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IMPACT OF CLIMATE CHANGE ON AERONAUTICS AND AVIATION

Abstract

The history of aeronautics and the development of commercial aircraft is extremely relate to climate facts. Mono-wings metallic aircraft were preferred to airships in the past century for many reasons once od these was related to the possibility to pressurize the cabin making the flight at high altitude possible. Aircraft structures are designed on the basis damage tolerance criteria and the reference loadings are a few gust-loading spectral density data, the most famous was given by Theodore von Kàrmàn. The dramatic climate change observed in the last decades introduce many issues in aeronautic and aviation. The appearance of unexpected loads demands more robust (heavier) structures and systems, that is existing aircraft are could be not able to contrast loading related to new gust spectra (airframe icing, wind shear phenomena, sand and dust storms, jet stream changes, clear air turbolence etc). A lot of effort, investment on new technologies are needed to make aircraft greener to contribute to C02 reductions (new fuel development, lighter and efficient wings). Effects of climate change on aviation business and economics include both physical risks such as flight delays or airport closures and related costs, and contractual, regulatory or legal compliance risks. In the shorter-term, effects to business and economics are more likely to be associated with disruptive events, such as extreme weather events which can lead to delays, cancellations and infrastructure damage. In the longer-term, gradual but persistent impacts, such as temperature change or sea level rise, may lead to damage or loss of infrastructure. A multi-disciplinary research effort by scientists, meteorologists, climatologists, engineers, is needed to understand better the impacts of the changing climate on the entire aviation system, including aircraft and infrastructure. Thereafter, dedicated guidance material by ICAO could target climate adaptation correlated issues, based on models of best practice. Such guidance material would aim to support the risk management activities of all stakeholders, including operators and pilots, airport managers, aircraft manufacturers, governments, and regulators. In this scenario the role of space infrastructure become crucial. These can provide and collect the necessary data, some of these in real time, to be used to design the above dedicated guidance materials by referring to AI systems. Effort should be made to put in low orbit the necessary payload/constellations to improve existing data on air traffic and climate monitoring along the aircraft routes.