



## ASSEMBLY — 42ND SESSION

### TECHNICAL COMMISSION

#### Agenda Item 23: Global Aviation Safety and Air Navigation Plans

#### INTEGRATION OF CLIMATE CHANGE ADAPTATION INTO THE FUTURE GLOBAL AVIATION SAFETY PLAN

(Presented by the Republic of Korea)

##### EXECUTIVE SUMMARY

This paper highlights the growing impact of climate change on aviation safety and proposes the explicit inclusion of climate-related operational safety risks in the future edition of the Global Aviation Safety Plan (GASP). The ICAO Strategic Plan 2026–2050 emphasizes the need to adapt aviation operations and infrastructure to climate change impacts as a part of its Strategic Goal- *Aviation is Environmentally Sustainable*. This adaptation is essential not only from an environmental perspective but also for maintaining the safety and resilience of the global aviation system. Operational implications — including more frequent turbulence events, high-temperature performance degradation, unpredictable icing, intensified storms, and increased flooding risk to airport infrastructure — pose significant safety challenges that demand coordinated global action.

The Republic of Korea proposes that the explicit recognition of climate-related operational safety risks in the future edition of the Global Aviation Safety Plan (GASP) will strengthen alignment amongst global, regional and State level strategies, support the development of targeted safety enhancement initiatives, improve technical cooperation, and enhance capacity-building for climate resilience

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

- recognize the potential impact of climate change on aviation safety;
- encourage ICAO Regional Offices and Member States to consider incorporating climate change-related safety risks into the Regional Aviation Safety Plans (RASP) and National Aviation Safety Plans (NASP), and to share relevant efforts aimed at enhancing climate resilience; and
- consider the inclusion of climate change-related safety risks and relevant activities in the 2029-2031 GASP and its Global Aviation Safety Roadmap.

|                                |                                                                                                                                                                                                                                                            |
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| <i>Strategic Goals:</i>        | This working paper relates to <i>Every Flight is Safe and Secure</i> and <i>Aviation is Environmentally Sustainable</i> .                                                                                                                                  |
| <i>Financial implications:</i> | Nil.                                                                                                                                                                                                                                                       |
| <i>References:</i>             | Doc 10184, <i>Assembly Resolutions in Force</i> (Resolutions A41-6 and A41-21)<br>Doc 10004, <i>2023-2025 Global Aviation Safety Plan</i><br>Doc 10161, <i>Global Aviation Safety Roadmap</i><br>A42-WP/26, <i>Climate Change – Adaptation and Science</i> |

## 1. INTRODUCTION

1.1 The *Global Aviation Safety Plan* (Doc 10004, GASP), endorsed by the Assembly (A41-6: *ICAO global planning for safety and air navigation*), is a strategic document designed to guide and harmonize global aviation safety efforts. It provides a framework for Member States, regions, and the aviation industry to improve aviation safety through coordinated objectives, targets, and the implementation of effective safety enhancement initiatives and activities, taking into account the evolving operating environment and key safety risk areas.

1.2 Assembly Resolution A41-21: *Consolidated statement of continuing ICAO policies and practices related to environmental protection — Climate change*, recognizes the need for enabling conditions for the implementation of long-term climate change adaptation measures, especially for vulnerable parts of the aviation system and infrastructure (refer to A42-WP/26). Furthermore, the ICAO Strategic Plan 2026–2050 emphasizes the need to adapt aviation operations and infrastructure to the impacts of climate change. This policy direction is critical not only from an environmental perspective, but also for maintaining the safety and resilience of the global aviation system. The Republic of Korea (ROK) views climate change as one of the key issues impacting today's operational environment in global aviation. In this context, the Republic of Korea proposes that initiatives aimed at mitigating climate change-related safety risks be considered for future inclusion in the GASP.

## 2. DISCUSSION

2.1 The Republic of Korea supports the continuous evolution of the GASP, which plays a pivotal role in harmonizing safety strategies at the global level while providing a strategic framework for regional and national implementation. In particular, the GASP provides a strategic basis for the development and implementation of Regional Aviation Safety Plan (RASP) and the National Aviation Safety Plan (NASP), promoting consistency between global, regional and State safety objectives, and encouraging their linkage with the State Safety Programme (SSP) of the Member States.

