PREFACE

Aviation is an integral part of the European way of life – connecting people, moving goods, driving economic growth, and strengthening the bonds that unite us. It is a true success story of the European project, enabling citizens to move freely across our continent and throughout the world. Aviation's contribution reaches far beyond its economic and social impact: the industry embodies Europe's innovation and competitiveness, showcasing its global leadership through the achievements of the world-class aviation companies that form our associations' memberships.

Amid the urgent need to address climate change, the aviation sector has committed itself to reducing its environmental impact. This generational challenge may seem insurmountable, but the aviation sector has always championed innovation and ingenuity. Just as air travel became an everyday reality, achieving net-zero flying is within our reach. We can get there.

Now, more than ever, time is of the essence. The next five years are pivotal, offering a narrow, critical window to put in place the policies and strategies needed to achieve Europe's 2050 climate goals. Our actions now will define our future.

The European aviation industry – encompassing airlines, airports, air navigation service providers, civil aeronautics industry – stands united in its commitment to achieving climate neutrality by 2050, aligned with the EU Green Deal and the Paris Agreement. At the heart of this commitment lies our alliance, DESTINATION 2050, guided by a collective vision: to make net-zero aviation a reality.

This is our second granular, scientifically driven roadmap, updating the initial roadmap published in 2021 and integrating significant advances in our actions and understanding of decarbonisation measures. These insights form the robust scientific foundation underpinning our policy recommendations.

The path to net-zero aviation is being shaped by transformative solutions across the industry. In addition to advancements in technology, air traffic management (ATM), and aircraft operations – which will enhance aviation's efficiency and optimise its use of energy resources – Sustainable Aviation Fuel (SAF) is central to decarbonisation. SAF is projected to deliver the largest share of emission reductions in aviation by 2050. However, achieving this potential depends on effective collaboration between the aviation sector, the energy industry, EU policymakers, and public and private investors to accelerate the development and scaling of SAF production in support of decarbonisation goals.

To this end, we urge policymakers to:

- **Prioritise aviation** in the upcoming Clean Industrial Deal, as well as establish a dedicated Aviation Industrial Strategy that drives decarbonisation whilst strengthening global competitiveness.
- **Champion Europe's emerging SAF industry** as the next great success story, unlocking prosperity, creating jobs, enhancing energy sovereignty, and building strategic resilience in a rapidly evolving and increasingly complex geopolitical landscape.

The good news is that net-zero aviation by 2050 remains within reach, thanks to advances in aircraft and engine technology, improvements in ATM and aircraft operations, the adoption of alternative fuels, and out-of-sector measures such as carbon removals.

However, we cannot do it alone. Achieving this goal demands a united effort. Policymakers and investors must work shoulder-to-shoulder with the aviation sector to ensure sustained support for critical research programmes and infrastructure that will accelerate progress toward decarbonisation.

With this updated roadmap, we, the DESTINATION 2050 partners, present a clear and actionable pathway to achieve net-zero aviation emissions by 2050. This is a historic opportunity to shape a competitive, sustainable European aviation sector that sets a global standard for decarbonising a hard-to-abate sector.

Boarding has started – will you join us in turning this vision into reality?

STOCKTAKE – Progress towards net-zero aviation

The journey to net-zero aviation is well underway, marked by significant strides since the release of the first DESTINATION 2050 roadmap in 2021. At both international and European levels, progress has been made to decarbonise the sector, demonstrating the commitment of both industry and governments to this critical objective. This stocktake outlines the advances made, the challenges ahead, and the measures required to accelerate the transition – all while ensuring Europe maintains its leadership in sustainable aviation innovation and competitiveness.

Progress at the International and European Levels

International Achievements

2021: The global aviation industry, represented by ATAG, committed to achieving net-zero carbon emissions for civil aviation operations by 2050.

2022: The 41st ICAO Assembly adopted a Long-Term Aspirational Goal (LTAG) for international aviation of net-zero carbon emissions by 2050, aligned with the UNFCCC Paris Agreement's temperature goal.

Simultaneously, ICAO revised the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), setting a new baseline at 85% of 2019 emissions to account for the impact of the COVID-19 crisis. This enhanced CORSIA's efficiency, with 129 states participating in the voluntary phase starting in 2025.

2023: At the Third ICAO Conference on Aviation and Alternative Fuels (CAAF/3), ICAO adopted a global framework for Sustainable Aviation Fuels (SAF), Lower Carbon Aviation Fuels (LCAF), and other cleaner aviation energy sources. Member States committed to a collective aspirational vision to reduce CO_2 emissions in international aviation by 5% by 2030, compared to zero cleaner energy use – a target aligned with the ReFuelEU Aviation Regulation.

EU Policy Progress

ReFuelEU Aviation Regulation: Adopted by the EU in 2023, this Regulation mandates that aviation fuel suppliers gradually increase the share of SAF blended into conventional aviation fuel at EU airports – from 2% in 2025, to 6% in 2030, and 70% in 2050. It also defines SAF sustainability criteria aligned with the Renewable Energy Directive (RED).

Revised EU Emissions Trading System (EU ETS):

- **Allocates SAF allowances:** The EU has allocated 20 million free EU ETS allowances (valued at €1.6 billion, based on an allowance price of €80) to aviation for the period 2024–2030. These allowances aim to cover a part of, or the entire price gap between conventional fossil fuels and eligible alternative aviation fuels uplifted from January 2024.
- **Possible extension of the EU ETS scope:** The European Commission is evaluating whether to extend the current geographical scope of the EU ETS as of 2027. This decision will be informed by an assessment report on CORSIA, focusing on whether CORSIA has strengthened its ambition and coverage of international aviation emissions.

