



**ASSEMBLY — 40TH SESSION**

**TECHNICAL COMMISSION**

**Agenda Item 30: Other issues to be considered by the Technical Commission**

**AMENDMENT TO THE ENGINE MONITORING STANDARDS FOR EXTENDED DIVERSION TIME OPERATIONS (EDTO) OF TWIN-ENGINE AEROPLANE**

(Presented by China)

**EXECUTIVE SUMMARY**

One of the requirements for extended diversion time operations (EDTO) for twin-engine aeroplane is the in-flight shutdown (IFSD) rates which was established 30 years ago. With technical progress and increased overall safety level, this requirement has become outdated, even lower than the average IFSD requirement for various mainstream engines. Also, there were cases where the IFSD rates for some new aeroplane/engine combination could not be regarded as satisfactory in normal operation, but could still meet the IFSD rates requirement for EDTO operations. As a result, the Civil Aviation Administration of China (CAAC) is making adjustment to the existing IFSD rates for EDTO operations of twin-engine aeroplane, in order to keep pace with the times and match the current safety level.

This working paper aims to recommend coordinated global efforts to update the IFSD rates for EDTO operations for twin-engine aeroplane. If this proposal is accepted by the General Assembly, corresponding technical research and analysis should be initiated to develop proposed amendment to relevant Standards and Recommended Practices (SARPs), and guidance materials.

**Action:** The Assembly is invited to:

- a) take note of the information included in this working paper;
- b) instruct, as appropriate, the Council to carry out analysis for the amendment to the IFSD rates for EDTO operations of twin-engine aeroplane; and
- c) amend the appropriate Annexes and relevant guidance materials if such analysis justifies the amendments.

<i>Strategic Objectives:</i>	This working paper relates to Strategic Objective of Aviation Safety.
<i>Financial implications:</i>	N/A
<i>References:</i>	Annex 6 — <i>Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes</i> Doc 10085, <i>Extended Diversion Time Operations (EDTO) Manual</i> Doc 9760, <i>Airworthiness Manual</i>

<sup>1</sup> English and Chinese versions provided by China.

## 1. INTRODUCTION

1.1 The current EDTO evolved from the concept of Extended-range twin-engine operations (ETOPS) introduced in the 1980s. The concept of ETOPS has not only made trans-oceanic operation of twin-engine aeroplane a possible, but has also been widely used in the selection of alternate airports for flights on non-transoceanic routes, making modern air transport significantly efficient.

1.2 In addition to the necessary configuration, maintenance, and procedures (CMP) document requirements, the in-flight shutdown (IFSD) rate is another important indicator used to evaluate the reliability level of the specific type of engines in certain aeroplane/engine combination. Although the civil aviation authorities of various states usually specify respective IFSD rates in their civil aviation regulations or relevant guidance materials, they have basically adopted the same standards as follows, including AMC 20-6 of the European Union Aviation Safety Agency, CFR 14 § 121.374 of the Federal Aviation Administration of the United States, and CCAR § 121.719 of the Civil Aviation Administration of China:

- 120-minute EDTO: 0.05/1000 engine flight hours (EFH)
- 180-minute EDTO: 0.03/1000 EFH
- Greater than 180-minute EDTO: 0.02/1000 EFH

## 2. DISCUSSION

2.1 On 1 February 1 1985, Trans World Airlines (TWA) made the first commercial 120-minute ETOPS flight using a Boeing 767. In 1988, FAA developed in its AC 120-42A the recommended IFSD rates for ETOPS operations, which was widely adopted around the world and has been applied to this day.

2.2 According to historical data, the IFSD rates for ETOPS operations recommended in FAA AC 120-42A was based on the documented average IFSD rates achieved by the air transport industry in the United States in the previous decade. With technical progress and enhanced safety management, the reliability levels of all types of engines have witnessed great improvement. For example, the IFSD rates of the global fleet with mainstream CF6 engines has continued to decrease from 0.025 per 1000 engine flight hours in 1989 to 0.005; and in the case of CFM56 engines, from 0.008 in 1999 to 0.002, far below the recommended IFSD rates for ETOPS operation.

2.3 The latest generation of turbine engines outperforms the previous generations for their high efficiency and lower fuel consumption, and can obtain airworthiness approval for EDTO operations in sync with the issuance of type certificate. However, the overall reliability of these engines still needs to be improved as there occurred many uncontrollable in-flight shutdowns since the delivery and put into operation of the twin-engine aeroplane installed with these engines. Their performance is not unacceptable considering that any new aviation product needs time to achieve technical maturity from the perspective of normal operation. But their performance is unsatisfactory considering that the EDTO operations shall follow a stricter IFSD rates requirement than the normal operations. The large number of in-flight shutdowns in some new turbine engines has resulted in widespread concern in the industry, civil aviation authorities and even the public, but what's odd is that these new engines still follow the existing IFSD rates requirement for EDTO operations.

2.4 In view of the above, CAAC has carried out relevant research and found that the current IFSD rates for EDTO operations are outdated and no longer compatible with current technical progress, safety management level and public expectations. Assume that there is a fleet of 100 aeroplanes, each operates 10 hours per day, an annual maximum of 36 in-flight shutdowns can be allowed in order to meet the IFSD rates requirement for the 120-minute EDTO operations, 21 for the 180-minute EDTO operations, and 14 for greater than 180-minute EDTO operations. If the number of aeroplanes in a fleet grows to several thousands, the number of in-flight shutdowns will be unbelievably high, making the existing IFSD requirement obviously too loose. To this end, CAAC plans to make the following amendment to the IFSD rates for the EDTO operations for twin-engine aeroplane:

- 120-minute EDTO: 0.005/1000 EFH
- 180-minute EDTO: 0.003/1000 EFH
- Greater than 180-minute EDTO: 0.002/1000 EFH

### 3. **PROPOSED MEASURES**

3.1 Considering the technical progress, safety management level increasement and high public expectations, it's recommended to update the IFSD rates for two-engine aeroplane EDTO operations.

3.2 Given the fact that actual operation data for the new generation of engines shall be collected to show their compliance with the IFSD rates for EDTO operations, it is recommended to reconsider the practice of issuing the airworthiness approval in sync with the type certificate, to ensure that sufficient data are collected before EDTO operation is approved.

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