



WORKING PAPER

ASSEMBLY — 40TH SESSION

EXECUTIVE COMMITTEE

Agenda Item 15: Environmental Protection – General provisions, Aircraft Noise and Local Air Quality – Policy and Standardization

**CONSOLIDATED STATEMENT OF CONTINUING ICAO POLICIES AND PRACTICES
RELATED TO ENVIRONMENTAL PROTECTION – GENERAL PROVISIONS, NOISE AND
LOCAL AIR QUALITY**

(Presented by the Council of ICAO)

EXECUTIVE SUMMARY

ICAO Assembly Resolution A39-1, *Consolidated statement of continuing ICAO policies and practices related to environmental protection – General provisions, noise and local air quality*, requires that the Council of ICAO keep this statement under review and advise the Assembly when changes are required. Accordingly, this paper contains information on the developments made by the Organization in addressing the impact of noise and emissions since the 39th Assembly, and the Resolution has been revised in light of such developments.

Upon adoption by the Assembly, the revised Assembly Resolution A39-1, together with the revised Assembly Resolution A39-2 and the revised Assembly Resolution A39-3, will constitute the consolidated statement of continuing ICAO policies and practices related to environmental protection.

Action: The Assembly is invited to:

- a) consider the information contained in this paper for the update of Assembly Resolutions A39-1, acknowledging the substantial progress made by the Organization in addressing the impact of noise and emissions during the triennium, and recognizing the importance for ICAO to closely follow-up innovative environmentally-driven technologies, and others that may impact the environment, including new energy sources for aviation, assessing their impact on noise and emissions, and maintaining and developing relevant ICAO environmental Standards and Recommended Practices (SARPs) and guidance, where necessary; and
- b) review and adopt the revised Assembly Resolution on the *Consolidated statement of continuing ICAO policies and practices related to environmental protection – General provisions, noise and local air quality*, presented in Appendix B.

<i>Strategic Objectives:</i>	This working paper relates to Strategic Objective – <i>Environmental Protection</i> .
<i>Financial implications:</i>	The activities referred to in this paper will be undertaken subject to the resources available in the 2020 – 2022 Regular Programme Budget and/or from extra budgetary contributions.
<i>References:</i>	Doc 10075, <i>Assembly Resolutions in Force</i> (as of 6 October 2016) A40-WP/54, <i>ICAO Global Environmental Trends – Present and Future Aircraft Noise and Emissions</i>

1. INTRODUCTION

1.1 With a view to minimizing the adverse effects of international civil aviation on the environment, the Organization formulates policies, develops and updates Standards and Recommended Practices (SARPs) on aircraft noise and emissions, and conducts outreach activities. These activities are conducted by the Secretariat and the Committee on Aviation and Environmental Protection (CAEP). In pursuing its activities, ICAO also cooperates with other United Nations bodies and international organizations.

1.2 Significant advances have been made in reducing the amount of noise and emissions produced by international civil aviation. For example, significant technological progress has resulted in aircraft produced today being approximately 75 per cent quieter and 80 per cent more fuel efficient per passenger kilometre than in the 1960s. New innovative technologies, that may impact the environment, and energy sources for aviation are under development at a fast pace, and much work by ICAO will be required to keep pace in maintaining and developing relevant ICAO environmental SARPs and guidance, where necessary. An overview of the recent progress on technology achieved by international civil aviation is provided in Appendix A.

1.3 This paper presents developments in aircraft noise and aircraft engine emissions during the last triennium, with a view to contextualize the proposed changes to the ICAO Assembly Resolution A39-1 - *Consolidated statement of continuing ICAO policies and practices related to environmental protection - General provisions, noise and local air quality*, as provided in Appendix B.

1.4 The organization has also diligently worked on updating the ICAO Global Environmental Trends – Present and Future Aircraft Noise and Emissions, and this is provided in A40-WP/54.

2. AIRCRAFT NOISE

2.1 The recommendations to amend Annex 16, Volume I – *Aircraft Noise*, and the *Environmental Technical Manual (ETM) (Doc 9501)*, Volume I – *Procedures for the Noise Certification of Aircraft* included general maintenance to keep the environmental SARPs up to date and relevant. Work also continued on the development of supersonic noise Standards for future aircraft, and an exploratory study will be conducted during the CAEP/12 cycle to better understand the airport noise impacts resulting from the introduction of supersonic aircraft. Work continued through CAEP on understanding the current state of sonic boom knowledge, research and supersonic aeroplane projects. It is anticipated that the certification of a supersonic aeroplane could occur in the 2020-2025 timeframe.

3. AIRCRAFT ENGINE EMISSIONS AFFECTING LOCAL AIR QUALITY

3.1 Aircraft engines burning hydrocarbon-based fuels emit gaseous and particulate matter (PM) emissions. At the engine exhaust, particulate emissions mainly consist of ultrafine soot or black carbon emissions, also known as non-volatile PM (nvPM).

