International Civil Aviation Organization

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WORKING PAPER

FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 26 August to 6 September 2024

Agenda Item 2: Timely and safe use of new technologies
2.1: Evolving aircraft technologies contributing to LTAG

INDUSTRY CONTRIBUTION TO THE ICAO LONG-TERM ASPIRATIONAL GOAL

(Presented by the Air Transport Action Group (ATAG), Airports Council International (ACI), Civil Air Navigation Services Organisation (CANSO), International Air Transport Association (IATA), International Business Aviation Council (IBAC) and International Coordinating Council of Aerospace Industries Associations (ICCAIA))

EXECUTIVE SUMMARY

This paper presents an overview of various technical and operational items that the aviation industry would like to progress as part of the sector's commitment to the long-term aspirational goal of net-zero carbon emissions by 2050. Included are items where States and ICAO can help with progress on new technology, sustainable aviation fuels and operational measures. The items noted in the discussion cover part of the sector's decarbonisation efforts.

Action: The Conference is invited to take note of the actions outlined in section 3.1.

1. INTRODUCTION

1.1 The 41st ICAO General Assembly agreed to the ICAO long-term aspirational goal (LTAG) of net-zero carbon emissions to be reached by 2050.

1.2 Underpinning the LTAG agreement itself is the Long-term Aspirational Goal Report (LTAG Report) along with the *Report of the High-Level Meeting on the Feasibility of a Long-Term Aspirational Goal for International Aviation CO_2 Emissions Reductions (HLM-LTAG). Montréal, 19-22 July 2022* (Doc 10178).

1.3 Industry provided considerable support and expertise in developing the technical sections of the LTAG Report, including by identifying the potential benefits of the mitigation options of the ICAO basket of measures, both on aircraft and engines technology aspects, and in the efficiency of operations and air traffic management that can deliver significant CO_2 emissions reductions. The technologies identified represent both evolutions from what is known and operated today and revolutions in terms of energy use, aircraft and engine configurations and design, and operations.

[1] Arabic, Chinese, English, French, Spanish and Russian versions provided by ATAG.

1.4 This paper describes the accommodations and adaptations that some, many or all of those technologies, operational changes and new alternative energies could require, and invites ICAO to work on the upstream identification of those needs to facilitate smooth introduction into service.

2. DISCUSSION

2.1 Achieving the LTAG presents challenges to the industry and requires an unprecedented level of effort, in particular as it both evolves current technologies and operations to be more sustainable; and as it develops revolutionary engine and airframe technologies and concepts of operations.

2.2 To facilitate implementation of these new developments, many of which are being developed in parallel, a "Standards Roadmap" that guides States towards regulations that will allow the technologies to be operated as envisioned and that matches the industrial technology and operations/ATM roadmaps is essential. It can help guide ICAO, States and industry in the identification of priorities, time sequences, and particularly in the allocation of resources to ensure that the required Standards are available when needed by the affected parties.

2.3 One cornerstone, short-term adaptation that will be needed to drive the early stages of the LTAG is the need to accommodate the use of sustainable aviation fuels (SAF) – see AN-Conf/14-WP/25. Indeed, the Third Conference on Aviation and Alternative Fuels (CAAF/3) agreed, in November 2023, a "*collective global aspirational Vision to reduce CO_2 emissions in international aviation by 5 per cent by 2030 through the use of SAF, LCAF and other aviation cleaner energies (compared to zero cleaner energy use)*". This vision will require the production and uptake of substantial quantities of SAF for use in engines and aeroplanes that are both in production and in operation and encourage the adaptation of aircraft and engines to accommodate up to 100 per cent SAF use as quickly as possible.

2.4 ICAO does not have the responsibility to approve fuels for use in aviation. This is primarily the role of ASTM International or similar bodies, it may be necessary for airports to be able to supply and deliver to the aircraft both drop-in fuels (i.e. fuels conforming to the same current standard as Jet A1 – ASTM D1655 and ASTM D7566) and non-drop in fuels (fuels which include higher blends of synthesised fuels with a new ASTM specification, currently in development) as the fleet transitions to increased use of SAF. Currently, SAF is delivered as a blend of up to 50 per cent, but manufacturers have made a commitment[2] to enable operation of aircraft and engines using 100 per cent SAF by 2030.

