

combustion chamber then only the ends (nozzle retainer and injector plate) would need to be bolted on.

Ignition of the paraffin was debated. To attempt to keep things as simple as possible for the prototype it was decided to try a simple electric match igniter with a solid AP/HTPB booster ring that could be embedded in the forward section of the paraffin. This may or may not work but we figured it would be simpler to implement than a 3rd gas to initiate combustion or a small solid propellant rocket motor that would increase the complexity of the manufacturing of the injector side of the motor.

Inspired by a linear bearing static test stand used at Penn State University (AIAA2001-3535) we came up with a design for our stand that will incorporate a break-away load cell and motor stop that will hopefully save our load cell in the event of motor failure. Jim W. is working up this design.

The current preliminary design still needs to be verified with the appropriate factors of safety applied to the pressure vessel, bolted and welded connections and any shortcomings corrected.

In addition we all committed to spending some more time reviewing the current state of the art for hybrids and many of the past technical papers written on both LOX/Paraffin and LOX/HTPB hybrids as well as Sutton's Chapter on Hybrids.

Next Hybrid Meeting will be in 2 weeks. During the interim design on the static test stand will continue. Revisions to the prototype motor design incorporating safety analysis findings. Also roughing out of raw materials for combustion chamber will commence and various components selections will be researched.

To Do List:

- Pressure vessel analysis
- Bolted connection analysis
- Weld analysis
- Nozzle design – Throat dia, exit dia., converging and diverging angles, O-ring placement
- Injector Design – Simple orifice, pintle, swirling, impinging doublet, (stainless steel or brass)?
- Calculate maximum flow rate give Cv for '42 series' Parker solenoid and Spartan Scientific solenoid valves.
- Grain jig layout for pouring paraffin.
- Research oxygen and nitrogen feed lines – Braided stainless steel? Look at different connectors and how they can adapt to the solenoid valves

Action Items:

- Vernon Blomquist: Verification Spread sheet of motor design using Stanford's numbers.
- Jim Cloer: Researching injector design
Researching possibility of mating Swagelok connectors to NPT connectors
- Brian O'Neel: Create plumbing diagram
Formal write up and spread sheet used for preliminary design
Machine combustion chamber flanges and injector plate
Post valve data sheets on Twiki
- Jim Ward: Update preliminary gox/paraffin motor drawing
Acquire load cell and research appropriate pressure transducer

Need to add to website:

- GOX/Paraffin and LOX/Paraffin pages
General specifications
 CAD drawings, dimensions, tolerances, materials
 Test Stand
Parts list and data sheets