International Civil Aviation Organization

Eleventh Meeting of the Air Traffic Management Sub-Group (ATM/SG/11) of APANPIRG

Singapore, 2 – 6 October 2023

Agenda Item 5: ATM Systems (Modernization, Seamless ATM, CNS, ATFM)

ENHANCING OPERATIONAL SAFETY AND EFFICIENCY THROUGH USE OF BIG DATA ANALYTICS ON MISSED APPROACH DATA AT HONG KONG INTERNATIONAL AIRPORT

(Presented by Hong Kong China)

SUMMARY

This paper presents the benefits of using big data analytics to analyse missed approach data at Hong Kong International Airport (HKIA). The analysis unfolds information like hidden trends and patterns, which allows early detection of safety risks and formulation of mitigating measures to manage operational risk of missed approaches, thus enhancing operational safety and efficiency at HKIA. The results from the analysis also aid the assessment of the impact on implementation of Enhanced Wake Turbulence Separation (e-WTS) for arrivals and the monitoring of runway occupancy time of arrivals (ROTA) at HKIA.

1. INTRODUCTION

1.1 According to IATA's study, approach and landing phases of flight account for a major proportion of all commercial aircraft accidents, therefore safe conduct of these two phases of flight play a critical role in ensuring flight safety[1]. Missed approach, or go-around procedure is considered a continuation of the approach and landing phases in case a successful landing cannot be achieved for whatever reasons, as such, it is regarded as an essential safety maneuver for all pilots[2]. Examining the causes of missed approach would help managing the risk during approach and landing phases to enhance operational safety.

1.2 Following a missed approach, a pilot may opt for another approach or diversion. Either way, the missed approach traffic will disrupt demand and capacity balancing of the runway as well as in related air traffic control (ATC) sectors, which will eventually affect the operational efficiency of the airport. Through the use of a big analytics tool to conduct regular analysis, information like dependent factors, hidden trends and patterns are unfolded and visualized, which is difficult by traditional analysis means, and causes of missed approach at HKIA are identified and followed up so that operational safety and efficiency can be enhanced.

2. DISCUSSION

2.1 The statistical analysis of missed approach aims at identifying dependent factors and reasons of events so that mitigating measures could be initiated and managed to reduce the incidence of avoidable missed approach. The analysis is being carried out monthly, which not only improves overall operational safety and efficiency, but also provides valuable indicators to monitor performance

1. IATA, "Examining Unstable Approaches – Risk Mitigating Efforts", *Unstable Approach – Safety Analysis Project Team*, 2022
2. David Owens, "The Go Around Procedure", *Safety first #12, The Airbus Safety Magazine*, July 2011

of ATC and airline operators. Through the use of a big data analytics tool, information like possible hidden patterns, trend, correlations, weakest links etc., related to missed approach could be uncovered at an earlier stage for the prevention of such events.

2.2 Causes identified are classified into 5 major categories: Weather, Equipment, ATC/ Pilot Interactions, Separation and Runway issues. Each of the occurrence will be examined carefully by means of investigation and are suitably followed up with relevant stakeholders. For instance, engineering department is responsible for looking into cases of missed approach related to the equipment issues; and air traffic management department is responsible for looking into those related to ATC/Pilot interaction, etc.

2.3 Data collected in the analysis will be summarized and displayed in a graphical manner as part of the big data analytics tool to facilitate identification of any hidden trend, distribution pattern etc. (see Figure 1 & 2), so that mitigating measures could be derived and implemented to reduce the number of missed approach, particularly those that could have been avoided with enhanced situation awareness of ATC and/or airline operators.

