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Aerodynamics of porous airfoils and wings
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Abstract
This paper presents novel wind tunnel test results on the aerodynamics of a symmetric thin porous airfoil and a porous rectangular half wing using a symmetric thin airfoil as its cross section, obtained by a six-component force balance. The variation of lift coefficient, drag coefficient, pitching moment, lift versus drag, the gradient of lift, and location of the aerodynamic center with respect to the angle of attack are presented as a function of the porosity. The data, where possible, are compared with the analytical results. The trend of the experimental results behaves in the same manner as the analytical solution. The measured drag coefficients of the airfoil and wing are also presented. The applicability of the standard equation relating the lift coefficient of a non-porous wing with that of a non-porous airfoil to the case of porous wings is verified by applying the equation to porous wings and validating the results using experimental data. Lift slope decreases as the porosity increases. The drag decreases at a low value of porosity and then increases as porosity increases. The standard equation for obtaining the lift coefficient of a wing from the lift coefficient of an airfoil is applicable and valid for porous wings and airfoils. © 2018, Springer-Verlag GmbH Austria, part of Springer Nature.

Author Keywords
Aerodynamics; Permeability; Porosity; Porous airfoil; Porous wing

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