors:** The statement that "NO depletes ozone, while NO<sub>2</sub> does not" is misleading. In the "1995 Scientific Assessment of the Atmospheric Effects of Stratospheric Aircraft" (NASA Reference Publication 1381, November 1995), it is reported that "NO<sub>x</sub> catalytically destroys stratospheric ozone," where NO<sub>x</sub> = NO + NO<sub>2</sub>. It is important to note that NO is the primary NO<sub>x</sub> constituent in aircraft exhaust, but is quickly converted to NO<sub>2</sub> through reactions with O<sub>3</sub> in the jet plume. This matter is of no consequence for this report on bunker fuels, but does show a tendency of the contractor to wander into areas where expertise is lacking.

In drawing from the recent IPCC report, this section should also reflect the degree of uncertainty about the impact on climate of the various types of emissions from aviation.

**7.2.1 Initiatives on the Reduction of Greenhouse Gases from Aviation:** This section on policy options to reduce emissions has no bearing on the purpose or main substance of this report. It includes highly provocative recommendations such as "focus might be turned towards improving the utilisation of scheduled flights and imposing measures penalizing operators allowing partly empty planes to operate." Such views are generally associated with policy, are not in any way supported by the data contained in the report, and should not be included in a technical report on reporting methodologies. This section should be deleted.

**8.2 ICAO:** It should be noted that the referenced ICAO standards are only for operation below 900 meters altitude, i.e., the landing-takeoff (LTO) cycle. Thus, data on emissions under 900 meters are of limited value to discussions of greenhouse gases.

**8.4 International Energy Agency -- Statistics and Methodology:** The third paragraph of this subsection states that the IEA approach differs because "military marine fuel is attended to differently." However, Table 8.4.1 shows the opposite -- military marine emissions reporting is consistent with the IPCC guidelines, while military aviation is inconsistent. The Table shows that IEA correctly categorizes "fuel use of national warships on international trips" in the category of "International Marine bunkers." However, the same chart shows that the IEA would incorrectly include "fuel use of national warplanes on ... international trips" within "Domestic Aviation." While we cannot say whether or not the authors have correctly analyzed the IEA methodologies, we can say that the IPCC guidelines for reporting international bunkers include military aviation and military marine components.

This same subsection also states that "fuel for military purposes are often confidential and hence difficult to estimate." The U.S. disagrees with this categorical characterization. While we understand that detailed activity data on military fuel use may contain confidential information, we believe that confidentiality concerns can routinely be overcome by appropriately aggregating military data at the national level. The U.S. has not raised confidentiality concerns with regard to reporting military emissions data under the current reporting guidelines or those proposed at SBSTA10. Indeed, the U.S. strongly supports the

adoption of the new common reporting format, which includes reporting emissions associated with multilateral operations in addition to bunker fuels.

**9.1.3 Allocation Options and Control:** This section is largely based on the views of the consultant, contains many unsubstantiated statements and should be dropped. For example, it is not appropriate for the author of this report to recommend that the "potential of reducing GHG emissions from the aviation industry might therefore be to implement measures forcing the industry to improve logistics in order to avoid flying empty or partially empty aircraft." All of chapter 9 should be deleted.

## II. U.S. VIEWS ON CONTINUING WORK UNDER DECISION 2/CP.3

Decision 2/CP.3, paragraph 4, in its final clause urges SBSTA to further elaborate on the inclusion of bunker fuel emissions in the "overall greenhouse gas inventories" of Parties. We view the call upon SBSTA to "further elaborate" on the inclusion of bunker fuel emissions to be most logically interpreted as a call for accuracy in the separate reporting of bunker fuel emissions. Indeed, this concern about accuracy is well placed, because at its Tenth Session, SBSTA received evidence of the need to be concerned about inconsistencies in the present reporting practices of countries. Many of these concerns are also raised by the informal paper from Det Norske Veritas, which we have already addressed in the first section of these comments. However, it is appropriate to note here that the on-going work by the IPCC inventory program to identify good practices in inventory compilation and preparation will also improve the consistency, reliability, and transparency of reporting for international bunker fuels. Many of the deficiencies identified by the informal paper were specifically addressed by the aviation and marine breakout sessions of the IPCC's Good Practice Workshop on Energy, Transportation and Fugitive Emissions in March 1999.

