Sustainability of the aviation industry

(Presented by the European Commission - DG MOVE)

In the past decade, the EU has adopted a number of essential policy instruments to address the environmental footprint of aviation. These instruments, are grouped in a so-called "basket of measures", namely market-based measures such as emissions trading, research and development for greener aircraft design and technology (CO2 standards, Clean Sky), more efficient air traffic management operations (Single European Sky and SESAR), and the use of sustainable aviation fuels.

CO2 emissions from aviation in the EU have been included in the EU emissions trading system (EU ETS) since 2012. Under the EU ETS, all airlines operating in Europe, European and non-European alike, are required to monitor, report and verify their emissions, and to surrender allowances against those emissions. Aircraft operators receive tradeable allowances covering on average, almost half of emissions from their flights. It is estimated that between 2013 and 2019, a net saving of more than 160 Mt CO2 has been achieved through the inclusion of aviation in the EU ETS. The auctioning of allowances to the aviation sector has moreover generated revenues which have been used in part for climate- and energy-related purposes including the Innovation Fund for demonstration of innovative low-carbon technologies. The EU ETS also contains incentives to promote the use of Sustainable Aviation Fuels (SAF). For the time being, the scope is limited to intra-EEA flights, with a "stop-the-clock" provision, as regards outbound to and incoming flights from non-EEA countries, in the EU ETS Directive which is valid until the end of 2023. This provision was intended to provide momentum for a global market-based mechanism.

In 2016, the EU played a leading role in the adoption by the International Civil Aviation Organization (ICAO) of the first ever sectoral scheme regulating CO2, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). All EU Member States will participate in the pilot-phase of the scheme, which will start in 2021, with the aim to offset growth in emissions beyond 2020 levels, without prejudice to the upcoming revision of the EU ETS Directive as regards aviation. Depending on participation and quality of offsets used, at global level, the ICAO CORSIA scheme could mitigate up to 2.5 billion tonnes of CO2 and generate up to approximately USD 40 billion of climate financing by 2035. The Commission is assessing different policy options for a legislative proposal to implement further aspects of CORSIA in the EU, through amending the EU ETS Directive.

The EU has also adopted new standards for aircraft CO2 emissions, which entered into force in 2019. These standards, which follow the global standards adopted by ICAO in 2017, provide additional requirements into the design process to focus on fuel efficiency. Also the adoption of new aircraft engine non-volatile Particulate Matter (nvPM) standards in ICAO was supported by the EU.

To develop the green and cutting-edge aircraft technology of the future, the EU relies on the Clean Sky Joint Undertaking. With a budget of EUR 4 billion and composed of over 600 entities from 27

countries, the Clean Sky 2 initiative (2014-2024) was designed to build on the Clean Sky 1, which aimed to develop technologies with reduced CO2, NOx and noise emissions.

The Single European Sky framework aims to make European skies more efficient, and can deliver important environmental benefits. The SESAR project, sponsored by the EU and the aeronautical industry, contributes to develop and deploy innovative ATM solutions with a potential to further reduce emissions. In 2013, the Commission proposed to complete the SES through amendments that could allow to decrease emissions up to 10%. However, with no progress on this proposal, the Commission presented an amended proposal on 22 September 2020, which is expected to facilitate discussions between the co-legislators.

Recognising the need for long-term sustainability of aviation and the commitment to continue efforts to reduce aviation sector's negative environmental impacts, the European associations collectively representing the entire European aviation called for an EU Pact for Sustainable Aviation. Through collaboration between all stakeholders in the aviation eco-system and policy-makers, the Pact is to contribute to the implementation of the European Green Deal, by reaching the objectives of significant CO2 emission reductions by 2030 and net-zero CO2 emissions by 2050 from all flights within and departing from the EU. The Pact will also consider the feasibility of making 2019 the peak year for CO2 emissions from European aviation while enabling the sector to continue delivering its social and economic benefits.

Zero- and low-emission vehicles and renewable and low carbon transport fuels

Substantial emission reduction has been achieved in the aviation sector by improving the fuel efficiency of aircraft engines and design. The sustained policy and industrial efforts to improve aviation sustainability have allowed to reduce noise from aircraft and fuel burn per passenger by respectively 14% and 24% between 2005 and 2017. However, the overall sustained growth of air traffic (+60% over the same period) has continued to outpace the environmental improvements. Substantial public and private investments and adequate policy frameworks are needed to accelerate the decarbonisation of air transport.

