Guest editorial: High-speed aerodynamics, from transonic to hypersonic

International Journal of Numerical Methods for Heat & Fluid Flow

2565

The Aerodynamics Technical Committee of the French Aeronautics and Aerospace Society (3AF) is very grateful to *Eric Chaput* who chairs the committee with great talent and dedication. A big thank you to Eric who succeeds *Jean Delery*, previous President of the committee for 20 years, member of the 3AF High Scientific Council, who sadly passed away on 6 December 2022.

In addition to Jean and Eric, this special issue is dedicated to *Patrick Gillieron* for the remarkable work he has accomplished for the 3AF Aerodynamics Committee over many years, his dedication and human qualities.

This special issue of the *International Journal of Numerical Methods for Heat & Fluid Flow* focuses on "High speed aerodynamics, from transonic to hypersonic", supervised by the 3AF.

It focuses on high-speed aerodynamics, characterised by strong or extreme compressibility effects giving rise to specific phenomena such as shock waves, and influencing many aspects of the flow field such as transition, turbulence and associated heat transfer phenomena. This special issue deals with both external and internal aerodynamic phenomena encountered in the aeronautical and space industry, as well as other fields such as energy production, transportation, wind and renewable energy. The experimental, theoretical and numerical aspects, from fundamental research to industrial applications are considered.

Among the many aspects of high-speed flows, many items are emerging or re-emerging as the future challenges, such as:

- shock wave/boundary layer interactions associated with increased drag, flow separation, unsteadiness and intense local heat transfer in supersonic and hypersonic flows;
- shock/shock interferences, concentrated expansion waves and intense slip lines, which can introduce detrimental effects, especially at high Mach number;
- buffet and buffeting and air intake buzz;
- unsteadiness, which can lead to detrimental fluid, structure and acoustic interactions;
- laminarity, considered as a promising and efficient way for drag reduction of transonic or supersonic transport aircraft, but also potentially for hypersonic vehicles;
- laminar/turbulent transition analysis in transonic, supersonic or hypersonic regimes. The laminar-to-turbulent transition is a primordial information for the design and trajectory assessment of supersonic and hypersonic objects;
- heat and mass transfer associated to the dynamical aspects of high speed flows;
- hypersonic flows related to non-equilibrium effects, rarefied gas effects, extremely intense shocks and high heat transfer rates;
- control of high-speed flows using both passive and active methods, used to delay transition, such as energy deposition and surface plasma implementation in hypersonic flows;

International Journal of Numerical Methods for Heat & Fluid Flow
Vol. 34 No. 7, 2024
pp. 2565-2566

0961-5539
DOI 10.1108/HFF-07-2024-945

- re-entry phenomena related to space debris;
- supersonic business jet emergence hindered by environmental aspects, low noise levels reduced fuel consumption (low drag);
- predictive methods, transition prediction, compressibility effects on turbulence, unsteadiness, shock separated flows; and
- new experimental methods and test facilities for high-speed flows simulation and characterisation.

The articles of this special issue have been reviewed by at least two independent international experts with the rigorous expertise process of the *International Journal of Numerical Methods for Heat & Fluid Flow*. Some works are the completed versions of the most instructive contributions to the 57th International Conference on Applied Aerodynamics AERO2023, organised in Bordeaux (France) by the 3AF.

The 3AF International Conference on Applied Aerodynamics is an annual event organised by the 3AF Aerodynamics Committee at places known for their activity in the field of aeronautics and/or aerospace science and technology. The future 58th International Conference on Applied Aerodynamics (AERO2024), is organised in Orléans (France) under the theme "Emerging approaches in aerodynamics", Orléans, 27–29 March 2024.

The Guest Editors and the 3AF Aerodynamics Committee would like to thank Aude Lurbe (3AF) and Sherry Xu (IJNMHFF) for their remarkable and efficient work.

Abderrahmane Bairi
Université de Paris, Ville d'Avray, France, and

Bruno Chanetz
ONERA Meudon, Meudon, France