- **Introduction of a non-CO_2 Monitoring, Reporting, and Verification (MRV) Framework:** Starting 1 January 2025, a new MRV framework will calculate CO_2 equivalent emissions per flight using data on flight information, aircraft and fuel properties, performance metrics, and weather conditions.

Single European Sky ATM Research (SESAR)

- SESAR continues to advance its innovation pipeline, moving closer to realising the **Digital European Sky** and its 2045 objective of making Europe "the world's most efficient and environmentally friendly sky to fly in the world". Operational stakeholders completed 300 implementation projects by the end of 2024, which are set to deliver almost € 17 billion in benefits to the industry by 2035, including savings of over 4 million tonnes of fuel savings and almost 14 million tonnes of CO2.
- An updated **SESAR EU ATM Master Plan**, released in December 2024, prioritises deployment objectives to guide investments, accelerate uptake, and address remaining development priorities to achieve the Digital European Sky.

Industry Progress

The aviation industry has achieved remarkable developments in recent years, particularly in aircraft innovation and sustainability:

Next-generation aircraft: Original Equipment Manufacturers (OEMs) have introduced a new generation of aircraft that achieve **20–25% lower CO_2 emissions** compared to previous models. Today, **30% of the global airline fleet** operates these advanced aircraft, with **70% still to be delivered**. This transition promises a significant reduction in air transport's emissions.

Investment in future technologies: OEMs are investing significantly in new technologies to drive further emissions reductions. The next generation of aircraft, expected to enter service within the next decade, aims to deliver a step-change in efficiency. According to ATAG, the civil aerospace industry spends **15 billion USD (14.41 billion EUR) annually** on efficiency-related research and development.

SAF compatibility testing: OEMs have conducted extensive testing of current and next-generation engines and aircraft using up to **100% Sustainable Aviation Fuels (SAF)**. These tests demonstrate SAF compatibility and ensure that technology is not a barrier to SAF adoption.

Airline commitments to SAF: **Fifty airlines**, representing **40% of global air traffic and jet fuel use**, have voluntarily committed to offtake SAF, targeting **5–30% of their jet fuel use by 2030**.

SAF production expansion: On the supply side, numerous new SAF production facilities have been announced in recent years. In 2023 alone, approximately **500,000 tonnes of neat (unblended) SAF** were produced and blended with conventional fossil fuels([1]).

[1] ATAG Aviation Benefits Beyond Borders 2024 report.

Air traffic management modernisation: The modernisation of air traffic management, including the adoption of new technologies and procedures, is enhancing capacity, optimising routes, improving efficiency, and reducing delays. These advancements are already saving **millions of tonnes of CO_2.** The SESAR ATM Master Plan estimates that efficiencies from ATM modernisation could reach 200 million tonnes by 2040: close to 3 years' worth of total CO_2 emissions from aviation in Europe.

Taking stock of progress

To assess the advances made so far – including the significant regulatory and technological developments in aviation over the past few years – and to chart the next steps in aviation's decarbonisation journey, we commissioned two independent, expert consultancies to conduct a comprehensive review of the DESTINATION 2050 roadmap. This updated roadmap provides a robust scientific foundation to guide our next steps and inform our policy recommendations, serving as a strategic blueprint for decarbonising European aviation. It ensures continued alignment with the ambitious goals of the European Green Deal and the forthcoming Clean Industrial Deal.

The roadmap reaffirms that the entire aviation sector, particularly in Europe, is fully committed to achieving net-zero CO_2 emissions by 2050 and is actively working to advance this ambitious objective. However, reaching net-zero carbon emissions in aviation is not something the industry can achieve alone.

Immediate actions required

For this reason, we urge the European Commission to prioritise aviation as a critical and essential hard-to-abate sector. This requires immediate, effective, fully aligned, and supportive policies at both EU and national levels:

1. **Include aviation within the scope of the forthcoming Clean Industrial Deal**.
2. **Develop a dedicated Aviation Industrial Strategy** that integrates the key recommendations outlined in this document, aligning with the insights from the Letta and Draghi reports.
3. **Scale up the availability and uptake of affordable Sustainable Aviation Fuels (SAF).**
4. **Accelerate research and development** by increasing and sustaining public funding for the Clean Aviation and SESAR Public-Private Partnerships (PPPs). Each PPP holds unique value and must remain a distinct entity. EU funding for SESAR deployment should extend beyond the current budgetary cycle, which ends in 2027.
5. **Enhance access to industrial financing** for technologies critical to decarbonisation, including electric, hybrid and hydrogen propulsion.

Time is of the essence; we have only one critical EU mandate ahead to set the trajectory for achieving our 2050 climate goals. This requires improving, deploying, and implementing the policy framework necessary to transition aviation toward net-zero carbon emissions. Achieving this transition demands a well-coordinated and collaborative effort among all stakeholders.

Engaging stakeholders through a high-level dialogue

To this end, we call on the European Commission and EU Member States to engage with the European aviation industry through the DESTINATION 2050 founding partner initiative. Establishing a structured, high-level dialogue at the EU level will be essential for aligning efforts and fostering collaboration across all stakeholders

and alliances. This dialogue will accelerate policy development and ensure the delivery of the necessary instruments to decarbonise aviation, supported by appropriate incentives and funding.