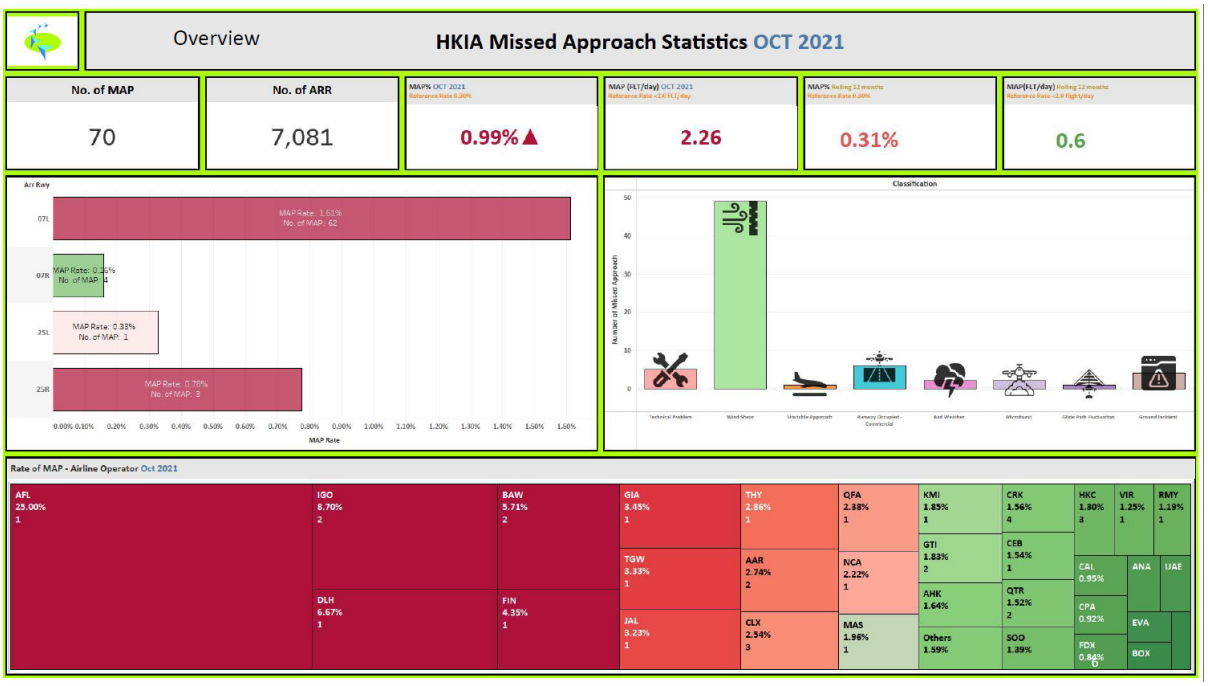

Figure 1: A screen capture of one of the big data analytics tools deployed by Hong Kong China to analyse HKIA missed approach data

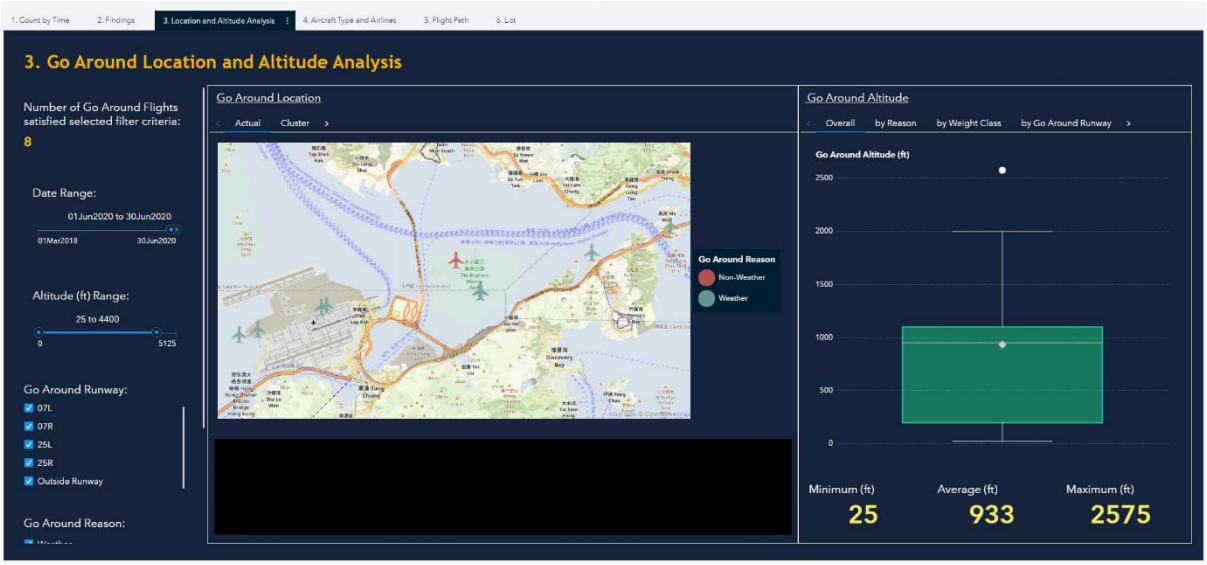

Figure 2: A screen capture of one of the big data analytics tools deployed by Hong Kong China to analyse HKIA missed approach data

2.4 The analysis supported the monitoring of operational impact of an ATC procedure/separation change. In November 2020, HKIA successfully implemented the e-WTS for arrivals. The monthly analysis served to provide solid evidence in confirming that no extra missed approach were induced from the implementation of e-WTS.

2.5 The analysis was also used to enhance the performance of ROTA of different types of aircraft from different airlines operating at HKIA. Since some cases of the missed approach were induced by excessively long ROTA of preceding arrival, optimizing the ROTA could definitely minimize the number of missed approach and improve the runway throughput.

2.6 Similar analysis is applicable using other ATC operational data to identify the dependent factors with a view to further enhancing operational safety and efficiency.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the experience shared by Hong Kong, China in using big data analytics to analyse missed approach data with a view to enhancing operational safety and efficiency at Hong Kong International Airport;

b) encourage States/Administrations to consider the benefits of using big data analytics to analyse data related to ATC operations to unfold dependent factors, hidden trends and patterns for further enhancing operational safety and efficiency, and share their relevant experience; and

c) discuss any relevant matters as appropriate.

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