3.2 The initial Standard for nvPM mass and its measurement methodologies were recommended by the CAEP/10 meeting, and adopted by the Council in March 2017 as part of Annex 16, Volume II – *Aircraft Engine Emissions*. As a next step, the CAEP/11 meeting recommended the both nvPM mass and number Standards for aircraft engines greater than 26.7kN. The proposed Standards included limit lines for nvPM mass and number, that would be applied to new engine types from 1 January 2023, providing some alleviation for engines with rated thrusts below 150kN. These new type Standards and Recommended Practices (SARPs) are accompanied by an in-production Standard for nvPM mass and number with an applicability date of 1 January 2023. The new nvPM mass and number Standards are recommended as an amendment to Annex 16, Volume II.

3.3 Further amendments to Annex 16, Volume II were recommended to keep the environmental SARPs up to date and relevant. The Secretariat is currently progressing the amendments to Annex 16, Volume II, including the new nvPM mass and number Standard, through the SARPs adoption process. In addition, the ETM (Doc 9501), Volume II –*Procedures for the Emissions Certification of Aircraft Engines* was updated and will be published.

3.4 Updates to ICAO Doc 9889, *Airport Air Quality Manual*, were also agreed, and include, amongst others, information related to nvPM emissions.

4. CO₂ EMISSIONS

4.1 A complete overview of the work on CO₂ emissions reductions and climate change is provided in A40-WP/55. The CAEP/11 recommendations to amend Annex 16, Volume III – *Aeroplane CO₂ emissions*, and the ETM (Doc 9501), Volume III–*Procedures for the CO₂ Emissions Certification of Aeroplanes* included general maintenance to keep the environmental SARPs up to date and relevant.

5. TECHNOLOGY GOALS FOR ENGINES AND AIRCRAFT

5.1 ICAO conducted an Independent Expert Integrated Review of aircraft and engine technologies. This was the very first review done in an integrated manner, considering the interdependencies between noise, fuel burn and emissions technologies. Based on this work, new technology goals for the sector were delivered, including noise, emissions and fuel efficiency, and recommended that these should be used to inform on ICAO noise and emissions activities. Details on these technology goals are provided in Appendix A.

6. ENVIRONMENTAL GUIDANCE AT AIRPORTS AND OPERATIONS

6.1 While ICAO's efforts are mainly focused on reducing the impact of international civil aviation on the global climate, the impact of climate change has been identified as a significant risk for the aviation sector and ICAO's work on climate adaptation is the foundation of risk preparedness. A Climate Adaptation Synthesis report was developed that contains information on the range of projected climate impacts on the aviation sector and views from international aviation stakeholders on how these might impact their operations, their level of preparedness and expectations.

6.2 Community engagement is an important aspect of aviation projects such as performance-based navigation (PBN). ICAO recently published Circular 351, *Community Engagement for Aviation Environmental Management*, that examines general industry practices. A report focusing on the community engagement aspects of PBN implementation and related challenges has also been developed, and was drafted on the basis of information gathered through a questionnaire, a literature review and analysis of the ICAO State PBN implementation plans.

6.3 An “Eco-Airport Toolkit e-collection”, which includes Renewable Energy at Airports, Waste Management, and Environmental Management Systems and the Eco-design of airport buildings, was also developed. The Eco-Airport Toolkit e-collection provides practical, ready-to-use information to the international aviation community.

6.4 With respect to the work on aircraft end-of-life and recycling, a report was prepared which provides an overview of the relevant international policies and industry guidance pertaining to the environmental management of aircraft end-of-life procedures

7. ENVIRONMENTAL TOOLS TO SUPPORT QUANTIFICATION

7.1 The ICAO Carbon Emissions Calculator is the official tool used to estimate the air travel-related portion of UN agencies' carbon inventories. The Secretariat is currently considering updates

to the ICAO Carbon Emissions Calculator and has developed an Application Programming Interface (API) to allow easy integration of the calculator into external websites and services.

7.2 The Secretariat has also continued to develop tools associated with the ICAO State Action plan initiative, including the Aviation Environmental System (AES), Environmental Benefits Tool, and a Marginal Abatement Cost Curve tool.

8. COOPERATION WITH OTHER UN BODIES

8.1 Of note during this triennium was ICAO's intense coordination within the UN system including the United Nations Framework Convention on Climate Change (UNFCCC), the World Health Organization (WHO), the Intergovernmental Panel on Climate Change (IPCC), the United Nations Environmental Management Group (EMG) and the Sustainable Mobility For All (SUM4ALL) initiative, and more information on climate-change-related cooperation in A40-WP/55.

8.2 World Health Organization (WHO)

8.3 ICAO undertook coordination with WHO-Europe with regard to the development of "WHO Environmental Noise Guidelines for the European Region", which contained recommendations related to aircraft noise and transportation policy. While ICAO provided WHO with an extensive list of comments on the document, the final WHO guidelines were published in October 2018, without considering them and/or having provided specific feedback on the ICAO comments.

9. AMENDMENTS TO THE EXISTING CONSOLIDATED STATEMENT

9.1 Appendix B to this working paper presents the revisions to ICAO Assembly Resolution A39-1 and its Appendices. The proposed revisions to Appendices A through H arise mainly from the work carried out by the ICAO Secretariat, in cooperation with other organizations and from the outcome of the activities conducted by the Committee on Aviation Environmental Protection (CAEP).

