Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Numerical flow Simulation around a flat plate during heavy rainfall using Lagrangian Eulerian approach[1] GAURAV DHIR, SAWAN SUMAN, None — Experimental evidence shows that aircrafts operating under heavy rainfall conditions face deterioration of lift and increase in drag. This scenario can be a critical design challenge especially for slow moving vehicles such as airships. Effective roughening of airfoil surface caused by an uneven water film, loss of flow momentum and the loss of vehicle momentum due to its collision with the raindrops are the primary reasons causing the drag to increase. Our work focuses primarily on the numerical quantification of boundary layer momentum loss caused due to raindrops. The collision of raindrops with a solid surface leads to formation of an ejecta fog of splashed back droplets with their sizes being of the order of micrometers and their acceleration leads to boundary layer momentum loss. We model the airflow within a flat plate boundary layer using a Lagrangian-Eulerian approach with the raindrops being considered as non-deformable, non-spinning and non-interacting droplets. We employ an inter-phase coupling term to account for the interaction between the boundary layer flow and the droplets. Our presentation will focus on several comparisons (velocity field, lift and drag at various angles of attack) with the results of the standard (rain-free) Prandtl boundary layer flow.

[1]Indian Institute of Technology, Delhi

Gaurav Dhir
None

Date submitted: 27 Jul 2015 Electronic form version 1.4