International Civil Aviation Organization

HLM-LTAG-WP/3
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WORKING PAPER

HIGH-LEVEL MEETING ON THE FEASIBILITY OF A LONG-TERM ASPIRATIONAL GOAL FOR INTERNATIONAL AVIATION CO_2 EMISSIONS REDUCTIONS (HLM-LTAG)

Montréal, 19 to 22 July 2022

Agenda Item 1: CO_2 emissions reduction scenarios and options for LTAG
Agenda Item 4: Conclusions and Recommendations of the Meeting

SCIENTIFIC UNDERSTANDING (BUILDING BLOCK 1)

(Presented by the ICAO Secretariat)

SUMMARY

This paper presents the recent developments in other United Nations bodies of relevance to international aviation and in particular to the feasibility of a long-term global aspirational goal (LTAG), such as the latest scientific findings by the Intergovernmental Panel on Climate Change (IPCC), and outcomes of the United Nations Framework Convention on Climate Change (UNFCCC).

Action by the Meeting is in paragraph 3.

1. UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

1.1 ICAO continues to cooperate with other United Nations (UN) bodies and international organizations involved in policy making on climate change, notably with the United Nations Framework Convention on Climate Change (UNFCCC). The ultimate objective of the UNFCCC is to achieve stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

1.2 The Kyoto Protocol, which was adopted by the Conference of the Parties (COP) to the UNFCCC in December 1997 and entered into force on 16 February 2005, calls for developed countries (Annex I Parties) to pursue limitation or reduction of greenhouse gases from "aviation bunker fuels" (international aviation) working through ICAO (Article 2.2 of the Kyoto Protocol).

1.3 Under ICAO's continuous leadership, Member States work together to limit or reduce emissions from international aviation, including the adoption at the 2010 Assembly of the ICAO global aspirational goals for the international aviation sector of improving fuel efficiency by 2 per cent per annum and keeping the net carbon emissions from 2020 at the same level. Due to the cross-national-boundary nature of international aviation emissions, the ICAO 2020 global aspirational goals set out the international aviation sector's collective goals, without attribution of specific obligations in the form of emissions reduction goals to individual States, and Member States contribute to the achievement of collective goals by planning and implementing different sets of measures to reduce CO_2 emissions from international aviation, under the umbrella of ICAO coordination.

1.4 For domestic aviation emissions (emissions from a flight departing and arriving within the same State), States can decide on its goal and select measures to implement to reach that goal. However, when it comes to addressing international aviation emissions, a different approach is taken, as the goal is concerned with measures that could be applied outside of the national territory of the States. Therefore, a collective global approach under ICAO is needed.

1.5 Due to the cross-national-boundary nature of international transport, emissions from international aviation and maritime are not included as part of the Nationally Determined Contributions (NDCs) of individual States under the Paris Agreement, adopted under the UNFCCC, and these are addressed globally as a sector by ICAO and the International Maritime Organization (IMO), respectively, to complement the achievement of the Paris Agreement temperature goals. ICAO regularly delivers statements and written submissions on the recent ICAO developments in addressing emissions from international aviation. ICAO also organizes and participates in relevant meetings and side events at the UNFCCC conferences[1], with the view to fostering further synergies and cooperation, whilst maintaining ICAO's leadership role on all issues related to international aviation and climate change.

1.6 The Paris Agreement, as adopted by the UNFCCC COP21 in 2015 in Paris, France, "aims to strengthen the global response to the threat of climate change, including by holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change"[2].

1.7 In addition, the Glasgow Climate Pact, as adopted by the recent UNFCCC COP26 in 2021 in Glasgow, UK, "reaffirms the long-term global goal to hold the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change"[3], and also "recognizes that the impacts of climate change will be much lower at the temperature increase of 1.5 °C compared with 2 °C, and resolves to pursue efforts to limit the temperature increase to 1.5 °C"[4], while noting with serious concern the current level of contributions of NDCs, and requested the strengthening of emissions reduction targets in the NDCs and long-term low GHG emission development strategies, toward the achievement of the temperature goal.

2. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

2.1 ICAO also continues to keep abreast of developments in other UN bodies, including the work of the Intergovernmental Panel on Climate Change (IPCC) and its latest scientific findings as part of the 6th IPCC Assessment Report (AR6).

2.2 According to the IPCC AR6 assessment, it is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. From a physical science perspective, the global surface temperature will continue to increase until at least mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades.

2.3 Based on the IPCC assessment of multiple lines of evidence, only under the very low (SSP 1-1.9) and low (SSP 1-2.6) GHG emissions scenarios (refer to the Figure 1 below), global warming of 2°C is extremely unlikely to be exceeded or unlikely to be exceeded, respectively. For the ICAO LTAG feasibility study, ICAO used the "very low GHG emissions scenario", under which it is more likely than not that

[1] ICAO outreach at UNFCCC COP26 (November 2021): https://www.icao.int/environmental-protection/Pages/cop26.aspx
[2] Article 2 of the Paris Agreement: https://unfccc.int/sites/default/files/english_paris_agreement.pdf
[3] Paragraph 15 of the Glasgow Climate Pact: https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf
[4] Paragraph 16 of the Glasgow Climate Pact: https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf

global temperature would decline back to below 1.5°C towards the end of the 21st century, with a temporary overshoot of no more than 0.1°C above 1.5°C global warming.

2.4 The IPCC AR6 states that limiting human-induced global warming to a specific level requires limiting cumulative CO_2 emissions, reaching at least net zero CO_2 emissions, along with strong reductions in other greenhouse gas emissions. Strong, rapid and sustained reductions in CH_4 emissions would also limit the warming effect resulting from declining aerosol pollution and would improve air quality.

2.5 The IPCC AR6 utilized an approach based on the carbon budget, which is the maximum amount of cumulative net global anthropogenic CO_2 emissions that would result in limiting global warming to a given level with a given likelihood, taking into account the effect of other anthropogenic climate forcers. For the IPCC AR6 estimated cumulative residual global anthropogenic CO_2 emissions (400 $GtCO_2$ at 67% probability) from the start of 2020 to limit global warming to 1.5°C, the international aviation share varies between 4.1 and 11.3%, depending on the LTAG Integrated Scenarios in the ICAO LTAG report. Similarly, for a warming limit of 2°C with the remaining allowed carbon emissions estimated to 1150 $GtCO_2$ at 67% probability, the international aviation share is between 1.4 and 3.9%, according to the ICAO LTAG report (also HLM-LTAG-WP/4 and IP/2 refers).

