Post-Launch Assessment Review

Student-Led Observations of Sinusoidal Hydrodynamics

(SLOSH)

NASA Student Launch 2025 for Middle and High School

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Full vehicle as flown

Vehicle Summary

Motor and Rocket Construction

Our vehicle flew on an AeroTech K-1103X motor with a total impulse of 1,789 Ns and a static stability margin of 4.23 calibers, with a predicted maximum velocity of 612 ft/s and rail exit velocity on an 8' 1010 launch rail of 87.7 ft/s. The predicted apogee was 4,688 ft, and the target apogee was 4,500 ft. Our rocket was constructed using 4" fiberglass tubing and a wall thickness of 0.06 inches. Fins were made using ⅛" G10 fiberglass, and our motor mount featured a 54mm fiberglass tube, along with a screw-on retainer. Our nose cone was bought off the shelf from Wildman Rocketry.

Recovery Systems and Payload Bay

Our vehicle used a dual-deployment recovery system, using two PerfectFlite Stratologger CF flight computers for redundancy. Our primary flight computer fired its charges at apogee for drogue and at 700 ft for main, with our backup flight computer firing its charges one second after apogee for drogue, and at 600 ft for main. The upper section of our rocket featured a payload retention system for our scientific experiment, which was held in place by stainless steel tie rods that minimized any movement to maximize the accuracy of the data collection system. The avionics bay, also located in the upper section, housed the flight computers, EggFinder GPS tracking transmitter, and payload battery.

Payload Summary

Design

Our payload was designed to determine the most effective mitigation style for fluid sloshing, using internal baffles. Our experiment, Student-Led Observations of Sinusoidal Hydrodynamics (SLOSH), consisted of three water-filled tanks in the upper section of our rocket. Our primary objective was to determine the effectiveness of two baffle designs—vertical and raised grid—in minimizing fluid sloshing during flight. Two of the tanks contained baffle designs, and the third acted as a control tank, with no baffles. Data was collected by three Runcam Hybrid 2 cameras, one mounted on each module, which recorded water sloshing during flight. The tie rods also secured the vehicle's avionics bay, contained within the coupler, which housed the two flight computers responsible for the recovery sequence, a GPS tracker, payload, avionics batteries, and switches to arm the payload and avionics. Additionally, each tank module housed two sun shades on either side to prevent light from interfering with data collection.

Objective

The primary focus of our experiment was to quantify the degree of fluid displacement under dynamic conditions and to identify which baffle design best minimized sloshing. We analyzed the video data post-flight using column averages, standard deviations, and the derivatives of the column averages. By comparing the sloshing in the grid-baffled and control fluid tanks, we analyzed both tanks' performance in stabilizing liquid within dynamic environments. Unfortunately, due to a failure in the third tank's camera system, we could not compare the performance of the two dissimilar baffle designs during flight.

Success and Failure Modes

Payload

Success: During flight, the payload successfully collected and stored video data of the entirety of our flight. Using this, we were able to cut the footage to an appropriate length by correlating the time stamps with the flight computer, as well as the red flashing lights that activated two minutes after launch detection. We found that the baffle designs we tested minimized fluid movement. Each tank, mount, and camera was securely and safely installed and remained safely retained for the duration of the flight, and our payload was also able to run through significant delays on the pad.
Failures: The third module's camera on the payload did not record data, likely due to damage during integration. The impact also fractured the clear polystyrene on the two baffled modules, resulting in fluid leaking from the tanks after touchdown.

Vehicle

Successes: The vehicle had a stable flight path and consistent motor performance. The motor was securely retained. Our rocket remained stable throughout the flight, which was accurate to the simulated vehicle data.
Failures: After impact, the vehicle sustained damage to the fillets. The impact also resulted in multiple scratches to our rocket's surface.

Recovery

Successes: The drogue parachute deployed effectively at apogee, while the main parachute was programmed to deploy at 700 ft, ensuring a controlled descent. The use of redundancy in deployment systems provided reliability, and the careful packing and secure attachment of the parachutes contributed to their effective operation. Moreover, GPS tracking was successful, enabling our rocket's efficient recovery.
Failures: Our main parachute failed to inflate after deployment, resulting in a fast descent and impact speed. Additionally, there was a small hole in the main chute.

Data Analysis

Successes: Clear video footage of the tanks was acquired, and the assembly ensured a stable configuration for the flight. Data was accurately collected, and fish eye and tank parameters were successfully adjusted. The baffles were effective in mitigating slosh.
Failures: Throughout construction, we faced challenges with wire management and glare from the sun through the upper tube and from the white LEDs, which sometimes partially disrupted data analysis. Additionally, the third camera recording the vertical baffle tank failed to record during flight, so we did not get any data from this tank.

Flight Results

Vehicle Results

Overall Flight

Our vehicle's ascent was entirely successful. The vehicle accelerated to a maximum speed of 602 ft/s and coasted to an apogee of 4572 ft, 72 ft from our target altitude of 4500 ft. Our vehicle remained stable throughout the ascent phase and did not experience any significant oscillations or deviations from a straight flight path.

