
NAKUJA PROJECT INTERNSHIP

WEEK 8 PROGRESS REPORT

PROPULSION

TASKS ACHIEVED THIS WEEK

- [#56] Fuel casting
- [#19] Iterative Static Firing Tests #7 (First time two grains)
- [#24] Test stand PCB design (Ongoing)
- [#135] 350kg load cell purchase
- [#136] 42mm O-rings purchase
- [#16] Test stand revamp (repairing)
- [#8] Design of the equipment case (Finalizing)

• [#19] Fuel Casting

We prepared two grains of fuel separately.

Both were prepared under similar conditions;

67:33 ratio of potassium nitrate to sorbitol, 5g of iron oxide.

The two grains were then fitted to the same casing.



[#24] Static Firing Test

This was the first time we tested the two grains at once.

We achieved a maximum thrust of 900N.

There was no pressure seal (o-ring) thus leakage in the interface between the nozzle and casing.

We faced a few challenges due to the high temperature and pressure within the casing:

1. A section of the casing melted away. The temperatures were too high for the material to withstand.

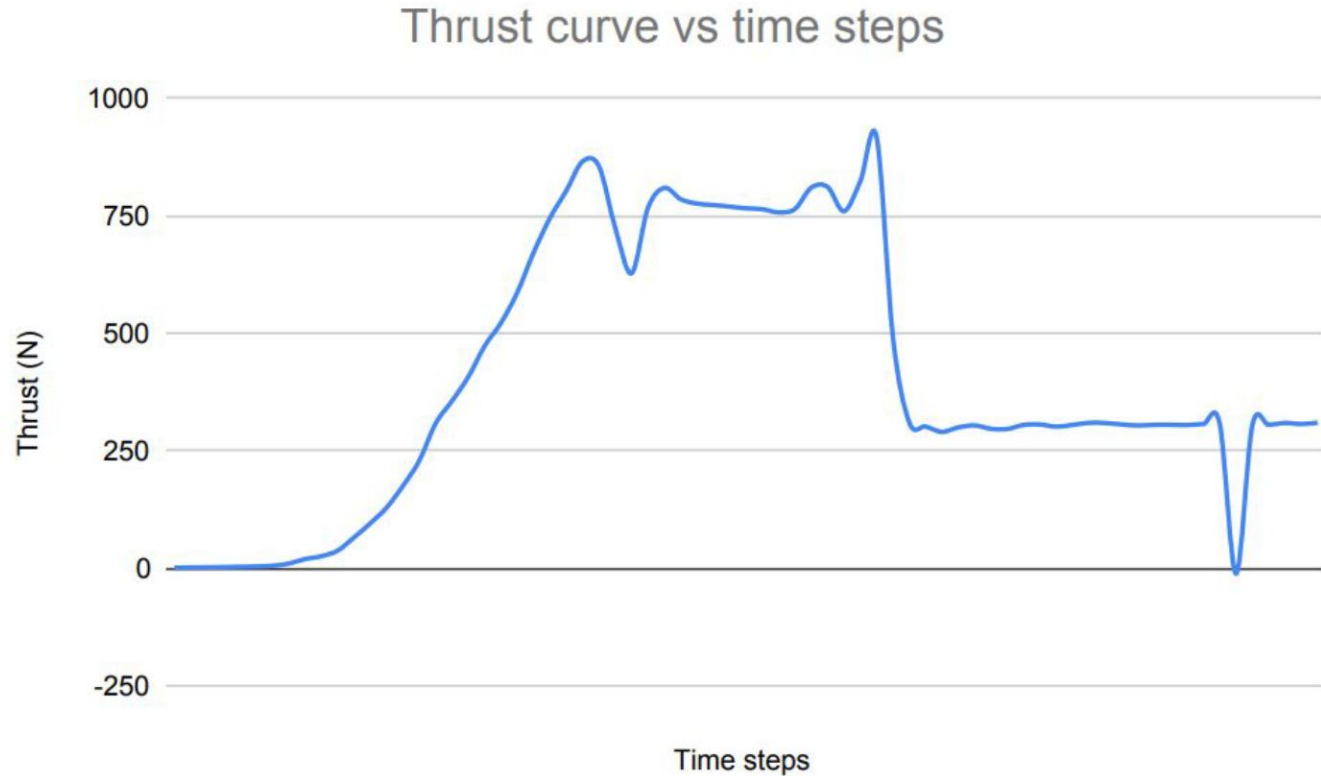
Solution; We are going to incorporate thermal insulation inside the casing walls. Going to research on the most suitable heat-resistant material which will protect the casing from the excess heat.