A jointly agreed EU Aviation Industrial Strategy

A jointly agreed EU Aviation Industrial Strategy, as part of the Clean Industrial Deal, is urgently needed. This strategy must foster innovation, secure financing, and provide regulatory certainty and consistency across policy initiatives. Such a framework will ensure the continued growth of a sustainable and competitive European aviation sector, which remains vital to Europe's connectivity, economic growth, and global competitiveness.

Investment needed for decarbonisation

Decarbonising the aviation sector requires substantial investment. This updated DESTINATION 2050 roadmap estimates total expenditures of **€2.4 trillion**, an increase of **€510 billion** (27%) from the **€1.89 trillion** identified in *The Price of Net Zero* report (excluding conventional fuel costs). The majority of this increase stems from rising premium expenditures, which have grown from **€820 billion** to **€1.3 trillion** (+57%), driven largely by higher Sustainable Aviation Fuel (SAF) market price estimates.

To meet these challenges, we must sustain and increase both private and public investment while fostering closer coordination and alignment among EU initiatives and Member States. This requires a regulatory framework that ensures market stability, provides long-term certainty, offers strong incentives for private investment within the EU, and establishes a global level playing field.

A Sustainable Transport Investment Plan

A **Sustainable Transport Investment Plan**, which should be implemented as part of the EU's Clean Industrial Deal, presents a unique opportunity to accelerate investment in sustainable technologies. Such a plan would secure access to clean, affordable energy as the aviation sector undergoes a critical transformation, ensuring Europe maintains its competitive edge in a rapidly evolving global landscape.

Aligning EU Regulations with global efforts

To ensure consistent progress, the EU's upcoming regulations must align with international efforts, particularly ICAO's work on CO_2 and noise standards. Strengthened cooperation within ICAO is a prerequisite for advancing decarbonisation at a global level. It is also critical if Europe is to remain a leader in aeronautics, driving innovation, economic growth, technological development, and prosperity for future generations.

Moving from regulation to implementation

Now is the time to move from setting regulations to effective implementation. This roadmap is built on four pillars to achieve net-zero emissions:

1. **Aircraft and engine technology**
2. **Renewable energy** (including SAF and hydrogen)
3. **Optimised air traffic management and aircraft operations**
4. **Out-of-sector measures** such as carbon removals.

Through collaboration and decisive action, Europe can lead the global aviation sector into a sustainable future.

KEY INDUSTRY FINDINGS

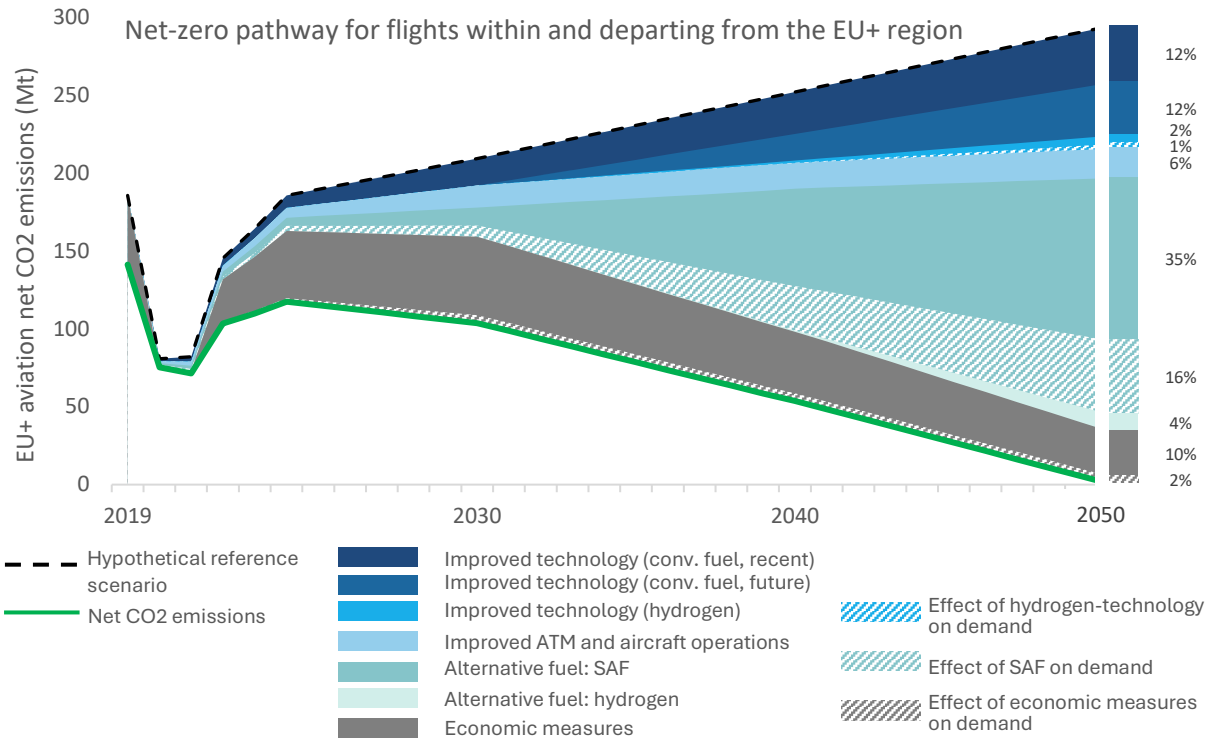
DESTINATION 2050 partners taking from the Roadmap report[2]

This DESTINATION 2050 roadmap provides an update on the ambitious pathway to net-zero aviation published in 2021. Since then, the European aviation industry has made significant progress towards decarbonisation. Research and development initiatives, such as Clean Aviation, the SESAR 3 Joint Undertaking, and national research programmes, have accelerated innovation, while the 'Fit for 55' package has strengthened policy implementation. Early deployment of Sustainable Aviation Fuels (SAF) and fleet renewal efforts have also begun contributing to tangible CO_2 reductions. This updated roadmap builds on these advancements to define the next steps towards net-zero aviation.