2.5 Into the next decade, it is envisaged that revolutionary propulsion and energy technologies such as hybrid (see AN-Conf/14-WP/23), electric (see AN-Conf/14-WP/22) and hydrogen (see AN-Conf/14-WP/24) will be brought to market and become progressively more commonplace in service. Concepts in all three categories are well developed with some demonstrations already having been completed. Once again, updated aerodrome standards will be needed, including common standards for refuelling or recharging infrastructure, including connectors, and adaptations to firefighting capabilities to be compatible with hydrogen fuels.

2.6 Standards and Recommended Practices for the generation of electricity or production of hydrogen on or very near airports will be needed. ACI estimates that up to an additional 1 700 TWh of electricity generation, either for direct use in recharging electric aircraft or their batteries, or for the production of hydrogen for use in aircraft, might be needed by 2050. This electricity will need to be generated and distributed cleanly and safely. In addition to such large generation capability, operators will

[2] ICCAIA media release https://iccaia.org/wp-content/uploads/2023/09/Public-Statement-100-SAF-Commitment-Final.pdf

need to be mindful of the need to comply with power supply and other regulations, not previously associated with airports.

2.7 Specifically in the case of hydrogen, since airport infrastructure adaptation is already beginning to allow the use of hydrogen powered ground service vehicles, the use of fuel cells to produce electricity on aircraft, perhaps in place of the auxiliary power unit, is likely to come to fruition well ahead of full flight using hydrogen as a fuel since lower volumes will be required.

2.8 It will be essential to ensure that safety of the new vehicle concepts is maintained and therefore it will be necessary to scrutinise the certification of aircraft performance characteristics (take-off, climb, landing) and aircraft configuration and design specifics to maintain emergency exit and escape standards. Revolutionary configurations of aircraft such as blended wing bodies or truss braced wings may introduce wingspans that require the recoding of airport infrastructure; monitoring of separation requirements; or even construction of new infrastructure.

2.9 New technologies in the flight deck are likely to also introduce new operational concepts such as wake energy retrieval (see AN-Conf/14-WP/28) and further increased accuracy for precision flying in all four dimensions. For example, implementation of required time of arrival (RTA) concepts through airport operations centre (APOC) can allow better sequencing of aircraft in terminal management areas to reduce, or ultimately eliminate, holding times.

2.10 The progressive implementation of advanced Aviation System Block Upgrade (ASBU) elements in the *Global Air Navigation Plan* (GANP, Doc 9750) will improve efficiency in all phases of flight and enable the efficient integration of diverse airspace users and the realisation of advanced trajectory-based concepts of operation. A shift to service-oriented architecture for air traffic management systems will facilitate faster and iterative system implementations, but necessitate corresponding changes to system certification to realise benefits.

2.11 While ICAO has set an ambitious goal, it is incumbent on the industry to invest in technology and operations to actually deliver that goal. Industry needs ICAO to help across all areas – airworthiness, certification, aerodrome standards and operations – to facilitate the timely delivery of standards that enable the safe use of alternative fuels, energies, configurations and operational concepts.

2.12 ICAO has already launched a series of collaborative actions through the Council Small Group on Innovation to better understand and anticipate future technological needs and has initiated work within the Air Navigation Commission to define a modus operandum that would implement a systemic approach to anticipating what new standards will be needed and by when to accommodate new aircraft technologies. Panels have also begun to understand the need to be prepared to facilitate the arrival of the new technologies. It will be important to ensure that operational improvements, including for a future of integrated airspace, can also be captured by the frameworks under development in the future.

2.13 The collaborative approach sees ICAO working with manufacturers, airports, air navigation service providers and airlines and operators to continue to ensure that ICAO has a clear understanding of the state-of-the-art and is thus equipped to anticipate the future direction that the sector will take to meet the LTAG. We encourage that this approach is continued.

3. CONCLUSION

3.1 The Conference is invited to:

a) note the industry's commitment to the LTAG and to the safe introduction of technologies that deliver the ambitious goal;

b) support the work of developing a comprehensive Standards and Recommended Practices Roadmap, reflecting the need for timely development of standards for technologies, operations and new energies, that facilitate the development of regulations for safe entry into service of the identified concepts; and

c) support the ongoing collaborative approach between ICAO and the industry to develop the Standards Roadmap.

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