

【欧州】 【航空】

Aviation - Gas emissions: The European Commission launches the Alliance for Zero-Emission Aviation (AZEA)

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【概要 : Summary】

Considering the European Green Deal' s targets of achieving net-zero GHG emissions in the EU and to reducing the transport sector' s GHG emissions by 90% by 2050, the aviation sector is one of the most difficult sectors to decarbonise.

The main problem is the difficulty to replacing jet engines based on fossil fuel propulsion systems with alternative propulsion systems such as electric or hydrogen-based systems. Due to the current absence of alternative propulsion systems with low or zero emissions for commercial aircraft, it is necessary to focus on the utilisation of sustainable aviation fuels (SAF). Based on the European Commission 's proposal of the ReFuelEU Aviation initiative (COM (2021) 561 final) under the "Fit for 55" package, it is envisaged to introduce a sector-specific gradually increasing blending mandate for SAFs and a sub-mandate for synthetic fuels to be used by airlines to stepwise decarbonise aviation fuels in the decades to come.

However, besides this temporary solution of using SAFs to reduce the CO₂ emissions from aviation, the aviation industry will have to develop radically new technologies and alternative propulsion systems for reaching a significant decarbonisation in the next decades. Different new propulsion systems will have to be developed

from electric hybrid, electric, and hydrogen-based propulsion systems, among others.

To create the right preconditions for achieving this change and to develop such zero-emission propulsion systems in aviation, the European Commission supports the industry by creating industrial alliances to activate and join forces in the industry. The potential market volume for zero emission aircraft has been estimated at 26,000 aircraft by 2050.

Therefore, to identify all barriers and problems to developing new zero-emission propulsion systems in aviation and to the entry of hydrogen-powered and electric aircraft into commercial service, the European Commission officially launched the new Alliance for Zero-Emission Aviation (AZEA) on 24 June 2022. AZEA is a voluntary European initiative of private and public stakeholders initiated. It is initiated by the Commission with the intention to activate the members of the aviation community to join forces in preparing the preconditions for zero emission aircraft. The AZEA aims to prepare the aviation sector and the aviation manufacturing industry for the development and deployment of hydrogen- and electric-powered commercial aircraft. The overarching aim of these efforts will be to ensure that air transport contributes to the EU' s 2050 Green Deal target to achieve climate neutrality.

【記事 : Article】**1. Preparing for the 2050 net-zero GHG emission target: The aviation sector-related “Fit for 55” package proposals**

To prepare the EU’s economic sectors for the transition toward climate neutrality by 2050, the European Commission presented the European Green Deal (COM (2019) 640 final) in 2019, with the target to achieving net-zero GHG emissions in the EU by 2050 and to reduce the transport sector’s GHG emissions by 90% by that time. The European Climate Law is the legal basis for preparing the EU for achieving this net-zero emission target of 2050. This includes to increase the 2030 GHG emission reduction level on at least 55% compared with 1990 levels.

To amend the legislation related to the CO₂ emission reduction in economic sectors, the European Commission presented the “Fit for 55” package of 14 July 2021. The package includes legislative proposals for revising all relevant policies and laws in all sectors related to the measures needed to reach the 55% reduction target for CO₂ emissions in the EU.

Most importantly the “Fit for 55” package includes legislative proposals to decarbonise the transport sector. Regarding the envisaged decarbonisation of the transport sector, the aviation sector is seen as one of the subsectors most difficult to decarbonise due to the problem of currently limited possibilities to replace the fossil fuel-based combustion engines with environmentally friendlier propulsion systems in commercial aircraft. Currently, contrary to the development of electric passenger cars for reducing GHG emissions in the road transport sector, the aviation sector lacks alternatives to the fossil fuel-based propulsion systems or the wide utilisation of sustainable aviation fuels for significantly reducing CO₂ emissions. Therefore, the aviation sector still creates 13.9% of the emissions from transport, making it the second biggest source of transport GHG

emissions after road transport (European Commission n. d. a).

To prepare the legislative basis for the EU’s climate objectives and the necessary changes regarding the EU-ETS for aviation, the Commission presented several aviation sector-related proposals including the proposals COM (2021) 551 final and COM (2021) 552 final on EU-ETS and CORSIA, the ReFuelEU Aviation initiative (COM (2021) 561 final), the Regulation on a Carbon Border Adjustment Mechanism (CBAM) (COM (2021) 564 final) and COM(2021) 567 final, regarding the notification of offsetting in respect of CORSIA for aircraft operators based in the EU.