Ascent and Descent Metrics

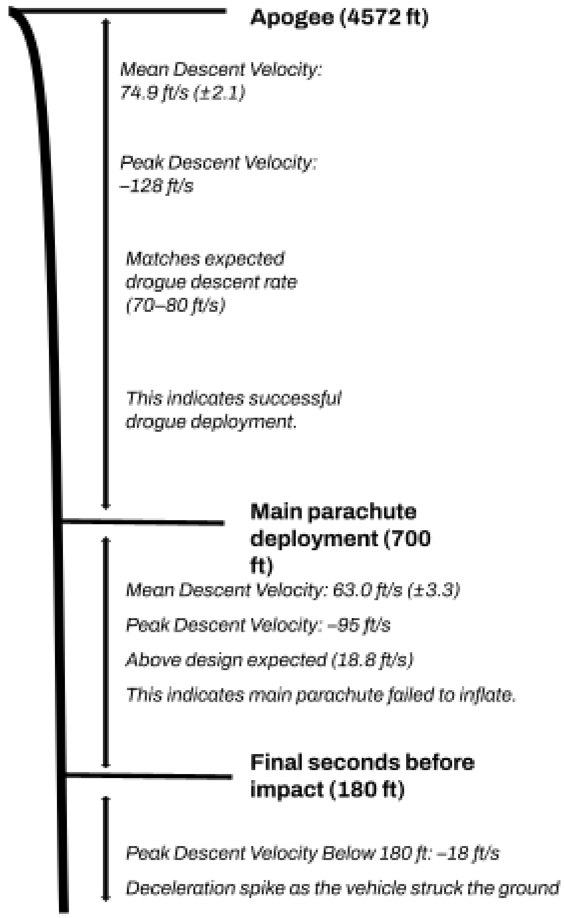
Our recovery sequence was nominal throughout drogue deployment, with evaluations from the flight computers and visual data pointing to a successful detonation of drogue charges. Although both flight computers recorded spikes at ~700 ft, the descent rate did not decrease to the expected 22 ft/s descent rate for our club-manufactured 66” toroidal main parachute.

Descent Analysis

Descent data indicates that the recovery system performed nominally through drogue deployment, which provided sufficient drag, until the main parachute failed to inflate, resulting in a sustained ~50 ft/s (±12.0 ft/s) descent rate and a hard landing. Upon investigation of the site of impact, all deployment charges were fired. Both StratoLogger flight computers were sampled at 20 Hz (0.05s intervals), and our raw CSV flight data was analyzed and converted to ft-AGL and ft/s for calculations.

Measured Descent Performance

Mean descent rates are measured between each visibly marked checkpoint. Descent rates for the analysis can be referenced on the following chart.



Flight Data Analysis

Flight Performance

Event	Primary	Backup	Δ (Absolute)
Liftoff	0.55s	0.55s	0.00s
Apogee	17.00s @ 4572 ft	17.05s @ 4573 ft	0.05s
Drogue Deployment	17.00s	18.05s	N/A
Detected Main Deploy (≤700ft)	70.55s @ 697 ft	70.50s @ 694 ft	N/A
Touchdown	86.35s	87.55s	1.20s
Total flight time	85.80s	87.00s	1.20s

Statistic	Primary	Backup
Max ascent velocity	602 ft/s	607 ft/s
Avg drogue descent rate	74.8 ft/s	75.9 ft/s
Avg post-main descent rate	62.8 ft/s	63.1 ft/s
Max descent rate	128 ft/s	95 ft/s

The above tables show the vehicle's flight performance. The first shows event timing (seconds after the start of recording), and the second shows velocity. The tables confirm each phase of flight and the anomaly point.

Kinetic Energy at Impact

Our kinetic energy was calculated using the formula KE = $\frac{1}{2}mv^2$

Section	Kinetic Energy
Nose Cone	93 ft-lbf
Upper	582.5 ft-lbf
Booster	325 ft-lbf

Every section of our vehicle impacted the ground with a kinetic energy that violated the NASA requirement of 75 ft-lbf for each individually tethered section. This was due to our vehicle's high rate of speed prior to touching down, without a fully inflated main parachute.

Acceleration Profile

Extracted from flight data on the Primary Stratologger.

