Preface

Special Issue dedicated to Aeroelasticity and Structural Dynamics

The key role of Aeroelasticity and Structural Dynamics in the design process of aircraft and spacecraft is clear. Even today, when scientists and industry are actively working on long endurance, high efficiency, flexible and active/adaptive aerospace vehicles, these disciplines continue to gain importance and attract interest from the global aerospace community.

The present issue of *Advances in Aircraft and Spacecraft Science* (AAS) intends to publish some selected, extended and peer-reviewed papers that were presented at the *International Forum on Aeroelasticity and Structural Dynamics* (IFASD) in Saint Petersburg, Russia, from June 28th to July 2nd, 2015. IFASD is the key international conference for engineers and scientists working in the fields of aeroelasticity and structural dynamics, and it has been running since 1981. In particular, the present issue wants to highlight the current state-of-the-art in the field by collecting those IFASD works that distinguished themselves for high quality and scientific impact, in line with the aims of AAS International Journal.

In the first contribution to this special issue, Francois *et al.* (2017) use the rib orientation and crenellated skin concept to control wing deformation under aerodynamic load. In this work, the impact of varying the rib/crenellation orientation, the crenellation width and thickness on the tip twist, tip displacement, natural frequencies, flutter speed and gust response are investigated through finite element modelling and experiments. The paper by Lancelot *et al.* (2017) summarises the design of a gust generator by high fidelity numerical simulations and experimental tests. The designed gust generator aims at performing gust response experiments on wings and assessing load alleviation in a low subsonic wind tunnel. Special attention is given in this work to the different design parameters that influence the shape of the gust velocity profile by means of computational fluid dynamics simulations and comparison with experiments. In the third contribution to this special issue, Lepage *et al*. (2017) give a wide overview of experimental characterization and control of the buffet phenomenon on 3D turbulent wings in transonic flow conditions. By means of several wind tunnel tests campaigns performed on a 3D half wing/fuselage body, the authors discuss the buffet aerodynamic instability and validate innovative fluidic control devices. Munk *et al.* (2017) propose a novel methodology for the vibration optimisation of structures subjected to dynamic loading. This method is based on a topology optimization algorithm that makes use of the sensitivity function derived from the finite element dynamic eigenvalue problem. Applications deal with maximising natural frequencies and the gap between two frequencies for stiffness improvement and flutter suppression. In a previous volume of AAS, Pagani *et al.* (2014) already published some of the results that were discussed by the authors at IFASD. In that work, they proposed exact, refined 1D dynamic stiffness elements for the flutter analysis of plate-like metallic and composite wing structures. In another paper collected in this special issue, Srinivasan and Joshi (2017) identify critical parameters influencing the servoelastic response of flexible aircraft. In this work, a sensitivity study is carried out to assess the extent of influence of each parameter, and a multi-parameter tuning approach is implemented to achieve an enhanced analytical model for improved predictions of aircraft servoelastic response. In the final contribution to this AAS issue, Zafar *et al.* (2017) investigate the nonlinear interaction between the aileron unrestrained oscillation and shock wave dynamics, which is the driving mechanism for non-classical aileron buzz. Simulation results give a detailed insight into the interplay between wing section geometry, shock wave motion with respect to various flow conditions and excitation of aileron buzz. Furthermore, the classical Describing Function technique is used to develop a quasi-linearized representation of the aerodynamics nonlinearities involved in non-classical aileron buzz. The resulting linearized aeroelastic system predicts limit cycle oscillation characteristics with satisfactory accuracy.

The guest editors wish the present issue to be of interest to AAS readers and people working in the field of aircraft and spacecraft aeroelasticity and structural dynamics. We would also take the opportunity to thank the authors for their valuable manuscripts, and the reviewers for their efforts in providing us with useful comments and suggestions. Also, we would like to thank profoundly the AAS Editor-in-Chief, Professor Erasmo Carrera, for his support and for giving us the opportunity to select and handle the manuscripts of the present special issue.

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