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Heavy rain effects on aircraft lateral/directional stability and control determined from numerical simulation data

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Abstract

In this paper, effects of heavy rain on the lateral/directional stability and control performance of a DHC-6 Twin Otter aircraft are determined based on from the numerical simulation data. A two-way momentum coupled Eulerian–Lagrangian approach developed for two-phase flow simulation is adopted to obtain the fundamental aerodynamic coefficients in the rain condition. Then the lateral/directional aerodynamic derivatives of the aircraft in rain are evaluated based on the linear fitting processing and the strip theory. Finally, the lateral/directional stability of the aircraft in rain is obtained and the controllability is analyzed by simulation of the responses to unit step changes in the control surface deflections. The present results indicate that heavy rain can cause penalties in both the

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