



International Civil Aviation Organization

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EX/7  
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## WORKING PAPER

### ASSEMBLY — 36TH SESSION

#### EXECUTIVE COMMITTEE

#### Agenda Item 17: Environmental protection

#### CONSOLIDATED STATEMENT OF CONTINUING ICAO POLICIES AND PRACTICES RELATED TO ENVIRONMENTAL PROTECTION (APPENDICES B THROUGH G)

(Presented by the Council of ICAO)

#### EXECUTIVE SUMMARY

As required by Assembly Resolution A35-5, the Council submits in this paper a draft consolidated statement of continuing ICAO policies and practices related to environmental protection. This is based on Assembly Resolution A35-5, Appendices B through G, with revisions in the light of developments since the 35th Session of the Assembly. The revisions arise from the seventh meeting of the Committee on Aviation Environmental Protection (CAEP/7), developments through cooperation with other UN bodies and scientific findings from the Intergovernmental Panel on Climate Change (IPCC). Proposals for the revision of Assembly Resolution A35-5, Appendices A, H and I, are presented in a separate working paper.

**Action:** The Assembly is invited to review, amend as required, and adopt the revised Appendices B through G of the Assembly Resolution on the consolidated statement of continuing ICAO policies and practices related to environmental protection presented in the Appendix.

<i>Strategic Objectives:</i>	This working paper relates to Strategic Objective C.
<i>Financial implications:</i>	Additional resources might be required in light of the level of Secretariat support needed for CAEP activities.
<i>References:</i>	A36-WP/34, <i>Developments in ICAO related to civil aviation and the environment</i> Doc 9848, <i>Assembly Resolutions in Force</i> (as of 8 October 2004)

## 1. INTRODUCTION

1.1 At its 35th Session, the ICAO Assembly adopted Resolution A35-5 entitled “Consolidated statement of continuing ICAO policies and practices related to environmental protection”.

1.2 In accordance with Resolving Clause 2 of this Assembly Resolution, the Council is submitting to the Assembly, for its review, a new consolidated statement of continuing ICAO policies and practices related to environmental protection (see Appendix). The draft statement appended hereto is based on Assembly Resolution A35-5, with revisions in the light of developments since the 35th Session, which are summarized in a separate Assembly working paper (A36-WP/34, *Developments in ICAO related to civil aviation and the environment*).

## 2. AMENDMENTS TO THE EXISTING CONSOLIDATED STATEMENT

2.1 Assembly Resolution A35-5 incorporates nine Appendices (identified as A through I) constituting the consolidated statement. The revisions arise primarily from the results of the seventh meeting of the Committee on Aviation Environmental Protection (CAEP/7, Montreal, from 6 to 15 February 2007), developments arising from the cooperation with other UN bodies, in particular with the United Nations Framework Convention on Climate Change (UNFCCC), and scientific findings from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (4AR) – *Climate Change 2007*.

2.2 The Appendix to this working paper presents the revision of Assembly Resolution A35-5, Appendices B through G. The revision of Appendices A, H and I, is the subject of a separate working paper.

## 3. FINANCIAL IMPACT OF THE PROPOSED ACTION

3.1 Some of the proposed amendments to Assembly Resolution A35-5 will lead to new work for both CAEP and the Secretariat. The work involved for the Secretariat is expected to be undertaken within the resources available under the draft Budget 2008-2010. However, the extent to which the Secretariat would be called upon to contribute to the CAEP studies is difficult to determine at present and additional resources might be required.

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## APPENDIX

### DRAFT RESOLUTION FOR ADOPTION BY THE 36TH SESSION OF THE ASSEMBLY

#### **Resolution 17/1: Consolidated statement of continuing ICAO policies and practices related to environmental protection**

*Whereas* in Resolution A35-5 the Assembly resolved to continue to adopt at each ordinary Session a consolidated statement of continuing ICAO policies and practices related to environmental protection;

*Whereas* Resolution A35-5 consists of an introductory text and a number of Appendices concerning specific but interrelated subjects; and

*Considering* the need to reflect developments that have taken place since the 35th Session of the Assembly in the field of aircraft noise and engine emissions, including new ICAO guidance material on market-based measures to limit or reduce emissions from aviation.

