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Pulsed Detonation Operation of an Axial Turbine DAVID MUNDAY, ANDREW ST. GEORGE, ROBERT DRISCOLL, EPHRAIM GUTMARK, University of Cincinnati, GAS DYNAMICS AND PROPULSION LAB TEAM — A detonation is by its nature a more thermodynamically efficient combustion mode than deflagration. Several attempts are underway to integrate detonating combustion into turbomachines in order to realize the increased efficiency available, save resources and reduce emissions. One approach to this challenge is to employ pulsed detonations as from pulsed detonation engines (PDEs) and use the pulsed outflow to drive a turbine. The difficulty with this approach is that turbines, especially the more efficient axial turbines suffer in efficiency when their inflow is pulsed. At present there is not even a commonly acknowledged turbine efficiency measure which works reasonably for a pulsed input. The present work investigates the efficiency of an axial turbine with pulsed flow. Initial tests are performed with non-combusting flow in order to study the influence of pulsation on the turbine performance. This cold flow will admit a broader range of instrumentation which can be inserted within the turbine. This allows time-resolved measure of the flow angles which have a pronounced effect on the turbine performance. Later tests with detonating inflow yield global measures and these are compared to the non-combusting results. Work sponsored by Innovative Scientific Solutions, Inc.

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