International Civil Aviation Organization

A42-WP/196[1]
TE/66
28/7/25

WORKING PAPER

ASSEMBLY — 42ND SESSION

TECHNICAL COMMISSION

Agenda Item 24 : Aviation Safety and Air Navigation Priority Initiatives

PROPOSAL FOR THE STANDARDIZATION OF FLIGHT RECORDER DATA DOWNLOAD INTERFACES AND ASSOCIATED HARDWARE/SOFTWARE SYSTEMS

(Presented by China)

EXECUTIVE SUMMARY

Flight data from a flight data recorder (FDR) and voice data from a cockpit voice recorder (CVR), serve as important physical evidence. In accident/incident investigations, it is essential to timely retrieve data from these recorders and analyse the data for advancing the investigation and finding the truth. Since there is no unified international standard for flight data download interfaces, different FDR manufacturers have designed specific data cables, download devices, and analysis software for their own models. Currently, there is no unified hardware and software that can accommodate most recorders, making it difficult for accident investigation authorities' laboratories to analyse flight data from various types of flight recorders available. By regional collaboration, relevant resources will be shared with other laboratories, but the communication and coordination bring additional workload to the investigators, making the investigation process slow to some extent.

Action: The Assembly is invited to:

a) pay close attention to this working paper and discuss the necessity, feasibility and economy of establishing a unified standard for flight recorder data download interfaces;
b) develop unified international standards to regulate such aspects as data interfaces, memory board interfaces, cables used for downloading data and hardware equipment, to achieve the goal of "one fits all", namely the unified cable, hardware and software can be used for all types of flight data recorders produced by different manufacturers, so as to improve the efficiency of investigations and reduce cost;
c) formulate a roadmap to facilitate the establishing of relevant unified interface standards; and
d) continuously follow the advancements in flight data transmission technology and promote the application of real-time flight data transmission technology.

Strategic Goals:	This working paper relates to *Every Flight is Safe and Secure*.
Financial implications:	The activities referred to in the attached draft Assembly working paper will be undertaken subject to the resources available in the 2026 – 2028 Regular Budget and/or from extra-budgetary contributions as guided by the ICAO Business Plan 2026-2028.
References:	Annex 6 — *Operation of Aircraft* Annex 13 — *Aircraft Accident and Incident Investigation*

[1] English and Chinese versions provided by China.

1. INTRODUCTION

1.1 Annex 6 — *Operation of Aircraft* defines a flight recorder as any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation. Flight recorders comprise one or more of the following systems: a flight data recorder (FDR), a cockpit voice recorder (CVR), an airborne image recorder (AIR), and a data link recorder (DLR).

1.2 Annex 13 — *Aircraft Accident and Incident Investigation* mandates in Chapter 5, 5.7 that "Effective use shall be made of flight recorders in the investigation of an accident or an incident. The State conducting the investigation shall arrange for the read-out of the flight recorders without delay".

1.3 Since there are lack of unified international standards, front-end data download interfaces of flight recorders produced by different manufacturers with differing models/part numbers lack uniformity, even the different generations of the ones from the same supplier, which results in a wide variety of cables, hardware equipment, and software used for analysing that required for data downloading, with substantial differences among them. Most States have no ability to decode and analyse all types of flight recorders due to various types.

1.4 ICAO recommends that "In the event that the State conducting the investigation of an accident or an incident does not have adequate facilities to read out the flight recorders, it should use the facilities made available to it by other States". However, if assistance from laboratories in other countries is sought, it will increase the investigation workload and time because of communication and transportation, thereby making the investigation slow to a certain extent.

2. DISCUSSION

2.1 Regarding to back-end data download interfaces of flight recorders produced by different manufacturers with various models/part numbers, there are relevant unified international standards. These interfaces can be installed on the same type of aircraft. For the airlines, they feel free to choose types. Competition drives technological progress, which benefits the industry.

2.2 Currently, aircraft flight recorders are manufactured by a handful of suppliers. Establishing a universal international standard for flight recorder data download cable, equipment, and software would involve a relatively small group of stakeholders.

2.3 Given that flight recorder data download interfaces predominantly use industry-standard connectors, and manufacturers only defined pin functions and designed data protocols, standardizing these interfaces would face minimal technical challenges and spend acceptable costs for manufacturers.

2.4 Adding a universal standardized interface specified to retrieve data on the memory module will make data decoding easier when the module needs to be removed from the crash-survivable memory unit (CSMU). The technology is relatively simple that will improve data recovery efficiency.

2.5 Drawing on international experience in communication devices, for instance mobile phones, the establishment of a unified international standard will be beneficial to the industry. By establishing a unified international standard for flight recorder data interfaces, the goal of 'one fits all' can be achieved, enabling a single cable, device, and software to be compatible with multiple flight recorder models, thereby improving the efficiency of flight recorder data download and analysis. At the same time,

this will significantly reduce the cost of purchasing software and hardware for laboratories, enabling Member States to have flight recorder download capabilities that cover all models.

2.6 With the application of new-generation communication and high-throughput satellite technology, air-ground data links evolve toward high bandwidth and low latency. By using real-time transmission technology, the critical flight data and voice data will be transited to the ground via wireless communication, representing a revolutionary upgrade to traditional flight data recording methods, which will further improve the investigation of accidents/incidents. It is recommended that ICAO continue to pay close attention to the developments in communication technology, draw on practices and experiences from the communications industry to establish minimum standards and technical roadmap for real-time flight data transmission technology, data requirements, and performance indicators, thus continuing to promote the application of real-time flight data transmission in the civil aviation sector.

— END —