

Interference of High Lift Systems in Low Speed Wind Tunnels

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Results of numerical, analytical and experimental studies on effects of free stream boundaries to the flow in an open test section wind tunnel are presented in [1] and [2]. This paper is dedicated to physical simulation of flows with solid boundaries in a low speed wind tunnel with an open test section. The paper also addresses issues of the semi-span method application for flow studies with free stream boundaries and with solid-wall boundaries.

Implementation of the semi-span method allows acquiring aerodynamic characteristic for a double span, acquiring parametric experimental investigation for zero yaw angles and improving physical modelling due to an increased geometric scale, and, therefore, increased Reynolds numbers Re . It is necessary to consider particular properties of experimental methods and techniques. These issues are also discussed in the proposed paper.

Integral aerodynamic characteristics of high-lift systems are obtained by using semi-span testing method in presence of an impermeable wall.

Numerical methods were applied for evaluation of aerodynamic characteristics. It is shown that in presence of free stream boundaries and solid-wall boundaries additional corrections are needed not only to geometrical angles of attack, but also to flaps' deflection angles. Those corrections depend on reference dimensions of a model and a flap reference chord. Corrections to angles of attack and to flap deflection angles in presence of free stream boundaries and solid-wall boundaries depend on the cross section of the wall-bounded flow. The method for evaluating corrections needed for compensating the influence of free stream boundaries and solid-wall boundaries is presented.

References

1. V.V. Zherekhov, O.A. Ledyankina, A.K. Sungatullin, V.V. Pakhov and A.N. Kusyumov, *Interference of the Flapped Wings in Low-Speed Closed-Circuit Wind Tunnels with opened test sections*; 47th International Symposium of Applied Aerodynamics, Paris, 26-28 March 2012.
2. V.Ciabaca, Michael Pott-Polenske, Stefan Melber-Wilkending and Georg Winchmann, *Computational and experimental results in the open test section of the aeroacoustic windtunnel Braunschweig*; 47th International Symposium of Applied Aerodynamics, Paris, 26-28 March 2012.