

The Sustainability of Aviation

A Statement by the Chief Technology Officers of seven of the world's major aviation manufacturers.

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A Unified Commitment

Aviation connects our world by efficiently and rapidly moving people, opening new economic opportunities and transporting food and goods all over our planet. Aviation promotes global understanding, generating rich cultural exchanges and thereby contributing to peaceful co-existence.

At the same time, climate change has become a clear concern for our society. Humanity's impact on the climate requires action on many fronts. The aviation industry is already taking significant action to protect the planet and will continue to do so.

Aviation contributes to two percent of human-made carbon dioxide emissions. The industry has challenged itself to reduce net CO₂ emissions even while demand for air travel and transport grows significantly. Through the Air Transport Action Group (ATAG), the aviation industry became the world's first industrial sector to set an ambitious target: reduce CO₂ emissions to half of year 2005 levels by 2050, and to limit the growth of net CO₂ emissions by 2020. We are on track to meet those near-term commitments, including the 2019 implementation of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) program as agreed upon by the nations of the International Civil Aviation Organization (ICAO).

The Chief Technology Officers of seven of the world's leading aviation manufacturers are now collaborating at an unprecedented level to ensure the industry meets these aggressive and necessary commitments.

The Strategy

There are three major technological elements to sustainable aviation:

1. Continuing to develop **aircraft and engine design and technology** in a relentless pursuit of improvements in fuel efficiency and reduced CO₂ emissions.
2. Supporting the commercialization of **sustainable, alternate aviation fuels**. Around 185,000 commercial flights have already proven that today's aircraft are ready to use them.
3. Developing radically new aircraft and propulsion technology and accelerating technologies that will enable the **'third generation'** of aviation.

Other factors, such as efficient air traffic management and aircraft routing that minimizes fuel consumption also have a vital part to play. Our industry has demonstrated significant progress on reducing noise and other environmental impacts and will continue to do so.



Aircraft and Engine Design and Technology

For the last 40 years, aircraft and engine technology has reduced CO₂ emissions by a yearly average of over one percent per passenger mile. This has been the result of significant R&D investments in materials, aerodynamic efficiency, digital design and manufacturing methods, turbomachinery developments and aircraft systems optimization.

For many years, through a variety of industry organizations and international bodies, the aviation community has voluntarily committed to meet a set of aggressive targets for enhanced airplane environmental performance. Targets set by the Advisory Council for Aeronautics Research in Europe call for a 75 percent reduction in CO₂, a 90 percent drop in NO_x and a 65 percent decrease in noise by 2050, compared with year 2000 levels.

To help achieve these aggressive goals, global agreements reached through ICAO call for a fuel-efficiency performance standard to be part of the certification process applied to every airplane.

We remain committed to improving existing aircraft and engine designs to continue the trajectory of improving efficiency as much as possible. Concurrently, we note the tremendous technological challenges ahead of us and the likely need to include more radical 'third generation' approaches.

Fostering the Energy Transition: Sustainable Aviation Fuels

Aviation will continue to rely on liquid fuels as the fundamental energy source for larger and longer-range aircraft for the foreseeable future. Even under the most optimistic forecasts for electric-powered flight, regional and single-aisle commercial airplanes will remain operating in the global fleet with jet fuel for decades to come. Therefore, the development of Sustainable Aviation Fuels (SAFs) which use recycled rather than fossil-based carbon and meet strong, credible sustainability standards is an essential component of a sustainable future. Five pathways for production of SAFs have already been approved for use, with commercial scale production of one of these pathways already in place. We believe that accelerating production scale-up of all commercially viable pathways, while simultaneously developing additional lower cost pathways, is the key to success. This work is already underway at research institutions and within companies in various industrial sectors. What is needed is an expansion of government support for technology development, production facility investment, and fuel production incentives around the world.

We are fully supportive of any fuel, which is sustainable, scalable, and compatible with existing fuels. We will work closely with fuel producers, operators, airports, environmental organizations and government agencies to bring these fuels into widespread aviation use well ahead of 2050.

The Third Era of Aviation

Aviation is at the dawn of its third major era, building on the foundation laid by the Wright brothers and the innovators of the Jet Age in the 1950s. Aviation's third era is enabled by advances in new architectures, advanced engine thermodynamic efficiencies, electric and hybrid-electric propulsion, digitization, artificial intelligence, materials and manufacturing. Larger aircraft will begin to benefit from novel designs that will further improve efficiency through management of aircraft drag and distributing propulsion in new ways. New materials will enable lighter aircraft, further improving efficiency.

We are excited by this third generation of aviation and, even though all of the represented companies have different approaches, we are all driven by the certainty of its contribution to the role of aviation in a sustainable future. We believe aviation is entering its most exciting era since the dawn of the Jet Age. This third era promises a transformative positive impact on lives around the globe — and we stand ready to make it a reality.

Call to Action: Let's Make This Future Together

The future of aviation is bright. Yet, in addition to the significant efforts our sector is undertaking, we also depend on the coordinated support from policymakers, regulators and governments working together to achieve these goals.

There must be additional public and private commitment to establish a sound regulatory foundation to address the novel issues associated with emerging aviation technologies and to provide the necessary economic support for widespread SAFs commercialization. We envision broader, deeper and ongoing coordination through ICAO to facilitate unified approaches to regulation with established national and global regulatory and standards-setting bodies. These include the U.S. Federal Aviation Administration, the European Aviation Safety Agency, and the Civil Aviation Administration of China, Transport Canada, ANAC of Brazil and others.

As industry CTOs we are now crossing competitive boundaries to coordinate and share our approaches to driving the sustainability of aviation. We believe in this industry and its role in making our world a brighter and safer place. We also strongly believe we have an approach to make aviation sustainable and play an even bigger role in our global community.

[SIGNATORIES LISTED ALPHABETICALLY BY COMPANY]

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