Editorial

Konstantin I. Matveev

School of Mechanical and Materials Engineering,
Washington State University,
Pullman, WA 99164-2920, USA
E-mail: matveev@wsu.edu

Significant increase of lift and reduction of drag of aerodynamically supported craft can be achieved when these craft move close to the ground. The ground effect on aircraft has been first noticed a century ago. Many ground effect vehicles were built and tested since then. However, no widespread application of this transportation concept has happened. The complexity of involved aerodynamics and dynamics, as well as associated cost and safety issues, remains a major obstacle toward practical implementation. With accumulation of experimental and theoretical knowledge and a growth in computational resources, it is expected that ground effect craft with higher performance will be developed in the future. This special issue focuses on new experimental and modelling results of relevant aerodynamics phenomena and ground effect vehicles.

It is a great honour for me to serve as a guest editor for the special issue on 'ground effect aerodynamics'. I would like to thank all the authors and referees for their contributions. This issue contains eight articles. A brief description of each paper is given below.

Akimoto, Kubo and Kanehira described wing in surface effect ship (WISES). This original approach is substantially different from more established Russian and German concepts. The authors looked at new areas and faced new challenges in developing this craft. The WISES concept, self-propulsion tests, and preliminary designs are discussed in the paper.

Barber carried out experimental studies on wingtip vortices in the ground vicinity. The vortices behind a wing section were investigated with a laser visualisation system. Significant lateral movement of the vortices is found for both lift- and down-force configurations.

Kornev, Kleinsorge and Migeotte developed a theory for stability of ultra-fast boats with aerodynamic support. The model utilised results for planing boats and wing in ground craft. The influence of various geometric and mass-loading parameters was systematically studied. This paper is a useful reference for high speed boat designers.

Matveev presented a new concept for high speed amphibious transportation. Power augmented ram vehicles represent skirtless platforms supported by propulsor jets and passive aerodynamic lift. A mathematical model for steady forward motion including stability consideration is developed and calculation examples are discussed.

Miller and Matveev reported experimental results on an innovative technique for increasing static lift and recovered thrust of jet-supported platforms. A front flap is utilised to augment jet-induced pressure under a platform. Test data demonstrate a possibility of doubling lift and thrust.

Lau and Srigrarom investigated aerodynamic performance of front wings employed on Formula One race cars. Experimental study was conducted in a water tunnel with a force balance and laser visualisation system. Computational fluid dynamics was applied for flow simulations. It is found that a straight wing generates much larger vertical force than a curved wing, but with a larger drag penalty.

Vogt and Barber conducted a computational study to characterise performance of two wing sections in ground effect. Results are presented for force coefficients, pressure distribution, and positions of dividing streamlines and stagnation points. A diffuser effect in the flow under wing sections is discussed.

W. Yang, Z. Yang and Ying analysed the effects of various geometric parameters on the longitudinal stability of wing in ground craft. Numerical viscous flow simulations were undertaken. It is confirmed that by shifting aerodynamic centres of pitch and height one can influence the longitudinal stability.