- **Peak acceleration (liftoff)**: 26.7 G (860 ft/s^2)
- **Peak deployment shock:** 11.8 G (380 ft/s^2)

To calculate the acceleration profile based on velocity data taken from the primary flight computer, we used the following formulas: (*where v_i is the velocity and t_i is time at index i)*

$$a_i = \frac{v_i - v_{i-1}}{t_i - t_{i-1}}$$

1. ***Instantaneous acceleration***:

2. ***Peak positive acceleration***: $a_{\max} = \max_{i \in [\text{liftoff, apogee}]} a_i$

3. ***Peak negative acceleration***: $a_{\min} = a_j$ *where j is the first index after apogee with* $v_j < 0$

4. ***Average ascent acceleration:*** $\bar{a}_{\text{ascent}} = \frac{1}{N} \sum_{i=\text{liftoff}}^{\text{apogee}} a_i$

   Taking the mean value of all the instantaneous accelerations during ascent

Failure Analysis

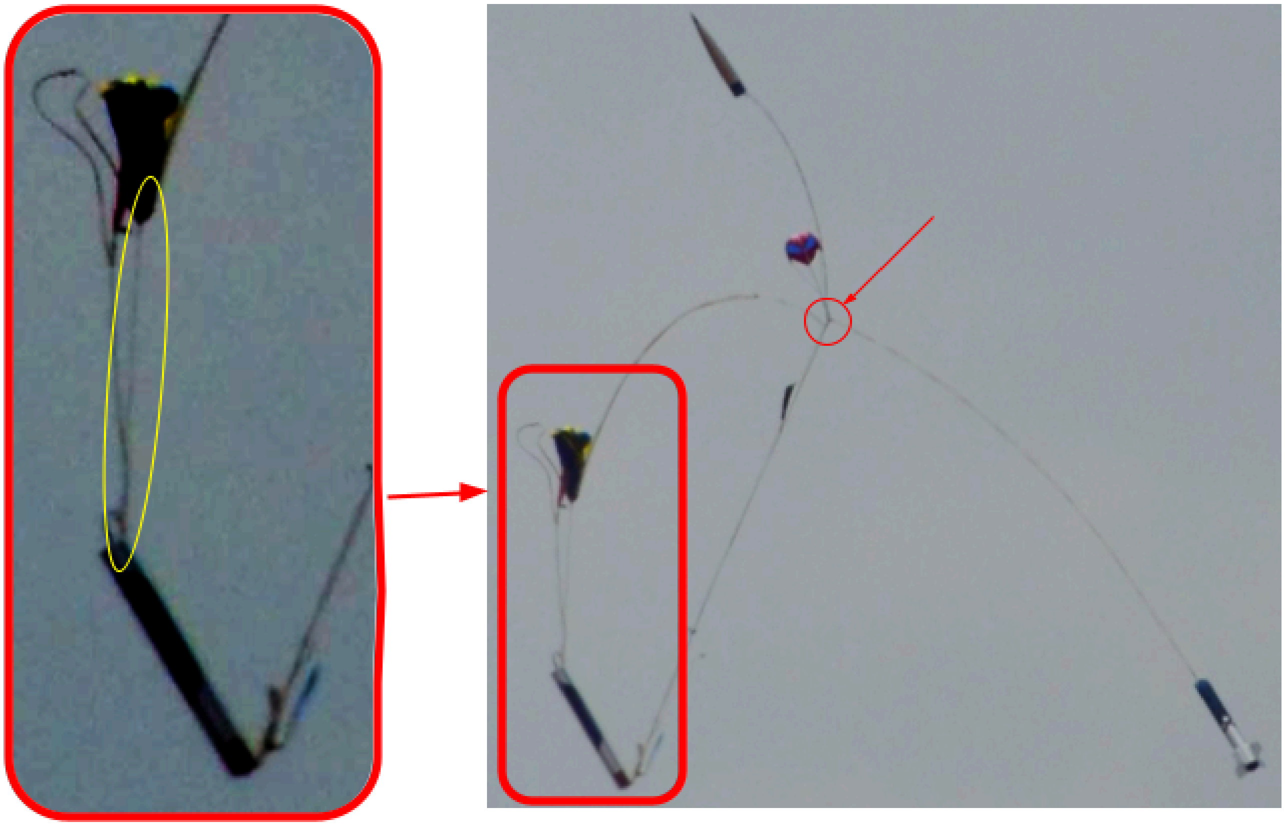
Evidence Summary

- **Flight data:** Both flight computers logged spikes at 70.0 (±0.05)s after launch, confirming the firing of the main charge. No step-change in velocity followed, and the mean descent rate dropped from 75 ft/s to ~63 ft/s, instead of the expected 22 ft/s.
- **Ground imagery**: In-flight photos from the ground suggest the main chute did not inflate, with the main shock cord twisted around the drogue shock cord. In our series of deployment images, it appears that after deployment, the shock cords twisted around each other, with the drogue cord eventually ending up across the main parachute's shroud lines, preventing it from fully inflating. Additionally, the e-match wires we used appeared tangled with the main chute, further preventing it from inflating.
- **Hardware inspection**: Shear pins sheared cleanly; no scorching or damage to ejection bulkhead; black powder residue present and charges deployed, with the chute fully deploying, but not inflating post-deployment.

