BYU Rocketry proudly presents
Payload Results from flight on 6-24-22

Our payload goal, that of measuring and determining whether or not the experimental container controlled by an RNN did experience less sloshing forces due to active anti sloshing efforts than an uncontrolled container does appear to be the case. While possibly due to our motor moving, or possibly due to one of many other reasons and forces occurring in flight, we are excited to share our results. We look forward to exploring the other issues in the future.

What is most apparent from our data at first glance is the simple story of each flight event; motor burn, motor cutoff, drogue, main deployment, and final resting. Cross referencing time stamps from the logged data seems to verify these visual trends and leads itself to a useful secondary insight from our flight. What are the nature of these stresses on the frame of the rocket during each of these flight events? Such an investigation could also be a useful future experiment.

In the meantime, the following is the data recorded during the flight of our rocket.

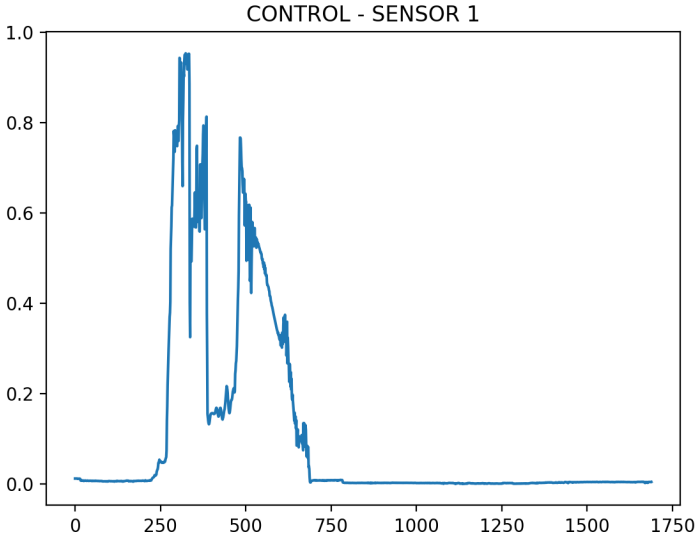
IMPORTANT: Each graph for each sensor has been normalized to its own readings. Since the sensors used in this payload don't measure an actual amount of force i.e. 5 Newtons, but just a change in resistance due to the presence of force, the actual reading of the sensor does not tell us very much information about the amount of force due to the sloshing from containers. However, the general change in resistance due to the presence of said force does indicate the trend and change of force over time. That being said, it still does appear that the forces on the experimental containers do follow a different trend overall compared to the control, hence, we do believe that the forces sustained on the experimental payload were less than that of the control. Further explanation is left in the respective sections.

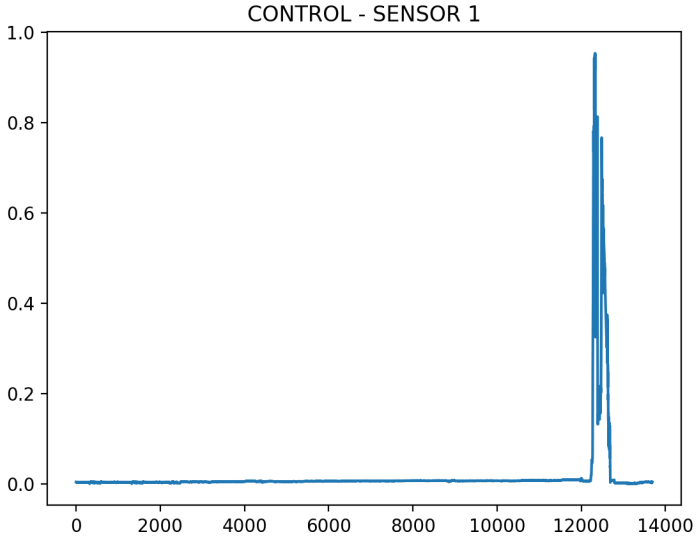
CONTROL:

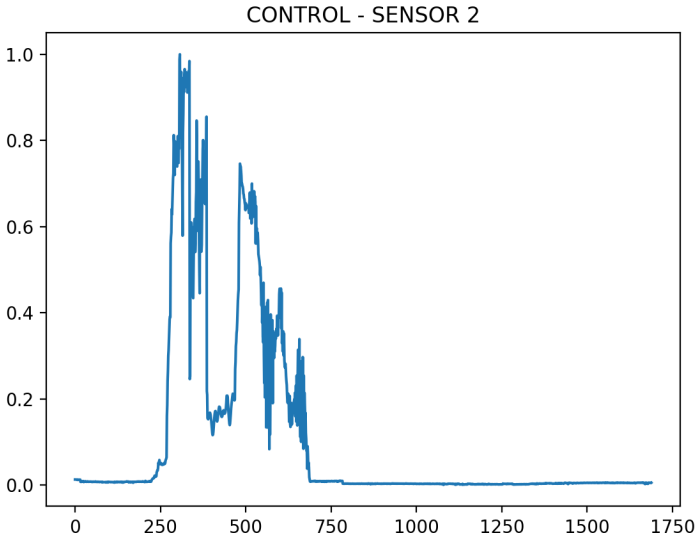
It appears that of the 3 sensors for the control container, 2 recorded data throughout the entire flight, but 1 of the sensors, labeled SENSOR-3 must have disconnected during descent. Compared to the other two sensors, SENSOR-3's readings were fuzzy, and likely had a bad connection during the flight.

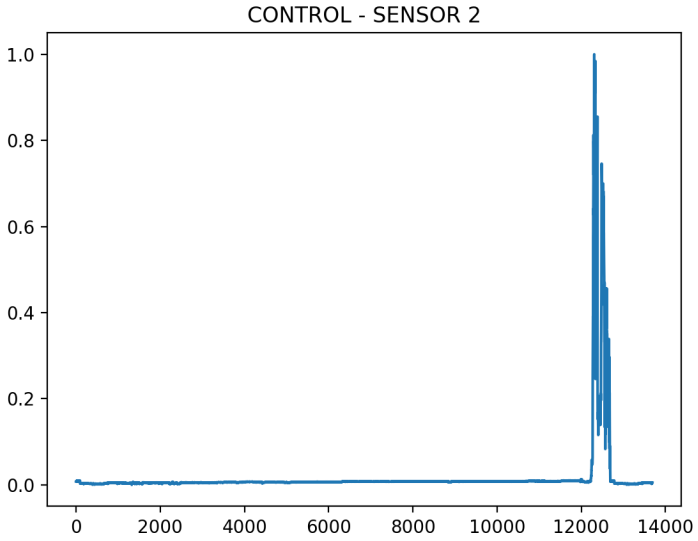
As discussed earlier, many of the flight events can be ascertained from the shape of the data. While each sensor still has its own signature, the trend seems to share similar stories during flight. Notice that the first photo in each row is a focus on just that of data during flight, trimming all of the on the ground time, and the second photo shows all data collected for that sensor.

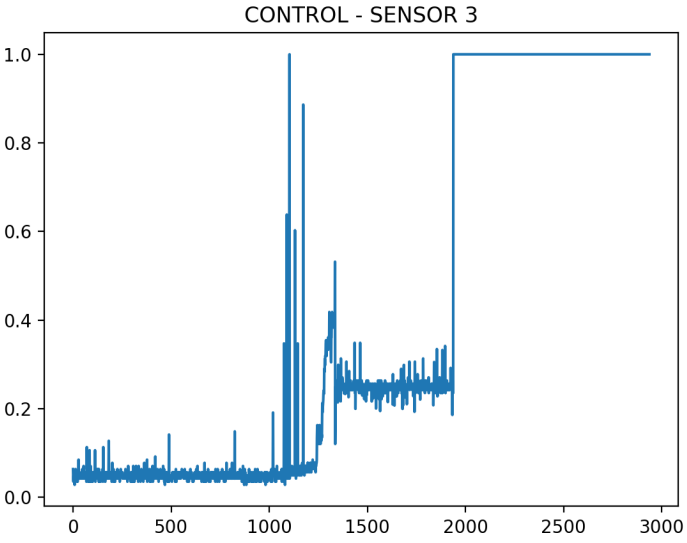
In cross referencing with the timestamps in the logs and footage from the livestream. We believe that the initial jump in slosh is that of the motor burn, then there is a dip for a very brief moment (small vertical line in control sensors 1 and 2 in first peaks) that likely was the coasting after burn. Then another smaller peak for drogue, followed by a coasting with drogue which apparently became fairly stable, but was interrupted by the peak of main chute deployment, and finally calmed down until landing firmly on the ground.