9.2 The following revisions are proposed in Appendix B to this working paper:

- Chapeau: minor editorial updates;
- Appendix A: a reference is included to reflect the importance of community engagement in reducing the adverse environmental effects of civil aviation activity, updates are included to capture the work completed by CAEP on the environmental trends which should be used as the basis for decision-making on environmental issues; a reference is included to reflect the importance for ICAO to follow-up innovative environmentally-driven technologies, and others that may impact the environment, including new energy sources for aviation; and the term "alternative" aviation fuels is no longer used and appropriate adjustments are made;
- Appendix B: reflection of the adoption of CO₂ Standard and non-volatile Particulate Matter (nvPM) mass Standard, as well as the CAEP/11 recommendation on the new nvPM mass and number Standards; the CAEP work on the first Integrated Technology Goals Assessment and Review for Engines and Aircraft; a reference is included to reflect the need for ICAO to follow-up new innovative technologies and energy sources for aviation, including hybrid and electric aircraft;

- Appendix C: a reference and actions for ICAO and States related to community engagement are included, in the context of balanced approach for noise management;
- Appendix D: no changes;
- Appendix E: no changes;
- Appendix F: reflection of Eco-Airport Toolkit e-collection as a useful resource for environmentally-sound management policies at and around airports;
- Appendix G: recognition of the need for an exploratory study to provide better understanding of airport noise impacts resulting from the introduction of supersonic aircraft; and
- Appendix H: changes related to the new nvPM mass and number Standards, and integrated review of technology goals.

APPENDIX A

LATEST TECHNOLOGY PROGRESS ACHIEVED BY AVIATION

1. AIRCRAFT TECHNOLOGY TO REDUCE CO₂ EMISSIONS

1.1 The progress on fuel efficiency improvement is the result of airframe, aero-engine, and aircraft systems manufacturers' continuous drive to develop new and innovative technologies. The industry estimates that each new generation of aircraft brings around 15-20% savings in fuel and CO₂ compared with the aircraft it replaces. Progress continues to be made today in, inter alia, advanced aerodynamics, aircraft systems, lighter airframe structures, and improved propulsive efficiency. The ICAO Aeroplane CO₂ Emissions Standard plays an important role in reducing the sectors fuel burn by ensuring that these fuel efficiency technologies are being implemented in the latest aeroplane designs.

1.2 Lower fuel consumption has been achieved in new aircraft type designs through the utilization of higher By Pass Ratio (BPR) engines, and lighter and high temperature materials which contribute to increased propulsive efficiency. For example, the push for greater fuel efficiency coupled with recent turbine developments now allow combustor exit temperatures to be above 1800K.¹

1.3 The combination of lighter weight materials and innovative structural technologies result in lower weight airframes and, therefore, lower fuel consumption. The aircraft manufacturers continue to consider various ways towards minimizing airframe weight including: integrated wing design, limiting landing gear length, structural optimisation and utilisation of new materials. More recent technological developments continue to result in increased use of composite materials in the latest aeroplane designs. Implementation of composite wings with larger span and improved aerodynamics will increase fuel efficiency but require additional wing tip folding solutions in order to ensure compatibility with airport requirements.

1.4 New aircraft types also incorporate an increasing level of electrical systems and controls that contribute to a low operating weight and help further enhance the operating efficiency of the aircraft.

2. OPERATIONAL MEASURES TO REDUCE CO₂ EMISSIONS

2.1 The Global Air Navigation Plan (GANP) is a strategy to achieve a global interoperable air navigation system, for all users during all phases of flight that meets agreed levels of safety, provides for optimum economic operations, is environmentally sustainable and meets national security requirements. The GANP includes a framework for operational improvements in the Aviation System Block Upgrades (ASBUs). The ASBUs provide a roadmap to assist air navigation service providers in the development of their individual strategic plans and investment decisions with a goal of global aviation system interoperability.

2.2 The Committee on Aviation Environmental Protection (CAEP) has performed a combined analysis of the fuel burn and CO₂ emissions reductions attributable to the implementation of the relevant ASBU Block 0 (B0) and Block 1 (B1) modules by 2025. Current and planned implementation of the B0/B1 ASBU elements detailed within the ASBU framework are estimated to provide a total annual

¹ ICAO Doc 10127, Independent Expert Integrated Technology Goals Assessment and Review for Engines and Aircraft, ICAO, 2019.

global fuel saving in 2025 of between 167 to 307 kg per flight, which corresponds to a reduction of 26.2 Mt of CO₂ to 48.2 Mt of CO₂, or savings of USD 5 billion to USD 9.2 billion.

2.3 Environmental assessment tools developed by ICAO have allowed States to successfully assess the environmental benefit of implementing the various operation measures. To assist the States to estimate fuel savings in a manner consistent with the models approved by CAEP and aligned with the GANP, the ICAO Fuel Savings Estimation Tool (IFSET) has been developed by the Secretariat with support from States and international organizations. IFSET is not intended to replace the use of detailed measurement or modelling of fuel savings, where those capabilities exist. Rather, it is provided to assist those States without such facilities to estimate the benefits from operational improvements in a harmonized way.

