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ASSEMBLY — 41ST SESSION

EXECUTIVE COMMITTEE

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NEW CERTIFICATION PROCEDURES FOR SUSTAINABLE AVIATION FUELS

(Presented by China)

EXECUTIVE SUMMARY

Sustainable aviation fuel (SAF) is an alternative fuel made from renewable raw materials. The widespread use of whole life-cycle carbon neutral or negative SAF is one of the most effective ways to achieve carbon neutrality in international aviation. Currently limited SAF usage leads to a series of bottlenecks for its development and deployment, such as insufficient performance data support, lack of system-level safety assessment criterion, and the sole dependence on testing instead of risk probability analysis in qualification and certification. The issue that needs to be addressed is how to make the evaluation standards more scientific and accessible and how to make an appropriate use of kerosene performance data while improving the safety of certified SAFs. Based on the current work in China, this paper introduces new concepts and paths to address key issues associated with SAF certification.

<i>Strategic Objectives:</i>	This working paper relates to Strategic Objective — <i>Environmental Protection; Safety</i>
<i>Financial implications:</i>	None
<i>References:</i>	

¹ English and Chinese versions provided by China

1. INTRODUCTION

1.1 Sustainable aviation fuel (SAF) is produced from renewable raw materials and expected to be an alternative for the conventional (fossil derived) aviation fuel. SAFs should be of equivalent chemical and physical characteristics to those of conventional fuel and can be blended with the latter to varying degrees, promising to be safely and widely used within existing aircraft and engines and compatible with fuel delivery systems at airports. All these features make SAFs attractive to airlines and other stakeholders in the industry. Through effectively reducing carbon dioxide emissions in the whole life cycle, SAFs can greatly help achieve carbon neutrality and negative emissions. With the increasing cost of carbon emissions in international aviation, SAF has significant potential in reducing carbon dioxide emissions along with improved technologies and operational improvements.

1.2 A key constraint to the widespread use of SAFs lies in insufficient performance data support. The SAF evaluation method should be the key to ensure SAF safety, but has turned to become the bottleneck of SAF development and deployment. The current SAF certification scheme does not see the point of utilizing performance data of conventional fuel, lacks system-level safety assessment criterion, and depends solely on testing instead of risk probability analysis in safety demonstration. The approach dependent on coupling fuel test and engine test not only results in significant SAF waste, but also is unable to deliver sufficient data support for safety. How to make the certification process more scientific and accessible and consume less SAF in certification without affecting SAF safety is the most pressing issue at present.

1.3 In addition, SAFs need to be sustainably certified as a CORSIA eligible fuel before it can be used under the CORSIA scheme. Research forces in China are committed to streamline SAF certification processes and accelerate relevant research and development.

2. DISCUSSION

2.1 The current SAF certification procedures mainly follow that of conventional fuel, and the precondition is that SAFs have the same qualities and characteristics. The certification requires the testing of SAFs performance in combustion chamber and engine, and a new engine model will require new certification, which results in complex and costly certification process. Considering the importance of SAF qualification and certification, it is necessary to develop more scientific certification criteria, establish more reasonable evaluation process, develop appropriate supporting tools, and create new procedures for SAF certification.

2.2 Multiple research projects on innovative SAFs technical certification standards and methods are currently underway in China, among which the following four aspects are focused:

- 1) modify SAF safety demonstration means. Taking engine system safety as the top-level objective and appropriately using kerosene's performance data at the engine level, based on the combination of modelling, testing and analysis instead of testing only, a new demonstration means featuring the capability of comparing safety at the system level and defining system safety boundaries has been explored. The new procedure for SAF certification with safety equivalence as the only criterion will enhance safety assurance;
- 2) innovate SAF safety certification approach. Proposing an innovative concept of taking SAF as an engine component, the China-EU joint project of Horizon 2020 utilizes the Technical Standard Orders (TSO) certification approach to establish a certification scheme for "fuel component". By addressing the prospect of using SAFs in engines of the same family, the new approach is expected to break the bottleneck of fuel-test-and-engine-test coupling during SAF certification and

promote the adaptability of certified SAF, reducing fuel consumption and challenges related to SAF certification;

- 3) define SAF safety evaluation facility. Based on the pathway of fuel effects on the safety of engine, the concepts of standard combustor and standard engine have been defined, and a more widely applicable safety evaluation system based on standard evaluation facilities has been established, which will surely encourage countries (especially the vast majority of late-developing countries) to launch their own SAF research and development effort and accelerate the pace of carbon neutrality; and
- 4) optimize SAF refining process and engine fuel system design. Based on the mapping of fuel composition and its physicochemical properties to safety objectives from the perspective of engine system safety, the set of key engine safety parameters are expanded, kerosene performance data is utilized to determine SAF safety parameter margin, and SAF refining process and engine fuel system design are optimized through parameter sensitivity analysis. The overall cost of SAF development and production will be decreased, and SAF safety and commercial use will be prompted.

2.3 The improvements on SAF safety demonstration means, safety certification approach, safety evaluation facilities and engine fuel system design will promote the widespread use of SAF in international aviation.

2.4 Researches in the field of SAF sustainability certification include:

- 1) for the problem of large deviations between the indirect land-use change emissions and core life-cycle emissions based on different models and processing methods, researches on the whole life-cycle emission estimating model for the whole industry chain have been conducted, enabling more accurate and faster sustainability assessments for SAFs; and
- 2) for lack of consideration to the traceability and quantitative assessment of carbon sequestration effects of by-products from SAF production, researches on carbon sequestration modelling and their importance to SAF whole life-cycle emission modelling have been conducted, expected to greatly support the implementation of carbon offsetting mechanism.

2.5 Through researches on SAF whole life-cycle emission modelling, the data collection and analysis process are optimized, sustainability standards are improved, and the efficiency of sustainability certification are enhanced.

2.6 Through researches on both airworthiness certification and sustainability certification, China's research forces will continue to explore new procedures for SAF certification, with a view to streamlining SAF certification and helping countries (especially those without original equipment manufacturers (OEMs) to accelerate the SAF development and deployment.