The report is based on a bottom-up analysis of measures that increase energy efficiency and reduce net CO_2 emissions. It includes both an impact assessment of emission reduction measures and a cost assessment. The report demonstrates that there is a viable pathway for the aviation sector to achieve net-zero carbon emissions by 2050 in Europe.

This roadmap considers CO_2 emissions from fuel combustion of scheduled passenger and cargo flights departing from any airport in the EU, UK, and EFTA (EU+). Consistent with the first edition, this report adheres to the definition of net-zero carbon emissions as defined by the IPCC, stating that any remaining carbon emissions will have to be removed from the atmosphere through direct air capture (DAC), nature-based solutions, and other technologies. However, achieving these carbon dioxide removals requires substantial investment in technologies and ecosystem synergies, such as those involving SAF with carbon capture. The report also includes an overview of aviation's non-CO_2 emissions and effects, ranging from climate impact to potential mitigation strategies.

[2] NLR / SEO Roadmap - NLR-CR-2024-416 | February 2025



From Roadmap report overall impacts on net CO_2 emissions (TtW) of flights within and departing from the EU+ region, for 2030, 2040 and 2050. Sustainability measures are not assessed year by year and as such, pathways and contributions of individual measures may differ from the linear interpolation shown in the graph.

Total emission reduction per pillar by 2050

Pillar	Total Emission Reductions	Components
Aircraft and Engine Technology	-27% -79 MT CO_2	Recent Technology 12% Future Technology 12% Hydrogen Technology 2% Demand reduction 1%
ATM and Aircraft Operations	-6% -19 MT CO_2	Airline operations Improvements in ATM Ground operations at airports } 6%
Alternative Fuels and Sustainable Energy	-56% -163 MT CO_2	Alternative Fuel SAF 35% Alternative Fuel Hydrogen 4% Demand reduction 16%
Economic Measures (EU ETS & CORSIA)	-12% -35 MT CO_2	Economic Measures 10% Demand reduction 2%

From 2030 onward, SAF and improved technology, as well as ATM and aircraft operations, will increasingly drive net emissions reductions and should therefore receive strong support. In the short term, fleet renewal with the latest generation of more efficient conventionally fuelled aircraft is also an important contributor, delivering 8% direct emissions reductions by 2030. Implementing all these measures is expected to lower the annual passenger growth rate from 2.0% in the reference scenario to 1.4% per year.

Accelerating the implementation of decarbonisation measures is also beneficial in the long term. Limiting cumulative carbon emissions is essential to adhere to carbon budgets, in line with the Paris Agreement's

temperature goals. Implementing the decarbonisation measures at the scale and speed outlined in this roadmap is compatible with a 1.7°C pathway (66% likelihood) with a sectoral allocation based on the IEA Net-Zero scenario. However, additional measures would be needed to be compatible with stricter carbon budgets associated with a 1.5°C pathway (50% likelihood).

Compared to the 2021 roadmap, progress has been made in Europe in terms of research and development (e.g. Clean Aviation, the SESAR 3 Joint Undertaking and national research programmes), policy implementation (e.g. the 'Fit for 55' package) and delivery of CO_2 reductions (e.g. fleet renewal, initial uptake of SAF and deployment of ATM solutions). Nevertheless, it is clear that without short term action from both industry and policymakers on all sustainability measures, this ambitious decarbonisation pathway will become increasingly more difficult - or even impossible - to follow.

Achieving the goals of the DESTINATION 2050 roadmap requires a significant increase in investment compared to business-as-usual scenarios. The premium expenditure associated with decarbonisation targets being achieved in line with this DESTINATION 2050 roadmap has increased compared to the first edition. The additional expenditure related to decarbonisation over the business-as-usual scenario has risen from 820 billion EUR to 1,300 billion EUR (+57%), largely due to higher SAF prices, including mark-ups by suppliers.

Strive to increase the pool of sustainable aviation fuel by 2050

SAF represents the largest potential contributor to CO_2 emission reductions by 2050. As such, the aviation sector is dependent on the energy sector and the sustainable fuels policy framework to reach its decarbonisation objectives. While the ReFuel EU Aviation Regulation mandates at least 70% SAF in the fuel pool by 2050, achieving climate goals and reducing reliance on carbon removal technologies will require 10% SAF to be additionally added to the fuel pool by 2050.

This equals to 37 Mt of sustainable fuels by 2050. In 2050, total electricity demand for SAF, hydrogen, and carbon removal technologies will reach 762 TWh, primarily used for the production of synthetic fuels and carbon removal technologies.