*The Assembly:*

1. *Resolves* that the Appendices attached to this Resolution and listed below constitute the consolidated statement of continuing ICAO policies and practices related to environmental protection, as these policies exist at the close of the 36th Session of the Assembly:

Appendix A — General

Appendix B — Development of Standards, Recommended Practices and Procedures and/or guidance material relating to the quality of the environment

Appendix C — Policies and programmes based on a “balanced approach” to aircraft noise management

Appendix D — Phase-out of subsonic jet aircraft which exceed the noise levels in Volume I of Annex 16

Appendix E — Local noise-related operating restrictions at airports

Appendix F — Land-use planning and management

Appendix G — Supersonic aircraft — The problem of sonic boom

Appendix H — Environmental impact of civil aviation on the atmosphere

Appendix I — Aviation emission policies and programmes — Local air quality and global climate.

2. Requests the Council to submit at each ordinary session of the Assembly for review a consolidated statement of continuing ICAO policies and practices related to environmental protection; and

3. Declares that this resolution supersedes Resolution A35-5.

#### **APPENDIX A**

The revised text of Appendix A is presented in a separate working paper.

#### **APPENDIX B**

##### **Development of Standards, Recommended Practices and Procedures and/or guidance material relating to the quality of the environment**

*Whereas* the problem of aircraft noise in the vicinity of many of the world's airports, which continues to arouse public concern and limit airport infrastructure development, requires appropriate action;

*Whereas* the Council has adopted Annex 16, Volume I — *Aircraft Noise*, which comprises noise certification standards for subsonic aircraft (except Short Take Off and Landing /Vertical Take Off and Landing) and has notified Contracting States of this action;

*Recognizing* noise and Local Air Quality -related charges are in use at some airports and ICAO policy guidance exists on this subject (*ICAO's Policies on Charges for Airports and Air Navigation Services*, Doc 9082);

*Whereas* aircraft engine emissions have an environmental impact at both the local and global levels which, while not fully understood, is a cause of concern;

*Whereas* the Council has adopted Annex 16, Volume II — *Aircraft Engine Emissions*, which comprises emissions certification standards for new aircraft engines and has notified States of this action;

*Whereas* the Council has established a Committee on Aviation Environmental Protection (CAEP) for the purpose of assisting in the further development of Standards, Recommended Practices and Procedures and/or guidance material on aircraft noise and aircraft engine emissions; and

*Noting* Resolution A35-14 (Appendix Q), drawing the attention of aircraft manufacturers and operators to the need for future generations of aircraft to be designed so that they are capable of being operated efficiently, and with the least possible environmental disturbance, from aerodromes used for the operation of present-day jet aircraft;

*The Assembly:*

1. *Welcomes* the adoption by the Council in June 2001 of the new, more stringent aircraft noise standard in Annex 16, Volume I, Chapter 4 and the new, more stringent standards for emissions of oxides of nitrogen to be implemented on 1 January 2008;

2. *Requests* the Council, with the assistance and cooperation of other bodies of the Organization and of other international organizations, to continue with vigour the work related to the development of Standards, Recommended Practices and Procedures and/or guidance material dealing with the impact of aviation on the environment;

3. *Welcomes* the adoption by the Council in March 2007 of the medium- and long-term technology goals for Nitrogen Oxides (NO<sub>x</sub>);

4. *Requests* the Council, with the assistance and cooperation of other bodies of the Organization and of other international organizations, to establish medium and long term technology and operational goals related to noise and fuel burn, in addition to the recent development of NO<sub>x</sub> goals;

5. *Requests* the Council to ensure that its Committee on Aviation Environmental Protection (CAEP) pursues its work programme in the noise and emissions fields expeditiously in order that appropriate solutions can be developed as quickly as possible, and that the necessary resources are made available to do so;

6 *Urges* Contracting States from regions of the world that are currently under-represented in CAEP to participate in the Committee's work;

7. *Requests* the Council to provide States and International Organizations information on available measures to reduce the impact of aviation operations on the environment so that action can be taken using the appropriate measures;

8. *Urges* Contracting States to follow, where appropriate, the ICAO provisions developed pursuant to Clause 2 of this Appendix; and

9. *Requests* the Council to continue the work on developing and employing scenarios for assessing the future environmental impact of aviation emissions and to cooperate with the IPCC in this area.

