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Editorial

Special Issue "Computational Aerodynamic Modeling of Aerospace Vehicles"

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Aerospace, an open access journal operated by MDPI, has published a Special Issue on the Computational Aerodynamic Modeling of Aerospace Vehicles. Dr. Mehdi Ghoreyshi of the United States Air Force Academy, United States and Dr. Karl Jenkins of Cranfield University, United Kingdom served as the Guest Editors. This Special Issue of *Aerospace* contains 13 interesting articles covering a wide range of topics, from fundamental research to real-world applications.

The development of accurate simulations of flows around many aerospace vehicles poses significant challenges for computational methods. This Special Issue presents some recent advances in computational methods for the simulation of complex flows. The research article by El Rafei et al. [1] examines a new computational scheme based on Monotonic Upwind Scheme for Conservation Laws (MUSCL) within the framework of implicit large eddy simulations. The research predictions show the accuracy of the new scheme for refined computational grids. Zingaro and Könözsy [2] present a new adoption of compressible Navier–Stokes equations for predicting two-dimensional unsteady flow inside a viscous micro shock tube. In another article by Teschner et al. [3], the bifurcation properties of the Navier–Stokes equations using characteristics schemes and Riemann Solvers are investigated.

An additional topic of interest covered in this Special Issue is the use of computational tools in aerodynamics and aeroelastic predictions. The problem with these applications is the computational cost involved, particularly if this is viewed as a brute force calculation of a vehicle's aerodynamics and structure responses through its flight envelope. In order to routinely use computational methods in aircraft design, methods based on sampling, model updating, and system identification should be considered. The project report by Zhang et al. [4] demonstrates the use of multi-fidelity aircraft modeling and meshing tools to generate aerodynamic look-up tables for a regional jet-liner. The research article by Ignatyev and Khrabrov [5] presents mathematical models based on neural networks for predicting the unsteady aerodynamic behavior of a transonic cruiser. Silva [6] reviews the application of NASA's AEROM software for reduced-order modeling for the aeroelastic study of different vehicles including the Lockheed Martin N+2 supersonic configuration and KTH's generic wind-tunnel model. Additionally, the article by Berci and Cavallaro [7] demonstrates hybrid reduced-order models for the aeroelastic analysis of flexible subsonic wings. The article by Singh et al. [8] introduces a multi-fidelity computational framework for the analysis of the aerodynamic performance of flight formation. Finally, Ghoreyshi et al. [9] creates reduced-order models to predict the aerodynamic responses of rigid configurations to different wind gust profiles. The results show very good agreement between developed models and simulation data.

The remaining articles show the application of computational methods in simulation of different challenging problems. Satchell et al. [10] shows the numerical results for the simulation of the wake behind a 3D Mach 7 sphere-cone at an angle of attack of five degrees. The article by Aref et al. [11] investigates the propeller–wing aerodynamic interaction effects. Propellers were modeled with fully resolved blade geometries and their effects on the wing pressure and lift distribution are presented for different propeller configurations. In another article by Aref et al. [12], the flow inside a subsonic intake was studied using computational methods. Active and passive flow control methods were studied to improve the intake performance. Finally, the article by Boudreau et al. [13] investigates the use of large eddy simulations in predicting the flow behind a square cylinder at a Reynolds number of 21,400.

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