Enhance research, innovation, and industrial efforts for future aircraft

Aircraft and engine manufacturers, supported and stimulated by policymakers, face two urgent tasks to ensure future aircraft deliver targeted CO_2 reductions. On the one hand, they must ensure sufficient and timely production of the latest-generation aircraft, despite current supply chain disruptions. On the other hand, the industry must simultaneously develop and heavily invest in new aircraft technologies, products, and infrastructure to launch future generation aircraft products from 2030 onwards, including hybrid-electric and hydrogen-powered types. In parallel, certification authorities such as the European Union Aviation Safety Agency (EASA) must have adequate resources and be ready to test, certify and approve the large number of disruptive technologies. Additionally, authorities must be ready to approve airport infrastructure for alternatively powered aircraft to ensure readiness for deployment.

Various publicly supported research programmes at global, European (e.g. Clean Aviation, Clean Hydrogen) and national levels already contribute to technology development and demonstration, as do the efforts of various manufacturers. It is crucial these efforts remain coordinated with the private sector, with gaps in funding addressed to meet aviation-specific challenges.

Ensure market-based measures align with net-zero goals

The DESTINATION 2050 pathway relies on market-based measures (MBMs) to bridge the gap until other emission reduction pillars, such as alternative fuels, have sufficient impact. For flights within the European Economic Area (EEA), the European Union Emissions Trading System (EU ETS) could provide a net-zero trajectory by incorporating high-quality carbon removals that are properly accounted for. For international flights, this roadmap assumes reliance on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) up to 2035. It is essential for States within the International Civil Aviation Organisation (ICAO) to converge on a comprehensive plan for post-2035, designing market-based measures that support the industry in reaching a net-zero target with widespread use of carbon removals.

Additionally, it will also be important to improve the quality and effectiveness of the carbon credits associated with CORSIA, as these aspects remain unresolved in the current regulatory framework.

ATM and aircraft operations enable emission reductions in the short and medium term

Improvements in Air Traffic Management (ATM) and aircraft operations are ongoing and can be actioned over the short and medium term. The direct improvement potential from the decarbonisation measures in aircraft operations and ATM increases from 14 Mt CO_2 in 2030 to 19 Mt CO_2 in 2050. Over time, this will enable 7.8% improvement in fuel burn on average per flight in 2030 and 11.6% improvement on average per flight in 2050.

Use a scalable, iterative, and holistic approach for the climate effects of aviation

The climate impact of aviation extends beyond the warming effects of CO_2 emissions. It includes non-CO_2 impacts such as contrail cirrus and nitrogen oxide emissions, which contribute significantly to global warming. This report focuses on the scientific and technological aspects of these non-CO_2 effects. The importance of addressing non-CO_2 climate impacts is supported by the current state of scientific understanding. While uncertainties remain, there is broad scientific consensus that non-CO_2 emissions have a warming effect.

Extensive research is ongoing in areas such as atmospheric science, weather forecasting, aircraft and engine technology, fuel type and potential operational mitigation strategies. Numerous industry and research projects are currently assessing the technical, operational, and economic feasibility of these solutions. Continued efforts in these areas are essential to reduce the level of uncertainty and enable informed decision-making.

POLICY RECOMMENDATIONS

To achieve net-zero aviation by 2050, DESTINATION 2050 urges policymakers to:

1. Prioritise European aviation as a critical and essential sector within the Clean Industrial Deal

- **Global sector**: Aligning with international efforts will enable the competitive decarbonisation of the European aviation industry within a global framework. The EU must address competition distortions in aviation caused by the 'Fit for 55' package and take steps to prevent carbon leakage.
- **Societal and economic benefits**: Aviation is essential to Europe's cohesion – connecting islands and remote regions with mainland Europe while fostering cultural and economic opportunities. It plays a fundamental societal role, creating high-quality, skilled jobs across the ecosystem and driving research and innovation. New products and services brought to market by European aviation generate economic prosperity, facilitate freedom of movement, and promote trade, cultural exchange, and stability.
- **Major economic driver**: As highlighted in Mario Draghi's report, *The Future of European Competitiveness,* aviation is a cornerstone of the EU's economic strength. It drives job creation, cross-sector prosperity, and positions Europe as one of the most connected regions globally. In **2019**, air transport supported **14 million jobs** and contributed **€851 billion to GDP** in Europe[3] – equivalent to 1 in every **17** jobs (**6**% of total employment) and **5**% of the continent's GDP. The European industry is a world leader in the design and manufacture of civil aircraft, with exports amounting to **€98.3 billion in 2022**, positively contributing to the EU trade balance. Continued economic growth is an enabler of Europe's environmental ambitions.
- **Sovereignty and economic security**: Aviation supports essential, reliable transport routes and contributes to Europe's defence capabilities, upholding both sovereignty and economic security. A strong aerospace and defence sector is a foundation for prosperity, enabling the investments needed for decarbonisation. Additionally, space activities play a unique role in sustainability, driving advancements in climate monitoring, resource management, and environmental protection. Maintaining a robust supply chain within Europe further safeguards our sovereignty and economic security.
- **Hard-to-abate sector**: Aviation is inherently a hard-to-abate sector, with stringent safety standards and technology certification requirements. While we are taking responsibility and action to decarbonise our sector, achieving net-zero emissions at pace will require further support from the EU to maintain momentum and contribute to both international aviation-specific and EU climate objectives.

Therefore, we urge the European Commission to recognise that aeronautics and civil aviation are strategic sectors for Europe.

[3] Europe i.e. EU, UK and EFTA.