3. AIRCRAFT TECHNOLOGY TO REDUCE LOCAL AIR QUALITY EMISSIONS

3.1 Engine manufacturers continue to make progress in combustor design to reduce emissions that impact Local Air Quality (LAQ) in the vicinity of airports. While Standards have been developed for Hydrocarbon (HC), Carbon Monoxide (CO) and smoke, and most recently for non-volatile Particulate Matter (nvPM) mass and number, much of the focus of international efforts has been on the reduction of NO_x. The ICAO engine emissions Standards ensure that the most efficient local air quality emissions reduction technologies are being implemented in the production of aircraft engines.

3.2 The NO_x emissions reductions are being achieved through a combination of engine cycle and advanced combustion technology. The most recent progress in NO_x reduction technology was the introduction of lean-burn combustors and as of late 2017, there were two engine families with lean-burn combustors in service. New type engines with Rich Quench Lean (RQL) combustion technologies continue to demonstrate reductions in NO_x emissions. Some advanced RQL and staged lean burn combustion technologies from medium and large engines (i.e. those larger than 89 kN thrust) have already met the ICAO NO_x medium-term goal².

3.3 The main NO_x reduction technologies also promise reductions in the less well-understood nvPM emissions.³ The manufacturers continue to investigate these interdependencies in order to comply with all engine emission SARPs, including the latest nvPM mass and number Standard, recommended by CAEP in 2019. During its 12th cycle CAEP agreed to review the margins to the recent CAEP/11 new type nvPM mass and number Standards and assess possible technological advancements to reduce nvPM emissions. This will involve the collation and analysis of the certified and certification-like nvPM mass and number emissions data that becomes available for all in-production engines during the period 2019-2022.

3.4 Hybrid electric propulsion technology is being investigated by manufacturers and its implementation could reduce the impact of international aviation on LAQ. Additionally, the use of sustainable aviation fuels has been shown to potentially result in substantial reductions in nvPM emissions.

² ICAO Doc 9953, Report of the Independent Experts to CAEP/8 on the Second Review and the Establishment of Medium- and Long-Term Technology Goals for NO_x, ICAO, 2010.

³ ICAO Doc 10127, Independent Expert Integrated Technology Goals Assessment and Review for Engines and Aircraft, ICAO, 2019.

4. AIRCRAFT NOISE

4.1 Aircraft and engine manufacturers have worked aggressively to reduce aircraft noise levels and major advances in airframe and propulsion system (engine and nacelle) designs combined with improvements in aircraft performance have further contributed to this reduction.

4.2 Aircraft manufacturers continue to work to reduce all the significant sources of aircraft noise, in particular jet noise, fan noise, and airframe noise. Technology continues to play a significant role in reducing the noise around airports, however the opportunities are limited for new technology to reduce noise further, short of major aircraft configuration changes⁴.

4.3 In parallel with the development of technologies to reduce noise, it is crucial that the broader context of the *Balanced Approach to Aircraft Noise Management*⁵ is considered, which includes 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.

5. INTEGRATED TECHNOLOGY GOALS FOR ENGINES AND AIRCRAFT

5.1 CAEP recently endorsed updated technology goals for engines and aircraft, as detailed in ICAO Doc 10127. For the first time, these goals were developed in an integrated manner, considering the tradeoffs between noise, emissions, and fuel burn. Four aircraft categories were considered: Business Jets (BJ), Regional Jets (RJ), Single-Aisle Aircraft (SA) and Twin-Aisle Aircraft (TA).

5.2 The fuel burn goals, expressed in terms of the CO₂ certification metric system as percentage margins relative to the CAEP/10 Annex 16 , Volume III, New Type Regulatory Level are:

EIS DATE				
2027	-15	-16	-14	-12
2037	-23	-26	-24	-21

5.3 The complementary noise goals expressed as EPNdB cumulative below Annex 16, Volume I Chapter 14 Noise Limit are:

EIS Date	BJ	RJ	SA	TA
2027	10.0	14.5	15.5	19.5
2037	15.0	17.0	24.0	26.5

5.4 The 2027 LTO NO_x Goal was set at 54 per cent below CAEP/8 (Annex 16, Volume II) at Overall Pressure Ratio (OPR) = 30, covering the entire OPR range.

⁴ ICAO Doc 10127, Independent Expert Integrated Technology Goals Assessment and Review for Engines and Aircraft, ICAO, 2019.

⁵ ICAO Doc 9829, Guidance on the Balanced Approach to Aircraft Noise Management.

6. AIRPORTS

6.1 272 airports representing 43.9 per cent of global passenger traffic have engaged in Airport Carbon Accreditation, an airport-specific carbon mapping management standard, and as of May 2019, 49 airports are carbon neutral for the emissions under their direct and indirect control.⁶

6.2 Airport operators have long been involved in local air quality management. Some of the most advanced air quality programmes include elements such as behavioural change of the ground support staff, purchase of low-emitting ground support equipment, adoption of stand technology and operations and involvement in research projects.

6.3 Noise is considered the first cause of adverse community reactions. In addition to the implementation of the ICAO's Balanced Approach to aircraft noise management, the effects of non-acoustical factors has been receiving more attention by airport operators, including the potential effect of community engagement on improving noise acceptability. In that regard, ICAO Circular 351⁷ provides lessons learned and good practices drawn from recent case studies on community engagement by aviation stakeholders. Building a trustful relationship with communities is increasingly considered as a good practice to address adverse responses to aircraft noise.