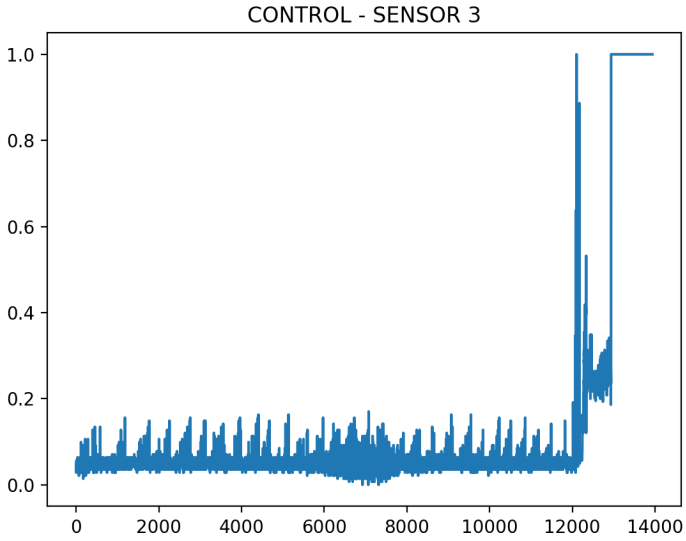






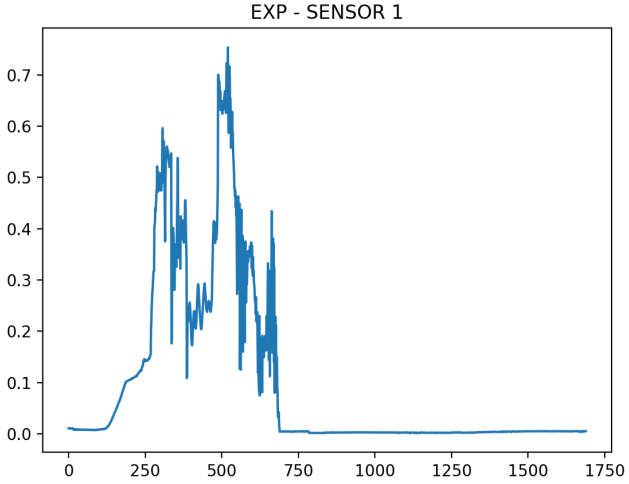






EXPERIMENTAL DATA

The following is our data for the container that was being interacted with by the motor and RNN. One major support to our goal, is the observation of our experimental container's data was kept at sloshing levels more stable throughout the entire flight, notice the fact that the peak at main burn flight and the peak at main deployment are closer in relative height, considering that in the sensors for control, during flight the water sloshed out of control and produced some maximal peak at the same point in according to each sensor. However the experimental water containers were kept within closer bounds during the entire flight never achieving a clear maximum moment. Also, since in the controlled data, the burn always seemed to give the largest peak readings, seeing that the experimental data had higher peak sloshing forces at other flight events seems to indicate that the levels of sloshing between the two cups were different, whether that actually means it was less or more stable, is a good point to investigate further.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0.7