While we recognize that others may have different interpretations of Dec 2/CP. 3, we believe that a clear path forward exists to producing the shared goal of meaningful and timely reductions in emissions from the aviation and marine sectors. Parties reiterated at SBSTA 10 that international bunker fuel emissions were not to be included in the national totals in the first budget period, but that actions to limit or reduce these emissions during this period was to occur through IMO and ICAO under Article 2.2 of the protocol. Both IMO and ICAO have taken up this task of developing programs to reduce or limit emissions and appear to be working towards a goal of concrete proposals for action.

Accordingly, we do not see the benefits, and we see some potential for harm, in focusing on this issue in the near-term. It makes sense, at a minimum, to wait and see how ICAO and IMO develop and implement their action plans. If SBSTA were to take back up the issue of allocation before ICAO and IMO had proposed policy actions, it would in effect "be putting the cart before the horse." What, if anything, we decide to do further on allocation for the second budget period can best be judged in light of the actions proposed by these organizations. Parties will have critical information on ICAO/IMO policies not yet available and more than adequate time to analyze options and modify reporting regimes as part of the negotiations for the 2<sup>nd</sup> budget period.

Finally, we would add that in addition to the work at IMO and ICAO on limiting emissions, we believe that the Parties' current priorities should include additional work on improving the reporting of data from these sectors as part of national inventories. This issue was highlighted as a shortcoming at SBSTA 10 and needs to be improved in the near-term for transparency and to serve as a basis for determining the effectiveness of future actions by ICAO and IMO. It needs to be done now notwithstanding any future decisions that may or may not be taken on allocation in the second budget period.

### **III. U.S. VIEWS ON IPCC *SPECIAL REPORT ON AVIATION***

We would like to express our appreciation to the IPCC and to the hundreds of experts from governments, academia, industry and the environmental community who participated in the drafting and review of this excellent and timely report on "Aviation and the Global Atmosphere." We also believe that ICAO should be commended for its foresight in 1996 when it requested the preparation of the report.

The report provides a clear view of our current understanding of the contribution from the aviation sector to climate change. It highlights the projected strong growth in demand and fuel use by this sector over the next several decades, but also the large uncertainties associated with longer term scenarios. It describes the unique characteristics of some types of emissions from aviation because they occur at altitude. It also summarizes what we know and what remains uncertain about the characteristics of these emissions and their impacts on climate.

As one of the primary audiences for this report, governments must be responsive to the information provided in setting future policy. In this respect, the report underscores the need for ICAO to provide leadership in moving forward in a timely manner to develop ways to reduce or limit greenhouse gas emissions from the aviation sector. The report describes a number of mitigation options, including the use of emissions trading, which are now under consideration within ICAO working groups. We urge ICAO to press forward in their review of these options leading to decisions that could be taken by the 33<sup>rd</sup> Assembly in 2001. We also urge support of ICAO in its efforts while the Parties focus on other sectors that are less precisely addressed under the Kyoto Protocol.

Finally, the IPCC report reinforces the importance of the role ICAO plays in regulating and standardizing the aviation sector. Article 2.2 in the Kyoto Protocol was adopted because of the uniquely international nature of the aviation (and marine) sector. We urge Parties to continue and enhance their support for working through ICAO in crafting an effective response to the findings in the IPCC report.



PAPER NO. 8: INTERNATIONAL CIVIL AVIATION ORGANIZATION  
**ICAO SECRETARIAT COMMENTS ON DRAFT REPORT PREPARED  
BY DET NORSKE VERITAS DATED 12 MAY 1999**

**A. COMMENTS CONCERNING ICAO DATA**

**Chapter 1.5**

2. The fifth paragraph, which summarises ICAO data, needs to be revised in the light of the detailed comments on Chapter 8. Suggested revision:

“ICAO can estimate fuel consumption figures individually for each scheduled flight. Assuming that the profile of flight categories, national (domestic) or international, of each flight can be defined, estimates of national and international fuel consumption could be developed. Using the present IPCC emission factors (or updated ones), fuel consumption could in turn be developed into emission inventories. Note that this would not cover non-scheduled operations, civil aviation of a non-commercial nature, or military aviation. There may also be confidentiality considerations to take into account.”