## APPENDIX C

### **Policies and programmes based on a “balanced approach” to aircraft noise management**

*Whereas* a goal of ICAO is to promote the highest practicable degree of consistency in international civil aviation, including environmental regulations;

*Whereas* the uncoordinated development of national and regional policies and programmes for the alleviation of aircraft noise could hinder the role of civil aviation in economic development;

*Whereas* the severity of the aircraft noise problem at many airports has given rise to measures which limit aircraft operations and has provoked vigorous opposition to the expansion of existing airports or construction of new airports;

*Whereas* ICAO has accepted full responsibility for pursuing a course aimed at achieving maximum compatibility between the safe, economically effective and orderly development of civil aviation and the quality of the environment, and is actively pursuing the concept of a “balanced approach” for the reduction of aircraft noise and guidance on how States might apply such an approach;

*Whereas* the balanced approach to noise management developed by ICAO consists of identifying the noise problem at an airport and then analysing the various measures available to reduce noise through the exploration of four principal elements, namely reduction at source, land-use planning and management, noise abatement operational procedures and operating restrictions, with the goal of addressing the noise problem in the most cost-effective manner;

*Whereas* the assessment of present and future impact of aviation noise is an essential tool for the development of policy by ICAO and its Contracting States;

*Whereas* the process for implementation and decisions between elements of the balanced approach is for Contracting States and it is ultimately the responsibility of individual States to develop appropriate solutions to the noise problems at their airports, with due regard to ICAO rules and policies;

*Whereas*, the ICAO guidance developed to assist States in implementing the balanced approach (*Guidance on the Balanced Approach to Aircraft Noise Management* (Doc 9829)) has been subsequently updated;

*Recognizing* that solutions to noise problems need to be tailored to the specific characteristics of the airport concerned, which calls for an airport-by-airport approach, and that similar solutions could be applied if similar noise problems are identified at airports;

*Recognizing* that measures to address noise may have significant cost implications for operators and other stakeholders, particularly those from developing countries;

*Recognizing* that States have relevant legal obligations, existing agreements, current laws and established policies which may influence their implementation of the ICAO “balanced approach”;

*Recognizing* that some States may also have wider policies on noise management; and

*Considering* that the improvements in the noise climate achieved at many airports through the replacement of Chapter 2 compliant aircraft (aircraft which comply with the noise certification standards in Volume I, Chapter 2 of Annex 16 but which exceed the noise levels in Volume I, Chapter 3 of Annex 16) by quieter aircraft should be safeguarded by taking account of the sustainability of future growth and should not be eroded by incompatible urban encroachment around airports;

*The Assembly:*

1. *Calls upon* all ICAO Contracting States and international organizations to recognize the leading role of ICAO *in dealing with the problems of aircraft noise*;

2. *Urges States to:*

- a) adopt a balanced approach to noise management, taking full account of ICAO guidance (Doc 9829), relevant legal obligations, existing agreements, current laws and established policies, when addressing noise problems at their international airports;
- b) institute or oversee a transparent process when considering measures to alleviate noise, including:

- 1) assessment of the noise problem at the airport concerned based on objective, measurable criteria and other relevant factors;
- 2) evaluation of the likely costs and benefits of the various measures available and, based on that evaluation, selection of measures with the goal to achieve maximum environmental benefit most cost-effectively; and
- 3) provision for dissemination of the evaluation results, for consultation with stakeholders and for dispute resolution;

3. *Encourages* States to:

- a) promote and support studies, research and technology programmes aimed at reducing noise at source or by other means;
- b) apply land-use planning and management policies to limit the encroachment of incompatible development into noise-sensitive areas and mitigation measures for areas affected by noise, consistent with Appendix F to this Resolution;
- c) apply noise abatement operational procedures, to the extent possible without affecting safety and taking into account the possible impact of such restrictions at other airports; and
- d) not apply operating restrictions as a first resort but only after consideration of the benefits to be gained from other elements of the balanced approach and in a manner which is consistent with Appendix E to this Resolution;

4. *Requests* States to:

- a) work closely together to ensure the harmonization of programmes, plans and policies to the extent possible;
- b) ensure that the application of any measures to alleviate noise are consistent with the non-discrimination principle in Article 15 of the Chicago Convention; and
- c) take into consideration the particular economic conditions of developing countries;

5. *Invites* States to keep the Council informed of their policies and programmes to alleviate the problem of aircraft noise in international civil aviation;

6. *Requests* the Council to:

- a) assess continuously the evolution of the impact of aircraft noise;
- b) ensure that the guidance on the balanced approach in Doc 9829 is current and responsive to the requirements of States; and
- c) promote the use of the balanced approach, for example through workshops; and

7. *Calls upon* States to provide appropriate support for this work on ICAO guidance and any additional work on methodologies, and for the assessment of the impact or effectiveness of measures under the balanced approach as necessary.

