

# Transient Plasma Ignition for Delay Reduction in Pulse Detonation Engines

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**This paper reviews the testing and evaluation of transient plasma for pulse detonation engine (PDE) ignition conducted at five laboratories. It also presents data showing significant reductions in times required for detonation. Critical to achieving functional levels of thrust are increased repetition rates, thus minimal delay to detonation times are an important parameter. Experiments have been conducted at the University of Southern California and in collaboration with researchers at the Naval Postgraduate School, Wright Patterson Air Force Research Laboratory, Stanford University, Ohio State University and the University of Cincinnati. In these studies it was observed that TPI significantly reduces delay times (factor of 2 to 9) in both static and flowing systems.**

## I. Introduction

**T**HIS paper reviews testing and evaluation of transient plasma for pulse detonation engine (PDE) ignition under various conditions. The aerospace community has ongoing interests in the development of propulsion technologies based on pulse detonating engines (PDEs), and work is underway to determine whether this is a feasible technology. The PDE provides impulse through fuel detonation, and its potential advantages include efficient operation at both subsonic and supersonic speeds. In theory, a PDE can efficiently operate from Mach 0 to more than Mach 4.<sup>1, 2</sup> In order to achieve almost continuous thrust, firing rates of 100 Hz or more are needed. Critical to achieving high repetition rates are minimal delay to detonation times. In work supported by the Office of Naval Research and the Air Force Office of Scientific Research, transient plasma ignition (TPI) has consistently

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