Abstract Submitted
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Investigation of asymmetric dielectric barrier discharge plasma actuator, driven by repetitive nanosecond pulses. ALEXANDRE LIKHANSKII, DMITRY OPAITS, MIKHAIL SHNEIDER, Princeton University, SERGEY MACHERET, Skunk Works Lockheed Martin, RICHARD MILES, Princeton University — DBD plasma actuators are known to be effective for low speed flow control. A comprehensive physically-based numerical model has been developed for explanation of DBD operation. The modeling showed the advantages of using repetitive nanosecond pulses with bias over the sine voltage. If the sine voltage is applied, it carries two functions – plasma generation and producing the body force on the gas. In the pulse case these processes are separated. The plasma is generated using repetitive nanosecond pulses, and the driving of charge particles, which produces the force on the gas, is between the pulses. In pulse configuration the variation of pulse amplitude, sign and the voltage between pulses can produce different force and heating effects on the flow. The verification of the modeling has been done in the experimental investigation of DBD. A new experimental approach for non-intrusive diagnostic of DBD induced flows in quiescent gas was proposed. The schlieren technique, burst mode of plasma actuator operation, and 2D Navier-Stokes numerical model coupled together allowed restoring the entire 2D induced flow and characteristics of the plasma induced force.

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