Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Control of flow and sound around leading-edge slat of 30P30N airfoil using plasma actuator YUSAKU ONISHI, JUN SAKAKIBARA, Meiji university — We studied active control of flow and noise around a multi-element airfoil (30P30N) using time-resolved particle image velocimetry (TR-PIV), microphone and dielectric barrier discharge plasma actuator (DBD-PA). The angle of attack of the wing model fixed in the hard wall test section was 6° to 10°, and the Reynolds number based on the stowed chord length was 1.1×10^5 to 1.5×10^5. As a result of acoustic measurement, characteristic peaks were confirmed in the range of $St = 1.0$ to 4.0, which is based on the slat chord length. Periodic disturbance ($St = 0.3 \sim 3.9$) was applied to a shear layer formed from the slat cusp using a DBD-PA placed at the lower of the slat. The noise peak frequencies were modified in synchronization with the disturbance frequencies of $St = 1.0 \sim 2.8$, these Strouhal number is close to the vortex shedding frequency in the case where the DBD-PA was deactivated. It was confirmed by TR-PIV and dynamic mode decomposition that the flow structures at the characteristic peak frequencies modified by the disturbance frequencies. The results show that the noise and the flow field around the leading edge slat could be controlled by the periodic disturbance.

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Date submitted: 26 Jul 2019 Electronic form version 1.4