Pulse Detonation Engines – PDE and Rotating Detonation Engines (RDE) 

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Project Description

A pulse detonation engine (PDE) offers few moving parts, high efficiency, high thrust, low weight, low cost, and ease of scaling. These make the PDE an attractive alternative to jet turbine engines for small disposable engines. The near constant volume heat addition process, along with the lack of a compression cycle, lend to the high efficiency and specific impulse, simplicity, and low-cost of pulse detonation engines. Pulse detonation engines have the potential for operation at speeds ranging from static to hypersonic, with competitive efficiencies, enabling supersonic operation beyond conventional gas turbine engine technology. Currently, no single cycle engine exists which has such a broad range of operability. Computational and experimental program is conducted at UC to investigate the performance of an air breathing pulse detonation engine (PDE). This research effort involves investigating such critical issues as: detonation initiation and propagation; valving, timing and control; instrumentation and diagnostics; purging, heat transfer, and repetition rate; noise and multi-tube effects; detonation and deflagration to detonation transition modeling; and performance prediction and analysis. Our lab has a unique hybrid engine that includes an array of 6 PDEs integrated with an axial turbine. This system potentially can replace the entire high pressure core of a jet engine, including high pressure compressor and turbine and the combustor.