2. Implement an EU Industrial Strategy for the development of Sustainable Aviation Fuels (SAFs)

2.1 Market dynamics and addressing the price gap for SAF

- **Increase EU Emissions Trading System (ETS) SAF Allowances**: To help airlines bridge the price gap between kerosene and SAF, significantly increase the currently available number of EU ETS SAF allowances and extend the scheme's original timeline beyond 2030.
- **Facilitate access for the use of biomass for aviation:**
  - **Prioritise access to the use of biomass for aviation.**
  - **Align feedstock eligibility**: Continuously review and align the EU's feedstock eligibility criteria with global standards to ensure the success of the ReFuelEU Aviation regulation and reduce the risk of over-reliance on imports.
  - **Remove restrictions on non-biogenic CO_2**: Eliminate the 2041 limitation on non-biogenic CO_2 usage.
- **ReFuelEU Aviation Regulation**:
  - **Avoid upward revisions**: Ensure the 2027 revision does not increase bio- or e-fuel targets in the mandate.
  - **Gradual SAF supply increases**: Introduce incremental increases in SAF supply rather than stepped increases every five years.
- **Balance SAF costs fairly:** Implement a system, such as a Carbon Border Adjustment Mechanism (CBAM)-like mechanism, to fairly distribute SAF costs between EU and non-EU airlines, to reduce carbon leakage.
- **Strengthen the Renewable & Low Carbon Fuels Alliance (RLCF)**, making it more agile and effective in fostering collaboration across the ecosystem and in turn public and private investment in SAF production.

2.2. Reducing the Cost of SAF

- **De-bureaucratise and de-risk SAF production: Provide direct EU funding for** refinery creation or establish an **EU Contracts for Difference (CfD) mechanism** funded through a portion of EU ETS revenues for those airlines which contribute to the scheme. Support this, in part, through the Sustainable Transport Investment Plan.
- Integrate **low carbon electricity needs:** Include electricity requirements for SAF (and hydrogen) production in the EU's energy supply plans and national equivalents, earmarking sufficient clean energy supply for airports.
- Implement an **EU Book and Claim System** as a way to support the deployment of SAF until it becomes available at all required locations.

3. Accelerate innovation, support research and foster funding for aviation decarbonisation

- Unlock **industrial investment tools:** The EU can unlock powerful investment tools, supported by the European Investment Bank, including repayable advance schemes and more ambitious venture debt funding for aviation.
- **Earmarking ETS revenues:** ETS revenues used by Member States should better contribute to the decarbonisation of affected industries, specifically hard-to-abate sectors such as aviation. Revenues should prioritise the decarbonisation transition, channelled towards research, development, and deployment of clean technologies. Mechanisms such as green Public Service Obligations (PSOs) could also enhance competitiveness in these industries.
- **Simplify the ETS Innovation Fund:** The existing ETS Innovation Fund could benefit from simplified administrative procedures and improved selection criteria for e-SAF production and other aviation projects.

- **Leverage EU instruments**: All available EU instruments, such as **the Connecting Europe Facility (CEF), InvestEU** and the **European Structural and Investment Fund (ESIF)**, should be leveraged to deploy new aircraft technologies at scale.
- **Innovation research umbrella strategy:** The EU should establish a dedicated innovation research umbrella strategy and programme for aeronautics and aviation, consolidating resources under a unified framework and a collectively defined work programme. As highlighted in the Heitor report on Framework Programme 10 (FP10), this should guarantee dedicated research funding instruments for civil aviation with an **increased budget** compared to Horizon Europe, aligned with the EU's and civil aviation sector's ambitions to move to climate neutrality by 2050 and the Digital European Sky vision. Key focus areas should include design efficiencies, production system advancements, supply chain resilience through onshore capabilities, and protecting European technological sovereignty.
- **Support the SESAR 3 and Clean Aviation Joint Undertakings:** These two aviation-related public–private partnerships address complementary fields of aviation research. Their difference notably lies in the types of technologies they concern and the actors they unite, and this is appropriately reflected in their individual governance, membership, budget and work plans. To ensure their continued success, these undertakings should be preserved with separate, non-competing budgets.
- **Strengthen EASA's role: The European Union Aviation Safety Agency (EASA)** is a strategic agency that enables the industry to bring products to market with appropriate safety certification. Increased EU-funded financial and personnel resources for EASA are essential to maintaining its focus on safety while supporting the sustainability and digital transformation of the aviation sector through its new ReFuelEU Aviation competences. A well-resourced EASA ensures that new products can be brought to market at the pace needed to safeguard Europe's aviation competitiveness and decarbonisation ambitions.
- Invest in **energy efficiency and technology:** Increased energy efficiency reduces aviation's energy demand. Continued support for Clean Aviation is essential to advancing more efficient and innovative aircraft. Research efforts should focus on highly efficient aircraft and propulsion systems, innovative wing and fuselage configurations, electrification and hybridisation, as well as collaborative platforms and alternative fuels (including hydrogen and SAF).
- **Mitigate non-CO_2 climate impacts: Aviation's non-CO_2 climate impacts must also be addressed**. Increased funding for research and collaboration among stakeholders, including ATC, airlines, OEMs, and researchers is needed to perform additional scientific studies to improve the accuracy of models used for mitigation, monitoring, reporting, and verification, and conducting flight trials at a larger scale to inform mitigation strategies.

