



Assessing flight path vulnerabilities over Himalayan terrain

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With a boom in the tourist industry both in India and adjoining Nepal, middle-class tourists from the Indian sub-continent have started routinely flying over Himalayan terrain over the last decade. There are on average 8 flights flying from Delhi to Kathmandu per day. Additionally, tourists in Nepal routinely fly 19-seater aircrafts such as the Beechcraft 1900D for a joy ride over the Himalayan range. This paper assesses the risks and vulnerabilities associated with these short duration flights starting from Kathmandu and covering the Himalayan region. This region experiences deep cumulonimbus clouds which form over a period of a few days and are potent during the monsoon season (June to September). The vertical extent of such clouds starts from a few kilometers and invariably extends up to the tropopause. This paper first assesses cumulonimbus mediated hazards along Himalayan flight routes with and without thunderstorm activity and then details a critique on the hazard tied down to secondary effects i.e. deposition of supercooled droplets on a Beechcraft 1900D even when an aircraft is not flying through a thunderstorm activity. The paper also explores the effect of small cumulonimbus clouds on the aircraft in the vicinity of downbursts. The research results obtained from careful WRF simulations delineates the most vulnerable parts of a Beechcraft 1900 aircraft likely to be affected by a flight path with small cumulonimbus activity. In particular, the paper explores the separate roles of ice and warm rain microphysics in tandem and the effects on updrafts which have the propensity to severely buffet tourist flight paths.