7. ELECTRIC AIRCRAFT

7.1 A consistent increase has been noted in the electrification of aircraft systems, research on electrical propulsion, and investments in electric or hybrid aircraft designs. As of January 2019, 32 ongoing projects have been identified globally by the Secretariat, ranging from general aviation or recreational aircraft; business and regional aircraft; large commercial aircraft; and vertical take-off and landing (VTOL) aircraft (also called electric urban air-taxis). Most of them target an entry-in-service date between 2020 and 2030, and some are already commercially available. Four of the projects had their first flights between January and May 2019 (Lilium, City Airbus, Boeing Aurora eVTOL, and Bye Aerospace Sun Flyer 2). Details on these projects, including MTOW, range, seat capacity, payload, cruise altitude and speed, and further details on hybrid and electric aircraft developments are provided in the ICAO Environment website⁸. It is important for ICAO to closely follow-up innovative environmentally driven technologies and others that may impact the environment, including new energy sources for aviation. This will likely include assessing the consequences for noise and emissions, and maintaining and developing relevant ICAO environmental SARPs and guidance, where necessary.

⁶ www.airportco2.org/managing-airport-co2-emissions.html

⁷ ICAO Circular 351, Community Engagement for Aviation Environmental Management

⁸ <https://www.icao.int/environmental-protection/Pages/electric-aircraft.aspx>

APPENDIX B

Resolution ~~A39-140~~-XX: Consolidated statement of continuing ICAO policies and practices related to environmental protection – General provisions, noise and local air quality

Whereas in Resolution ~~A38-17~~A39-1 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 ~~A38-17~~A39-1 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 ~~38th~~39th Session of the Assembly in the field of aircraft noise and engine emissions;

The Assembly:

1. *Resolves* that the Appendices attached to this Resolution and listed below, together with ~~A39-2~~A40-xx: *Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change* and ~~A39-3~~A40-xx: *Consolidated statement of continuing ICAO policies and practices related to environmental protection – ~~Global Market-based Measure (MBM) scheme Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)~~*, constitute the consolidated statement of continuing ICAO policies and practices related to environmental protection, as these policies exist at the close of the ~~39th~~40th 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

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

3. *Declares* that this resolution, together with ~~A40-xx~~A39-2: *Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change*, and ~~A40-xx~~A39-3: *Consolidated statement of continuing ICAO policies and practices related to*

environmental protection – Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) Global Market-based Measure (MBM) scheme, supersede Resolutions A39-1, A39-2 and A39-3A38-17 and A38-18.

APPENDIX A

General

Whereas the preamble to the *Convention on International Civil Aviation* states that “the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world . . .” and Article 44 of that Convention states that ICAO should “develop the principles and techniques of international air navigation and . . . foster the planning and development of international air transport so as to . . . meet the needs of the peoples of the world for safe, regular, efficient and economical air transport”;

Whereas many of the adverse environmental effects of civil aviation activity can be reduced by the application of comprehensive measures embracing technological improvements, more efficient air traffic management and operational procedures, aircraft recycling, the use of clean, renewable and sustainable energy sources, the appropriate use of airport planning, land-use planning and management, *community engagement and market-based measures*;

Whereas all ICAO Member States agreed to continue to pursue all aviation matters related to the environment and also maintain the initiative in developing policy guidance on these matters, and not leave such initiatives to other organizations;

Whereas other international organizations are emphasizing the importance of environmental policies affecting air transport;

Whereas the sustainable growth of aviation is important for future economic growth and development, trade and commerce, cultural exchange and understanding among peoples and nations; therefore prompt action must be taken to ensure that it is compatible with the quality of the environment and develops in ways that alleviate adverse impacts;

Recognizing that the work of the Organization on the environment contributes to ~~ten~~¹⁴ of 17 United Nations Sustainable Development Goals (SDGs);

Whereas reliable and best available information on the environmental effects of aviation is essential for the development of policy by ICAO and its Member States;

Acknowledging that substantial progress has been achieved in addressing the effects of aviation on the environment, and that aircraft produced today are 80 per cent more fuel efficient and 75 per cent quieter than they were in the 1960s;

Recognizing that new innovative technologies and energy sources for aviation are under development in a fast pace, and much work by ICAO will be required to keep pace with the timely environmental certification of such new technologies, as appropriate;

Whereas as far as there are recognized interdependencies of the environmental effects from aviation, such as noise and engine emissions, they need to be considered when defining source control and operational mitigation policies;

Whereas airspace management and design can play a role in addressing the impacts of aviation greenhouse gas emissions on the global climate, and the related economic and institutional issues need to be addressed by States, either individually or collectively on a regional basis;

Whereas cooperation with other international organizations is important to progress the understanding of aviation's impacts on the environment and in order to develop the appropriate policies to address these impacts; and

Recognizing the importance of research and development in fuel efficiency and ~~alternative fuels for aviation fuels~~ that will enable international air transport operations with a lower environmental impact, both in terms of local air quality and the global climate;

