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MAKING AVIATION GREENER- A SNAPSHOT ON EUROPEAN MEASURES FOR SUSTAINABLE TRANSPORT

(Presented by the European Commission)

SUMMARY

This paper describes the measures in Europe to support greener aviation and providing incentives to deploy sustainable fuels in transport in the context of the European research & development programmes and the 10% target for the use of renewable energy sources in transport.

1. INTRODUCTION

1.1 The objective of this paper is to describe the measures at the European level supporting research and development to make aviation “greener” as well as the development and promotion of alternative fuels, including in particular fuels from renewable energy sources, in transport.

2. THE RIGHT TECHNOLOGIES ARE INDISPENSABLE

2.1 The objective of transport research in Europe's 7th Framework Programme for research and technological development (2007-2013) (FP7) is to develop safer, greener and smarter transport systems for Europe that will benefit citizens, respect the environment, and increase the competitiveness of European industries in the global market.

2.2 While the transport system and transportation of people and goods are essential for prosperity, ways must be found to mitigate the negative impacts and consequences of increased mobility in relation to the environment, energy usage, safety and security and public health. Consequently FP7 supports activities aiming at the reduction of emissions, work on engines and alternative fuels, air traffic management, safety aspects of air transport, and environmentally efficient aviation. Overall, the research activities aim at contributing to the 2020 targets issued by the ACARE Advisory Council for Aeronautics Research in Europe: a 50% reduction of CO₂ emissions through drastic reduction of fuel consumption, an

80% reduction of NO_x (nitrogen oxide) emissions, a 50% reduction of external noise and a green product life cycle: design, manufacturing, maintenance and disposal / recycling.

2.3 One flagship of these ambitions is the Clean Sky Joint Technology Initiative¹, a public-private partnership with a total budget of 1.6 billion Euros, equally shared between the European Commission and industry, over the period 2008 – 2013, and the biggest single initiative in this area. The objective is to speed up technological breakthrough developments and shorten the time to market for new solutions tested on Full Scale Demonstrators. Clean Sky assembles 86 organisations from 16 countries as members of this initiative which addresses aircraft and engine technologies, systems for green operations and eco-design.

3. TOWARDS SUSTAINABLE FUELS

3.1 The 7th Framework Programme for research and technological development is an important instrument to also support the development of sustainable fuels at the European level. The objective of energy research² under FP7 is to aid the creation and establishment of the technologies necessary to adapt the current energy system into a more sustainable, competitive and secure one. As regards the area of renewable fuel production, the programme aims to research, develop and demonstrate improved fuel production systems and conversion technologies for the sustainable production and supply chains of solid, liquid and gaseous fuels from biomass (incl. biodegradable fraction of waste). Emphasis is on new types of biofuels in particular for transport and electricity as well as on new production schemes, storage and distribution routes for existing biofuels, including the integrated production of energy and other added-value products through biorefineries.

3.2 Ongoing projects³ include first large scale demonstrations of a Biomass to Liquid (BtL) production chain (OPTFUEL⁴), 2nd generation vegetable oil fuels (2NDVEGOIL⁵) and dimethylether (DME) as an optimised synthetic biofuel produced from black liquor (BIODME⁶). These projects concentrate on fuels for road transport, however, the underlying processes can also be used to produce aviation fuels. The current 2010 FP7 Call has a Topic on demonstration projects for biofuels production from algae which could deliver sustainable biofuels for aviation use.

3.3 The transport programme in FP7 currently funds 2 projects specifically dealing with alternative fuels for aviation: ALFABIRD⁷, exploring options, including for biofuels, also beyond "drop-in" fuels, and DREAMS⁸ on innovative engines including activities dedicated to alternative fuels. The FP6 project ECATS⁹ ('Environmentally Compatible Air Transport System') laid the groundwork for a scientific experts' network contributing to the environmental goals of the ACARE Vision 2020 for Aeronautics and the Strategic Research Agenda.

