NASA SBIR/STTR Technologies

Proposal No. T9.01-9975 - Hydroxyl Tagging Velocimetry for Rocket Plumes

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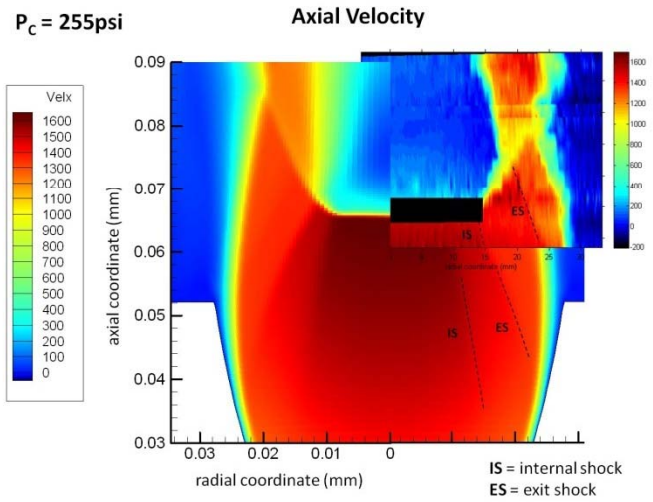

Identification and Significance of Innovation

Traditional velocimetry methods can fail under the extreme temperatures, vibrations, and dynamic pressures of a typical rocket engine. Hydroxyl tagging velocimetry (HTV) enables non-intrusive velocity measurements by "tagging" lines in the flow with OH molecules via laser-induced dissociation of H_2O, followed by laser-induced fluorescence for interrogation. Lines of OH are tracked to obtain the velocity field of a hostile unseeded flow.

TRL Range at the end of Contract (1-9): 6

Technical Objectives and Work Plan

The objectives of this Phase II effort were to:

1. Perform OH chemistry modeling and experimental validation of OH tag lifetimes at conditions representing throttling, rich and lean mixture ratios, and variations in temperature.
2. Characterize the OH laser-induced fluorescence excitation spectrum near 266 nm to enable a simpler, cheaper "read" laser: the Nd:YAG.
3. Predict and test performance of the optical detection system.
4. Design and fabricate a working prototype HTV system for rocket applications.
5. Demonstrate the prototype system with velocity measurements in a rocket engine exhaust.

NASA Applications:

Development of hardware, rocket engine testing, validating computer models. Once validated, models can enable simulation in place of testing to arrive at optimum designs more rapidly and cost effectively.

Non-NASA Applications:

Aerospace propulsion industry including rockets, missiles, scramjets, turbine engines, pulse detonation engines. Development of new engine designs.

Firm Contacts

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