## APPENDIX D

### Phase-out of subsonic jet aircraft which exceed the noise levels in Volume I of Annex 16

*Whereas* certification standards for subsonic jet aircraft noise levels are specified in Volume I of Annex 16;

*Whereas* for the purpose of this Appendix, a phase-out is defined as withdrawal of a noise-based category of aircraft from international operations at all airports in one or more States;

*Whereas* the Committee on Aviation Environmental Protection has concluded that a general phase-out of Chapter 3 aircraft operations by all the countries which imposed a phase-out on operations of Chapter 2 aircraft is not supported on cost-benefit grounds;

*Whereas* some States have implemented or initiated phase-outs of aircraft which exceed the noise levels in Volume I, Chapter 3 of Annex 16, or are considering so doing;

*Recognizing* that the noise standards in Annex 16 are not intended to introduce operating restrictions on aircraft;

*Recognizing* that operating restrictions on existing aircraft may increase the costs of airlines and could impose a heavy economic burden, particularly on aircraft operators which may not have the financial resources to re-equip their fleets, such as those from developing countries; and

*Considering* that resolution of problems due to aircraft noise must be based on the mutual recognition of the difficulties encountered by States and a balance among their different concerns;

*The Assembly:*

1. *Urges* States not to introduce any phase-outs of aircraft which exceed the noise levels in Volume I, Chapter 3 of Annex 16 before considering:

- a) whether the normal attrition of existing fleets of such aircraft will provide the necessary protection of noise climates around their airports;
- b) whether the necessary protection can be achieved by regulations preventing their operators from adding such aircraft to their fleets through either purchase, or lease/charter/interchange, or alternatively by incentives to accelerate fleet modernization;
- c) whether the necessary protection can be achieved through restrictions limited to airports and runways the use of which has been identified and declared by them as generating noise problems and limited to time periods when greater noise disturbance is caused; and
- d) the implications of any restrictions for other States concerned, consulting these States and giving them reasonable notice of intention;



2. *Urges* States which, despite the considerations in Resolving Clause 1 above, decide to phase out aircraft which comply with the noise certification standards in Volume I, Chapter 2 of Annex 16 but which exceed the noise levels in Volume I, Chapter 3 of Annex 16:

- a) to frame any restrictions so that Chapter 2 compliant aircraft of an individual operator which are presently operating to their territories may be withdrawn from these operations gradually over a period of not less than 7 years;
- b) not to restrict before the end of the above period the operations of any aircraft less than 25 years after the date of issue of its first individual certificate of airworthiness;
- c) not to restrict before the end of the period the operations of any presently existing wide-body aircraft or of any fitted with engines that have a by-pass ratio higher than 2 to 1; and
- d) to inform ICAO, as well as the other States concerned, of all restrictions imposed;

3. *Strongly encourages* States to continue to cooperate bilaterally, regionally and inter-regionally with a view to:

- a) alleviating the noise burden on communities around airports without imposing severe economic hardship on aircraft operators; and
- b) taking into account the problems of operators of developing countries with regard to Chapter 2 aircraft presently on their register, where they cannot be replaced before the end of the phase-out period, provided that there is proof of a purchase order or leasing contract placed for a replacement Chapter 3 compliant aircraft and the first date of delivery of the aircraft has been accepted;

4. *Urges* States not to introduce measures to phase out aircraft which comply, through original certification or recertification, with the noise certification standards in Volume I, Chapters 3 or 4 of Annex 16;

5. *Urges* States not to impose any operating restrictions on Chapter 3 compliant aircraft, except as part of the balanced approach to noise management developed by ICAO and in accordance with Appendices C and E to this Resolution; and

6. *Urges* States to assist aircraft operators in their efforts to accelerate fleet modernization and thereby prevent obstacles and permit all States to have access to lease or purchase aircraft compliant with Chapter 3, including the provision of multilateral technical assistance where appropriate.