4. Prepare the European aviation ecosystem for hydrogen and electric aircraft

- **Support investment in infrastructure:** Facilitate investment in hydrogen infrastructure – including electrolysis, liquefaction plants, gaseous pipeline networks, liquid hydrogen (LH_2) distribution, storage, and refuelling – as well as electric charging infrastructure at airports. EU funding mechanisms, such as the European Investment Bank, Connecting Europe Facility, Cohesion Funds, and Regional Funds, should support these investments. These are essential to accommodate and supply the energy volumes required for deploying zero-emission aircraft. Additionally, accelerate the authorisation process to expedite the development of this critical infrastructure development.
- **Integrate renewable electricity needs:** Incorporate electricity requirements for electric charging and hydrogen production into the EU's energy supply plan.
- **De-risk hydrogen production**: Establish **EU Contracts for Difference (CfD) mechanisms** for hydrogen, funded in part through EU ETS revenues, for those airlines which contribute to the scheme.
- **Incentivise zero-emission routes:** Promote air traffic routes and networks with zero carbon emissions in flight, starting with Public Service Obligation (PSOs) routes.
- **Strengthen the Alliance for Zero Emission Aviation (AZEA):** Integrate AZEA into European Commission policy-making and enhance its agility and effectiveness.

5. Support the modernisation and digitalisation of Air Traffic Management (ATM) led by the SESAR Joint Undertaking

- **SESAR's strategic role:** SESAR is vital to advancing the EU's digital and climate goals. **Modernising ATM** enhances passenger safety, increases capacity, improves cost efficiency, reduces delays, optimises airline operations, and delivers significant environmental benefits. SESAR aims to enable the most efficient and sustainable ATM operations across Europe and beyond.
- **Continued funding and support:** Ensure joint EU funding beyond 2027 for research and innovation and deployment. Political support for SESAR is essential to create incentives for early movers, accelerate key SESAR technology developments, and maintain collaboration, digitalisation, and climate impact reduction.
- **Stakeholder involvement**: Ensure continued involvement of the operational stakeholders – air navigation service providers, manufacturers, airspace users and airports – in SESAR governance and management activities.

6. Incentivise the uptake of Carbon Capture Utilisation (CCU) for aviation

- **Invest in CCU R&D**: Support investments in CCU research and technology through instruments like the EU ETS Innovation Fund, Horizon Europe, and the Connecting Europe Facility. There is significant potential to couple CCU with SAF production, enabling carbon-negative SAF through CO_2 capture during the manufacturing process and/or via the creation of biochar from bio-based residues.
- **Integrate negative emissions into the EU ETS:** By 2026, include negative emissions in the EU ETS framework to support their adoption.
- **De-risk carbon removals:** Introduce a CfD mechanism for carbon removals, partially funded through EU ETS revenues for those airlines which contribute to the scheme.
- **Ensure SAF allowance benefits**: Allow low-carbon synthetic fuels to benefit from the 20 million SAF allowances included in the EU ETS.
- **Establish SAF allowance initiatives:** Develop initiatives to offer free SAF allowances, helping mitigate the cost of rising mandates while ensuring that the amount of allowances is substantial and sufficient.

7. Strengthen CORSIA and international cooperation to enable future technologies and align international standards to those of the EU at ICAO level

- **Global solutions for global problems**: **Environmental diplomacy** is critical to implementing global frameworks and roadmaps. Collaborative work with ICAO and other states is essential to assisting Member States in delivering the Long-Term Aspirational Goal (**LTAG**) for international aviation, strengthening CORSIA, and establishing an **ambitious global SAF** policy to tackle non-CO_2 emissions through international approaches.

8. Recognise the specificities of the aviation industry in EU regulations

- **EU ETS allowances after 2026**: Aviation is the only sector that will no longer benefit from free EU ETS allowances after 2026. This, along with the relatively higher cost of SAF and required investments in latest generation aircraft, will bring a significant additional cost to airlines. The Energy Taxation Directive (ETD) should exempt aviation in the current revision until at least 2035, in order to support the significant investment airlines need to make to decarbonise while maintaining global competitiveness.

- **REACH and ESPR flexibility:** Regulations like REACH and the Ecodesign for Sustainable Products Regulation (ESPR) should take into consideration the aerospace industry's unique airworthiness and safety standards, long lifecycles and complex global supply chains. PFAS restrictions should consider aviation-specific needs, especially for fluoropolymers. Indeed, as recognised by the European Union Aviation Safety Agency (EASA) and the European Chemicals Agency (ECA), PFAS are essential to the aviation industry due to their unique properties, and no alternatives currently exist that meet the same safety requirements. Failure to address this will delay the deployment of the most efficient aircraft and, consequently, hinder the sector's ability to decarbonise.
- **Temporary use of hazardous materials**: Acknowledge that hazardous chemicals and materials may be temporarily necessary for reaching climate targets by enabling key clean technologies until alternatives are developed. Align **the EU taxonomy's Do No Significant Harm (DNSH)** criteria with REACH exemptions and include Helicopter and Business Jet manufacturing in future revisions.
- **Structural alignment with REACH**: Revisions to the Climate Taxonomy Delegated Act should ensure alignment with REACH to streamline compliance.

