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CONFERENCE ON AVIATION AND ALTERNATIVE FUELS

Rio de Janeiro, Brazil, 16 to 18 November 2009

Agenda Item 1: Environmental sustainability and interdependencies

CONTINUOUS IMPROVEMENT IN AIRCRAFT FUEL EFFICIENCY

(Presented by the International Coordinating Council
of Aerospace Industries Associations)

SUMMARY

Aircraft and engine manufacturers, in collaboration with research organisations and other stakeholders, continuously strive to develop innovative technology and design highly performing products to provide the air transport sector with vehicles that can achieve their mission in the safest, most cost-effective and environmentally friendly manner. This is supported by extensive, continuous and consistent research programmes and collaborative partnerships that deliver significant technical improvement steps that contribute to the remarkable past records in terms of aircraft efficiency and will keep delivering comparable results in the future. This continuous efficiency improvement path, particularly in terms of fuel burn, provides proportional reductions in terms of CO_2 emissions. Sustainable alternative fuels can now be envisaged as an additional potential solution to further reduce the emissions from aviation.

Action by the conference is in paragraph 3.

1. INTRODUCTION

1.1 Aircraft and engine manufacturers, in collaboration with research organisations and other stakeholders, continuously strive to develop innovative technology and design highly performing products to provide the air transport sector with vehicles that can achieve their mission in the safest, most cost-effective and environmentally friendly manner.

1.2 This task involves the compromise of many challenges of differing nature, related in particular to technical, economic and environmental issues, to be evaluated over a long-term horizon, as aircraft and engine manufacturing activities constitute a long life-cycle industry.

1.3 This is supported by extensive, continuous and consistent research programmes and collaborative partnerships that deliver regular technical improvement steps that contribute to the remarkable past records in terms of aircraft efficiency and will keep delivering comparable results in the future.

1.4 This continuous efficiency improvement path, particularly in terms of fuel burn, provides proportional reductions in terms of CO_2 emissions. Sustainable alternative fuels can now be envisaged as an additional potential solution to further reduce the emissions from aviation. Whatever these fuels are, they have to be compatible with high performance requirements, and better than or at least comparable to the current performance of traditional jet fuel.

1.5 This paper gives an overview of the path of continuous improvement in fuel efficiency in which the manufacturing industry is engaged: it summarizes the record achievement made over the past decades and gives an overview of the ambitious commitments and goals that the industry has taken for the future. Additional information is provided through Information Paper IP/08.

2. A HIGHLY EFFICIENT INDUSTRY

2.1 Over the past decades, market forces have always ensured that fuel burn (and associated CO_2 emissions) have been kept to a minimum for efficiency reasons. As a result of permanent fleet modernization, with new aircraft achieving unmatched efficiency performance, fuel burn has been reduced by about 70% over the last 40 years.

2.2 Improvements in aircraft fuel efficiency are inextricably linked to how engine, aircraft and systems manufacturers design their products. The concepts, the design criteria, the design optimization and the technology transition processes are all tightly interconnected, and the interactions usually increase as a product is developed

2.3 Generation after generation, aircraft have shown impressive weight reductions, aerodynamics improvement and engine performance increase, thus reducing drastically the amount of fuel burn (and of CO_2 emitted) to perform the same or further improved operational mission.

2.4 Simultaneously, product innovations are permanently introduced through design, simulation, modelling, testing and validation tools. The optimization process and the challenging trade-offs involve iterative loops at the technology, design and product levels. A detailed description of six key technical elements that contributed to the past record achievements is given in IP/08

2.5 As a consequence, it takes approximately a decade to design and develop an aircraft.

2.6 In order to make the appropriate decisions, when investing in future technologies, aircraft engine and airframe manufacturers need a stable regulatory framework, based on dependable scientific knowledge, and consistent funding to sustain the current and future extensive research programmes.

2.7 Some commitments have been taken by the manufacturing industry to keep that improvement trend: in Europe, the goals set by the Advisory Council for Aeronautics Research in Europe (ACARE) are targeting an additional 50% improvement in fuel burn and associated CO_2 emissions in 2020, compared to 2000 performance. This should be done while reducing the perceived noise levels by 50% and the emissions of NOx by 80% over the same period. Comparable objectives are set in the US, through the different programmes running with the NASA for instance

2.8 Associated research programmes, development clusters to foster synergies through appropriate partnerships, have been set up, thus enabling to better take in consideration the challenges associated to the interdependencies between environmental improvement and other parameters (performance, economics…) and within the environmental criteria themselves between noise, local air quality and climate change-related issues. Some choices for future technology engine and aircraft configuration will be based on the decisions the society will make relative to these challenges.

2.9 In addition to the traditional embedded technological improvement pattern that aircraft engine and airframe manufacturers are continuously supporting, some further opportunities to further reduce the emissions from aviation may arise. They are related to the design, development, validation and production of sustainable alternative fuels. This new avenue must be further explored to identify the environmental benefit it can generate, on top of the expected technological improvements.

3. RECOMMENDATIONS

3.1 The conference is invited to:

a) take note and acknowledge the past record improvements that the air transport industry achieved over the past decades as explained in this WP and associated IP/08;

b) acknowledge the challenge of interdependencies associated with environmental improvements when dealing with design and development of future products;

c) recommend that the opportunity of sustainable alternative fuels for aviation be further studied as a new possibility to further reduce emissions from aviation; and

d) recommend that the funding for research and technology programmes to further improve the efficiency of air transport be maintained or improved, irrespective of the necessary funding to support the study and development of sustainable alternative fuels.

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