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Control of Vortex Shedding on an Airfoil using Mini Flaps at Low Reynolds Number DAISUKE OSHIYAMA, DAIJU NUMATA, KEISUKE ASAI, Tohoku University — In this study, the effects of mini flaps (MFs) on a NACA0012 airfoil were investigated experimentally at low Reynolds number. MFs are small flat plates attached to the trailing edge of an airfoil perpendicularly. All the tests were conducted at the Tohoku-University Basic Aerodynamic Research Tunnel at the chord Reynolds number of 25,000. Aerodynamic forces were measured using a 3-component balance and the surface flow was visualized by luminescent oil film technique. The results of force measurement show that attachment of MFs enhances lift and the enhanced lift increases with MF height. On the other hand, the results of oil flow visualization show that attachment of MFs enlarges the separated region on the airfoil rather than diminishes it. To understand the physical mechanism of MFs for lift enhancement, the flow around the airfoil was visualized by the smoke-wire method and the wake profile behind the airfoil was measured using a hot wire anemometer. It was found that vortices shed periodically from the tip of the MFs and interact with the separated shear layer from the upper surface. This unsteady vortex shedding forms a low-pressure region on the upper surface, generating higher lift. These results suggest that the height of MFs controls the frequency of vortex shedding behind the MF, forcing the separated shear layer on the upper surface flow in unsteady manner.

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