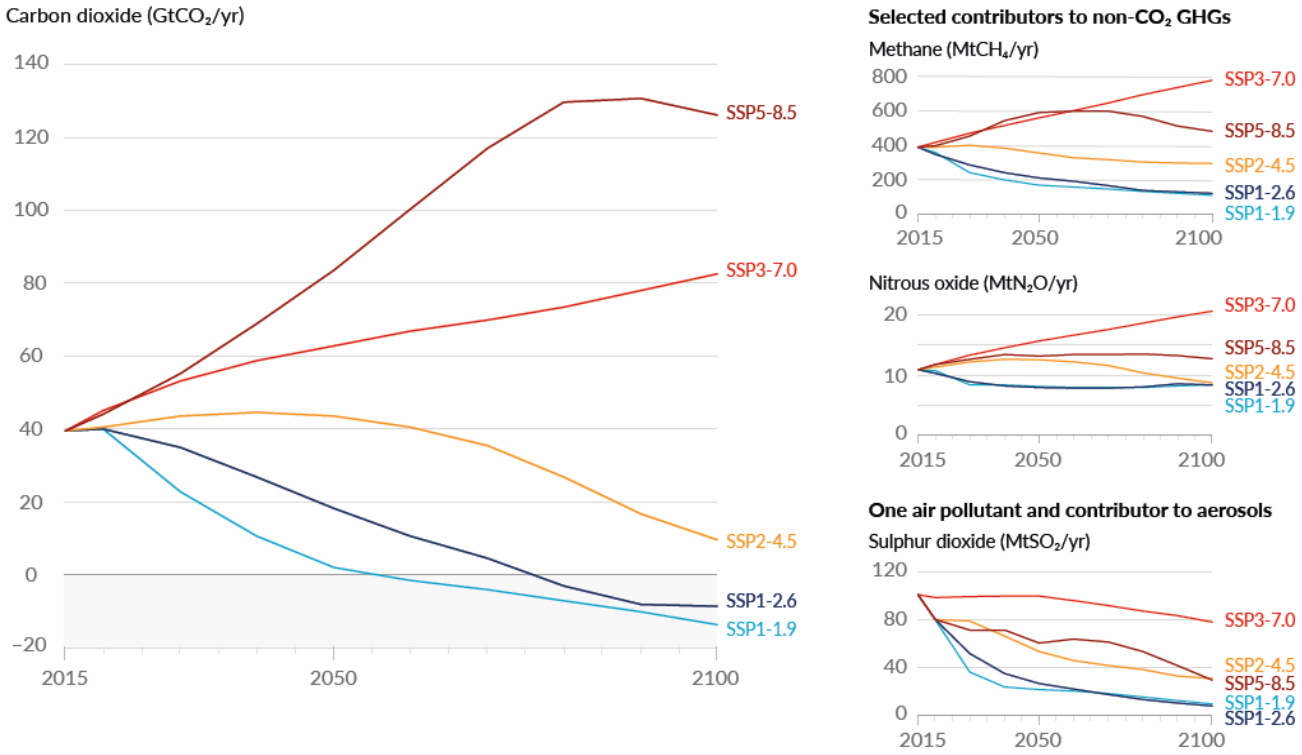

Figure 1. Future annual emissions of CO_2 (left) and of a subset of key non-CO_2 drivers (right), across five IPCC AR6 illustrative scenarios (Figure SPM.4 (part of) from IPCC AR6 WG1, 2021).

2.6 The IPCC AR6 also states, that while efficiency improvements (e.g., optimised aircraft designs, mass reduction, and propulsion system improvements) can provide some mitigation potential, additional CO_2 emissions mitigation technologies for aviation will be required. For aviation, such technologies include high energy density biofuels, and low-emission hydrogen and synthetic fuels, while electrification could play a niche role for aviation for short trips and can reduce emissions from airport operations. The IPCC AR6 also provides that current sectoral levels of ambition vary, with emission reduction aspirations in international aviation and shipping lower than in many other sectors.

2.7 According to the IPCC's latest scientific findings, achieving net zero global CO_2 emissions by around 2050 will provide the best chance to keep the global average temperature increase below 1.5°C, and

that the 1.5°C temperature goal is beyond reach without immediate and deep emissions reduction across all sectors, while achieving net zero global CO_2 emissions by around 2070 will provide the best chance to keep the global average temperature increase below 2°C. Accelerated and equitable climate action in mitigating, and adapting to, climate change impacts is critical to sustainable development.

2.8 In light of the IPCC's latest assessment, it is clear that while current ICAO global aspirational goals for international aviation in Assembly Resolution A40-18 (i.e. fuel efficiency improvements and carbon neutral growth) will keep the net CO_2 emissions from international aviation at a certain level, these goals will not align with a path in support of the 1.5°C temperature goal or the 2°C temperature goal.

2.9 In accordance with the IPCC AR6, many regulatory and economic instruments have already been deployed successfully. Such instruments could support deep emissions reductions and stimulate innovation if scaled up and applied more widely. Policy packages that enable innovation and build capacity are better able to support a shift towards equitable low-emission futures than are individual policies. Economy-wide packages, consistent with national circumstances, can meet short-term economic goals while reducing emissions and shifting development pathways towards sustainability.

3. ACTION BY THE HLM-LTAG

3.1 The HLM-LTAG is invited to:

a) recognize the recent developments and findings under the UNFCCC, the Paris Agreement, and IPCC of relevance to international aviation, in particular the feasibility of an LTAG, and the implications of international aviation CO_2 emissions' long-term pathways; and

b) use the information contained in this paper, for consideration of possible outcomes of the HLM-LTAG related to the LTAG Building Block 1: *Scientific Understanding*, including the recent developments under the UNFCCC process and the latest findings by the IPCC of relevance to international aviation, in particular the feasibility of an LTAG.

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