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WORKING PAPER

ASSEMBLY — 42ND SESSION

TECHNICAL COMMISSION

Agenda Item 24 Aviation Safety and Air Navigation Priority Initiatives

STRENGTHENING INFRASTRUCTURE RESILIENCE TO NATURAL DISASTERS

(Presented by Morocco)

EXECUTIVE SUMMARY

Aware of the challenges posed by disruptions and damage caused by natural disasters, it is essential to deepen the understanding of these phenomena, assess their impact on aeronautical infrastructure, and strengthen coordination within the aviation community. These efforts aim to mitigate risks and enhance the resilience of infrastructure in the face of increasingly frequent and intense natural events, particularly earthquakes.

Action: The Assembly is invited to:

a) request ICAO to promote the strengthening of the resilience of aeronautical infrastructure against the risks associated with natural disasters, in particular earthquakes, by adopting a proactive, integrated, and coordinated approach within the aviation community;
b) request ICAO to undertake a review of existing Standards and Recommended Practices (SARPs) and related guidance material, with a view to integrating appropriate seismic engineering requirements in the design and modernization of aeronautical infrastructure; and
c) request ICAO to develop specific SARPs governing the adaptation of existing aeronautical infrastructure, in order to reduce their physical and operational vulnerability to seismic risks.

Strategic Goals:	This working paper relates to *Every Flight is Safe and Secure*.
Financial implications:	The actions referred to in this paper will be subject to the resources available in the Regular Program Budget and/or from extra budgetary contributions.
References:	Annex 14 – *Aerodromes*, Volume I - *Aerodrome Design and Operations* Annex 14 – *Aerodromes*, Volume II – *Heliports* Doc 9157, *Aerodrome Design Manual*, Part 3 – *Pavements*

[1] English and French versions provided by Morocco.

1. INTRODUCTION

1.1 In recent decades, the world has witnessed a marked increase in the frequency and intensity of natural disasters, driven primarily by the effects of climate change and growing urbanization. Floods, droughts, storms, wildfires, landslides, and earthquakes are becoming more frequent, more severe, and affecting increasingly wider areas.

1.2 As for earthquakes, although their origin is tectonic and their natural frequency remains relatively constant, their human, material, and economic impact can vary considerably. This intensification is largely due to urban expansion into high-risk zones, increasing population density, and, in some cases, the absence or non-compliance with appropriate seismic-resistant construction standards. As a result, earthquakes increasingly cause severe consequences for critical infrastructure that supports vital services, ranging from minor building cracks to total structural collapses.

1.3 Aeronautical infrastructure is not exempt from the damage caused by natural disasters, particularly earthquakes. The damage sustained can lead to major disruptions in air transport services, significant economic losses, and compromised safety of flight operations.

1.4 Aware of the challenges posed by such disruptions and damage, considerable efforts are being made to adapt aeronautical infrastructure and enhance its resilience. This includes implementing preventive, protective, and recovery measures to minimize impacts and ensure the safety and continuity of air transport services.

2. DISCUSSION

2.1 The 2023 Earthquake in Morocco:

2.1.1 On 8 September 2023, Morocco was struck by a 6.8 magnitude earthquake, with the epicenter located in Al Haouz Province, approximately 70 km southwest of Marrakech. It was the most powerful earthquake ever recorded in the country. Several critical infrastructures sustained significant damage, resulting in considerable human and material losses.

2.1.2 With all critical infrastructure in the regions affected by the earthquake, aeronautical facilities and infrastructure were also affected. Admittedly, the damage observed at Casablanca Mohammed V, Marrakech Menara, Benslimane and Zagora airports was not of a structural nature, and did not hinder the handling or flow of air traffic. However, the control tower at Ouarzazate airport suffered major damage that compromised the stability of its structure, rendering it temporarily impassable. In order to guarantee the safety of flight operations and ensure continuity of air traffic control service on this platform, a mobile control tower was promptly deployed by the airport operator.

2.1.3 Following the event, technical inspections and structural assessments were conducted at the affected airport sites, and corrective actions were subsequently undertaken. These included necessary repair works and the progressive restoration of normal operating conditions. In addition, increased pressure on the logistical capacities of airports close to the disaster zone required swift measures to adjust air traffic flows (to handle relief operations).

2.1.4 In the national context, numerous preventive measures are already being implemented to strengthen the resilience of critical infrastructure. Moreover, integrated technical studies are conducted for

complex infrastructures, incorporating, among other elements, the risk dimension associated with this type of event.

2.2 **Damages and Potential Risks :**

2.2.1 Generally, this type of seismic event can cause damage of various types and severity to components essential for the continuity and safety of air operations, including:

a) aeronautical pavements (runways, taxiways, aprons): the appearance of cracks, slab upheaval, and localized subsidence that may compromise structural integrity and surface friction;

b) control tower: structural weakening and malfunctions of communication and surveillance systems;

c) electrical installations and navigation systems: power outages, damage to electronic equipment, misalignment or failure of navigation aids (ILS, VOR, lighting systems);

d) technical buildings and terminals: cracks in load-bearing walls, damage to suspended ceilings, pipe ruptures, and functional disruption of services; and

e) fuel storage and logistics networks: risks of leakage, fires, or environmental contamination.

2.2.2 These damages may lead to:

a) temporary closure of the airport or certain critical areas (runways, terminals, hangars);

b) suspension of flights or diversion to other airports;

c) disruption of air traffic at national or regional levels; and

d) high repair costs and economic losses due to service interruption.

2.3 **Need for a Proactive and Coordinated Approach**

2.3.1 In this context, it is essential to strengthen strategies for the prevention, anticipation, and management of seismic risks at airports, with a focus on:

a) developing effective monitoring and early warning tools;

b) enhancing the safety, continuity, and reliability of airport services in seismic contexts;

c) integrating appropriate seismic engineering in the design and modernization of aeronautical infrastructure;

d) incorporating specific emergency planning (business continuity plans, vulnerability audits, seismic simulation exercises, etc.);

e) reducing the physical and operational vulnerability of airport installations and infrastructure; and

f) integrating seismic risk management into the governance of air transport.

2.3.2 Therefore, a proactive and coordinated approach within the aviation community is now essential to strengthen the resilience of aeronautical infrastructure.

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