3.4 In addition to fuels from renewable energies, activities dedicated to carbon capture and storage addresses the preconditions for the use of other fossil energy sources as potential alternative sources for future aviation fuels in the light of security of supply.

¹ http://www.cleansky.eu/index.php?arbo_id=50&set_language=en

² http://cordis.europa.eu/fp7/energy/home_en.html

³ http://ec.europa.eu/energy/renewables/biofuels/biofuels_second_en.htm

⁴ <http://www.optfuel.eu/>

⁵ <http://www.2ndvegoil.eu/>

⁶ <http://www.biodme.eu/>

⁷ <http://www.alfa-bird.eu-vri.eu/>

⁸ <http://www.dream-project.eu/index.aspx>

⁹ <http://www.ecats-network.eu/>

3.5 The Strategic Energy Technology Plan (SET-Plan) describes the strategy to develop a sustainable supply of bioenergy in Europe, including transport fuels, and in the recent Communication on Investing in the Development of Low Carbon Technologies¹⁰ the European Commission describes possible investment strategies and financing means.

3.6 In order to bring the different results together, the European Commission has launched the study SWAFEA (Sustainable Way for Alternative Fuels and Energy in Aviation) with the objective of establishing a comparative analysis of different promising fuel options in the short to medium term, including their technical feasibility, their environmental impact and their economic dimension. SWAFEA will cooperate with other projects and integrate results from different international activities as available. The final results will be available in the first half of 2011, and at the end of 2010/early 2011 an international conference is foreseen to discuss the findings.¹¹

3.7 Relevant work is also being undertaken within the European Civil Aviation Conference (ECAC), following the December 2008 ECAC Forum. At that meeting, Directors General held a strategic discussion of the economic implications for civil aviation of pressures on future supplies of oil, including the role of alternative fuel sources. They subsequently established an ECAC Task Force on Fuel Security, with a mandate to produce a full analysis of the issues, with the intention of securing in due course a discussion of them at the international level, particularly in ICAO. The report from the Task Force is intended to be submitted to ECAC Directors General in December 2009.

4. TARGET SETTING FOR GREENER TRANSPORT

4.1 The European Union has a target of 10% for the use of renewable energy sources in transport by 2020, established in the Directive 2009/28/EC on the promotion of the use of energy sources from renewable sources¹². For the use of biofuels, this Directive defines sustainability criteria which have to be met in order to be counted towards the 10% target by the states and in order to benefit from public support schemes. In practice the major part is expected to be achieved in road transport, which is already a user of biofuels. The target addresses transport as a whole, and the sustainability criteria constitute the framework also for the assessment of new sustainable aviation fuels. More details are described in the Information Paper on sustainability criteria for the use of biofuels in the EU and life-cycle assessment for the agenda point on environmental sustainability and interdependencies.

4.2 The sustainability criteria in the Directive on the use of renewable energy sources establishes sustainability criteria and the methodology to calculate them is based on the methodology developed in the JEC Well-to-Wheels study¹³ as far as greenhouse gas impacts are concerned. Work continues to update data and to refine the LCA for the calculation of overall energy consumption and environmental and climate change impact of alternative fuels, taking into account the whole supply chain from "well to wheel" or, for aviation, from "well to wake". Further research is needed with a view to embracing environmental and social sustainability in a holistic approach, in particular regarding factors with considerable degree of variety, uncertainty and interdependencies, including in particular the possible indirect effects of the production and use of biomass as feedstock for fuels. The "European

¹⁰ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee on the Regions, Investing in the Development of Low Carbon Technologies (SET-Plan), COM(2009) 519 final of 07.10.2009 on http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm

¹¹ <http://www.swafea.eu/>

¹² http://ec.europa.eu/energy/renewables/index_en.htm and <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0028:EN:NOT>

¹³ EUCAR, CONCAWE, JRC Well-to-Wheels, first issued 2006, latest update 2008 available on <http://ies.jrc.ec.europa.eu/WTW>

Platform on Life Cycle Assessment”¹⁴ deals with methodological questions and a harmonised approach to life cycle assessment.

