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WORKING PAPER

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ASSEMBLY — 41ST SESSION

TECHNICAL COMMISSION

Agenda Item 33: Other issues to be considered by the Technical Commission

REGULATORY SAFETY ASSESSMENT AND COOPERATION FOR SAFE SUSTAINABILITY

(Presented by Singapore and the Flight Safety Foundation)

EXECUTIVE SUMMARY

This paper highlights the safety pressures on the aviation system resulting from the actions taken to combat climate change, including actions taken to protect the environment, and proposes that States and ICAO implement explicit arrangements for regulatory safety assessment and regulatory cooperation.

Action: The Assembly is invited to:

a) request ICAO to study the deficiencies in the regulatory impact assessment process as identified in this paper and assign an appropriate working group to further explore the possible enhancements and develop guidance for regulatory safety assessment and invite states to implement it; and

b) request ICAO to promote an understanding across the aviation community of the necessity of regulatory cooperation to address, among other things, the potential safety impact of pressures coming from outside aviation to combat climate change.

Strategic Objectives:	This working paper relates to the Safety and Environmental Protection Strategic Objectives.
Financial implications:	N/A
References:	Proceedings and summary of Flight Safety Foundation's "Safe Sustainability" Safety Forum, SKYbrary, July 2022

1. INTRODUCTION

1.1 The importance of sustainable aviation and the necessity to take urgent action to combat climate change and its impact are transforming civil aviation. It is important to balance the long-term positive effects aviation has on the global economy, social development, inclusiveness, equitability and infrastructure development against the different pressures on the aviation system to manage its environmental impact. The pressures on the aviation system, if not properly identified and counterbalanced, can lead to the reduction in safety margins

1.2 To address the safety pressures on the aviation system resulting from the actions taken to combat climate change, including actions taken to protect the environment, when developing and implementing regulatory policies, there is a need for an explicit regulatory safety assessment considering the potential goal conflicts and trade-offs. Furthermore, the ICAO work program should evolve the provisions related to safety management to support an explicit regulatory safety assessment to address the safety pressures stemming from the different objectives' tensions.

2. DISCUSSION

2.1 ICAO mapped its strategic objectives to 15 of the 17 United Nations Sustainable Development Goals (UN SDGs). The aviation system is a key enabler for the global economy, connectivity, infrastructure improvement and the expansion of trade and tourism. In this way, the aviation system profoundly supports the UN SDGs.

2.2 To ensure the aviation system's overall positive effect on global sustainable development, it is important to balance the long-term positive effects aviation has on the global economy, social development, inclusiveness, equitability and infrastructure development against the different pressures on the aviation system to manage its environmental impact. To achieve that, it is key for the industry to promote and develop a culture of sustainability that includes safety, environmental and social aspects. Such a culture is characterized by a system design with sufficient safety margins, providing information and knowledge to front-end professionals and empowering them to make balanced decisions based on real-time risk management.

2.3 In July 2022, Flight Safety Foundation's "Safe Sustainability" Safety Forum identified that pressures on the aviation system originating from climate change, pressures from the actions to combat climate change's impact and pressures from actions taken to protect the environment. The Forum concluded that these pressures can have safety effects if the aviation system is not resilient enough to properly manage them.

2.4 Four pressures that can affect aviation safety were identified: pressures on the aviation system to reduce its carbon footprints, pressures on the aviation system stemming from the climate change developments outside aviation, pressures on the aviation system stemming directly from climate change and pressures on the aviation system to manage aircraft noise and local air quality. The identified pressures are described in an appendix to this paper.

2.5 When developing and implementing regulatory policies, there is a need for an explicit regulatory safety assessment that considers potential goal conflicts and trade-offs in order to address the safety pressures on the aviation system that result from actions taken to combat climate change, including actions taken to protect the environment.. Additionally, to address the safety pressures on the aviation

system originating from climate change, there is a need for a systematic and continuous process of climate change safety impact assessment.

2.6 The regulatory safety assessment can be an integral part of the regulatory impact assessment; an approach for collecting, organizing, and analyzing data on the impacts of the regulatory policy options and to promote evidence-based decision-making. Such a regulatory impact assessment provides an objective, unbiased assessment that is an essential component of policy development. The regulatory impact assessment aims to determine the best option to achieve the objective of a rulemaking activity while minimizing potential negative impacts.

2.7 However, regulatory impact assessments are not consistently implemented globally and are not standardized. Additionally, a regulatory impact assessment, wherever implemented, does not always address the potential impact of regulatory policies on aviation safety. To efficiently address the impact of regulatory policy and rules on aviation safety, it is suggested that a regulatory safety assessment will:

a) be a process that is a part of regulatory impact assessment and is integrated with the policy- and rule-development processes;

b) involve the relevant stakeholder consultation;

c) identify all possible impacts — safety benefits, detrimental safety impacts and their combined effect;

d) be performed either as a qualitative or quantitative assessment;

e) address all phases of regulatory policy and rule-development processes involving preliminary safety assessment, regulatory safety assessment and ex-post safety evaluation; and

f) include more than hazard identification and risk mitigation by enlarging the scope of assessment to safety pressures identification and elaboration of safety considerations

2.8 The identified pressures coming from actions taken outside aviation to combat climate change (e.g., wind turbines and photovoltaic installations near airports) call for aviation regulators to cooperate with the relevant regulators and entities to ensure the risk of affecting aviation safety is properly addressed. This includes establishing a risk assessment framework to ensure a consistent standard of evaluation in identifying risks and deriving risk mitigation measures. It is key that states promote such regulatory cooperation and specific risk analysis frameworks for the relevant regulators and aviation regulators.

