International Civil Aviation Organization

MIDANPIRG/19 and RASG-MID/9 Meetings

(Riyadh, Saudi Arabia, 14-17 February 2022)

Agenda Item 3.2: MID Region Safety priorities (Plenary)

ADVANCED DATA ANALYTICS IN AVIATION SAFETY

(Presented by the United States)

SUMMARY

The aviation world is impacted by the complex set of challenges presented by "big data" and regulators need tools to efficiently interpret large amounts of safety data that inform safety decisions. This paper discusses how the Federal Aviation Administration (FAA) is building capabilities in this area and explores opportunities for global engagement.

1. INTRODUCTION

1.1 "Big data" is defined as an "accumulation of data that is too large and complex for processing by traditional database management tools" and its impact is felt in every aspect of modern life, from information technology to manufacturing, from healthcare to finance, from government to global commerce, and more. Through advanced tools and dedicated resources, experts attempt to extrapolate insight from vast data sets to inform decision makers, drive innovation and efficiencies, and increase safety. Aviation is at the forefront of the big data challenge as manufacturers, operators, air navigation service providers and regulators alike generate and have access to a vast amount of data on a global scale. This presents a unique opportunity for Civil Aviation Authorities (CAA) to collaborate in the field of data analytics to make sense of complex information, promote systemic efficiencies, and support safety-enhancing innovations.

1.2 The Federal Aviation Administration (FAA) is committed to expanding and strengthening its enterprise-level data analytics. Under the direction of the U.S. Department of Transportation, the FAA has been tasked with improving data sharing practices internationally. The FAA Administrator also recently announced a strategic framework that emphasizes the use of predictive data analytics to proactively identify and take action to reduce emerging safety risk and promote global safety information sharing.

1.3 In alignment with this FAA-wide effort, in June 2021 the Aircraft Certification Service (AIR), responsible for the Continued Operational Safety (COS) process for U.S. aircraft, engines, propellers and articles, and the issuance of all Type Design approvals for domestic products and validation of foreign products, launched the Analyze Safety – Performance Insight – Results Environment (ASPIRE) program. ASPIRE, with the support of other FAA safety organizations, is an advanced data analytics environment that maximizes the technical output of our engineering workforce through established COS processes that leverage integrated data and advanced analytics.

2. DISCUSSION

2.1 In April 2019 the U.S. Secretary of Transportation announced the formation of a "Special Committee to Review the Federal Aviation Administration's Aircraft Certification Process." The Committee's findings highlighted gaps in the FAA's ability to ingest and analyze data, recommending that the FAA "expand its engagement, policies, technical assistance, and training efforts to foster higher international safety standards and practices for aircraft certification, operations, and maintenance," and further "propose to the International Civil Aviation Organization (ICAO) the sharing of operational data internationally, to enhance safety initiatives."

2.2 ICAO Standards and Recommended Practices harmonize global aviation safety and provide a guiding framework for the development of national regulatory requirements. ICAO Annex 8, Airworthiness of Aircraft, emphasizes safety data collection and analysis in the oversight of aircraft and continuing airworthiness:

a) ICAO Annex 8 requires that a State of Design (SoD) manage the type design they oversee by issuing Mandatory Continuing Airworthiness Information (MCAI) when the national authority identifies an unsafe condition. The ICAO Airworthiness Manual states that a SoD shall transmit such MCAI to applicable States of Registry (SoR) for the affected product. It further states that a SoD shall ensure there is a system to address the information received from the SoR on faults, malfunctions, defects and other occurrences that might cause adverse effects on the continuing airworthiness of the aircraft. It also formalizes SoR responsibilities including, upon receipt of MCAI from a SoD, adoption of the information directly or assessment of the information and taking appropriate action to ensure the continuing airworthiness of the impacted aircraft in their registry; and

b) ICAO Annex 19 provides the framework for a State Safety Programme (SSP) describes the components and elements that form a robust Safety Management System (SMS), including safety assurance measures based on data collection, analysis and exchange, data-driven targeting of oversight, and dissemination of safety information.

2.3 The FAA, as the U.S. aviation safety regulator, is responsible for both its domestic fleet as SoD and as the SoR for non-U.S. SoD aircraft. Many ICAO Member States bear SoR responsibility for U.S. aeronautical products on their registry. With the continuing expansion and globalization of aviation, both in manufacturing and operations, increasing amounts of U.S. products are operated outside of the United States. The FAA, as well as other CAAs, need to close the information gap created by the complexity of sharing large amounts of safety data internationally, and overcome proprietary data concerns that stifle the flow of safety data. By amplifying the role of data analytics and data sharing in aviation safety, Member States with SoD responsibilities would be able to better support fleets and products worldwide and SoR States would gain greater insights into regional/national COS issues.

2.4 Increased access to safety data, matched by the ability to interpret information and identify emergent safety issues, is essential to the FAA and other CAAs in fulfilling national regulatory requirements and enhancing global civil aviation safety as ICAO Member States. The FAA is taking concrete steps in augmenting, maturing and promoting its advanced analytics capabilities to meet both its domestic and international responsibilities.

2.5 At the core of ASPIRE lies a software platform that is capable of data preparation and integration of a variety of discrete data sources, both internal to FAA and external. For example, the platform already includes daily failures, malfunctions, and defects data per Title 14 of the Code of Federal

Regulations § 21.3 (internal source) and the Service Difficulty Reporting (SDR) system. End users have a suite of advanced analytical tools at their disposal in a central location within the platform.

2.6 As the AIR user base grows incrementally, ASPIRE is already operational and employed to monitor several COS activities and/or events, such as:

a) Monitoring the Return-to-Service of the Boeing 737 MAX in near real-time

b) Unleaded General Aviation gas – developing monitoring parameters to track distribution

c) International Notices to Airmen Effects – developing algorithms to identify diversions

2.7 Although the ASPIRE platform is built with aircraft certification and COS needs in mind, it does not interfere or overlap with other established FAA enterprise-wide solutions, such as the Aviation Safety Information Analysis and Sharing (ASIAS) system, or new emerging data initiatives. ASPIRE's commercial roots also lend flexibility to its interoperability with other off-the-shelf software solutions or FAA designed applications.

2.8 In parallel to the domestic launch of the platform, the FAA is also reaching out to the international community to promote cooperation in data analytics. In August 2021 we introduced the ASPIRE effort to the FAA co-led Asia Pacific COS Forum, a periodic meeting with regional CAAs to discuss safety issues at a technical working level. Bilaterally, the FAA is reaching out to interested CAAs that wish to collaborate on use cases that test advanced analytics. The FAA's outreach strategy is not-platform centric and does not promote any specific commercial data analytics products.

2.9 The launch of the ASPIRE platform exemplifies FAA's commitment to advance global safety by enriching SoD domestic data with SoR/CAAs data and strengthening SoRs' safety information ecosystems. Robust collaboration on data analytics would also give SoRs additional insight on local and regional safety issues. This exchange could have immediate application at the practical level, such as in measuring the effectivity of Airworthiness Directives on a global scale. Through concurrent outreach efforts the FAA encourages a productive dialogue among subject matter experts around the world to test advanced analytics in a data enabling environment and to explore ways of augmenting data sharing practices internationally.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information provided.

3.2 CAAs interested in collaborating with the FAA on data analytics and data sharing are invited to are invited to contact the FAA at 9-AWA-AVS-AIR400@faa.gov

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