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**WORKING PAPER**

# ASSEMBLY — 41ST SESSION

## TECHNICAL COMMISSION

**Agenda Item 30: Aviation Safety and Air Navigation Policy**
**30.3 Relevant Outcomes of the High-level Conference on COVID-19, Safety Stream (HLCC 2021)**

## PROMOTING BIG DATA ANALYSIS IN IDENTIFYING AND SHARING OPERATIONAL RISKS AT SMALL AND MEDIUM-SIZED AIRPORTS

(Presented by China)

**EXECUTIVE SUMMARY**

In recent years, China's civil aviation, by collecting and analyzing industry-wide flight data and identifying and evaluating risks at small and medium-sized airports, has discovered and identified risks in the approach and departure phases at some airports, and promptly provided risk alerts and recommendations on mitigation measures to flight crews, thereby playing data-supporting role in safety supervision.

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

a) recommend that ICAO and Member States strengthen the research on the identification and alert of operational risks at small and medium-sized airports around the world, and the analysis and application of flight data in airport operational risks; and
b) recommend that ICAO establish a global operational risk sharing system for small and medium-sized airports to promote sharing of information on airport safety risk identification and mitigation

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| *Strategic Objectives:* | This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives. |
| *Financial implications:* | The activities referred to in this paper will be undertaken with resources available in the 2022-2025 Regular Programme Budget |
| *References:* | Annex 13 — *Aircraft Accident and Incident Investigation*<br>Doc 9859, *Safety Management Manual* |

[1] English and Chinese versions provided by China.

## 1. INTRODUCTION

1.1 To improve regulatory effectiveness, the Civil Aviation Administration of China (CAAC) has focused on data-driven regulation and risk management to collect and analyze the flight data of all fleets. As a result, China's civil aviation have had a general understanding of the industry's safety operation trend and continuously monitor typical events, thus playing an important role in improving data-driven safety management and supervision.

1.2 CAAC uses the technology of "expertise + big data mining" to analyze the risks at small and medium-sized airports in China, providing both the analysis of high-risk events such as Control Flight Into Terrain (CFIT) and runway veer-off and overrun, and the thematic analysis of incidents such as unstabilized approaches, design flaws in arrival and departure procedures, hard landing and tail strike.

1.3 CAAC has developed the "airport flight operation risk system", which includes functional modules of airport overview, crew notifications, airport operation, FOQA statistics, safety risks, safety information, 3D simulation and recommended practices and provides notifications and alerts concerning airport operation risks to airlines and crew.

1.4 In China, small and medium-sized airports generally refer to the airports with an annual passenger throughput of less than 2 million passengers. Their overall situation is characterized by the large number, fewer movements and wide distribution; some of them are located in complex terrains, which makes takeoff and landing more difficult; investment in their safety is relatively limited and their overall safety foundation needs to be further consolidated.

1.5 Among 195 small and medium-sized airports in China, 32 have instrument landing system (ILS) in both landing directions, and the rest 163 only have ILS in one landing direction or no ILS. The main pattern of the approach procedures in small and medium-sized airports are ILS in one landing direction+ RNP-APCH in opposite direction. 128 airports have adopted this pattern, accounting for 66%. Statistics show that the probability of occurrences caused by a non-precision approach procedure at small and medium-sized airports is much higher than that of a precision approach procedure, and the incidence of occurrences per 10000 movements in the former situation is about twice that in the latter situation. Therefore, the identification and prevention of safety risks based on big data analysis is particularly important.

## 2. DISCUSSION

2.1 Civil aviation safety data is increasingly rich in the era of big data. We should promote the integration of safety data from multiple sources, collect comprehensive safety information covering human, aircraft, environment, and management to facilitate big data analysis and application. China's civil aviation has used big data analysis to be aware of civil aviation safety situation, monitor risk and give alert and provide intelligent auxiliary analysis. We have implemented classified policies for airlines, airports and other service providers and promoted differentiated and refined supervision, thus achieving good results.

2.2 Examples of big data analysis in identifying risks at small and medium-sized airports

2.2.1 Ground Proximity Warnings at Cangyuan Airport

2.2.1.1 Cangyuan Airport (ZPCW), a high elevation airport (elevation 5,977 feet) in southwest China, officially operated on December 8, 2016. GPWS Terrain warnings have occurred to several flights of different airlines that land at Canyuan Airport since airport operation. The data analysis reveals that the locations and altitudes where these GPWS Terrain warnings occurred were basically the same, and the main reason is that the terrain database at Canyuan Airport has not been updated promptly and warnings were all invalid. The equipment manufacturer was urged to revise the terrain database of Canyuan Airport, and it was updated in March 2018, and since then the invalid GPWS Terrain warnings haven't occurred anymore.

2.2.2 Frequent risky climbing slopes during RNAV departure at Daocheng Airport

2.2.2.1 Daocheng Airport (ZUDC) is a very high elevation airport (elevation 14,466 feet) in southwest China, where two types of aircraft of B737 and A319 operate currently, which can depart according to traditional instrument departure or RNAV mode. In 2018, after analyzing the flight data of 103 flights departing from Daocheng Airport, it was found that: in all the 101 flights (including B737 and A319) that had departed according to RNAV with autopilot on and LNAV on, in the process of left turn close to 90 degrees, the maximum bank angle of 86 flights exceeded 30 degrees, accounting for 85%, of which the maximum turn bank angle reached 38.7 degrees. There is a safety risk for low-altitude and large bank angle flights at high plateau airports, so China’s civil aviation suspended the RNAV departure procedure at Daocheng Airport and redesigned the flight procedure.

2.2.3 The risk of overrun during the landing at Dali Airport

2.2.3.1 Dali Airport (ZPDL) is a high elevation airport (elevation 7059 feet) in southwest China, surrounded by a complex terrain of mountains. Daqing Mountain (elevation 2603m), which is located at magnetic bearing 035° of the center of the runway and 4.8km away from the airport has a significant influence on the landing. Strong wind prevails from November to April, with an annual average wind speed of 5.3m/s and a maximum instantaneous wind speed of 29m/s. There are often turbulences of different degrees over the airport and occasional windshear and turbulence in the final approach. In order to prevent the influence of windshear at low altitude, the crew will increase the airspeed appropriately, which might extend the landing roll distance and increase the risk of overrun. After a comprehensive analysis of flight data of 2697 flights of B737, it is recommended that the crew may increase the airspeed but not exceed Verf+18kts.

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