*Final Report Overview*

*Burnwire Performance Optimization*

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**Introduction**

The Oregon Small Satellite Project’s antenna systems are designed to compress into a small volume prior to deployment. A series of nylon monofilament burn wires will prevent the stowed antennas from deploying until voltage is fed through resistive wires, heating them up, causing the nylon monofilament to fail.

The project requires optimizing a set of parameters with the goal of ensuring that the mechanism deploys successfully without premature failure in an unpredictable space environment. This entails maximizing wire strength and minimizing time to failure.

**Proposal**

Successful cutting of the burn wire occurs when sufficient heat has been transferred from the resistive wire heating element to the nylon monofilament. Environmental and material factors will need to be tested and correlated to ensure the best performance of our system. The following list of variables will be tracked and measured:

Constants

* Voltage (3 V)

Control Variables

* Monofilament Strength
* Monofilament Tension (1-8 lbs)
* Resistive Wire Size
* Ambient Temperature (-40 °C, 20 °C, 150 °C)
* Ambient Pressure (1.5kPa to 101 kPa)

Resultant Values (Defined by Control Variables)

* Monofilament Strength
* Monofilament Glass Transition Temperature
* Current (< 10 A)

Dependent Variables (Measured in the Laboratory)

* Resistive Wire Temperature
* Time to Failure (< 10 s)

**Questions**

Limits for these variables have been appended where appropriate. Air pressure needs to be taken into account as orbital conditions will eliminate convective heat transfer from the heating element to the burn wire. The most important factor being tested is the temperature of the resistive wire chosen and that it will be able to reach a temperature hot enough to cause the monofilament to fail in all environmental conditions while the monofilament is strong enough to hold the tension required.