

Abstract Submitted
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Experimental testing of a liquid bipropellant rocket engine using nitrous oxide and ethanol diluted with water JEFF PHILLIP, RUDY MORALES, STEWART YOUNGBLOOD, New Mexico Tech, W. VENNER SAUL, MARK GRUBELICH, Sandia National Laboratories, MICHAEL HARGATHER, New Mexico Tech — A research scale liquid bipropellant rocket engine testing facility was constructed at New Mexico Tech to perform research with various propellants. The facility uses a modular engine design that allows for variation of nozzle geometry and injector configurations. Initial testing focused on pure nitrous oxide and ethanol propellants, operating in the range of 5.5-6.9 MPa (800-1000 psi) chamber pressure with approximately 667 N (150 lbf) thrust. The system is instrumented with sensors for temperature, pressure, and thrust. Experimentally found values for specific impulse are in the range of 250-260 s which match computational predictions. Exhaust flow visualization is performed using high speed schlieren imaging. The engine startup and steady state exhaust flow features are studied through these videos. Computational and experimental data are presented for a study of dilution of the ethanol-nitrous oxide propellants with water. The study has shown a significant drop in chamber temperature compared to a small drop in specific impulse with increasing water dilution.

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