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INFORMATION PAPER

SPECIAL AFRICA-INDIAN OCEAN (AFI) REGIONAL AIR NAVIGATION (RAN) MEETING

Durban, South Africa, 24 to 29 November 2008

Agenda Item 6: Development of a set of comprehensive work programmes in the air navigation field, aimed at improving efficiency of the air navigation system (Efficiency Committee)

CONSIDERING THE ENVIRONMENTAL EFFECTS FROM CIVIL AVIATION

(Presented by the Secretariat)

SUMMARY

This paper provides an overview of the work of ICAO's Committee on Aviation Environmental Protection (CAEP); its environmental initiatives related to the assessment and mitigation of climate change due to aviation; and a review of the recent developments within ICAO and other related UN bodies.

1. INTRODUCTION

1.1 Environmental background

1.1.1 Emissions from aviation come from the combustion of aviation gasoline and jet fuel. Like any device powered by a hydrocarbon-based fuel, aircraft emit carbon dioxide (CO_2) in direct proportion to fuel burn. Given the state of aircraft engine combustion and fuel refining technology, an alternative to a hydrocarbon-based fuel is not likely within the next few years for aviation, though work is proceeding to make environmentally friendly alternative aviation fuels available as soon as possible.

1.1.2 In the last few centuries, the activities of humans have directly or indirectly caused the concentration of the major greenhouse gases (GHGs) to increase. Scientists predict that this increase will escalate the greenhouse effect and result in making the planet warmer. Of the number of gases involved in this process, according to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Synthesis Report, CO_2 is believed to be the single most important as it represented 77% of the total anthropogenic GHG emissions in 2004[1]. Furthermore, in its assessment the IPCC noted that "aviation has a larger impact on radiative forcing than that from its CO_2 forcing alone," due in part to ozone production as a result of NO_x emissions, soot particle emissions, the release of water vapour, and the formation of contrails[1]. The IPCC Fourth Assessment Working Group III Report: "Mitigation of Climate Change"[2] explains that even when considering the enhanced radiative forcing

[1] Intergovernmental Panel on Climate Change, "Climate Change 2007: Synthesis Report," 2007. http://www.ipcc.ch/ipccreports/ar4-syr.htm

[2] Kahn Ribeiro, S., S. Kobayashi, M. Beuthe, J. Gasca, D. Greene, D. S. Lee, Y. Muromachi, P. J. Newton, S. Plotkin, D. Sperling, R. Wit, P. J. Zhou, 2007: Transport and its infrastructure. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R.

effects from aviation GHG emissions, aviation accounted for approximately 3% of the anthropogenic radiative forcing in 2005 and 2% of the total anthropogenic CO_2 emissions.[3]

1.1.3 Although the contribution of aviation emissions to the total CO_2 emissions is relatively small, scheduled aviation traffic grew at an average rate of 3.8% between 2001 and 2005[2] despite the downturn from the terrorist attacks and the Severe Acute Respiratory Syndrome (SARS). Scheduled traffic is currently growing at a rate of 5.8% per year[2] and is projected to grow at a rate of 4.6% per year through 2025[4]. This growth raises questions on the future contributions of aviation activity to climate change and on the most effective way of addressing those emissions in a future climate agreement.

1.1.4 As a result, global climate change is a growing concern and many countries are developing action plans to significantly reduce the release of GHG into the atmosphere from all sources. ICAO has been working with environmental issues since 1968, primarily through a technical committee of the ICAO Council, which became known as the Committee on Aviation Environmental Protection (CAEP) in 1983.

1.2 ICAO/CAEP initiatives

1.2.1 In 1998, during the CAEP/4 meeting, a working group was established to "monitor progress in relation to CNS/ATM implementation, and to promote early implementation for environmental reasons." Since that time, CAEP has been very active in the environmental assessment of CNS/ATM changes. This includes work in 2001 (CAEP/5) to define and evaluate operational procedures and strategies for reducing aircraft noise exposure around airports, the publication in 2004 of the ICAO Circular 303: "Operational Opportunities to Minimize Fuel Use and Reduce Emissions," and an assessment of Noise Abatement Departure Procedure (NADP) noise and emissions (NO_x and CO_2) effects in 2007 (CAEP/7).

1.2.2 In 2006, at the request of the PIRGs to develop simple methodologies for estimating environmental benefits of CNS/ATM at the national level ("rules of thumb") to be used on general, preliminary estimates of potential reductions of CO_2 accrued from fuel savings, CAEP provided practical information that could be used by States to estimate the emissions benefits of implementing CNS/ATM. This was presented in ALLPIRG/5-WP/5, section 3 "Guidelines for States Assessing Benefits." Specifically, rules of thumb for estimating average fuel burn per minute of flight, average fuel burn per nautical mile of flight, and average additional fuel burn for a change in flight level, were defined.

1.2.3 Today, CAEP Working Group 2 – Operations (WG2) is in the process of updating and augmenting the guidance provided in Circular 303. The working group is revising Chapter 11 (Descent and Landing) of the Circular to provide new guidance that will harmonize and standardize the implementation of Continuous Descent Arrivals/Approaches (CDA). This work is being developed in coordination with the ICAO Instrument Flight Procedure Panel (IFPP) and the ICAO Operations Panel (OPSP). In addition, studies are underway to assess the effect of takeoff thrust and deeper cutback on noise and emissions, fuel consumption, and climb-out time; assess and validate noise and emissions reductions accrued from the use of CDA techniques; and to assess the benefits of

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Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. http://www.ipcc.ch/ipccreports/ar4-wg3.htm

[3] Barker T., I. Bashmakov, L. Bernstein, J. E. Bogner, P. R. Bosch, R. Dave, O. R. Davidson, B. S. Fisher, S. Gupta, K. Halsnæs, G.J. Heij, S. Kahn Ribeiro, S. Kobayashi, M. D. Levine, D. L. Martino, O. Masera, B. Metz, L. A. Meyer, G.-J. Nabuurs, A. Najam, N. Nakicenovic, H. -H. Rogner, J. Roy, J. Sathaye, R. Schock, P. Shukla, R. E. H. Sims, P. Smith, D. A. Tirpak, D. Urge-Vorsatz, D. Zhou, 2007: Technical Summary. In: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O. R. Davidson, P. R. Bosch, R. Dave, L. A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-ts.pdf

[4] ICAO Circular 313. "Outlook for Air Transport to the Year 2025."

steeper approaches. Reports on each of these topics are anticipated in advance of the February 2010 CAEP/8 meeting.