Noting the importance of updated information on the present and future impact of aircraft noise and aircraft emissions, as provided in the ICAO global environmental trends, to support decision-making on environmental matters;

The Assembly:

1. *Declares* that ICAO, as the lead United Nations (UN) Agency in matters involving international civil aviation, is conscious of and will continue to address the adverse environmental impacts that may be related to civil aviation activity and acknowledges its responsibility and that of its Member States to achieve maximum compatibility between the safe and orderly development of civil aviation and the quality of the environment. In carrying out its responsibilities, ICAO and its Member States will strive to:

- a) limit or reduce the number of people affected by significant aircraft noise;
- b) limit or reduce the impact of aviation emissions on local air quality; and
- c) limit or reduce the impact of aviation greenhouse gas emissions on the global climate;

2. *Emphasizes* the importance of ICAO continuing to demonstrate its leadership role on all international civil aviation matters related to the environment and *requests* the Council to maintain the initiative in developing policy guidance on these matters, which recognizes the seriousness of the challenges which the sector faces;

3. *Requests* the Council to continue to assess regularly the present and future impact of aircraft noise and aircraft engine emissions and to continue to develop tools for this purpose;

4. *Requests* the Council to closely follow-up innovative technologies and new energy sources for aviation to prepare for the timely environmental certification of such technologies, as appropriate;

54. *Requests* the Council to maintain and update knowledge of the interdependencies and trade-offs related to measures to mitigate the impact of aviation on the environment so as to optimize decision-making;

65. *Requests* the Council to establish a set of aviation environmental indicators which States could use to evaluate the performance of aviation operations and the effectiveness of standards, policies and measures to mitigate aviation's impacts on the environment;
76. *Requests* the Council to disseminate information on the present and future impact and trends of aircraft noise, aircraft fuel consumption, aviation system fuel efficiency, and aircraft engine Particulate Matter (PM) and Oxides of Nitrogen (NO_x) emissions, reflecting the work of the Organization, action plans submitted by States, the ICAO Global Air Navigation Plan, ICAO Standards and Recommended Practices, and ICAO policy and guidance material in the environmental field, in an appropriate manner, such as through regular reporting and workshops, including through the coordination with the ICAO Regional Offices;
87. *Invites* States to continue their active support for ICAO's environment-related activities, and urges Member States to support activities not foreseen in the budget by providing a reasonable level of voluntary contributions;
98. *Invites* States and international organizations to provide the necessary scientific information and data to enable ICAO to substantiate its work in this field;
109. *Encourages* the Council to continue to cooperate closely with international organizations and other UN bodies on the understanding of aviation impacts on the environment and on the establishment of policies to address such impacts; and
1140. *Urges* States to refrain from environmental measures that would adversely affect the orderly and sustainable development of international civil aviation.

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 scientific community is improving the understanding of uncertainties associated with the environmental impact of aircraft emissions at both the local and global levels, this impact remains a cause of concern and requires appropriate action;

Recognizing that there are interdependencies related to technology, design and operations of aircraft when addressing concerns related to noise, local air quality, and climate change;

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 engine emissions;

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 aeroplanes) and has notified Member States of this action;

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

Whereas the Council has adopted Annex 16, Volume III — *Aeroplane CO₂ Emissions*, which comprises CO₂ emissions certification Standards for aeroplanes and has notified Member States of this action;

~~*Welcoming*~~ *Recognizing* the recommendation by CAEP on a new mass and number standard for non-volatile particulate matter (nvPM) emissions that, once adopted, will be part of Annex 16, Volume II;

~~*Welcoming*~~ the recommendation by CAEP on a new global CO₂ emissions certification Standard for aeroplanes that, once adopted, will constitute Annex 16, Volume III — *Aeroplane CO₂ Emissions*;

Recognizing that the nvPM emissions certification Standard and CO₂ emissions certification standard are ~~is~~ a technical comparison of aviation technologies designed for use in nvPM emissions certification and CO₂ emissions certification processes, respectively, and were ~~was~~ not designed to serve as a basis for operating restrictions or emissions levies;

Whereas ICAO policy guidance on measures to address environmental concerns related to aircraft noise and engine emissions has been developed, amended and published; and

Recognizing the work of CAEP on its first integrated review of aircraft and engine technologies and the development of medium-term (2027) and long-term (2037) technology goals for noise, fuel burn and emissions;

~~*Whereas*~~ the Council has adopted medium- and long-term technology goals for reduction of noise and oxides of nitrogen (NO_x), and technology and operational goals for aircraft fuel burn reduction;

Recognizing new innovative technologies and energy sources for aviation being under development in a fast pace, including hybrid and electric aircraft;

The Assembly:

1. *Welcomes* the continuing benefits of the more stringent aircraft noise Standard in Annex 16, Volume I, Chapter 4 that took effect on 1 January 2006;
2. *Welcomes* the adoption by the Council in March 2014 of the new, more stringent Standard for noise ~~to be implemented~~ which became applicable on or after 31 December 2017 and to become applicable on or after 31 December 2020 for aircraft less than 55 tonnes Maximum Take-off Mass (MTOM);
3. *Welcomes* the adoption by the Council in March 2014 of the new Standard for noise ~~to be implemented~~ which became applicable for Tilt-rotors on or after 1 January 2018;
4. *Welcomes* ~~the development~~ the adoption by the Council in March 2017 of the new aeroplane CO₂ Standard to become applicable ~~be implemented~~ on or after 1 January 2020 for new aeroplane types, except those new aeroplane types of less than or equal to 60 tonnes MTOM and with a maximum

passenger seating capacity of 19 seats or less, which would have an applicability ~~date~~ date of on or after 1 January 2023;

