Abstract Submitted
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A new plasma-driven pulsed jet actuator for flow control JEAN-PAUL BONNET, retired, CNRS Institut Pprime Poitiers, GWENAEL ACHER, ANTON LEBEDEV, NICOLAS BENARD, ERIC MOREAU, CNRS Institut Pprime Poitiers, ELECTRO-FLUIDO GROUP TEAM — Active flow control requires actuators with enough authority and high frequency response. Synthetic jets can have high frequency response but are rather limited in terms of authority providing the exit velocity is limited. Pressurized (flowing) jets have a very high potential in terms of authority particularly for high velocity flow control purposes. However, for most purposes, high frequency modulation (of order of several kHz) is required in order to excite most unstable modes and to operate in closed mode. Rapid mechanical valves are limited in terms of frequency (up to typically a few hundred of Hz). We develop a new generation of plasma-driven pulsation of flowing jet. The principle is to increase the temperature at the sonic throat through a plasma discharge located at the throat. The flow rate being proportional to the square root of the temperature for a perfect gas, for the same settling chamber pressure, the actuator flow rate can be varied. The frequency is then no limited by any mechanical constraint. A demonstrator has been tested with a 1mm sonic throat. The electric discharge is created by a 10 kV voltage applied between the anode and the throat acting as the cathode. Within these conditions, a 30% modulation of the flow rate can be obtained.

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