9. Strengthen the industrial ecosystem to develop and deploy low-carbon aviation technologies

- **Support critical raw materials and advanced materials**: Ensure appropriate resource allocation to value chains and technology-enabling material ecosystems that are critical for aviation decarbonisation.
- **Simplify Research & Development (R&D) participation**: Improve access to R&D investments and encourage participation in public–private partnerships to foster industrialisation and accelerate innovation.
- **Promote emission capture technologies**: Encourage investments in emission-capture technologies and modernise existing processing plants to reduce Europe's dependency on imports.
- **Promote and incentivise emission capture technologies for hazardous chemicals**: Promote and incentivise emission capture technologies when hazardous chemical use is currently unavoidable.
- **Develop "Safe & Sustainability by Design" materials:** Strengthen initiatives that promote the development of materials designed with safety, sustainability and environmental considerations at their core.
- **Address supply chain gaps:** Identify current gaps in European material supply chains and address immediate needs to increase competitiveness and protect sovereignty
- **Net Zero Industry Act: Leverage the Net Zero Industry Act to** create a one-stop shop that supports and promotes innovation, while connecting sellers and buyers across the aviation ecosystem.

10. Reduce & simplify the regulatory burden

- **Ensure a level playing field:** Address the heavier and more numerous compulsory sustainability requirements imposed on EU companies compared to their non-EU competitors:
  - Acknowledge both quantitatively and qualitatively the regulatory due diligence and reporting gaps between EU and non-EU regulations, as well as inconsistencies among EU Member States.
  - Establish strong EU/non-EU equivalence mechanisms to reduce the burden on companies (e.g. through an EU reference guide or soft law instrument).
  - Develop EU ESG diplomacy (sustainability and climate) to speed up adoption in non-EU countries, through discussions in Free Trade Agreements and bilateral negotiations.
  - Provide incentives/benefits for companies complying with EU rules without creating additional administrative burdens.
- Strengthen **the Sustainable Finance Framework: Ensure the Framework supports** companies in attracting private investments for transitional activities.
  - Increased industry involvement in rulemaking processes, including representation on the Platform for Sustainable Finance.
  - Focus more on incentivising investments in transitional activities, encouraging banks and investors to recognise these efforts as eligible for sustainable finance.

- **Reduce reporting and compliance burdens:**
    - Conduct a review to identify and align common or overlapping data points between regulations, including SFRD, CSRD, CS3D, CBAM and Taxonomy. Aim to reduce significantly the number of required data points, for instance, through the Omnibus for Reporting proposal.
    - Provide CBAM flexibility guidance to allow the use of default values in situations where collecting actual values is overly complex, especially for supply chain SMEs and mid-tier enterprises.
    - Explore the creation of a secure EU data space (cloud) to centralise and re-use various reporting requirements at EU and national levels, reducing duplicated transmissions.
- Timely publication of the guidance: Publish regulatory guidance promptly to avoid or minimise divergences in transposition laws, reduce uncertainty and limit over-implementation.

11. Ensure sufficient resources are allocated to sustain each value chain and support a specific sector or technology enabling material ecosystem.

- **Strengthen the link between the CRM Act and sovereign funds:** Maximise leverage within and across sectors by linking the Critical Raw Materials (CRM) Act with sovereign funds. For example, develop melting and forging capacity to enable proper reuse and simplify material traceability processes to support aviation.
- **Promote emission-cleaning technologies:** Incentivise investments in emission-cleaning technologies where hazardous chemicals are necessary for the industry.
- **Incentivise material substitution R&D: Support research and development into critical raw material substitution** and better promote innovation in advanced materials to enhance global competitiveness.
- **Prioritise recycling: Bolster sovereignty** and reduce external dependencies by prioritising recycling and scaling up material recycling technologies, facilities, and channels across Europe.

Support for low-carbon energy:

- **Review the PFAS ban's impact:** Assess the cost-benefit impact of the fluoropolymer restrictions under the PFAS regulation on clean technologies, including SAF and hydrogen ecosystems.
- **Acknowledge temporary use of hazardous materials:** Recognise the necessity of hazardous chemicals and materials in achieving climate targets, while prioritising environmental, health, and safety (EHS) conditions and pollution control.

Regulatory support for innovation:

- **Leverage regulatory sandboxes**: Promote and support the use of regulatory sandboxes to test and unleash the full potential of European innovation.
- **Utilise a one-stop shop: Create a one-stop shop** to support and promote innovation in projects aimed at reducing aviation's environmental footprint. This should include connecting sellers and buyers and reducing administrative burdens.
- **Incentivise circularity:** Reduce regulatory restrictions on reuse and recycling to further decarbonise by minimising aviation's material footprint.
- **Unleash regulatory toolboxes:** Allow the use of regulatory toolboxes to unlock European innovation potential while reducing administrative burdens.
- **Involve aerospace authorities**: Enable aerospace regulatory bodies (EASA, EDA, ESA) to participate in European Chemicals Agency (ECHA) consultations as sectoral authorities.

Social implications and Just Transition:

- **Address the social impact of regulatory policies**: Recognise and address the socio-economic implications of policies related to critical raw materials, deforestation, and renewable energy.
- **Mitigate the socio-economic impacts of transition**: Support regions and workers affected by industrial shifts through the **Just Transition Mechanism**. Accompany decarbonisation policies with investment and incentive measures to ensure a resilient supply chain transition:
  - **Reduce compliance complexity for SMEs and suppliers** to prevent economic strain and social risks.
  - **Incorporate social support mechanisms** into existing regulations to foster workforce development, community engagement, and fair labour practices in the aerospace supply chain.
  - **Promote public-private partnerships** to offer co-investment opportunities for companies adopting sustainable supply chain practices, fostering social equity.

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