

Executive Summary

This month I upgraded my rocket engine test stand and ran two tests on the HF fuel core, one of which was on the new test stand. On the second test, I increased the HTP load to 62.4 ml. Ignition occurred in ~ 0.8 seconds and lasted ~ 5.0 seconds. The thrust was ~ 24 N and the c^* efficiency was ~ 91%. Total propellant load was ~ 105 gm.

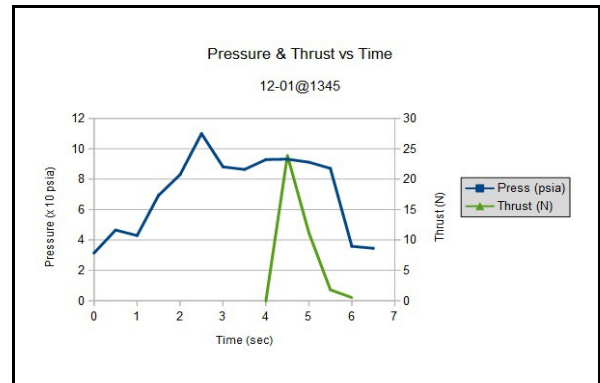
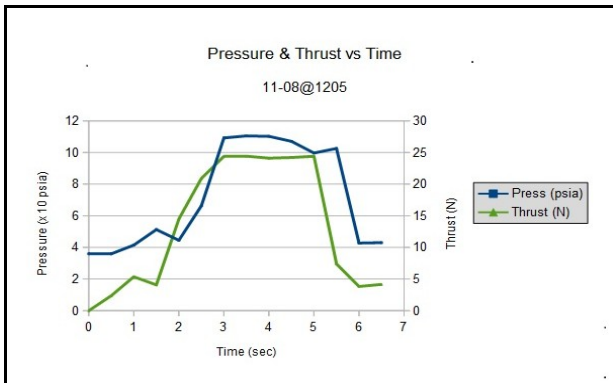
Technical Stuff

This month I upgraded my rocket engine test stand and ran two tests on the HF fuel core. I mounted a new rocket engine test stand to a concrete reinforced wall. The 4000 psi wall segment is 4' wide x 6' high x 6" deep. The test stand can handle thrust up to ~ 2000 lb, more than enough to meet my requirements. Most of my effort this month was pouring the concrete, mounting the test stand, re-configuring my test article to fit the test stand, and making adjustments to the stand. As such, I only ran two test, one of which was on the new test stand.



Video

Both test used the same high flux (HF) fuel core (ref; Oct 2022 EOM report). The fuel cores were 14 cm long with an L/D of 9.2. The initial surface flux was 0.2 gm/cm²/sec. The fuel core parameters closely matched the scaling parameters in the low flux fuel core as presented in the October end of month report. The only difference between the two test was the propellant load. I used 50 ml of HTP and 2 ml of ethanol in the first test and 60 ml of HTP and 2.4 ml of ethanol in the second test. As shown in the graph below, for the 12-01 test, there was a peak pressure of 110 psia at ignition which settled down to an average of 91.4 psia during the burn. Ignition took ~ 0.83 sec and lasted for ~ 5.0 sec. The O/F ratio was ~ 3.0 and the total propellant mass was ~ 105 gm. Thanks to the FAA, the propellant requirement is now 125 gm for a class I engine.



Please note that I only got one good data point for thrust on the 12-01 test. I attribute that to a ground fault due to a bare wire touching the steel frame of the new test stand. My load cell diagnostic kept resetting. However, it reads to be ~ 24 N. Characteristic velocity was only 91% for the 12-01 test. As such, I plan to decrease the length of the fuel core to 13 cm to increase the oxidizer to fuel ratio.