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WORKING PAPER

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ASSEMBLY — 41ST SESSION

TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety and Air Navigation Standardization

**STUDY AND FORMULATE AIRWORTHINESS REQUIREMENTS FOR ELECTRIC
POWERED AIRCRAFT**

(Presented by China, Co-sponsored by Singapore)

EXECUTIVE SUMMARY

Recognizing the increasing growth of electric powered aircraft, the challenge encountered in certification, and the need for harmonizing the airworthiness standards among States, it is proposed that ICAO develop appropriate airworthiness requirements for electric powered aircraft.

Action: The Assembly is invited to request ICAO to task the Airworthiness Panel to develop guidance materials or appropriate airworthiness standards, for the certification of electric powered aircraft.

<i>Strategic Objectives:</i>	This working paper addresses the strategic objectives of aviation safety and environmental protection.
<i>Financial implications:</i>	It is expected that this activity will be covered in the current triennial programme budget.
<i>References:</i>	Annex 8 – <i>Airworthiness of Aircraft</i>

¹ English and Chinese versions provided by China.

1. INTRODUCTION

1.1 The focus on reducing aviation carbon footprint has accelerated the development of electric powered aircraft as these electric powered aircraft have no carbon emissions or lesser emissions as compared against conventional aircraft. While the application of electric engines are currently focused on general aviation aircraft with a limited thrust capacity, the technology when fully developed could be progressively applied in larger aircraft.

1.2 In addition, the strong industry interest in electric vertical take-off and landing (EVTOL) aircraft, which had since attracted billions of dollars in research funding, will further propel the realization of electric powered aircraft. EVTOL aircraft is also expected to play a positive role in developing air traffic modes and aids in alleviating traffic congestion on the ground in the future.

1.3 The main difference between electric powered aircraft and traditional powered aircraft is that the energy source of electric motor is usually energy storage batteries, fuel cells, solar cell or generators, including controller and inverter power systems. The development of electric engine will bring about innovation of technologies on larger energy storage mediums and charging facilities, which is key infrastructure when electric aircraft are flown internationally.

1.4 At present, Annex 8 of the Convention lacks the airworthiness standards for electric powered aircraft and may not be able to support sufficiently the certification of electric propulsion system. This paper provides update on the development of electric powered aircraft, steps taken by States of Design to address the challenges in certifying these aircraft with current airworthiness requirements and the needs to develop a set of airworthiness standards for electric powered aircraft.

2. DISCUSSION

2.1 The development of the electric powered aircraft is accelerating globally. According to published statistics, as at the end of 2019, there were more than 240 electric powered aircraft research and development projects worldwide, more than half of which started 2017. With the development of electric powered aircraft, a few products have obtained airworthiness certification. For example, the RX1E aircraft designed by Liaoning General Aviation Academy from China obtained Type Certificate issued by the Civil Aviation Administration of China (CAAC) in February 2015. Its serial derivative RX1E-A and RX1E-S aircraft also received Type Certificates issued by CAAC in October 2018 and December 2021 respectively. Other authorities such as EASA has also issued type certificates for electric aircraft (e.g. Pipistrel Velis Electro (Model Virus SW 128) which was issued a type certificate on 18 May 2020).

2.2 At present, there are also several types of electric powered aircraft that are undergoing type certification process. For example, China's Liaoning General Aviation Academy's four-seat electric aircraft (RX4E), and other authorities such as FAA also have electric propulsion aircraft projects under their review.

2.3 As there were no airworthiness standards for aircraft powered by electric propulsion such as those using lithium batteries, States of Design are making use of "Special Conditions" to complement existing airworthiness standards to address the novel design. CAAC issuance of "Lithium ion Batteries for RX1E Series Electric Aircraft" (SC-LSA-F2840-001) is one such example to mitigate the current lack of standard.

2.4 To facilitate the growth of this industry and address aviation safety risk, a coordinated certification policy among States is very important for the cross-border exchange/operations of electric powered aircraft. For this reason, aviation authorities hope to communicate to each other on the certification requirements and experience. For example, in March 2022, CAAC and EASA held a symposium on “Electric/Hybrid Propulsion System (EHPS)”. The two authorities, together with their industries, shared their respective roadmaps for EHPS certification, their special conditions issued, as well as the certification experiences from both the authorities and the industries.

2.5 It would be beneficial if these special condition requirements developed by various States of Designs can be further harmonized and studied for a set of standardized electric powered aircraft airworthiness requirements. The harmonized requirements may then be incorporated into Annex 8 of the Convention as airworthiness standards or guidance materials for electric powered aircraft. This will better guide the formulation of regulations on airworthiness requirements of electric powered aircraft by states and play a positive role in the development of civil aviation industry and the safety of civil aviation.

3. CONCLUSION

3.1 In light of the above, the Assembly is invited to request ICAO to task the Airworthiness Panel to develop guidance materials or appropriate airworthiness standards, for the certification of electric powered aircraft.

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