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GREPECAS/22 — WP/10  
 23/08/24

**Fourth GREPECAS–RASG-PA Joint Meeting and  
 Twenty-second Meeting of the CAR/SAM Regional Planning and Implementation Group  
 (GREPECAS/22)**

Virtual Phase (Asynchronous, 16 September to 11 October 2024)  
 In-Person Phase (Lima, Peru, 20 to 22 November 2024)

**Agenda Item 5: Implementation of Air Navigation Services (ANS) CAR/SAM  
 5.3 Aeronautical Meteorology and Environment**

**SEVERE METEOROLOGICAL PHENOMENA AND THEIR IMPACTS ON AVIATION**

(Presented by the Secretariat)

<b>EXECUTIVE SUMMARY</b>	
This working paper presents a proposal for topics that should be considered in the activities of the aeronautical meteorology area within GREPECAS.	
<b>Action:</b>	As indicated in paragraph 4.1
<i>Strategic Objectives:</i>	<ul style="list-style-type: none"> <li>• Safety</li> <li>• Air Navigation Capacity and Efficiency</li> <li>• Environmental Protection</li> </ul>
<i>References:</i>	<ul style="list-style-type: none"> <li>• Annex 3 – Meteorological Service for International Air Navigation</li> <li>• International reports of incidents and accidents caused by meteorological phenomena</li> </ul>

**1. Introduction**

1.1 ICAO Annex 3, in Chapter 3, presents the services provided by global systems, support centres, and meteorological offices.

1.2 The same Annex, in Chapter 7, covers severe weather warnings and lists meteorological phenomena that may affect the safety or comfort of an air operation

1.3 Meteorology works on and studies the environmental aspects of aviation development. The atmosphere sometimes presents instabilities that can pose risks to flight operations during the flight phase.

1.4 Atmospheric instability can also present adverse conditions for ground operations.

1.5 These adverse meteorological phenomena can endanger flight safety, cause damage to the aircraft structure, and even lead to serious incidents that could result in human casualties.

## **2. Analysis and Discussion**

2.1 ICAO Annex 3, in Appendix 1, provides examples of flight documentation, including sample maps and forms.

2.2 In Appendix 2 of the same Annex, technical specifications are presented regarding global systems, support centres, and meteorological offices responsible for providing meteorological information and advice, upon request, to ATS units, aerodrome units, and flight crews about current and forecasted conditions at the station and along the planned route.

2.3 ICAO Annex 3, in Appendix 6, presents the different templates for severe meteorological phenomena warning messages, on which the offices mentioned in the previous point provide advice, if requested.

2.4 In recent years, there have been reports of aircraft encounters with severe storms, involving a range of meteorological phenomena (severe turbulence, hail, lightning strikes, etc.).

2.5 There have also been reports of aircraft affected by clear-air turbulence (CAT) and mountain wave turbulence.

2.6 Additionally, there have been reports of severe phenomena with intense rain and thunderstorms affecting ground operations, leading to temporary closures at airports.

2.7 One of the most notable reports regarding the impact of severe weather on aviation is the flooding of Porto Alegre Airport (Brazil), which remains inoperative to this day.

2.8 The deepening depressions over the South Atlantic, as well as the intensification of Mesoscale Convective Complexes, represent an increase in the existing risks.

2.9 Moreover, extensive droughts have created ideal conditions for large wildfires, which sometimes affect airport operations due to reduced visibility and health problems caused by poor air quality.

2.10 In the scientific community, there is an interesting discussion about the impact of climate change on the intensity and frequency of adverse meteorological phenomena affecting aviation.

2.11 The GREPECAS Secretariat has promoted the study of certain severe meteorological events that have led to accidents and incidents endangering the safety and comfort of flights and has prepared a work plan to disseminate these studies.

2.12 The Secretariat should encourage States, organizations, and service providers to collect information on severe phenomena that have affected the safety of air operations as well as airport operability, in order to capture lessons learned and study procedures to be implemented to mitigate the new risks associated with the severity of these meteorological phenomena.

### **3. Conclusions**

3.1 It is undeniable that the aviation development environment is always subject to risks that are either acceptable or manageable. The atmosphere, being an unstable medium, influenced by temperature variations, CO<sub>2</sub> emissions, and other factors, develops phenomena that can endanger the safety and comfort of an air operation.

3.2 Scientific analyses of climate change indicate that meteorological phenomena tend to become more extreme. This development implies that meteorological phenomena will become more severe and frequent.

3.3 The Secretariat plans to carry out activities to raise awareness of the risks of climate change and its impacts on aviation through Workshops and Seminars in the coming years, in coordination with other organizations involved in the study of climate change.

3.4 Additionally, the GREPECAS Secretariat is working on an evaluation of the work of meteorological units in providing meteorological information to support air navigation, and is assessing whether there are opportunities for improvement in this process or if there is a gap in the understanding of the information transmitted to ATS service providers, flight crews, or flight dispatchers, in order to address these opportunities for improvement and provide tools for better understanding of the situation related to severe meteorological phenomena by ATS services, flight crews, and dispatchers.

3.5 After evaluating the information included in this paper, the Meeting may consider approving the following conclusion:

<b>DRAFT CONCLUSION</b> <b>GREPECAS/22/XX</b>		<b>Dissemination of the Impacts of Climate Change on the Safety of Air Operations</b>
<b>That:</b>  1) That States, organizations, and service providers: a) Collect information on the impact of severe meteorological phenomena on the safety of air operations and airport operability.  2) That the Secretariat: a) Work in coordination with organizations, States, and service providers to organize dissemination activities on severe phenomena, their possible connection to Climate Change, and their impact on aviation;  b) Work in coordination with organizations, States, and service providers to analyse severe phenomena that have impacted air operations and airport operability to assess the emergence of new risks associated with these phenomena;  c) Work in coordination with organizations, States, and service providers to establish mitigation procedures for these new risks, if determined.	<b>Expected impact:</b>  <input checked="" type="checkbox"/> Political / Global <input checked="" type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Technical / Operational	
<b>Why:</b> States parties are required to ensure the operational safety of air operations by providing services and information that ensure a real situational awareness of the environment in which the air operation will take place.		
<b>When:</b> GREPECAS/23		<b>Status:</b> <input checked="" type="checkbox"/> Valid / <input type="checkbox"/> Invalid / <input type="checkbox"/> Finalized
<b>Who:</b> <input checked="" type="checkbox"/> States <input checked="" type="checkbox"/> ICAO <input checked="" type="checkbox"/> Others:		Organizations and Service Providers

#### 4. Recommended action

4.1 The meeting is invited to:

- a) Take note of the information provided in this working paper;
- b) Support dissemination and capacity-building activities for better understanding the impact of climate change on aviation;
- c) Support capacity-building activities for the assessment and mitigation of risks, in addition to the already known ones, associated with severe meteorological phenomena at airports and in flight;

- d) Approve the proposed conclusion included in section 3.5.; and
- e) Take any other actions considered necessary.

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