2. SAFs and new propulsion system options of aircraft

The need to reduce GHG emissions of aircraft and to make them more environmentally friendly has also led to considerations to develop new propulsion systems. There are attempts to develop electric propulsion systems for aircraft, although zero-emission commercial aircraft are not yet available and options to decarbonise aviation are limited. However, there exist promising new programmes and projects worldwide for developing all-electric or hybrid-electric propulsion aircraft concepts. Several start-up companies as well as established aircraft manufacturers intend to launch hybrid or all-electric commercial passenger jets, capable of flying passengers on short-haul routes within a decade (ICAO Secretariat 2022). In its non-extensive lists of projects, ICAO currently lists six ongoing projects of business and regional aircraft projects, out of which four are full electric aircraft and 2 hybrid aircraft projects for electric passenger jets of 9-18 passengers’ capacity (ICAO Secretariat 2022).

In the same way as electric vehicles, also electric aircraft could get their propulsion energy from on-board batteries. Electric propulsion systems for aircraft are considered

being especially beneficial for the environment as electricity could be completely generated from renewable sources.

Therefore, since the development of alternative propulsion systems in aviation like electric motors or hydrogen propulsion for commercial aircraft have not yet matured sufficiently, it is necessary to focus on the utilisation of SAFs and thereby to decarbonise aviation fuels. As the SAFs will be the main option to reduce GHG emissions from aircraft in the decades to come, the European Commission intends to introduce sustainable aviation fuels (SAFs) to be mixed with the fossil fuel-based kerosene supplied at EU airports.

Accordingly, on 14 July 2021, the European Commission proposed the ReFuelEU Aviation initiative (COM (2021) 561 final) under the “Fit for 55” package to increase the share of renewable and sustainable fuels in aviation. The ReFuelEU Aviation (COM (2021) 561 final) defines a sector-specific gradually increasing blending mandate for SAFs and a sub-mandate for synthetic fuels to be used by airlines. Under the ReFuelEU Aviation (COM (2021) 561 final) the fuel suppliers are obliged to blend-in the gradually increasing levels of SAFs into the fossil-fuel based kerosene jet fuel at EU airports.

The mandate for the minimum of SAF blending volumes in aviation fuel will rise from 2% in 2025 to 5% in 2030 and 63% in 2050, based on COM (2021) 561 final. Since the SAFs can be mixed with kerosene up to around 50% without the necessity to making any changes to the aircraft engines, the wider introduction of SAF in aviation will be in particular important in the first two decades of the 2020s and 2030s. Towards the 2040s and 2050s decades, it can also be expected that a different generation of more sustainable aircraft engines will become available. The different positions regarding the scope of aircraft operators, the level and timing of the mandates introduced in this ReFuelEU

Aviation regulation and the definition of SAFs will have to be solved in a compromise on the future version of the ReFuelEU Aviation Regulation (Council of the EU 2022).

The general objective will be to reduce the aviation sector’s CO₂ emissions in line with the 2030 and 2050 climate objectives of the EU, by enabling the transition from fossil fuel-based jet fuel towards the use of SAFs, while at the same time a level playing field on the aviation market is ensured. Thereby, the ReFuelEU Aviation initiative could help to improve the aviation sector’s currently very limited possibilities of reducing GHG emissions (COM (2021) 561 final). The negotiations on the final version of the ReFuelEU Aviation Regulation between the European Parliament and the Council of the European Union will decide, which shares of SAFs will be introduced at what point of time.

3. Background of the Alliance for Zero-Emission Aviation (AZEA) and the Toulouse Declaration

Besides the temporary solution of using SAFs to reduce the CO₂ emissions from aviation, the aviation industry will have to develop radically new technologies for introducing zero-emission propulsion systems in the next decades. Different new propulsion systems will have to be developed from electric hybrid, over electric, to H₂ propulsion, among others. Over the next two decades, the European Commission expected that more than 44,000 new aircraft could be placed on the market. The potential market volume for zero emission aircraft has been estimated at 26,000 by 2050, with a total value of €5 trillion (European Commission 2022a).

Therefore, in its “Communication from the Commission to the European Parliament, the Council, the European economic and social Committee, and the Committee of the Regions. Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe’s

recovery “ (COM (2021) 350 final) of 5 May 2021, the European Commission announced that it would consider to preparing an Alliance for Zero-Emission Aviation (AZEA) to accelerate the process of the development and deployment of aircraft with alternative propulsion systems.

In the EU, there exist several industrial alliances, including the European Raw Material Alliance, the European Clean Hydrogen Alliance, the European Battery Alliance, the Circular Plastics Alliance and the European Alliance for Industrial Data, Edge, and Cloud. The proposal for an Alliance for Zero-Emission Aviation reflects increasing efforts by the aeronautical industry in Europe to develop innovative technologies to support the greening of aviation. An Alliance on Zero Emission Aviation (AZEA) should ensure market readiness for disruptive aircraft configurations like hydrogen and electric (COM (2021) 350 final).