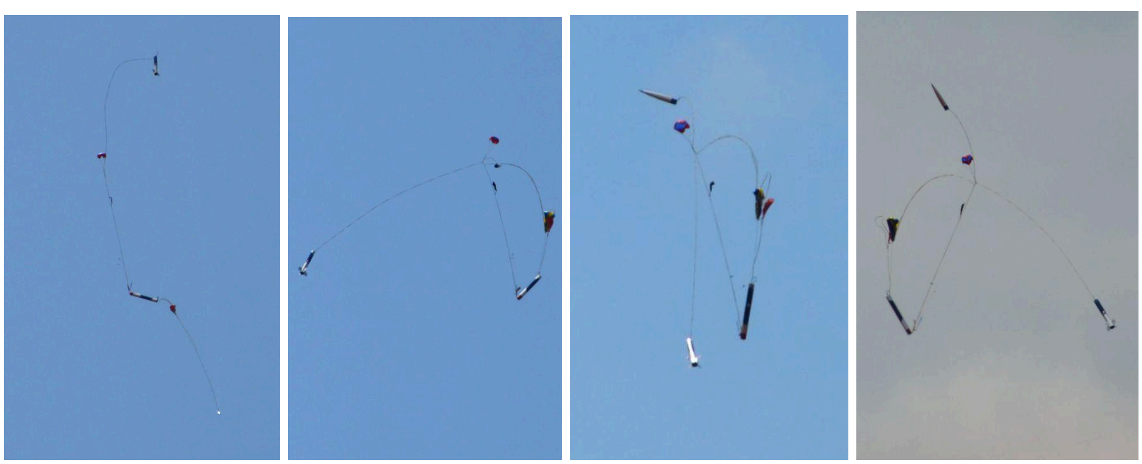
Failure Cause Analysis

Level	Cause	Rationale
Contributing	E-match wire entanglement around the main shock cord or shroud lines.	Visible in photo evidence, possibly tangled with the main cord. Also, the wires were excessively long, likely a contributing factor.
Root	Tension created by the initial descent and misfortune in entanglement.	Main shock cord tangled with drogue shock cord in post-launch on-site assessment, ground images show entanglement.

Symptom	Evidence	Probable cause
Main fails to inflate	No velocity inflection, photographic analysis.	Shroud line entanglement around the nose cone harness, tangling with deployment charge leads.
Charge fired nominally	The firing current peak has been recorded on both flight computers.	Charges checked at recovery, all deployed.
Redundancy proven in backup flight computer	Both flight computers reported nearly identical data.	Rules out a flight computer reading error.



In-flight photos after main chute deployment, tangled and visibly not inflated. Cc: Patrick Morrison.



Entire main deployment sequence, shock cords twisting and overlapping. Cc: Patrick Morrison.

Recovery Photos

Photos taken during vehicle recovery

Raw Flight Computer Data

Our vehicle was equipped with two PerfectFlite StratoLogger CF flight computers, which provided precise altitude measurements in intervals of 0.05 seconds (20 Hz) throughout the flight. They recorded velocity data, apogee, and parachute deployment times. The following data was collected directly from the flight computers.

Primary Flight Computer Data

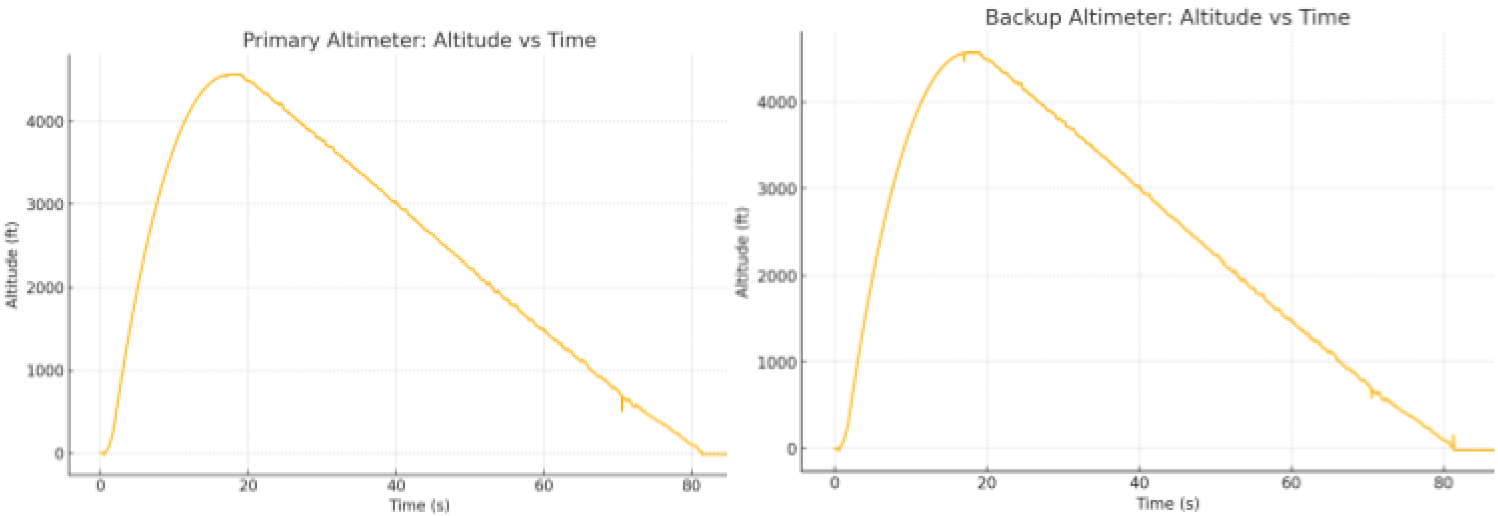
- Apogee reached: 4572 feet
- Drogue parachute deployment: ~1.95 seconds after apogee, inflation at 4559 feet
- Main parachute deployment: 697 feet at 70.0 seconds
- Descent rate under drogue: 72.6 ft/s
- Descent rate under main: 62.8 ft/s
- Touchdown detected: 85.8 seconds after liftoff