5. ~~Welcomes the development~~ the adoption by the Council in March 2017 of the new aeroplane CO₂ Standard ~~to be implemented~~ to become applicable on or after 1 January 2023 for in-production aeroplanes with a production cut-off date of 1 January 2028;

6. ~~Urges States to recognize that the CO₂ emissions certification Standard was not designed to serve as a basis for operating restrictions or emissions levies;~~

67. ~~Welcomes the development~~ the adoption by the Council in March 2017 of the ~~initial new-nvPM~~ mass emissions Standard for all turbofan and turbojet aircraft engines with rated thrust greater than 26.7kN and for which the date of manufacture of the individual engine is on or after 1 January 2020, and further development by CAEP of the new nvPM mass and number emissions Standard for all turbofan and turbojet aircraft engines with rated thrust greater than 26.7kN with the applicability date of 1 January 2023;

7. ~~Urges States to recognize that the nvPM and CO₂ emissions certification Standards were not designed to serve as a basis for operating restrictions or emissions levies;~~

8. *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;

9. *Requests* the Council to closely follow-up innovative technologies and new energy sources for aviation to prepare for the timely environmental certification of such technologies, as appropriate;

109. *Requests* the Council to ensure that 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;

1140. *Urges* Member States from regions of the world that are currently under-represented in CAEP to participate in the Committee's work;

1244. *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;

1342. *Urges* Member States to follow, where appropriate, the ICAO provisions developed pursuant to Resolving Clause 8 of this Appendix; and

1443. *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 other international organizations 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 Member States;

Whereas the process for implementation and decisions between elements of the balanced approach is for Member 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 ICAO Circular 351, *Community Engagement for Aviation Environmental Management*, highlights the role of community engagement as an essential component of a comprehensive noise management policy;

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;

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; and

Take note that the CAEP analysis of Trends in aircraft noise show that, under an advanced technology improvements scenario, an increase in aircraft operations may no longer result in an increase in noise contour area after 2030, if a number of ambitious actions are carried out by ICAO Member States to realize this scenario;

The Assembly:

1. *Calls upon* all ICAO Member States and international organizations to recognize the leading role of ICAO in dealing with the problems of aircraft noise;
2. *Welcomes* the progress achieved to date in addressing aircraft noise and encourages States, manufacturers and operators to continue to engage in the work of ICAO in addressing aircraft noise, and to continue to pursue technologies and policies that reduce the impact of aircraft noise in the communities that surround airports;
3. *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;
4. *Encourages* States to:
 - a) promote and support studies, research and technology programmes aimed at reducing noise at source or by other means taking into account interdependencies with other environmental concerns;
 - 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 considering interdependencies with other environmental concerns; 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 and taking into account the possible impact of such restrictions at other airports;
5. *Requests* States to:
- a) work closely together to ensure the harmonization of programmes, plans and policies to the extent possible;
 - b) engage with communities on a timely and consistent basis, as per the principles defined in ICAO Circular 351;
 - c) 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
 - d) take into consideration the particular economic conditions of developing countries;
6. *Invites* States to keep the Council informed of their policies and programmes to alleviate the problem of aircraft noise in international civil aviation;
7. *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) ensure that appropriate guidance on community engagement is made available to States and maintained; and
 - d) promote the use of the balanced approach, for example through workshops; and
8. *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 and had undertaken the work that led to the recommendation of a new noise certification standard in Volume I of Annex 16 on the understanding that a new phase-out should not be considered;

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, 4 or any more recent Chapter 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 further reductions in noise at source are expected as a result of the adoption of new noise certification standards in Volume I of Annex 16 and through the assimilation of noise reduction technology in the fleet;

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 standards contained in Annex 16, Volume I, Chapter 4 and Chapter 14, and any further stringency levels adopted by the Council, are 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 and Chapter 14 of Annex 16 and any further stringency levels adopted by the Council.

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;

Recognizing that the standard contained in Annex 16, Volume I, Chapter 4 has increased the opportunities for operators to replace aircraft in their fleets by quieter aircraft;

Recognizing that the standard contained in Annex 16, Volume I, Chapter 14, when implemented, 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;

Recognizing that the update of the 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 Management*; and

Recognizing that the ICAO Circular 351 *Community Engagement on Aviation Environmental Management* complements the current policy of aircraft noise management at and around airports; and

Recognizing the Eco-Airport Toolkit e-collection as a useful resource for environmentally sound management policies at and around airports;

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 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, including through the Eco-Airport Toolkit e-collection.

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;

Recognizing the ongoing work to develop a new supersonic noise Standard for future aircraft, and the work to understand the current state of sonic boom knowledge, research and supersonic aeroplane projects;

Recognizing that the airworthiness certification of a supersonic aeroplane could occur in the 2020-2025 timeframe, and the need for an exploratory study to provide better understanding of airport noise impacts resulting from the introduction of supersonic aircraft;

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.

