

A Study on Unsteady Vortical Structures and Substantial Drag Reduction

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Abstract

The aerodynamic drag has the unsteady fluctuations in time line due to the various size vortexes that are appearing, growing, separating and vanishing. In this paper, we analyze the unsteady flow using Large Eddy Simulation (LES), and we clarify the fluctuating flow structure around a vehicle with the new reduction guideline of aerodynamic drag. From the analyses, it is clarified the vortex ring behind the vehicle that is periodical appearing cause the aerodynamic drag fluctuations and increasing the mean aerodynamic drag. And, it is proposed the below hypotheses to control the fluctuations for aerodynamic drag reduction.

- (1) Making separated vortex smaller.
- (2) Making frequency of the vortex ring smaller.
- (3) Breaking the vortex ring.
- (4) Increasing distance of the vehicle to the vortex ring.

Keywords : Vehicle, Aerodynamic, Unsteady Flow, LES, Drag