Backup Flight Computer Data

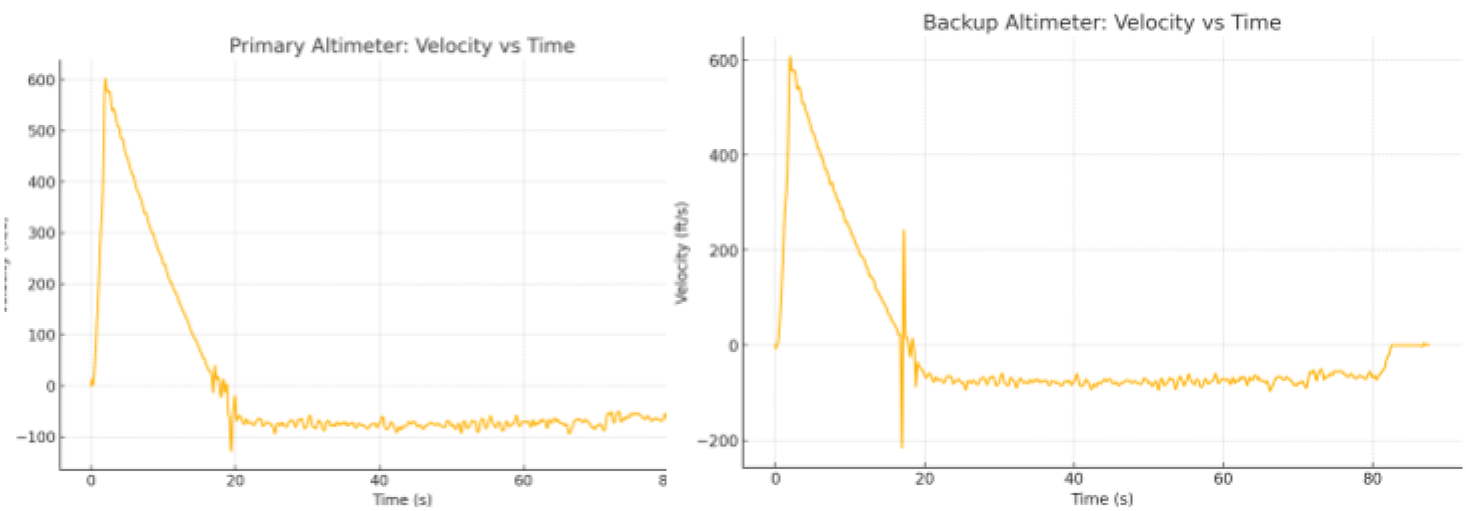
- Apogee reached: 4573 feet
- Drogue parachute deployment: ~0.3 seconds after apogee, inflation at 4568 feet
- Main parachute deployment: 694 feet at 71.15 seconds
- Descent rate under drogue: 73.8 ft/s
- Descent rate under main: 63.1 ft/s
- Touchdown detected: 86.9 seconds after liftoff

Both the primary and backup flight computers provided redundant measurements for flight data analysis. Any discrepancies between the two were analyzed to retain data accuracy, and the final recorded values were based on the most consistent dataset.

Flight Profile Plots



Altitude Versus Time Flight Profile Graphs



Velocity Versus Time Flight Profile Graphs

Data Analysis and Vehicle Results

Our vehicle was designed for consistent and predictable flight performance through simulations and test flights. The data analysis of the competition flight focused on performance metrics like altitude, velocity, acceleration, and descent rates. This analysis was conducted using two onboard PerfectFlite CF Stratologger flight computers and an EggFinder GPS tracking system.

Vehicle Performance Analysis:

- Apogee: 4573 ft
- Maximum velocity: 602 ft/s
- Average drag coefficient of drogue parachute: 1.64
- Average drag coefficient under main: N/A (Main parachute failed to inflate)
- Flight duration: 86.3 s
- Descent time: 62.1 s
- Drift: ~500 ft

Our vehicle maintained structural integrity for most of its flight profile, sustaining minor damage to its fin fillets upon landing. Our ComSpec RDF Tracker remained transmitting throughout the flight, but the EggFinder GPS Tracker failed to transmit data after landing. This was likely due to the high impact velocity of the vehicle, which could have damaged the transmitter. The transmitter was checked and functioning nominally in the moments leading up to launch, so the failure occurred during the flight and descent of the vehicle.

