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Flow separation control over a NACA0015 airfoil by nanosecond-pulse-driven plasma actuator ATSUSHI KOMURO, KEISUKE TAKASHIMA, Department of Electrical Engineering, Tohoku University, NAOKI TANAKA, TAKAHIRO SENZAKI, DAIJU NUMATA, Department of Aerospace Engineering, Tohoku University, TOSHIRO KANEKO, AKIRA ANDO, Department of Electrical Engineering, Tohoku University, KEISUKE ASAI, Department of Aerospace Engineering, Tohoku University — Separation flow control using a nanosecond-pulse-driven plasma actuator was studied experimentally. Wind tunnel experiments on a 10-cm chord NACA0015 airfoil were carried out at various post-stall angles of attack for free stream velocity up to 40 m/s. The pressure distribution on an airfoil surface was measured and the results showed that the nanosecond-pulse-driven plasma actuator caused flow attachment to the airfoil surface at post-stall angles. We use the custom-made pulse power source which can be operated in various operation mode such as continuous frequency mode and burst pulse mode. The effects of the pulse repetition rate, amplitude of the voltage, and rise rate of the voltage on the flow were measured. The results show that the most effective frequency of the voltage changes depending on the angle of attack and the velocity of the free stream. Additionally, the flow around the airfoil was visualized by the smoke-wire method. It is clearly shown that the normally separated flow is reattached to the suction surface of the airfoil by an on-off control of the plasma actuator.

Atsushi Komuro
Department of Electrical Engineering, Tohoku University

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