APPENDIX H

Aviation impact on local air quality

Whereas there are growing concerns about the impact of aviation on the atmosphere with respect to local air quality and the associated human health and welfare impacts;

Whereas the evidence of this impact from emissions of NO_x and particulate matter (PM) from aircraft engines on local surface and regional air quality is now more compelling;

Recognizing that the scientific community is improving the understanding of uncertainties associated with the impact from emissions of NO_x and PM from aircraft engines on the global climate;

Recognizing that there are interdependencies related to design and operations of aircraft when addressing concerns related to noise, local air quality, and climate change;

Recognizing that ICAO has established technical Standards and fostered the development of operational procedures that have reduced significantly local air quality pollution from aircraft;

Recognizing the work of CAEP on its first integrated review of aircraft and engine technologies and the development of medium-term (2027) and long-term (2037) technology goals for noise, fuel burn and emissions;

Whereas many pollutants such as soot and unburned hydrocarbons from aircraft engines affecting local and regional air quality, have declined dramatically over the last few decades;

Whereas progress in operational procedures such as continuous descent operations has resulted in further reduction of emissions from aircraft;

Whereas an assessment of trends in aviation emissions of NO_x, PM, and other gaseous emissions shows increasing global emissions values;

Whereas the impacts of aviation emissions of NO_x, PM, and other gaseous emissions need to be further assessed and understood;

Recognizing the robust progress made in understanding impacts of non-volatile components of PM emissions while the scientific and technical work continues on better assessment of volatile components of PM emissions;

Whereas the impacts of aviation emissions on local and regional air quality ~~is~~ are part of the total emissions in the affected area and should be considered in the broader context of all sources that contribute to the air quality concerns;

Whereas the actual local air quality and health impacts of aviation emissions depend on a series of factors among which are the contribution to the total concentrations and the number of people exposed in the area being considered;

Whereas Article 15 of the *Convention on International Civil Aviation* contains provisions regarding airport and similar charges, including the principle of non-discrimination, and ICAO has developed policy guidance for Member States regarding charges (*ICAO's Policies on Charges for Airports and Air Navigation Services*, Doc 9082) including specific guidance on noise-related charges and emissions-related charges for local air quality;

Whereas the ICAO Council had adopted on 9 December 1996 a policy statement of an interim nature on emissions-related charges and taxes in the form of a resolution wherein the Council strongly recommends that any such levies be in the form of charges rather than taxes, and that the funds collected

should be applied in the first instance to mitigating the environmental impact of aircraft engine emissions;

Whereas such charges should be based on the costs of mitigating the environmental impact of aircraft engine emissions to the extent that such costs can be properly identified and directly attributed to air transport;

Whereas the ICAO Council has adopted policy and guidance material related to the use of emissions-related charges to address the impact of aircraft engine emissions at or around airports;

Noting that the ICAO Council has published information on environmental management systems (EMS) that are in use by aviation stakeholders; and

Noting that the ICAO Council has developed an Airport Air Quality ~~Guidance~~ Manual which has been subsequently updated;

The Assembly:

1. *Requests* the Council to monitor and develop its knowledge of, in cooperation with other relevant international organizations such as WHO, the effects of aviation emissions of PM, NO_x and other gases on human welfare and health, and to disseminate information in this regard;

2. *Requests* the Council to continue its work to develop technologically feasible, environmentally beneficial and economically reasonable standards to further reduce the impact of local air pollution from aircraft;

3. *Requests* the Council to continue to ~~develop certification requirements for non-volatile PM emissions while continuing to~~ monitor progress in scientific and technical understanding of volatile and non-volatile components of PM emissions;

4. ~~*Encourages* action by Member States to aid the development of certification requirements for nvPM emissions;~~

45. *Requests* the Council to ensure that the interdependencies between measures to reduce aircraft noise and engine emissions that affect local air quality as well as global climate are given due consideration;

56. *Requests* the Council to continue its work to develop ~~integrated medium- and long-term technology and operational goals for the reduction of fuel burn, noise and aircraft engine emission of NO_x and nvPM; and operational goals for the reduction of fuel burn with respect to aviation environmental issues, including NO_x and nvPM emissions from aircraft;~~

67. *Requests* the Council to continue to foster operational and air traffic improvements that reduce the impact of local air pollution from aircraft;

78. *Encourages* action by Member States, and other parties involved, to limit or reduce international aviation emissions affecting local air quality through voluntary measures and to keep ICAO informed;

89. *Welcomes* the development and promotion of guidance material on issues related to the assessment of airport-related air quality;

940. *Requests* the Council to work with States and stakeholders in promoting and sharing best practices applied at airports in reducing the adverse effects of aviation emissions on local air quality;

1044. *Welcomes* the development of the guidance on emissions charges related to local air quality and *requests* the Council to keep up to date such guidance and *urges* Member States to share information on the implementation of such charges; and

1142. *Urges* Member States to ensure the highest practical level of consistency and take due account of ICAO policies and guidance on emissions charges related to local air quality.

— END —