Data Analysis and Results of Payload

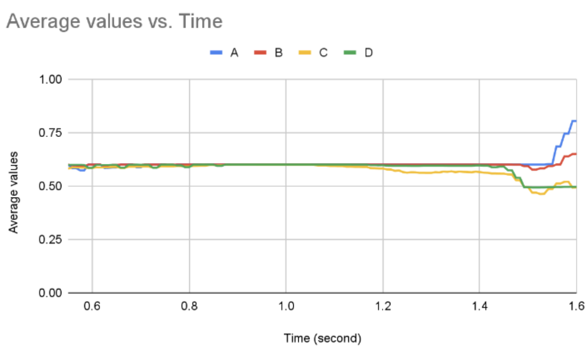
The following is graphs and tables of data collected using an analysis of the 120 fps video feed from each payload tank that worked (vertical baffle camera data failed).

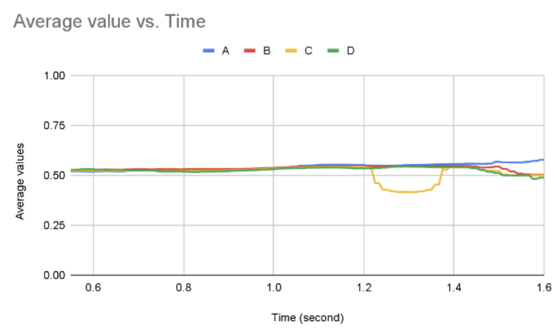
Visual Data Analysis:

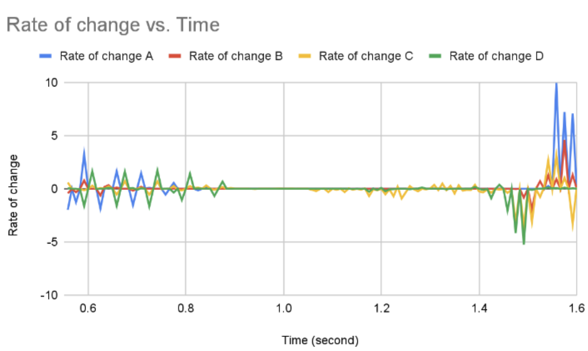
Control tank

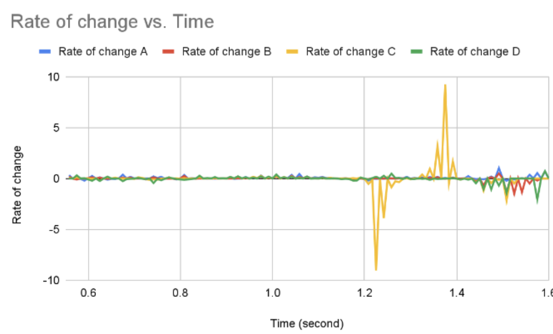
Grid tank

Boost





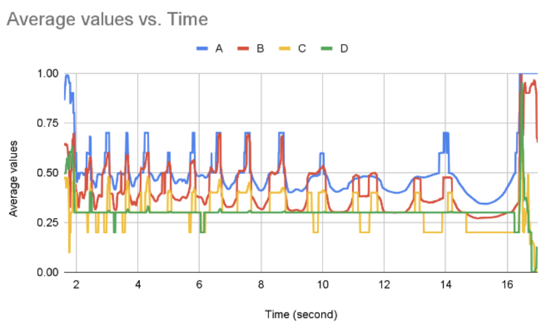


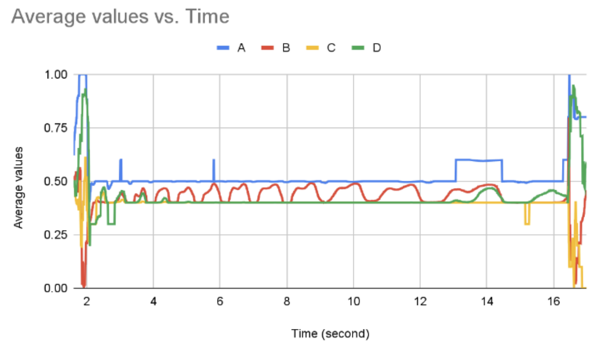


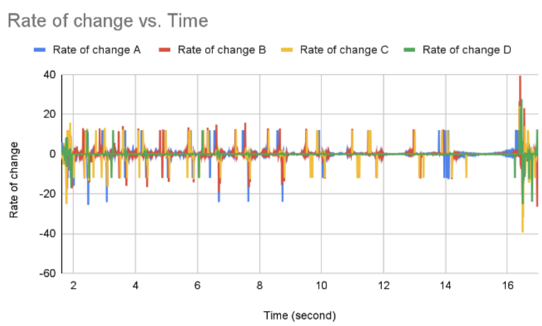
Control tank

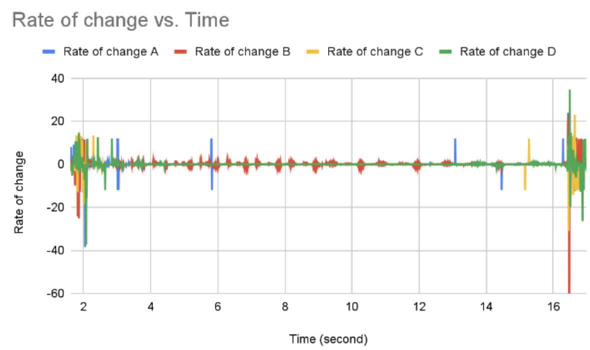
Grid tank

Coast







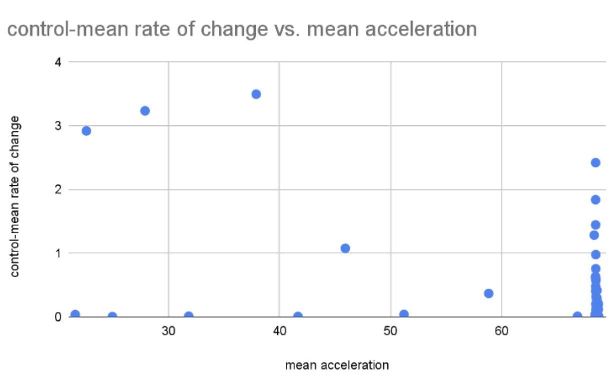


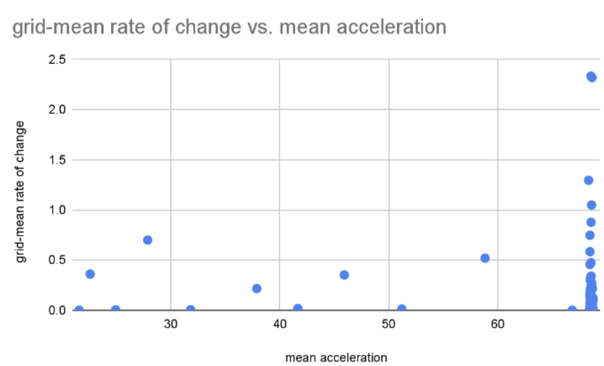
Average Values/Rate of Change Versus Time Graphs

Control tank

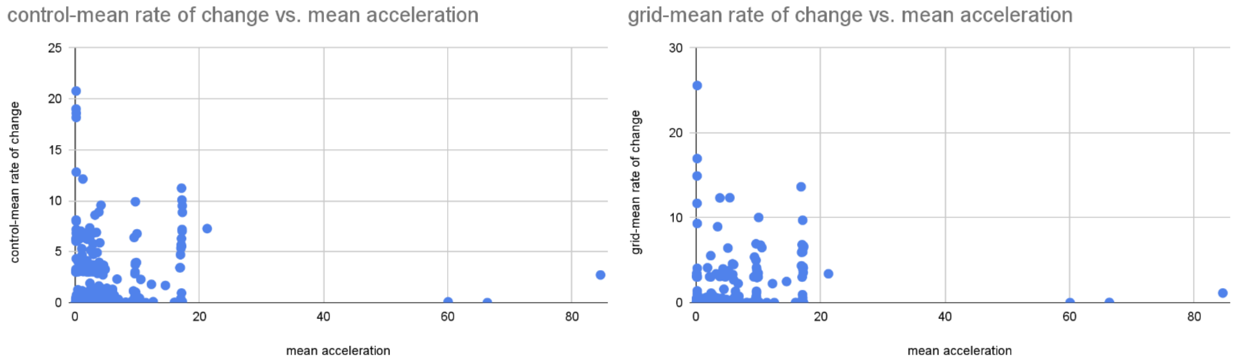
Grid tank

Boost

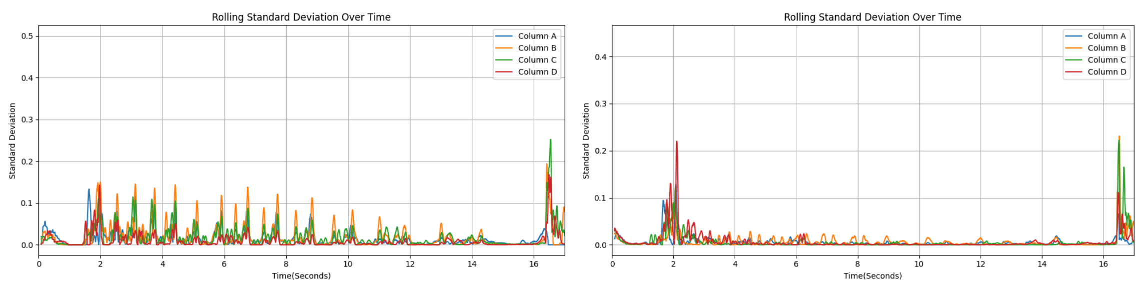




Coast



Mean Rate of Change versus Mean Acceleration Graph



Standard Deviation versus Time Graph

Data Table

Phase	Control tank		Grid tank	
	Standard Deviation of average values	Mean rate of change	Standard Deviation of average values	Mean rate of change
	Column A		Column A	
Boost	0.03325	0.3109	0.01553	0.08782
Coast	0.1418	0.5668	0.09460	0.1981
	Column B		Column B	
Boost	0.008915	0.1174	0.01089	0.08713
Coast	0.1355	0.7150	0.06851	0.3268
	Column C		Column C	