**Chapter 3.2.3.1**

2. Regarding the fuel consumption estimates provided in the final paragraph:
  - a) more up-to date figures are available in the recently published IPCC Special Report (Chapter 9);
  - b) the quoted figure of 138 Mt from Balashov and Smith (ICAO Secretariat) relates to world civil aviation (domestic plus international) and not, as the draft states, to international only;
  - c) in the Reference section, the title of the B&S article should read “ICAO analyses trends in fuel consumption by world’s airlines” and the date shown should either be 1990 (the year of the data) or August 1992 (when the article was published in the ICAO Journal).

**Chapter 5.1.1, page 22**

3. Line 2: Reference is incorrect.
4. First italicised paragraph: Add “International - ” before “A flight stage...”
5. Second italicised paragraph: Add “Domestic - ” before “A flight stage...” and move final quotation mark to the end of the next paragraph.
6. The next paragraph is part of the ICAO definition and should therefore be italicised. It should commence “Note: In the case...”.

7. Following paragraph, line 5: Replace “do” by “does”.

## **Chapter 8**

8. Line 3: Replace “Organisation” by “Organization”.

### **Chapter 8.2**

9. Title: See item 8 above.
10. Line 1: Replace “the specialist” by “a specialized” and add “first” before “introduced”.
11. Line 3: Replace “criteria’s” by “criteria” and replace “and HC” by “, unburned hydrocarbons and soot”.
12. Line 5: Replace “supplies” by “makes”.
13. Line 9: Add “These activities primarily cover the commercial sector of civil aviation as described in Chapter 2.4.2”.

#### **Chapter 8.2.1**

14. Line 6: Replace “tonnes-kilometres” by “tonne-kilometres” (or by “tonne-kms” for consistency in this sentence).

#### **Chapter 8.2.2**

15. Line 1: Add at beginning of sentence, “In addition to its Statistics Programme, ICAO...”, in order to distinguish this exercise from the more formal Statistics Programme.
16. Line 2: Replace “was presented” by “is usually published annually”.
17. Line 8: Delete “(as defined by ICAO)”, because the data is in a format that allows for any definition to be used.
18. Line 12: The expression “high quality” seems overstated. Suggest replacing “data of high quality” by “useful data”.
19. Lines 15/16: While the final phrase accurately reflects what was provided by ICAO to DNV, we are concerned that the bracketed text is potentially misleading. We would therefore request its omission and an amendment to the last sentence to read “...and there may be some underestimation of fuel consumption.”

20. End of 8.2.2: The information provided by ICAO to DNV briefly referred to the confidential nature of some of this data, but this is not mentioned in the draft. Since we believe that the confidentiality aspect could be significant if this data were to be used, we would suggest adding a warning along the following lines:

“Some of the fuel-related data used in this study has been provided by industry sources confidentially on the understanding that it is for use by the ICAO Secretariat in these annual studies. Any wider use of this data would probably require the agreement of the sources concerned.”

#### **Chapter 8.2.4**

21. Line 1: Since the study described in 8.2.2 is not part of the ICAO Statistics Programme, the first sentence needs to be amended. Suggested replacement text: “In chapter 8.2.2, ICAO’s cost studies are briefly discussed.”
22. Line 2: Replace “determine” by “estimate”.
23. Line 3: Replace “airliner” by “airline”.
24. Line 4: See item 17 above.

### **B. OTHER COMMENTS**

#### **Chapter 1.4**

25. Line 8: The statement “The effect of emissions from aviation is largely dependent upon flight altitude” is true for some emissions, but not for others (such as carbon dioxide).
26. Given that the effect of some emissions is dependent on altitude, does this have implications for the type of data that needs to be collected, estimated and reported? This question does not appear to be addressed in the draft.

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