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STATE SAFETY RISK MANAGEMENT: A DATA-DRIVEN APPROACH THROUGH A STATE SAFETY RISK REGISTER

(Presented by Saudi Arabia)

EXECUTIVE SUMMARY

This working paper addresses the evolution of State safety management from a compliance-based approach to a proactive, data-driven, risk-based, and performance-based system, as envisioned in Annex 19 — *Safety Management* and the *Global Aviation Safety Plan* (GASP, Doc 10004). While the State Safety Programme (SSP) provides the framework, there is a need for a practical, standardized tool to effectively manage safety risks at the State level.

The paper discusses the critical role of State Safety Risk Management (SSRM) in identifying, assessing, and mitigating aviation safety risks. It proposes the establishment of a State Safety Risk Register (SSRR) as a core component of a State's SSP. The SSRR serves as a dynamic, centralized repository for State-level operational and organizational safety risks, informed by a robust safety data collection and processing system (SDCPS).

Based on the principles of the *Safety Management Manual (SMM)* (Doc 9589) and best practices implemented by Saudi Arabia, this paper outlines a phased, collaborative approach to SSRM.

This paper proposes that the Assembly urge States to adopt a data-driven SSRM framework centred around a State Safety Risk Register and invites ICAO to develop comprehensive guidance material to support this implementation, ensuring global harmonization and continuous improvement in aviation safety.

<i>Strategic Goals:</i>	This working paper relates to <i>Every Flight is Safe and Secure</i>
<i>Financial implications:</i>	Activities to be undertaken within the regular budget.
<i>References:</i>	Annex 19 – <i>Safety Management</i> Doc 10184, <i>Assembly Resolutions in Force (as of 7 October 2022)</i> Doc 10159, <i>Safety Intelligence Manual</i> Doc 10131, <i>Manual on the Development of Regional and National Aviation Safety Plans</i> Doc 10004, <i>2020-2022 Global Aviation Safety Plan</i> Doc 9589, <i>Safety Management Manual (SMM)</i>

1. INTRODUCTION

1.1 The foundation of global aviation safety is each State's effective discharge of its safety management responsibilities, as established in the Convention on International Civil Aviation and detailed in Annex 19 — *Safety Management*. The implementation of a State Safety Programme (SSP) is the primary means by which a State meets these obligations.

1.2 The *Global Aviation Safety Plan* (GASP, Doc 10004) defines a course for the continuous improvement of aviation safety, emphasizing a move towards proactive and predictive safety management. Assembly Resolution A41-6 further reinforces the importance of global planning and calls on States to implement national aviation safety plans (NASPs) that are aligned with GASP goals.

1.3 A fundamental component of an effective SSP is State Safety Risk Management (SSRM). This process ensures that safety risks to the civil aviation system are systematically identified, assessed, and managed to an acceptable level. As aviation systems grow in complexity and new technologies are introduced, a purely compliance-based oversight model is insufficient. A data-driven, risk-based, and performance-based approach is essential.

1.4 This paper proposes that the effective implementation of SSRM is best achieved through the development and maintenance of a State Safety Risk Register (SSRR). The SSRR functions as a dynamic management tool, providing a consolidated picture of the State's most significant safety risks and driving the strategic actions detailed in its NASP.

2. DISCUSSION

2.1 The need for a structured, data-driven SSRM

2.1.1 The principles of Annex 19 require States to establish a safety data collection and processing system (SDCPS) to capture, store, and analyse safety data. This shift from reactive investigation to proactive analysis is central to effective safety management. The ultimate goal is to generate safety intelligence—actionable insights that inform decision-making.

2.1.2 SSRM is the State-level process that utilizes this safety intelligence. It involves a systematic methodology to identify hazards that affect the national aviation system, assess the associated risks, and develop effective mitigation strategies. A key aspect of SSRM is its collaborative nature, involving interaction and data sharing between the State aviation authorities and industry stakeholders.

2.2 The State Safety Risk Register (SSRR) concept

2.2.1 The SSRR is proposed as the central pillar of a State's SSRM process. It is a living document that provides a comprehensive and current overview of the State's significant safety risks. Its purpose is to:

- a) systematically document hazards and risks identified from all available data sources;
- b) prioritize risks based on a standardized risk assessment methodology;

- c) track the development, implementation, and effectiveness of corresponding risk mitigation actions;
- d) directly inform the strategic priorities and Safety Enhancement Initiatives (SEIs) contained within the NASP.

2.3 **A phased, collaborative approach to SSRM**

2.3.1 Drawing from best practices, including the model implemented by Saudi Arabia, an effective SSRM process can be structured in three iterative levels of risk assessment and management:

- a) *data collection and hazard identification*: the process begins with the systematic collection of safety data from diverse sources, including:
 - 1) mandatory and voluntary occurrence reports;
 - 2) oversight activities (audits, inspections);
 - 3) accident and incident investigation reports; and
 - 4) data shared through regional and global platforms.

This data is validated and analysed to identify hazards and emerging trends.

- b) *collaborative risk assessment*: once hazards are identified, risk assessment is conducted collaboratively to determine the likelihood and severity of potential outcomes. This is most effective when performed at multiple levels:
 - 1) *technical level*: conducted within specific oversight departments (e.g., flight operations, airworthiness) to analyse domain-specific hazards;
 - 2) *working group level*: assessed by cross-functional working groups composed of regulatory and industry experts, allowing for a broader perspective and development of initial mitigation strategies; and
 - 3) *State level*: the most significant operational and organizational risks are escalated to a high-level national committee (such as Saudi Arabia's National Aviation Safety Committee - NASC), which addresses systemic risks and endorses national-level mitigation plans;
- c) *mitigation and integration with the NASP*: State-level risks and their corresponding mitigations are systematically integrated into the State Safety Risk Register. This register then serves as the data-driven foundation for the National Aviation Safety Plan (NASP), ensuring a coordinated, evidence-based approach to enhancing aviation safety.

2.4 **The need for ICAO guidance**

2.4.1 While the principles of SSRM are established in ICAO documentation, there is a lack of specific, consolidated guidance on the practical development and management of a SSRR.

2.4.2 The provision of comprehensive ICAO guidance material on SSRR would:

- a) promote a standardized, harmonized approach among Member States;
- b) provide States, particularly those with developing aviation systems, with a clear roadmap for establishing this critical SSP component;
- c) facilitate the effective sharing of safety information by providing a common structure for identifying and classifying State-level risks; and
- d) accelerate the global transition towards proactive, risk-based, and performance-based safety management, in line with the vision of the GASP.

3. CONCLUSION

3.1 The continued safety and sustainable growth of the global aviation system depend on the evolution of State safety management capabilities from a compliance-based to a proactive, data-driven, Risk-based, and performance-based model.

3.2 The establishment of a structured SSRM process, centered around a dynamic SSRR, is a fundamental step in this evolution. The SSRR provides the mechanism to translate safety data into actionable intelligence, driving the strategic priorities of the NASP.

3.3 The collaborative, multi-level approach to risk assessment ensures that insights from all stakeholders are considered, leading to more effective and robust safety risk mitigations.

3.4 To ensure global consistency and support all States in this endeavour, there is a clear need for ICAO to develop and issue comprehensive guidance on the establishment and management of a SSRR.

3.5 The Assembly is invited to discuss and adopt the action items proposed in this paper as described in the executive summary.

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