Some of the solutions under development involve technologies such as hydrogen, battery-electric or hybrid propulsion not previously used in aircraft. The commercial use of such new aircraft types will require an important adaptation of the entire aviation ecosystem (COM (2021) 350 final). The purpose of the Alliance would be to identify and prioritise the challenges related to the entry into service of zero emission aircraft and ultimately to help implement practical solutions to these. The Alliance will need to mobilise interested stakeholders in all parts of the aeronautical industry - from large to small enterprises - and among other relevant actors - airports, airlines, services providers, air navigation service providers, research organisations and networks, national and regional authorities, etc (COM (2021) 350 final).

The European aeronautics industry together with other players in the European aviation sector intends to ensure that air transport in Europe meets Europe 2050 climate’s objectives by developing zero-emission aircraft based on novel

propulsion technologies like electric or hydrogen (European Commission n.d.b).

To gather feedback from the industry and interested stakeholders, the Commission carried out an online survey at the end of 2021 to consider the concept of an Alliance in aviation for developing zero-emission aviation. Many companies and organisations offered to play an active role in such an Alliance (European Commission n.d.b). By 15 October 2021, 73 responses from across the aviation ecosystem were received, including from major industry associations across the aviation system. Several responses were accompanied by scoping papers on the Alliance’s future structure (European Commission 2022b). The Alliance for Zero-Emission Aviation (AZEA) should channel existing investments under the Clean Sky initiative and contribute to Europe’s 2050 climate neutrality objective, working in full complementarity with the Renewable and Low-Carbon Fuels Value Chain Industrial Alliance, which had its inaugural general assembly on 12 July 2022 (COM (2021) 350 final). The Renewable and Low-Carbon Fuels Value Chain Industrial Alliance is a key new initiative to support the FuelEU Maritime and RefuelEU Aviation initiatives, focusing on boosting production and supply of renewable and low-carbon fuels in the aviation and waterborne sectors (European Commission n.d.c).

After the European Commission’s AZEA public consultation ended on 15 October 2021, on 4 February 2022, the Toulouse Declaration was endorsed (European Commission n.d.d). Being the first joint initiative aligning all EU stakeholders on the principles and actions needed to decarbonise and transform Europe’s aviation sector, on 4 February 2022, the French Presidency launched the so-called “Toulouse Declaration” as first-ever public-private initiative supporting European aviation’s goal to reach net zero CO₂ emissions by 2050 (Ministère Chargé des Transports 2022).

According to the Toulouse Declaration, the public and private aviation stakeholders declare that they strive for environmentally sustainable and inclusive connectivity, in Europe and globally (Ministère Chargé des Transports 2022).

Besides their commitment to decarbonise aviation by 2050, they support a package of measures with effective and ambitious intermediate steps to accelerate the transition of both the European and international aviation sector to achieve net zero carbon emissions by 2050, such as improved aircraft technology, improved operations, the use of sustainable aviation fuels of sustainable aviation fuels, market-based measures, carbon pricing, financial incentives and support for environmental and climate innovation in the sector, a number of which are addressed in the Fit for 55 package.

They also call on all stakeholders worldwide to work together at the 41st Assembly, to adopt an ambitious Long Term Ambitious Goal (LTAG) for international aviation (LTAG) for international aviation, namely zero net carbon emissions by 2050. Finally, they invite other countries and international organisations to join this declaration, to engage in the development of sectoral roadmaps and to work together towards the sustainability and decarbonisation of aviation worldwide (Ministère Chargé des Transports 2022).

A number of European airports and airport associations have endorsed the Toulouse Declaration, which complements their objective of reaching net zero CO₂ emissions by 2050 at the latest. This ambitious goal was first set out in June 2019 in the ACI EUROPE Resolution committing European airports. 89 airport operators of 311 airports in the EU and beyond came out in support of the Toulouse Declaration (Ministère Chargé des Transports 2022).

4. The European Commission launches the new Alliance for Zero-Emission Aviation (AZEA)

Zero emission propulsion technologies are key to mitigating aviation's CO₂ emissions, which are responsible for at least 3% of global warming. This does not include the impact of non-CO₂ emissions, which are responsible for two thirds of the sector's climate impact.

The introduction of hydrogen and battery-electric propulsion will entail major changes to the air transport system. These technologies will not only lead to the introduction of a new generation of aircraft, but it will also require major changes to airport infrastructures, airlines, air traffic management and energy networks (European Commission 2022a).

Environmentally sustainable aircraft have huge market potential and may strongly contribute to industry's future competitiveness in all market segments (European Commission 2022a). Some new technologies are being developed within the Clean Aviation Partnership and are expected to reduce GHG emissions by 30-50%, compared to 2020.

