

Surface Pressure Distribution of a Flapped-Airfoil for Different Momentum Injection at the Leading Edge

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Abstract : The aim of the research work is to modify the NACA 4215 airfoil with flap and rotary cylinder at the leading edge of the airfoil and experimentally study the static pressure distribution over the airfoil completed with flap and leading-edge vortex generator. In this research, NACA 4215 wing model has been constructed by generating the profile geometry using the standard equations and design software such as AutoCAD and SolidWorks. To perform the experiment, three wooden models are prepared and tested in subsonic wind tunnel. The experiments were carried out in various angles of attack. Flap angle and momentum injection rate are changed to observe the characteristics of pressure distribution. In this research, a new concept of flow separation control mechanism has been introduced to improve the aerodynamic characteristics of airfoil. Control of flow separation over airfoil which experiences a vortex generator (rotating cylinder) at the leading edge of airfoil is experimentally simulated under the effects of momentum injection. The experimental results show that the flow separation control is possible by the proposed mechanism, and benefits can be achieved by momentum injection technique. The wing performance is significantly improved due to control of flow separation by momentum injection method.

Keywords : airfoil, momentum injection, flap, pressure distribution

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