New aircraft models provide 20% to 25% of improved fuel efficiency compared to the previous generation. Promoting fleet modernisation by an earlier retirement from circulation of old aircraft and their replacement with a significantly more fuel-efficient aircraft can generate significant CO2 per each flight in the transition until breakthrough clean aircraft are developed and commercially available for deployment. Ensuring the capacity of European industry to increase the environmental performance of aircraft would have an important impact on the greening of global air transport as European aircraft today represent 45% of the worldwide commercial fleet and European engines power 70% of single-aisle aircraft in the world.

In the longer-term, new disruptive technologies need to be developed and deployed in the market, notably to unleash the full potential of sustainable fuels and otherwise provide for new clean methods of propulsion and power generation in aircraft.

This requires considerable investment in research and innovation, such as envisaged under the Horizon Europe programme by the proposed set-up of a Clean Aviation partnership with the aviation industry and further investment in collaborative research in clean aviation technology. The partnership should follow in the footsteps of the Clean Sky Joint Undertaking, which had a participation of 1.7 billion EUR from the EU budget. The priority focus should be on the development of technologies that can generate the largest impact on overall aviation emissions, notably hybrid and full electric prolusion, ultra-efficient aircraft configurations, and the development of sustainable alternatives such as the emerging potential of hydrogen powered aircraft. Accompanying measures would be necessary to develop infrastructure and production capacity for hydrogen.

The stimulus for the development of new technologies should be seen in conjunction with the measures taken relating to innovation, production and deployment of sustainable aviation fuels (SAF). This is because in order to decrease significantly its emissions, the aviation sector will especially need to rely on the use of liquid SAF in the years to come. Indeed, whereas other transport modes have access to various sources of energy including renewable energy, aviation is still almost exclusively reliant on liquid fossil fuel, due to the physical properties of flying.

Decarbonising air transport sector, next to addressing the challenges related to aircraft emissions reductions (including air and noise pollution), would also require investments into airport infrastructure and operations to optimise air traffic management and strengthen the integration of airports into a genuinely multimodal network. It would necessitate improving airports' energy efficiency, ensuring the supply and infrastructure for sustainable aviation fuels, and hydrogen for hydrogen-powered airport operations and related services as well as renewable energy generation on-site, together with electrification and greening measures of airside activities such as groundhandling, ground traffic operations and aircraft on the ground, and other measures reducing environmental impacts.

In June 2019, as part of the aviation industry ambition, vision and roadmap, ACI EUROPE and its members (203 airports) committed to net zero carbon emissions from airport operations fully within their own control by 2050 at the latest, reducing absolute emissions to the furthest extent possible and addressing any remaining emissions through investment in carbon removal and storage. Three airports have already reached this target, while several others have announced to reach it before 2030.

So far, 162 European airports (representing 67.2% of European air passenger traffic) have volunteered to join the Airport Carbon Accreditation programme, which provides a common framework for carbon management with the primary objective to encourage and enable airports to implement best practices. 51 airports are carbon neutral suggesting good progress towards the ACI EUROPE target of 100 carbon neutral airports by 2030 and confirming the importance airports place on carbon neutrality. In November 2020, the programme added further obligations, namely

alignment with the Paris Agreement, extended carbon footprint covering all significant operational emissions from third parties, including airlines, and enhanced stakeholder engagement.

Fuel supply

The deployment of vehicles, vessels and aircraft as well as infrastructure and services needs to happen everywhere in the EU, in an interoperable manner. However, there are a number of issues that prevent the uptake of sustainable transport fuels: limitation of appropriate supply, lack of a suitable refuelling/recharging network and low or fragmented demand for the sustainable fuels and vehicles/vessels, influenced also by pricing and tax regimes.

The lack of appropriate supply is particularly relevant for certain fuels, namely sustainable biofuels, e-fuels, clean hydrogen, and biogas. Apart from electricity from renewable sources there is still considerable lack of availability of renewable energy sources for transport: the EU share of renewable energy in transport reached 8.3% in 2018.

Air and waterborne transport must have priority access to sustainable liquid and gaseous fuels, since suitable alternatives do not exist for these modes, and these fuels are the furthest from mass production and use.

