Introduction

By the ICAO Secretariat

According to the Intergovernmental Panel on Climate Change (IPCC) Assessment Report 6 (AR6), near-term actions that limit global warming to close to 1.5°C would substantially reduce projected losses and damages related to climate change, in both human systems and ecosystems, compared to higher warming levels. The International Civil Aviation Organization (ICAO) took sound actions in advance, and in 2010 adopted two sectoral aspirational goals: 2% annual fuel efficiency improvement and carbon neutral growth from 2020 onwards. In 2010, international aviation became the first sector that committed to carbon neutral growth – this was a milestone for aviation marking the realization of this commitment.

A concrete strategy was developed to achieve it – an ICAO basket of measures, which consisted of a set of actions to mitigate CO_2 emissions; including aircraft new technologies, air traffic management and operational improvements, and sustainable aviation fuels. The main objective was to achieve the necessary CO_2 emissions reductions within the sector to the greatest extent possible. In addition, acknowledging that these measures alone were not enough to meet carbon neutral growth from 2020, ICAO adopted CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) in 2016.

In October 2010, the 37th ICAO Assembly requested the development of an ICAO CO_2 Emissions Standard. Following seven years of development and coordination with ICAO Member States, civil aviation authorities, aviation industry and other stakeholders, on the 6th of March 2017, the ICAO Council adopted a new aircraft CO_2 emissions standard, contained in Volume III "Aeroplane CO_2 Emissions" of the Annex 16 "Environmental Protection". These new requirements assist in tracking the environmental gains achieved by new aeroplanes, and the benefits accrued via specific technology evolutions.

In January 2020, the ICAO CO_2 Standard became applicable to New Type aeroplane designs, and in June 2021, the Standard adopted globally through ICAO was applied by the European Union Aviation Safety Agency (EASA) for its

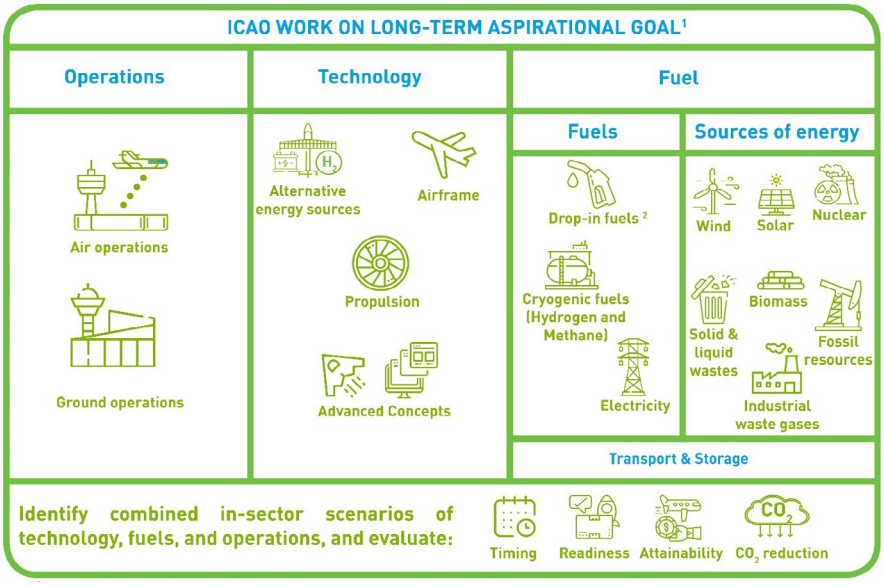

FIGURE 1: ICAO LTAG work elements and its technology-relevant components.

latest type certificate issuance for the new Airbus A330-941neo. EASA's application of the new ICAO provisions assured aircraft compliance with the latest and most stringent environmental standards, addressing the full spectrum of aircraft impacts on the environment and the climate.

Moreover, ICAO's outlook has been directed into the future, with innovations at its core. The ICAO Stocktaking process for in-sector CO_2 reductions, which has been significantly enhanced in recent years to support the feasibility study of a long-term aspirational goal (LTAG) for international aviation (Figure 1), revealed strong calls for high ambition from governments and industry leaders. It also emphasized the importance of new innovations in technology, operations, and fuels to accelerate the realization of sustainable aviation.

Aviation technologies are constantly evolving, from engines, to airframes, and to aerodynamics. These are incremental advances, such as more fuel-efficient combustion jet engines, or winglets for retrofitted aircraft, or new aircraft. There can also be entirely new concepts and technological breakthroughs. From the short- and mid-term perspectives, the current air fleet is being upgraded with continuous development of the conventional technologies in airframe and propulsion towards cleaner and greener operations. From the mid and long-term standpoint, manufacturers and researchers are featuring new aircraft designs and propulsion to reduce CO_2 emissions, and a wide range of options on sustainable aviation fuels and clean energy sources, such as hydrogen and electrification.

The gradual electrification of aircraft is also a reality. Some urban electric and hybrid transport flying systems are performing test flights and start entering the market. Hybrid electric aircraft have been researched and considered by major manufacturers to enter service around 2030. To support such a transition, aviation infrastructure is switching to renewable energies originating from solar panels, wind turbines and geothermal energy, of which some can be deployed directly at airports. Solar-at-Gate pilot projects in Cameroon and Kenya, implemented by ICAO through external funding, allow aircraft to avoid the use of fossil fuels while on the ground. The objective is to replicate these types of projects broadly at other airports.

To facilitate the promotion of sustainable growth of international aviation, ICAO has also created the Global Coalition for Sustainable Aviation, closely following up the development of innovations that can generate in-sector CO_2 emissions reductions. To complement this Coalition, ICAO is closely following up the development of innovations that can generate in-sector CO_2 emissions reductions by means of Tracker Tools.

These are organized in four main streams: Technology, Operations, Sustainable Aviation Fuels, and net zero initiatives. The Technologies tracker[1] provides a variety of information on initiatives related to technologies and innovation, aimed at reducing the environmental footprint of aviation, including details of past and ongoing initiatives. ICAO will continue to facilitate and promote all aviation innovations and technological advancements towards the sustainable future of the aviation sector.

1 ICAO in-sector aviation CO_2 emissions reduction initiatives – Technology Tracker tool: https://www.icao.int/environmental-protection/SAC/Pages/Technology.aspx