

Stochastic Response of an Airfoil and Its Effects on Limit Cycle Oscillations' Behavior under Stall Flutter Regime

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Abstract : In this work, we investigate the effect of noise on a classical two-degree-of-freedom pitch-plunge aeroelastic system. The inlet velocity of the flow is modelled as a stochastically varying parameter by the Ornstein-Uhlenbeck (OU) stochastic process. The system is a 2D airfoil, and the elastic problem is simulated using linear springs. We study the manifestation of Limit Cycle Oscillations (LCO) that correspond to the varying fluid velocity under the dynamic stall regime. We aim to delve into the unexplored facets of the classical pitch-plunge aeroelastic system, seeking a comprehensive understanding of how parametric noise influences the occurrence of LCO and expands the boundaries of its known behavior.

Keywords : aerodynamics, aeroelasticity, computational fluid mechanics, stall flutter, stochastic processes, limit cycle oscillation

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