Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Characterization and Control of Separated Entrance Flow in a Branched Channel[1] C.J. PETERSON, B. VUKASINOVIC, A. GLEZER, Georgia Institute of Technology — The evolution of the flow downstream of the inlet of a rectangular channel that is branched along the entire span of the side wall of a primary channel of the same height is investigated experimentally in an air facility. Of particular interest is the formation and scaling of a separated flow domain downstream of the entrance plane into the secondary channel and its interaction with the flow surfaces at speeds up to $M = 0.4$. The separation is actively controlled using a spanwise array of fluidic actuators on the primary channel's surface upstream of the inlet plane of the secondary duct. The effects of the actuation on the evolution of the separation and attachment of the vorticity layer between upstream surface of the primary duct and the surface of the secondary duct downstream of the branched inlet in the presence of a strong confined adverse pressure gradient are investigated using particle image velocimetry coupled with detailed static surface pressure distributions. The effects of the controlled separation within the secondary channel on the global flow within the primary duct and on flow split between primary and secondary channels are assessed, and it is demonstrated that actuation can effect significant changes in the flow fractions between the channels.

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Date submitted: 12 Aug 2015 Electronic form version 1.4