## APPENDIX E

### Local noise-related operating restrictions at airports

*Whereas* certification standards for subsonic jet aircraft noise are specified in Volume I of Annex 16;

*Whereas* for the purposes of this Appendix an operating restriction is defined as any noise-related action that limits or reduces an aircraft's access to an airport;

*Whereas* Appendix C to this Resolution calls for States to adopt a balanced approach to noise management when addressing noise problems at their international airports;

*Whereas* the scope for further reductions in noise at source is limited in that past improvements in noise reduction technology are being gradually assimilated into the fleet but no significant breakthroughs in technology are anticipated in the foreseeable future;

*Whereas* at many airports, land-use planning and management and noise abatement operational procedures are already being used and other noise mitigation measures are in place, although urban encroachment continues in certain cases;

*Whereas* implementation of the phase-out of aircraft which comply with the noise certification standards in Volume I, Chapter 2 of Annex 16 but which exceed the noise levels in Volume I, Chapter 3 of Annex 16 (as provided for in Appendix D to this Resolution) has been completed in some States and, assuming continued growth in aviation activity, without further action the number of people exposed to aircraft noise at some airports in those States may increase;

*Whereas* there are significant regional differences in the extent to which aircraft noise is expected to be a problem over the next two decades and some States have consequently been considering placing operating restrictions on certain aircraft which comply with the noise certification standards in Volume I, Chapter 3 of Annex 16;

*Whereas* if operating restrictions on Chapter 3 aircraft are introduced at certain airports, this should be based on the balanced approach and relevant ICAO guidance (Doc 9829) and should be tailored to the specific requirements of the airport concerned;

*Whereas* these restrictions could have a significant economic impact on fleet investments of aircraft operators from States other than those in which the restrictions are imposed;

*Recognizing* that these restrictions go beyond the policy established in Appendix D to this Resolution and other relevant policy guidance developed by ICAO;

*Recognizing* that ICAO places no obligation on States to impose operating restrictions on Chapter 3 aircraft;

*Recognizing* that the noise standards in Annex 16 were not intended to introduce operating restrictions on aircraft and, specifically, that the new standard contained in Annex 16, Volume I, Chapter 4 is based on the understanding that it is for certification purposes only; and

*Recognizing* in particular that States have legal obligations, laws, existing arrangements and established policies which may govern the management of noise problems at their airports and could affect the implementation of this Appendix;

*The Assembly:*

1. *Urges* States to ensure, wherever possible, that any operating restrictions be adopted only where such action is supported by a prior assessment of anticipated benefits and of possible adverse impacts;

2. *Urges* States not to introduce any operating restrictions at any airport on aircraft which comply with Volume I, Chapter 3 of Annex 16 before:

- a) completing the phase-out of aircraft which exceed the noise levels in Volume I, Chapter 3 of Annex 16, at the airport concerned; and
- b) fully assessing available measures to address the noise problem at the airport concerned in accordance with the balanced approach described in Appendix C;

3. *Urges* States which, despite the considerations in Resolving Clause 2 above, permit the introduction of restrictions at an airport on the operations of aircraft which comply, either through original certification or recertification, with Volume I, Chapter 3 of Annex 16:

- a) to base such restrictions on the noise performance of the aircraft, as determined by the certification procedure conducted consistent with Annex 16, Volume I;
- b) to tailor such restrictions to the noise problem of the airport concerned in accordance with the balanced approach;
- c) to limit such restrictions to those of a partial nature wherever possible, rather than the complete withdrawal of operations at an airport;
- d) to take into account possible consequences for air transport services for which there are no suitable alternatives (for example, long-haul services);
- e) to consider the special circumstances of operators from developing countries, in order to avoid undue hardship for such operators, by granting exemptions;
- f) to introduce such restrictions gradually over time, where possible, in order to take into account the economic impact on operators of the affected aircraft;
- g) to give operators a reasonable period of advance notice;
- h) to take account of the economic and environmental impact on civil aviation; and
- i) to inform ICAO, as well as the other States concerned, of all such restrictions imposed; and

4. *Further urges* States not to permit the introduction of any operating restrictions aimed at the withdrawal of aircraft that comply, through either original certification or recertification, with the noise standards in Volume I, Chapter 4 of Annex 16.