2.2 The Republic of Korea considers the operational impact of climate change to be one of the key safety issues at the State level, as it increasingly influencing the operational environment and posing new safety considerations for aviation operations. As climate change leads to more frequent and severe meteorological and environmental phenomena, with significant implications for flight operations, air traffic management and airport operation and its infrastructure, it might be regarded as a critical factor and incorporated as a key consideration in the development of many States in their NASP.

2.3 The following types of occurrences, but not limited to these, are of particular concern:

2.3.1 *Increased turbulence events.* Changes in atmospheric circulation patterns and increased atmospheric instability may lead to increases in the frequency and intensity of severe turbulence, particularly on long-haul and transoceanic routes. Some studies show moderate to severe turbulence frequency at cruising altitudes has increased over recent decades. This poses increased risks to passengers, flight and cabin crew, and aircraft structural integrity, as well as challenges to flight planning.

2.3.2 *High temperature effects on aircraft performance.* Rising ambient temperatures reduce air density and adversely affect aircraft performance. This can result in longer take-off distances, reduced climb rates, and payload restrictions, which may increase operational risks, particularly during take-off and initial climb.

2.3.3 *Icing and weather variability.* Greater variability in temperature and humidity levels increases the unpredictability of in-flight and ground icing conditions through the likelihood of more convective weather. These conditions require improved meteorological forecasting, enhanced operational procedures, and more robust de/anti-icing capabilities. These consequences also extend to in-flight engine performance issue; high-altitude engine power loss events through ice crystal icing mostly occurred above the international standard atmosphere and under convective weather conditions.

2.3.4 *Shifts in wildlife (bird) migration patterns.* Climate changes in temperature and seasonal cycles alter wildlife migration routes and timing. Such changes may necessitate adjustments to airport-specific wildlife strike prevention measures and, in some cases, may lead to an increased risk of wildlife strikes during critical phases of flight—such as take-off and landing—due to the unanticipated congregation of wildlife in operational areas not previously considered high-risk.

2.3.5 *Increased storm frequency and intensity.* Severe weather events, including thunderstorms, intense rainfalls, lightning, hail, and wind shear, are expected to become more frequent and intense. Such events increase the likelihood of flight delays, diversions, go-arounds, and accidents and/or incidents.

2.3.6 *Airport flooding and infrastructure disruption.* Sea level rise and more frequent extreme precipitation events heighten the vulnerability of coastal and low-lying airports to flooding. Resulting impacts include runway closures, damage to airside and landside infrastructure, and long-term operational disruptions.

2.3.7 In addition, there may be other impacts of climate change on aviation safety that have not yet been fully identified. Continued monitoring, research, and information sharing will be essential to detect unknown safety risks and ensure that appropriate mitigation measures are incorporated into safety strategies at the global, regional and state levels.

2.4 These safety risks collectively represent a global aviation safety challenge that requires not only national-level responses but also coordinated action at the global level. Integrating climate change related operational safety risks into the GASP framework would promote harmonized safety strategies, strengthen cooperation, enhance global situational awareness, and build the capacity of aviation personnel and stakeholders to respond effectively, through relevant safety enhancement initiatives and activities under the GASP and its Global Aviation Safety Roadmap (GASR). Furthermore, this approach would align with other ICAO strategic goals in the 2026–2050 Strategic Plan, including adaptation to climate change and enhancing aviation resiliency.

### 3. CONCLUSION

3.1 In order to enhance Member States' ability to address the impacts of climate change on aviation operations, it is proposed that climate change-related operational safety risks be explicitly recognized in the future 2029-2031 GASP and its GASR. Such inclusion would support the development of targeted mitigation strategies, relevant data collection and related safety risk indicators, and capacity-building initiatives, thereby helping to ensure the continued resilience of global aviation safety in a changing climate.