1.2.4 CAEP WG2 has also defined an Independent Expert (IE) process, to examine and make recommendations for noise, oxides of nitrogen (NOx) and fuel burn goals with respect to air traffic operational improvements in the mid term (10 years) and the long term (20 years). WG2 has received nominations for this panel following a State Letter and is in the process of fully populating its team of independent experts. Their specific tasking is to assess the gain that can be realistically expected from each component of the global air traffic system in terms of a reduction of NOx, CO_2 and noise. This will be accomplished by considering the integration of NextGen and SESAR into the global system, the processes of bringing technologies to market, and the regulatory framework and the processes associated with actual implementation by States of future ATM systems. Starting in October 2008, the IE panel is expected to begin a study of technological and operational changes planned for the mid term and long term. A workshop on the subject is also scheduled for later in 2008. The IE Panel will work in close collaboration with the ICAO Panels, such as the Air Traffic Management Requirements and Performance Panel (ATMRPP) and other groups and organizations involved in the definition and implementation of CNS/ATM systems based on the Global Air Navigation Plan and Global concept to support this effort and plans to have a final report available for the CAEP Steering Group by April 2009.

1.2.5 Recognizing that a balance of operational and technological improvements are needed to address aviation environmental issues, the work of CAEP Working Group 3 – Emissions Technical (WG3) is also relevant to PIRGs. CAEP WG3 is divided into three task groups: Characterization of Emissions (CETG), Certification (CTG) and Long-Term Technology Goals (LTTG). As mentioned in the paragraph above, work is underway to develop fuel burn engine and airframe technology goals for the mid-term and the long-term. A roadmap for establishing these goals has been proposed that includes a workshop in March 2009. These goals will consider “the effects of ‘major technologies’ on fuel burn and efficiency, as well as combinations of improvements from aircraft and engine, including best possible and optimised integration”.

1.3 **Other developments**

1.3.1 In June 2008, ICAO posted on their website an impartial, peer reviewed Carbon Emissions Calculator that estimates the carbon dioxide emissions from air travel for use in offset programs. The Calculator allows passengers to estimate the emissions attributed to their air travel through a simple interface that requires the user to enter only their origin and destination airports, and their class of service. The methodology used by the calculator applies the best publicly available industry data to account for various factors such as aircraft types, route specific data, passenger load factors and cargo carried. The ICAO Carbon Emissions Calculator can be accessed through the ICAO website: www.icao.int by clicking the link labelled “ICAO Calculator” on the left side of the homepage.

1.3.2 ICAO’s Carbon Calculator supports the United Nations (UN) Climate Neutral Initiative which calls for all agencies and units of the UN system to determine their total carbon emissions. It makes it possible to harmonize the emissions estimates attributable to the air travel component of their operations. UN sister agencies, like the World Tourism Organization (UNWTO), will be using and promoting the Calculator. For airline-specific programmes, the International Air Transport Association (IATA) has issued guidance recommending that their members use the ICAO methodology coupled with their own airline-specific data for use in their carbon offset programmes, to achieve a more consistent approach to estimating the CO_2 footprint of flights while providing more precision through airline-specific data.

1.3.3 The 36th Session of the ICAO Assembly in 2007 established the Group on International Aviation and Climate Change (GIACC) consisting of 15 high-level government officials from States that are geographically representative of developed and developing countries alike. Their

collective mandate is to develop and recommend to ICAO an aggressive programme of action for international aviation and climate change to be considered by the Organization under a timeline that takes into account the 15th Conference of the Parties to the UNFCCC in Copenhagen, at the end of 2009. In July, GIACC held its second meeting and discussed the possible establishment of global short-, medium- and long-term aspirational goals for fuel burn. They also formed smaller working groups to expedite work on the goals, measures and means to evaluate progress to reduce aviation GHG.

1.3.4 GIACC is required to investigate, inter alia, improvements in aircraft technology and ground based equipment; more efficient operational measures and more extensive use of such measures; improvements in air traffic management to improve efficiency, shortening routes and reducing congestion; the use of market-based measures, including positive economic incentives; the deployment of modern, efficient aircraft into the in-service fleet; and other options to improve the environmental performance of international civil aviation. Per the terms of reference for the group, GIACC operates on a consensus basis and avails itself of the technical work of CAEP. The structures of CAEP and GIACC are parallel with CAEP WG3 being able to provide direct input regarding new technology, CAEP WG2 being able to provide direct input regarding operational measures, and CAEP Market Based Measures Task Force (MBMTF) being able to provide direct input regarding market based measures. The proceedings from the first two GIACC meetings are available on the ICAO website at: www.icao.int/icao/en/env/workshops.htm.

1.3.5 While ICAO is working towards the development of GHG reduction and other goals at the global level, implementation takes place at the regional and local levels. For this reason, it is critical for regional groups to understand the high-level objectives of ICAO and for technical groups, like CAEP, to be informed of developments in the regions to able to support the assessment of the environmental protection benefits of regional plans.

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