## APPENDIX F

### Land-use planning and management

*Whereas* land-use planning and management is one of the four principal elements of the balanced approach to noise management;

*Whereas* the number of people affected by aircraft noise is dependent on the way in which the use of land surrounding an airport is planned and managed, and in particular the extent to which residential development and other noise sensitive activities are controlled;

*Whereas* activity may increase significantly at most airports and there is a risk that future growth may be constrained by inappropriate land use near airports;

*Whereas* the phase-out of subsonic jet aircraft which comply with the noise certification standards in Volume I, Chapter 2 of Annex 16 but which exceed the noise levels in Volume I, Chapter 3 of Annex 16 has succeeded at many airports in reducing the size of the noise contours depicting the areas where people are exposed to unacceptable noise levels as well as in reducing the total number of people exposed to noise;

*Considering* it essential that these improvements should be preserved to the greatest extent practicable for the benefit of local communities;

*Whereas* it is also expected that the new standard contained in Annex 16, Volume I, Chapter 4 will increase the opportunities for operators to replace aircraft in their fleets by quieter aircraft;

*Recognizing* that while land-use management includes planning activities that may primarily be the responsibility of local authorities, it nevertheless affects airport capacity, which in turn has implications for civil aviation; and

*Whereas* guidance material on appropriate land-use planning and noise mitigation measures is included in the Airport Planning Manual (Doc 9184), Part 2 — Land Use and Environmental Control, which has recently been updated;

*The Assembly:*

1. *Urges* States that have phased out operations of Chapter 2 aircraft at their airports as provided for in Appendix D to this Resolution, whilst preserving the benefits for local communities to the greatest extent practicable, to avoid inappropriate land use or encroachment whenever possible in areas where reductions in noise levels have been achieved;

2. *Urges* States to ensure that the potential reductions in noise levels to be gained from the introduction of quieter aircraft, particularly those complying with the new Chapter 4 standard, are also not avoidably compromised by inappropriate land use or encroachment;

3. *Urges* States, where the opportunity still exists to minimize aircraft noise problems through preventive measures, to:

- a) locate new airports at an appropriate place, such as away from noise-sensitive areas;

- b) take the appropriate measures so that land-use planning is taken fully into account at the initial stage of any new airport or of development at an existing airport;
  - c) define zones around airports associated with different noise levels taking into account population levels and growth as well as forecasts of traffic growth and establish criteria for the appropriate use of such land, taking account of ICAO guidance;
  - d) enact legislation, establish guidance or other appropriate means to achieve compliance with those criteria for land use; and
  - e) ensure that reader-friendly information on aircraft operations and their environmental effects is available to communities near airports; and
4. Requests the Council to:
- a) ensure that the guidance on land use in Doc 9184 is current and responsive to the requirements of States; and
  - b) consider what steps might be taken to promote land-use management, particularly in those parts of the world where the opportunity may exist to avoid aircraft noise problems in the future.

## APPENDIX G

### Supersonic aircraft — The problem of sonic boom

*Whereas* since the introduction of supersonic aircraft in commercial service action has been taken to avoid creating unacceptable situations for the public due to sonic boom, such as interference with sleep and injurious effects to persons and property on land and at sea caused by the magnification of the sonic boom; and

*Whereas* the States involved in the manufacture of such supersonic aircraft, as well as other States, continue to carry out research into the physical, physiological and sociological effects of sonic boom;

*The Assembly:*

1. *Reaffirms* the importance it attaches to ensuring that no unacceptable situation for the public is created by sonic boom from supersonic aircraft in commercial service;

2. *Instructs* the Council, in the light of the available information and availing itself of the appropriate machinery, to review the Annexes and other relevant documents, so as to ensure that they take due account of the problems which the operation of supersonic aircraft may create for the public and, in particular, as regards sonic boom, to take action to achieve international agreement on measurement of the sonic boom, the definition in quantitative or qualitative terms of the expression “unacceptable situations for the public” and the establishment of the corresponding limits; and

3. *Invites* the States involved in the manufacture of supersonic aircraft to furnish ICAO in due course with proposals on the manner in which any specifications established by ICAO could be met.

**APPENDICES H AND I**

The revised text of Appendices H and I is presented in a separate working paper.

— END —