Sustainable aviation fuels (SAF) are fully compatible with current aircraft technology and already certified up to 50% of the fuel used in a flight. Although they have the potential to make an important contribution to tackling GHG emissions in aviation (emission savings can go up to 80% compared to conventional jet fuel), this potential is still largely untapped. Current production and use of SAF is below 0.1% of total jet fuel consumption in the EU. While the Renewable Energy Directive and the EU Emissions Trading Scheme contain some mechanisms intended to reward the use of SAF, these measures have so far limited impact to boost SAF supply and demand.

As a concrete deliverable of the European Green Deal, the Commission adopted the “ReFuelEU Aviation” initiative, to boost the sustainable aviation fuels market. Several Member States also intend to promote SAFs in their national legislations (such as Finland, France, Germany, the Netherlands, Spain and Sweden).

Airport charges, slot allocation and groundhandling services

The existing framework on airport charges, airport slots allocation and groundhandling services can also play an important role in making the sector more sustainable.

Airport charges are paid by airlines to airports for the use of facilities and services, which are exclusively provided by the airport managing body and which are related to landing, take-off, lighting and parking of aircraft and processing of passengers and freight. While the Directive requires that airport charges are non-discriminatory, it permits modulations for environmental issues provided that they are relevant, objective and transparent. The 2019 evaluation of the Directive showed that only 61% of airports modulate charges on account of noise and only 20% of airports do

so on account of NOx emissions. The 2019 evaluation did not find any airports that would modulate airport charges on account of CO2 emissions. The planned revision of the Airport Charges Directive could aim to ensure the setting of airport charges is strategically aligned with the Green Deal Communication and environmental ambitions of the EU.

Current rules concerning the allocation of slots do not contain measures that would align slot allocation with environmental objectives. However, the Slot Regulation states that slot-coordinators shall take into account industry rules, such as the Worldwide Slot Guidelines in the slot allocation process. In their 11th version, published June 2020 the guidelines state that slot coordinators should try to ensure that due account is taken of environmental factors in the allocation of available slots. Environmental concerns could also be considered in local rules which apply to specific airports. However, their scope is quite limited with only a local impact.

Groundhandling is an essential service provided for airport users and often represent important costs for them. It involves ground administration and supervision, handling of passengers, baggage, mail, freight, and ramps, aircraft services, fuel and oil handling, aircraft maintenance, flight operations and crew administration, surface transport and catering services. Groundhandling services generate GHG and air pollutant emissions at airports. These are caused by usage of diesel fuel for airport vehicles and ground support equipment (GSE), fossil fuel for electricity and heating, jet fuel for auxiliary power units (APUs) that power aircraft at airport gates, and other sources. Airport operators can implement several measures to reduce the environmental impact of groundhandling services, including provision of electric buses for passenger transport, pre-conditioned air fixed power units to avoid GPU/APU (which run on diesel or kerosene), centralised de-icing pads to avoid contamination of groundwater, and alternative fuels for ground support equipment. Ground support equipment could also be pooled for use by all groundhandling service providers. Under this approach, either by agreement or as mandated by the airport, groundhandling equipment at the airport is owned centrally by the airport itself or by a leasing company on behalf of the airport. Such equipment can consist of for example electric lower deck loaders, electric conveyor belt loaders, electric passenger steps, main deck loaders, electric baggage tractors, power tractors and cool container dollies. The groundhandlers are then required to use the (modern and environmentally friendly) equipment to serve the aircraft, which they are contracted to handle.

The Groundhandling Directive leaves it to the Member States to ensure the adequate level of environmental protection. Member States may make the groundhandling activity conditional upon obtaining the approval of a public authority independent of the managing body of the airport. The criteria for such approval can include environmental protection. The Directive allows the limitation of the number of groundhandling service providers in case of four categories of groundhandling services: baggage handling, ramp handling, fuel and oil handling and freight and mail handling. In case such a limitation is applied, the providers need to be selected in a public tender and the Member States may establish standard conditions or technical specifications covering also environmental aspects.

The Groundhandling Directive is currently being evaluated. This evaluation will closely examine issues related to the environmental and climate impact of groundhandling activities (particularly noise and emissions) and to climate change mitigation/adaptation policies employed by and/or incumbent (and enforced) upon groundhandling service providers and airports.