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APPENDIX

POTENTIAL SAFETY EFFECTS ARISING FROM DIFFERENT PRESSURES ON THE AVIATION SYSTEM ORIGINATING FROM CLIMATE CHANGE, FROM THE ACTIONS TO COMBAT CLIMATE CHANGE'S IMPACT AND FROM ACTIONS TAKEN TO PROTECT THE ENVIRONMENT

A. Pressures on the aviation system to reduce its carbon footprints with potential safety effects are:

i. Single-engine aircraft taxi-out that could affect the safety of operations by disrupting the flight crew's normal task flow and contributing to the chance of aircraft misconfiguration and lack of or loss of critical situational awareness for the subsequent takeoff and departure;

ii. the use of sustainable aviation fuel (SAF) that could contribute to an increased chance of flame out when used by uncertified or technically unfit aircraft;

iii. pressure to reduce the fuel reserves, which could lead to reduced safety margins and increased operational pressure and workload, which, in turn, could affect decision-making and increase the likelihood of diversion, low fuel situations and associated emergencies;

iv. pressures to have most efficient flight trajectories, which could affect air traffic complexity;

v. pressure to save fuel in flight, which could lead to increased risk of turbulence encounter or increased risk of loss-of-control events;

vi. pressures to save fuel on approach; for example, by landing with idle reverse thrust, use of minimum landing flaps or late gear selection and use of continuous descent approaches that could affect the most optimal landing performance, especially if combined with other pressures like poor weather or performance-limited runways;

vii. pressures to save fuel by reducing the total lift required through aft center of gravity (CG) loading (load aftward) that could increase the risk of degraded stall recovery performance, tail tipping and tail strike;

viii. pressures to save fuel by increased takeoff and climb thrust that could increase the risk of engine wear, greater asymmetry in case of engine failure, affected contaminated runway minimum control speed and increased foreign object debris (FOD) damage on the runway;

ix. pressures to reduce aircraft-generated condensation trails (contrails) that could result in air traffic control (ATC) operational procedures to provide instruction to avoid specific contrail inductive airspace that could impact air traffic controllers' workload and increase the risk of aircraft encountering significant weather;

x. all-electric flights that could introduce pressures related to problems such as battery fire and thermal runaway, motor failure, toxic fumes, personal exposure to high voltage or current, battery energy uncertainty, battery charging safety, energy regeneration hazards, common mode failures, battery aging, and battery performance variability with temperature; and

xi. hydrogen-powered flights that could introduce pressures related to new types of fires, new infrastructure with associated procedures and technologies, fuel cell fires or explosions, new cryogenic hazards and new fueling procedures.

B. Pressures on the aviation system stemming from climate change developments outside aviation are:

xii. wind turbine installations that could create hazards for aircraft operations or for air traffic management system (ATM) – e.g., impacts on visual and instrument flight procedures; turbulence/aerodynamic effects; obstacle limits; and effects on communication, navigation and surveillance (CNS) equipment (e.g., Doppler VHS omnidirectional radio [DVOR]);

xiii. increased use of electric ground service equipment (GSE) that could change the fire vulnerability at the airport;

xiv. photovoltaic installations (PV) at buildings and on the ground within or close to the airport premises that could create hazards for aircraft operations (e.g., safety clearances on the ground, obstacle limits, effects on CNS, risk of glint and glare, runway safety and impacts on rescue firefighting services and emergency planning and management);

xv. increasing the photovoltaic installations at buildings and on the ground within or close to the airport premises that could affect firefighting tactics, equipment and reaction times when installed on the ground; and

xvi. pressure to improve biodiversity at and around airports that could increase the risk of airport wildlife hazards.

C. Pressures on the aviation system stemming directly from climate change are:

xvii. sea level rise and storm surge that could increase the risk of airports flooding and runway contamination;

xviii. temperature changes that could make more airports performance-critical in terms of current certification assumptions, affecting the required runway length, the aircraft payload and the existing safety margins;

xix. temperature changes (both cold and hot) that could lead to more frequent damages to runway surface;

xx. larger/more intense convective systems that could affect multiple hub airports and impose risk in case of mass diversions;

xxi. larger/more intense convective systems that could increase the likelihood of lightning strikes;

xxii. larger/more intense convective systems that could increase the risk of operational disruptions, including delays, re-routings, route extensions, trajectory management, flight efficiency, increased fuel burn and emissions;

xxiii. increase in both the frequency and strength of moderate and severe en route clear-air turbulence that could increase the risk of passenger and crew injuries and aircraft damage;

xxiv. more frequent significant weather phenomena such as heavy rain or more intense thunderstorms that could increase the risk of runway excursions or aircraft damage; and

xxv. changing wind patterns that could increase the possibility of runway crosswinds.

D. Pressures on the aviation system to manage aircraft noise and local air quality are: pressures to reduce aircraft noise around airports that could increase the likelihood of runway excursions, in particular in relation to operations on wet, slippery or contaminated runways, or the likelihood of bird strikes due to prolonged flight at low level or difficulties in achieving standard instrument departure (SID) procedure design gradients (e.g., with significant tail wind component aloft).

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