THRUST TIME CURVE

Thrust maxed out t
around 950 N.

Load cell limit is 500N

Load cell was
damaged







2. The nozzle was ejected from the casing but did fall close to the casing.

Other than that, the steel nozzle was able to withstand the temperature and pressure.

Solution; Redesigning of the nozzle and adjusting a few changes by reducing the material.



3. The test stand was damaged. The cantilever holding the load cell was bent and the cage was damaged.

Solution; The test stand was repaired.

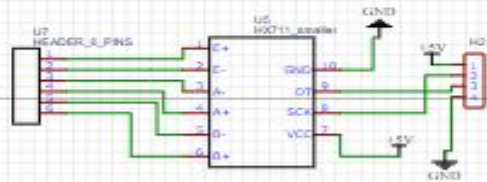
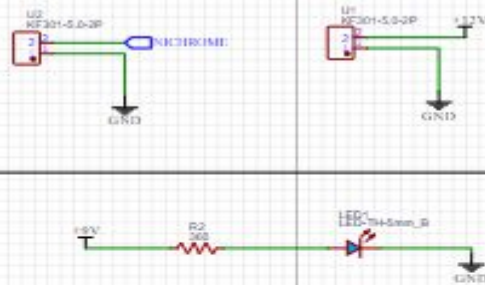
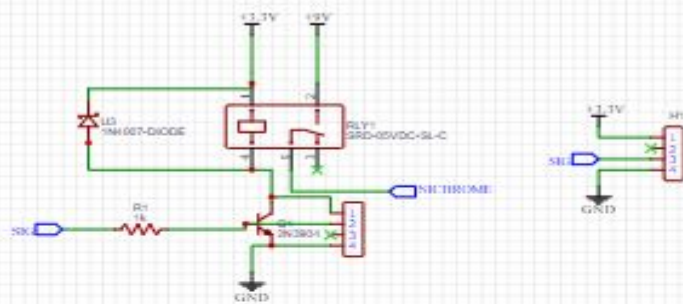
The cantilever was replaced.

[#24] Test stand PCB Design

The last PCB failed during the firing test. The relay was blown up due to the excess current passing through.

In the new PCB design, issues of over current and over voltage are being solved by the use of a fuse(10A) and zener diode(9V) respectively.

The items are being purchased and the new PCB will be used for the next static firing test.



[#36] Items purchase

A new load cell(350kg) was acquired after the previous one was ruined in the static firing test.

New O-rings were also bought for the bulkhead.

[#16] Test stand revamp (Repairing)

As noted previously, the test stand was repaired.

The cantilever was replaced with mild steel and the case fixed.

[#8] Design of the equipment case (Ongoing)

A new design was made to protect the different electronics during the firing tests.

This will ensure they are not damaged.

TASKS TO BE DONE

- [#32] Test stand PCB Etching
- [#99] Camera mount for test stand
- [#11] Casting Tools Fabrication [Curing under pressure]
- [#108] Implement servo controlled wireless ignition
- [#98] Temperature & Pressure measurement during static testing
- [#19] Iterative static firing test.

Timeline

Month	Intern week	Tasks
Jan		
	Week 1	Designs [Fuel, Casing, Nozzle, Bulkhead, Casting tools, Test stand]
	Week 2	Fabrication of items
	Week 3	Fuel Fabrication and test stand revamp
Feb	Week 4	Fabrication of items & Fuel casting
	Week 5	Iterative Fuel tests
	Week 6	Launch Pad design and iterative fuel tests
	Week 7	Iterative fuel testing and improvement