Special Issue: Guest Editor's Note

Vehicle aerodynamics is an engineering field with large potential in applications of flow control. The esthetic properties of passenger vehicles are of great importance and aerodynamic shape optimization cannot be applied to its extremes. Commercial vehicles on the other hand have practical limitations for aerodynamic shape optimization as the loading capacity must be maximized; this implies box-shaped vehicles that produce large wakes, which leads to high aerodynamic drag. Flow control that does not require large changes in the shape of a vehicle is certainly an approach to improving aerodynamic properties of vehicles that should be explored. This has been recognized by the vehicle industry and academia and most car and truck manufacturers have projects or programs that aim to investigate flow control techniques. Particularly interesting is active flow control, which in its closed-loop form can adapt to the flow conditions. If realized, such closed-loop flow control may be "the ultimate solution" for improving the aerodynamic properties of vehicles.

Flow control in academia is done in close cooperation with industry, although studies are often applied to generic vehicle bodies such as the well known Ahmed body. Most studies are numerical and allow different actuation techniques from constant blowing or suction and synthetic jets to plasma actuators. Different numerical techniques such as large-eddy simulation (LES), hybrid RANS-LES approaches, lattice Boltzmann methods and vortex methods are used. In addition to numerical simulations, experimental studies in wind tunnels and track tests are done. This variety in research approaches shows that the research field is young and the research community is still searching for the best tools to study flow control for vehicle aerodynamics. Interest in the research field is substantial, which is illustrated by the fact that a third of all the contributions at the recent conference in vehicle aerodynamics called AEROVEHICLES 1 (http://aerovehicles1.sciencesconf.org/) presented research in flow control.

This special issue on flow control in vehicle aerodynamics is an attempt to present some research in the field that has not been previously published elsewhere. I am aware that the four papers presented in this issue do not give a fair picture of the broad international activity in the research field. However, my intention was to make a first thematic issue about applications of flow control in vehicle aerodynamics in the *International Journal of Flow Control*. This issue will hopefully be followed by other special issues creating a forum in the International Journal of Flow Control for flow control in vehicle aerodynamics.

This special issue consists of three experimental and one numerical paper. The experimental contributions range from an application of flow control on a quasi-2D generic body by Lubinsky and Seifert and a 3D generic body by Barros et al. to an active flow control investigation on a full-scale production car by Aider et al. This illustrates that research is being done on different levels of the complexity of vehicle geometries and resulting flows. The study of Lubinsky and Seifert presents the actuation and the resulting drag reduction produced by their internally developed actuators. Baross et al. report an experimental investigation of flow control of a so-called square back Ahmed body using pulsed jets. The paper by Aider et al. is one of first public studies of active flow control applied to a full-scale production car. Finally, the paper by Mimeau et al. is a numerical investigation using a vortex-penalization method for passive flow control using porous coatings.

Guest Editor

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