0.6
0.5
0.4
0.3
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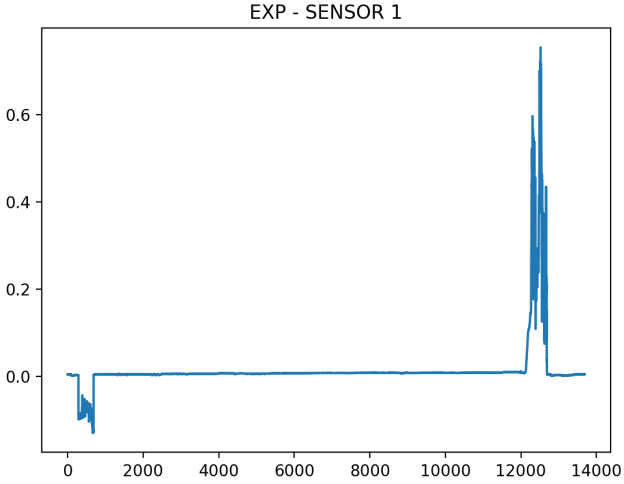
0.1
0.0
0
250
500
750
1000
1250
1500
1750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6000
8000
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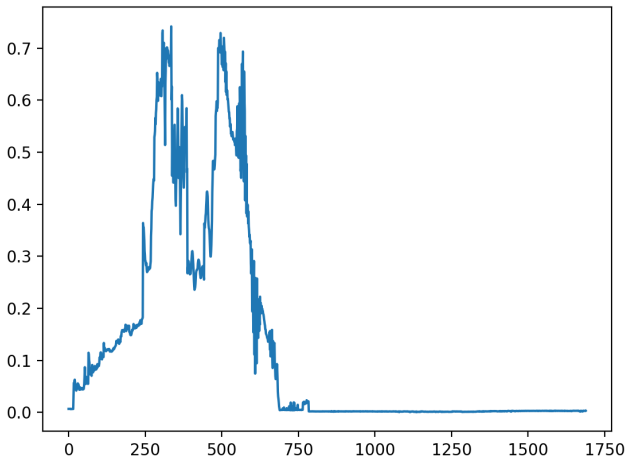
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0
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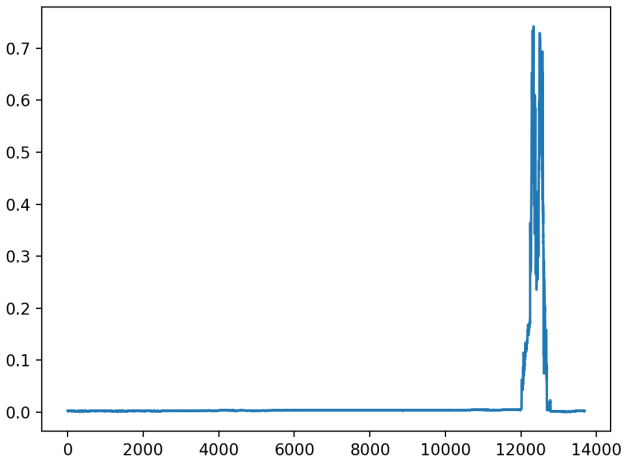
750
1000
1250
1500
1750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8000
10000
12000
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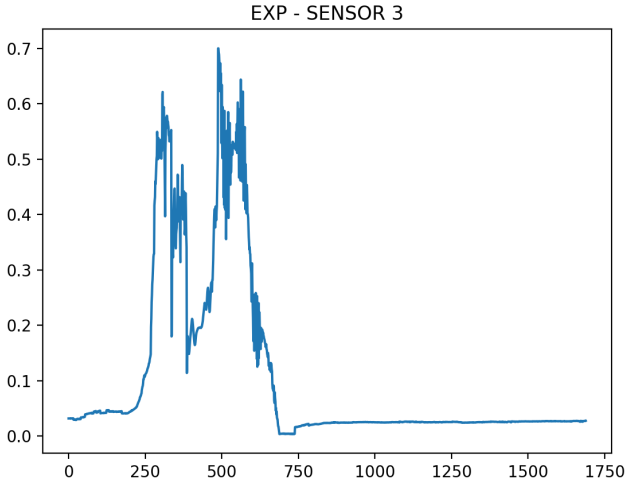
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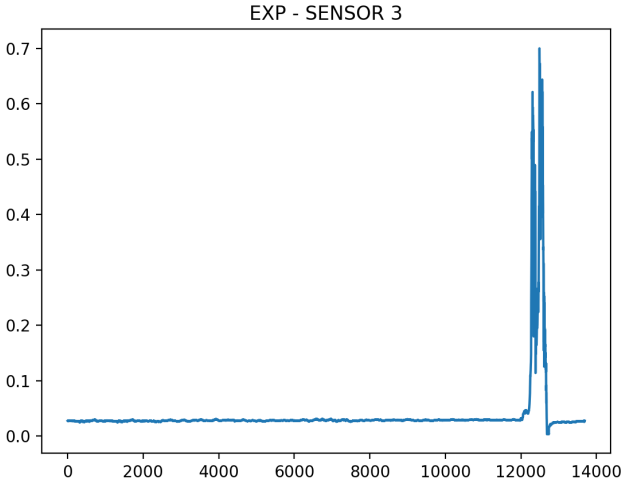
1500
1750


EXP - SENSOR 3
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0.0
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8000
10000
12000
14000