Regulatory oversight of air navigation services

The Single European Sky has contributed to certain improvements in the performance and modernisation of the European ATM sector but it has not yet generated the expected paradigm change in terms of performance by ANSPs and has not sufficiently reduced fragmentation of the European ATM system. Currently, the Commission is the de-facto economic regulator of monopolistic air navigation service providers. It adopts implementing Decisions, based on the advice from the independent Performance Review Body (PRB). Those Decisions are adopted under qualified majority voting of Member States that are at the same time the owners of the regulated entities. To increase the efficiency and effectiveness of the economic regulation, the Commission proposed in its recent SES2+ amended proposal to establish a fully independent European regulator. Furthermore, economic regulatory oversight of air navigation services that are provided under monopolistic conditions is not effective. Where National Supervisory Authorities (NSAs) lack independence from entities that exert ownership rights over regulated service providers, conflicts of interest inevitably hamper service quality and price.

Defragmentation of the European airspace requires economic regulation and monitoring across borders where and as long as competitive supply of services does not prevail. Presently, economic regulation lacks the necessary independence from the entities that exert ownership rights over the regulated undertakings. Users lack trust and confidence in national economic regulatory bodies, they do not lodge complaints and the national supervisory authorities generally hesitate to take stringent decisions and do not apply penalties to enforce them. National economic regulators have no procedures to exchange dossiers, to handle cases jointly. They do not exchange information on cases, there is no joint investigation, and site inspections of service providers are not foreseen in Union legislation on economic regulation.

According to a survey at the level of the National Supervisory Authority Coordination Platform-Performance Working Group, airspace users do not lodge complaints with NSA on aspects of economic regulation. Economic regulators have to be able to impose penalties where a regulated entity does not abide by their decision or does not give access to requested information. Although Single European Sky legislation foresees the instrument of penalties, most national economic regulators have not used it. Similarly, judicial appeals against decisions of regulators or air navigation service providers have rarely occurred.

Effective regulation can ensure transparency and effective stakeholder consultation. Airlines should understand what they pay for and they should be able to curb excessive surpluses of service providers, as long as air navigation services are not provided on market conditions. Surpluses of

regulated undertakings in excess of surpluses in competitive sectors can indicate monopolistic pricing and ineffective price regulation. Conversely, where air navigation services previously provided under monopolistic service provision were shifted to be provided under market conditions, the competent authorities witnessed a significant drop of the price with the same or better service quality.

There are also challenges related to automation and traffic management in the European airspace. Digitalisation holds promise to substantially improve the situation. Progress has been achieved on the research and innovation side through the SESAR project. However, today Air Traffic Management (ATM) still relies to a large extent on an outdated technology.

Scalability of ATM - in a safe, efficient and effective way - remains one of the most important challenges for the sector. Today this is not fully achievable due to the fragmented and monopolistic nature of ATM in Europe.

A true network oriented approach to ATM in Europe is also missing. The local approach to Air Navigation Services provision is less effective and leads to congestion and capacity crisis whereas experience shows that more effective network coordination decreases delays and congestion.

The shortcomings of the current ATM system lead to a number of environmental challenges. The congestion above Europe in 2018 and 2019 led to environmentally sub-optimal flight paths in terms of CO2 emissions, when pilots had to fly around congested airspace sectors. The way the ATM services are charged is also not optimal from the environmental perspective. Under the current system, airspace users optimise their routings by minimising not only the sum of fuel costs, but also the route charges. This may lead to choosing to fly longer routes because the charges are lower in a certain charging zone. The overall “benefit pool” of ATM sector is at least 11.6 Mt of excess CO2 emissions that ATM can directly influence.

Challenges of automation and smooth integration into a smart transport system are also relevant for the deployment of drones – a growing business in Europe, delivering services in all environments (from mapping, infrastructure inspections, delivery of goods and e-commerce, to mention just a few), with a potential to reduce congestion, accidents and make mobility cleaner.

These ATM challenges are addressed through the Single European Sky framework and in particular through its technological pillar, the SESAR project. SESAR aims to establish the ‘digital European sky’ that will allow the optimal use of the European airspace through innovative technological and operational solutions based on a high degree of digitalisation and automation. The digital European sky addresses air and ground operations offering solutions for civil and military airspace users, airports, air navigation service providers. More efficient flight trajectories will also allow modern aircraft to fully exploit their greener and quieter technologies.

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