5. THE MODERNISATION OF AIR TRAFFIC MANAGEMENT

5.1 Not only technical improvements, but also the optimisation of aircraft and flight operations contributes to more energy and environmental efficiency. In Europe, the current fragmentation of air space has led to the daily situation of ineffective routing and holdings in the final flight phase which causes an average of 50 km unnecessary flight and related emissions. The Single European Sky (SES) is the main policy vehicle to bring about the necessary fundamental overhaul of air traffic infrastructure and management in Europe. The initial legislative framework of 2004 was updated this year. Key components are a true European network approach through performance targets including environmental performance, the reorganisation of air space in cross-border airspace blocks and the flexible use of air space in coordination through civil and military use.

5.2 SESAR (Single European Sky ATM research), the EU research and development programme for ATM modernisation, is set up to support the implementation of the European ATM Master Plan.¹⁵ It is a 2,1 billion Euros programme which is implemented in a public-private partnership with the European Commission, Eurocontrol and industry actors. In addition to capacity, safety and cost reduction targets, SESAR aims at a 10% reduction of CO₂ emissions per flight. It is international by definition, driven by the need for interoperability. Informal contacts are ongoing with a number of countries and world regions. Formal cooperation has started with the US NextGen initiative to ensure the emergence of interoperable solutions at global level.

5.3 The effectiveness of "Green Flights" e.g. through continuous descent approach (CDA) is demonstrated through the AIRE initiative (Atlantic Initiative for the Reduction of Emissions) in cooperation with the US FAA. In 2009 a new series of demonstration flights takes place, supported through the SESAR Joint Undertaking. Eurocontrol has developed an awareness and action programme to promote CDA together with airports, air navigation service providers and airlines.¹⁶

6. INCENTIVES THROUGH MARKET-BASED MEASURES

6.1 Market-based measures complete the portfolio of policy measures at the European level. The Emission Trading Scheme (ETS) in Europe has been in place since 2005 and covers more than 10,000 energy intensive installations, accounting for around 50% of the EU's total CO₂ emissions. From 2012 air transport will also be covered. Concrete preparation for aviation's inclusion starts already this year with airlines required to submit their individual monitoring and reporting plans as a first step. In parallel, discussions are ongoing in ICAO and UNFCCC to define the position of air transport in the post-2012 period. In the event that an agreement is reached on global measures to reduce greenhouse gas emissions from aviation, the EU will consider whether amendments to the ETS as it applies to aircraft operators would be necessary.

6.2 Market-based measures are an important incentive to support the uptake of measures to save energy and to reduce greenhouse gas emissions, and creating a pathway for overall systems and cost efficiency by allowing for an exchange of allowances between different sectors.

¹⁴ <http://lct.jrc.ec.europa.eu/eplca>

¹⁵ http://www.sesarju.eu/public/subsite_homepage/homepage.html

¹⁶ http://ec.europa.eu/transport/air/environment/aire_en.htm and http://www.sesarju.eu/public/standard_page/aire.html

6.3 Market-based measures also have the potential to generate revenues. Revenues from the auctioning of allowances under the EU emission trading system will be collected by the EU Member States. The Commission advocates the use of these revenues to support the development of sustainable industries including research and development, and investments to promote the production and use of sustainable biofuels.

6.4 In addition the European Investment Bank provides loan financing instruments and guarantees for investments into sustainable technologies and production plants.

7. A POLICY PACKAGE TO SUPPORT SUSTAINABLE AVIATION

7.1 In aviation, sustainable biofuels are emerging as a new possibility to reduce the climate change impact of this further growing transport sector. Whilst the efforts to improve aircraft efficiency and fuel consumption, operations and the application of market-based measures must be continued, policy measures specifically dedicated to the question of alternative fuels should build on a comprehensive analysis of their environmental, social and economic sustainability, taking into account their technical feasibility and safety aspects. Research and development are ongoing and if results are robust and promising, targeted measures and roadmaps to promote the use of sustainable fuels at large scale can be considered.