The European aeronautics industry together with other European players in the aviation sector also committed to meet Europe's 2050 climate objectives. The Commission is supporting this objective through concrete action like the Clean Aviation Programme under Horizon Europe, the EU-ETS and the Innovation Fund. These initiatives support the development of zero emission aircraft based on novel propulsion technologies (e.g., electric, hydrogen) (European Commission 2022a). On 24 June 2022, the European Commission officially launched the new alliance called Alliance for Zero Emission Aviation (AZEA). The AZEA is a voluntary European initiative of private and public partners initiated by the European Commission, who share the objective to prepare the entry into commercial service of hydrogen-powered and electric aircraft (European Commission n.d.d). The AZEA gathers aircraft manufacturers, airlines, airports, energy

companies and fuel providers, standardisation and certification agencies, passenger and environmental interest groups and regulators to jointly work to identify all barriers and problems to the entry into commercial service of these aircraft (European Commission 2022a).

The European Commission calls on the members of the aviation community to join forces in preparing for the arrival of zero emission aircraft and to prepare the entry into commercial service of hydrogen-powered and electric aircraft (European Commission 2022a, COM (2021) 350 final).

5. The AZEA' s objectives and tasks

The Alliance for Zero-Emission Aviation (AZEA) aims to prepare the aviation ecosystem for the market entry of electric-powered aircraft, and with hydrogen (whether used in combustion turbines or fuel cells) propulsion, which will completely eliminate in-flight CO₂ emissions and significantly reduce other emissions, thereby ensuring that air transport contributes to the European Green Deal' s 2050 climate neutrality objective (European Commission 2022a, n. d. c).

The new propulsion technologies used by such aircraft will have a profound impact not only on aircraft design, but also on the fuels and airport infrastructures they require.

The Alliance is expected to identify and prioritise the challenges posed by zero-emission aircraft and propose practical solutions to overcome these challenges of the entry into service of electric and hydrogen-powered aircraft (European Commission n. d. d).

The analysis will cover aspects such as access to renewable energy, readiness of airport infrastructures, standardisation, certification, regulatory requirements, skill needed and the implications for air traffic management and for business models as well as for the air transport system (European Commission 2022d).

The tasks of the Alliance will also include to encourage new partnerships within the Alliance' s

membership, and to coordinate efforts with other European initiatives, such as the Clean Aviation Joint Undertaking, and the Clean Hydrogen Alliance, among others.

The Alliance will promote investment projects and create synergies and momentum amongst its members. The Alliance should also identify and assess existing relevant public and private financing opportunities (European Commission 2022d).

They will also look at issues such as the fuel and infrastructure requirements of hydrogen and electric aircraft at airports, standardisation and certification, and the implications for operators (airlines) and air traffic management (European Commission 2022a).

The Alliance will give recommendations to identify policy, regulatory and standardisation needs, and to consider how to promote the introduction of electric and hydrogen-powered aircraft globally (European Commission 2022d).

The Alliance is expected to deliver roadmaps with detailed actions, including at international level, to be undertaken and their appropriate timing to enable the earliest possible entry into service of electric and hydrogen-powered aircraft (European Commission 2022c).

The activities of the Alliance may be organised in working groups covering the main issues at stake. These working groups will be open for participations to all Member Organisations with appropriate activities and expertise in relation to the working groups' area of work (European Commission 2022c). The European Commission will steer the work of the Alliance, monitoring progress against the EU' s policy and investment agenda and acting as a facilitator for dialogue and matchmaking and engagement of all stakeholders (European Commission 2022c).

The Commission will also organise at least twice a year a General Assembly for all participants of the Alliance and a first meeting of the general assembly will take place in autumn 2022 (European Commission 2022a, 2022c).

6. Conclusion

Electric but also hydrogen propulsion are already safely used in automobiles and trains, and they might become promising future propulsion technologies, applicable in larger commercial aircraft. However, currently, it is the aviation industry's challenge to adapt these potentially zero-emission propulsion systems to the commercial aviation's needs. Hydrogen-based propulsion is just tested by some aircraft manufacturers as R&D projects, but it has the potential to become a suitable substitute for fossil fuel based conventional jet propulsion systems. Instead, electric propulsion still relies on heavy battery packs, creating weight problems for the application in large commercial aircraft.

To create a favourable environment for the development of new aircraft propulsion technologies, both, the aviation industry, and the European Commission will have to create synergies within cooperation fora like the Alliance for Zero-Emission Aviation. They must jointly work to identify all barriers and problems that still hamper the introduction of electric or hydrogen propulsion-based aircraft and prepare the market for the entry into service of zero-emission aircraft.

The AZEA Alliance should be able to create the right momentum to stimulate cooperation between the relevant stakeholders in the aviation industry and beyond to develop new technologies and propulsion systems for zero-emission aircraft. It could still take decades, but the long-term aim will be to completely eliminate in-flight CO₂ emissions and significantly reduce other emissions in aviation.

In the meantime, the currently most feasible option for the at least a partial decarbonisation of commercial aircraft will be the increased use of sustainable aviation fuels (SAF) in the next two decades.

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