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Flow Field Measurements for Instability Mitigation in Lean Direct Injection[1] JOSHUA KRSEK, Rose-Hulman Institute of Technology — Lean direct injection (LDI) is a method of combustion used in aviation gas turbines which results in reduced emission of carbon monoxide, nitric oxides (NOx), soot, and unburned hydrocarbons. LDI often results in potentially destructive thermoacoustic instabilities, which can lead to combustor structural failure. A ceramic foam insert has been shown to passively mitigate such thermoacoustic instabilities. Further work has shown that this effect is caused at least in part by the porosity of the insert, as fully dense inserts are not universally effective at mitigating these instabilities. This study attempts to develop a fundamental understanding of the combustor flow structure by analyzing particle image velocimetry (PIV) for combustion under the presence of a porous insert, solid insert, and no insert. The results from this study will play a pivotal role in the design of an optimal instability-weakening porous insert for the NASA developed swirler-venturi injector.

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