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North American, Central American and Caribbean Office

WORKING PAPER

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Tulum, Mexico, from 8 to 12 September 2025

Agenda Item 3: Use and Integration of Aeronautical Meteorological Data

Impact of Meteorological Phenomena on Aviation

(Presented by the Secretariat)

EXECUTIVE SUMMARY

This note analyses the impact of severe meteorological phenomena on aviation within the context of GREPECAS/22/9 Conclusion. It examines the guiding documents from ICAO, WMO, and ACI-LAC to address climate risks. The text highlights the need for a proactive approach and greater regional coordination, proposing actions to strengthen resilience and operational safety in the region.

Action:	As presented in numeral 4
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• Annex 3 – Meteorological Service for International Air Navigation, Twentieth Edition, July 2018. • 2018 ICAO Climate Adaptation Synthesis Report • AeM Series No. 9: Compendium of Findings on the Effects of Climate Change on Weather Hazards and Analysis of the Impacts of Climate Change on Aviation Operations (WMO) • Climate Change: Climate Risk Assessment, Adaptation and Resilience • Adaptation of Latin American and Caribbean Airports to Climate Change (ACI-LAC)

1. Introduction

1.1 The purpose of this study note is to propose topics that should be considered in the activities of the aeronautical meteorology area within the NACC/WG. This activity is part of the participation in the Workshop on Severe Meteorological Phenomena and Aviation, which took place in Lima, Peru, from June 23 to 27, 2025, within the framework of ICAO's Regional Projects RLA/06/901 and RLA/09/801.

1.2. The document directly follows up on GREPECAS/22/9 Conclusion, which urges States, international organizations, and service providers to collect and disseminate information on the impact of these phenomena on operational safety and airport operability. Additionally, this conclusion encourages the coordination of risk analysis activities and the development of mitigation measures to strengthen the sector's resilience. The ultimate goal is to ensure that contracting States provide services and information that allow for a real situational awareness of the operational environment.

2. Analysis and Discussion

2.1. Global climate change is increasing the frequency, intensity, and nature of meteorological hazards, which represents a systemic and growing threat to aviation. This situation directly affects the safety, efficiency, and continuity of air operations.

2.2. Recognizing aviation's vulnerability as a strategic asset, key organizations such as the International Civil Aviation Organization (ICAO), the World Meteorological Organization (WMO), and the Airports Council International for Latin America and the Caribbean (ACI-LAC) have developed a comprehensive documentary framework to address these challenges and strengthen the sector's resilience.

2.3. The Documentary Framework

For a complete understanding of the challenges and solutions, the following reference documents are highlighted, the application of which is fundamental for strategic and operational planning in the context of climate change:

2.3.1 ICAO's 2018 Climate Adaptation Synthesis Report: This report serves as a starting point for climate adaptation in aviation. It analyzes and synthesizes the sector's vulnerabilities to the impacts of climate change. The report highlights the need for a proactive approach to integrate adaptation measures into planning and operations, addressing the resilience of airport infrastructure, air traffic management systems, and aircraft.

2.3.2 AeM Series No. 9: Compendium of Findings on the Effects of Climate Change on Weather Hazards and Analysis of the Impacts of Climate Change on Aviation Operations (WMO): This WMO compendium provides the scientific and technical basis. It details how changes in the global climate manifest as specific meteorological hazards, such as more intense turbulence, severe convective storms, extreme crosswinds, and heatwaves that affect aircraft performance. Its content is vital for air navigation service providers and air operators to understand the changing nature of the threats they face.

2.3.3 Climate Change: Climate Risk Assessment, Adaptation and Resilience (ICAO): This document transforms the information from the WMO compendium into a practical methodology. It provides detailed tools and procedures for States and organizations to conduct a systematic assessment of climate-associated risks. This guide facilitates the development of specific adaptation plans and the implementation of mitigation measures that strengthen resilience, ensuring that operational and strategic decisions are based on a well-founded risk analysis.

2.3.4 Adaptation of Latin American and Caribbean Airports to Climate Change (ACI-LAC): This report complements the ICAO guide with a crucial regional perspective. It focuses on the unique challenges faced by airports in the NACC and SAM regions, such as sea-level rise, coastal flooding, water scarcity, and the intensification of hurricanes and tropical cyclones. The document offers recommendations and lessons learned that are directly applicable and essential for infrastructure and airport operations planning in the region.

3. Conclusions

3.1 The application of the aforementioned guides is crucial for States and organizations to consider transitioning from a reactive to a proactive approach. Severe phenomena not only cause delays and cancellations but can also compromise operational safety and infrastructure.

3.2 The development of standardized procedures for alerting, information coding, and responding to these phenomena is fundamental. This includes the need for better coordination among meteorological centers, air traffic services, and airport operators to ensure critical information reaches users at the right time.

3.3 The analysis of recent events and the creation of a regional database on the impact of these phenomena are essential actions to identify emerging risks and improve decision-making. This collaborative approach, in line with GREPECAS/22/9 Conclusion, will allow for the exchange of lessons learned and best practices, thus strengthening safety and efficiency throughout the region.

3.4 Severe meteorological phenomena represent a complex and growing threat to aviation that requires a proactive and adaptive approach. ICAO, WMO, and ACI-LAC have made valuable guides and tools available to States to address this issue systematically. It is imperative that the aeronautical industry recognizes the availability and importance of these documents for decision-making. Therefore, their analysis, dissemination, and practical application in daily planning and operations should be prioritized.

4. Suggested Actions

4.1 It is recommended that the NACC/WG meeting consider the following actions to strengthen the resilience and safety of the civil aviation system in the region:

a) Establish coordination mechanisms for the management of severe phenomena.

b) Incorporate climate scenarios and resilience measures into strategic civil aviation plans, promoting the review and use of ICAO guides, particularly the report "Climate Change: Climate Risk Assessment, Adaptation and Resilience."

c) Drive the standardization of procedures for alerting, coding, and responding to severe meteorological phenomena to improve situational awareness and response efficiency.

d) Continue the systematic collection of information on the impact of severe phenomena and aim for the consolidation of a regional database to serve as input for risk analysis and decision-making.

e) Promote continuous training in meteorological surveillance, alert issuance, and the development of mitigation plans, contributing to the assessment of new emerging risks and preparation for future events.

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