7.2 In view of the environmental challenges ahead, however, no single measure can deliver the required success on its own. A comprehensive approach is needed in order to be effective and to manage the complexity of possible trade-offs. This applies to policy measures as well as to the strategies of aircraft operators, navigation service providers and airports. All are launching considerable efforts in this direction, but only these combined and joint efforts will maintain public acceptance and keep the aviation sector competitive and able to serve its mission to link people, businesses and regions in the spirit of cohesion, communication and welfare creation.

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APPENDIX

SUSTAINABLE WAYS FOR ALTERNATIVE FUELS AND ENERGY IN AVIATION: THE EC SWAFEA STUDY

1. INTRODUCTION

1.1 Considering the dependence of transport, in particular aviation, on petroleum to satisfy an increasing energy demand, the impact of fossil fuel use on global warming and local air quality, as well as the impact of volatile oil prices on the economic situation of fuel users, the question needs to be addressed, what alternative options the aviation sector could have in the future.

1.2 In this context, the European Commission's Directorate General for Energy and Transport has initiated the study SWAFEA (Sustainable Ways for Alternative Fuels and Energy in Aviation) to investigate the feasibility and the impact of the use of alternative fuels in aviation in order to evaluate the potential and perspectives of new energy sources in aviation.

2. OBJECTIVES AND CONTENT OF THE STUDY

2.1 The goal is a comparative analysis of different options on the basis of a synthesis of the available data, and to build a vision and a possible roadmap for their deployment. SWAFEA will provide the policy makers with information and decision elements.

2.2 A comprehensive answer to the issues raised by the introduction of alternative fuels in aviation requires handling a number of various and interdependent multidisciplinary topics, not only technical but also environmental and economic.

2.3 In a first step, the study is building a synthesis of the present knowledge, embracing the results of the various ongoing projects and industrial initiatives. Promising options will then be analysed in depth from the point of view of their use in aviation, and technical studies and tests will be performed to complement existing data regarding specific requirements for aviation.

2.4 The environmental impact of these fuels, considering their entire life cycle, and also the ecological and societal impact of their use will be assessed in parallel. The contribution to green house gas effects will be a major concern, with a requirement for the new options to have a better carbon foot print than present fuels and considering the EU requirements for sustainable biofuels. The sustainability of the production is a second critical aspect which requires, in particular for biofuels, taking into account questions such as land use, potential competition with food chain or induced pollution. Also local air quality aspects need to be considered.

2.5 Economical aspects will also be studied with a view to the business case of new solutions and the time horizon for their possible implementation. These various elements will contribute to the definition of a deployment roadmap, addressing also political measures and research and development needs. Within the study, the input from industry will be assessed, validated and put into a coherent reporting framework by a team of researchers.

3. THE TEAM

3.1 To address these various topics, a team coordinated by ONERA, the French Aerospace Laboratory has been built with 19 European and international partners¹⁷, representing all sectors concerned: aircraft manufacturing, air transport, oil industry, research and consulting.

4. INTERNATIONAL COOPERATION

4.1 In addition a stakeholder forum with all European relevant stakeholders will be established that will allow exchange of information and best practices, along with communication and validation of the results. Also cooperation with other international initiatives will be important, e.g. with the US CAAFI initiative. The final results will be available in the first half of 2011.

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¹⁷ **SWAFEA partners:** ONERA, DLR, IFP, University of Sheffield, ALTRAN, BAUHAUS LUFTFAHRT, AIRBUS, AIR FRANCE, CERFACS, CONCAWE, EADS-IW, EMBRAER, ERDYN, IATA, INERIS, INRA, ROLLS ROYCE (UK and Germany), SHELL, SNECMA