Boost	0.03329	0.2936	0.03638	0.3195
Coast	0.08226	0.6073	0.05931	0.2353
	Column D		**Column D**	
Boost	0.03286	0.2321	0.01340	0.1256
Coast	0.06483	0.2279	0.09325	0.2808

Mean Rate of Change and Standard Deviation of Average Values

Mean acceleration	Boost	Coast
x-direction	-1.1481	-1.095
y-direction	2.3516	0.4673
z-direction	-65.94	-0.1401

Mean Acceleration in Each Dimension of Each Stage

Data analysis

- We analyzed the data during the boost and coast phases separately. A total of 1975 frames (~16.45s at 120fps from liftoff to apogee) were analyzed.
- Average values of the fraction of each grid covered by water and the rate of change of said values were calculated and graphed over time.
- The mean rate of change and standard deviation of the average values were calculated.
- The average slosh reduction percentage was calculated using the equation: (control-grid)/control.
- The mean acceleration in each dimension was calculated for the boost and coast sections.
- The relationship between acceleration and fluid displacement was investigated by analyzing mean acceleration in conjunction with visual data.
- The standard deviation over time graph was created by iterating a standard deviation calculation function over the available data. Data iterations began at 0.08 seconds to ensure no statistical variation.

Results

- The grid baffle showed a 28% greater reduction in fluid sloshing overall, in comparison to the control tank.
- The average slosh reduction percentage across columns A and D is 32.68%, and the average slosh reduction percentage across columns B and C is 22.3%. This shows that the baffles have a greater effect on reducing slosh on the edge of the tank than in the middle. Therefore, the baffles have a greater impact on reducing the slamming effect of fluid on the tanks' walls.
- More significant slosh events occurred during the coast phase, with a greater variance in the average values and rate of change of the average values over time.
- Acceleration in the z-direction (up and down) changed significantly from the boost section to the coast section.
- No direct dependency relationship was found between acceleration and fluid displacement.
- The standard deviations vs. time graph shows the fluid movement over time in the baffled tanks had a singular spike in the standard deviations, whereas the non-baffled tanks had multiple spikes.

Visual Data Observed

Data Collection

Our SLOSH experiment produced clear and informative visual data, captured with the high-resolution Runcam Hybrid 120fps cameras inside each payload mount. The recorded video captures the fluid behavior within the tanks during the flight.

Data Observation Results

Our visual data validated our hypotheses about baffle performance and gave us an understanding of how slosh can be controlled under different conditions. The 1080p recorded footage allowed the data to be observed with high clarity, and the 120fps camera allowed for a detailed, frame-by-frame analysis.

Achievement of Scientific Value

Goal Achievement

We successfully achieved a major goal of the SLOSH experiment by collecting clear, accurate, and measurable data on fluid dynamics during flight. However, we did not achieve our primary objective—determining the effectiveness of two dissimilar baffle designs in reducing fluid slosh within water-filled tanks during rocket flight. We failed to accomplish this, largely in part to our inability to collect data from one of our fluid tanks. However, our experiment still holds value, as the control and grid-baffled tank successfully collected accurate and analyzable data on how each baffle design influenced sloshing behavior.

Our project contributed to a more advanced understanding of fluid management in dynamic environments–a concept directly applicable to fields in aerospace and engineering, where fluid stabilization is essential in fuel tanks, liquid storage, and other fluid-related systems.

Overall Experience Summary

General Involvement

Our participation in the NASA Student Launch 2025 was an educational experience, including, but not limited to, technical achievements, teamwork, and problem-solving. From the statement of work to the launch in Huntsville, we, as a team, immersed ourselves in a thorough engineering process, starting with a conceptual design, moving through detailed simulations, and after the construction, further testing and flights of our rocket. Throughout this journey, we developed and expanded critical skills in aerospace engineering, data analysis, safety management, teamwork, and STEM outreach, which played a significant role in the progress.

The Process

We brainstormed many ideas for the payload before settling on slosh baffles. After designing the vehicle to reach the set target altitude, while maintaining integrity and stability, we modeled and tested it using CAD and simulations like OpenRocket to create the designs, optimizing and refining them as we encountered various issues with the payload and vehicle. Additionally, the construction phase tested the team's technical abilities and challenged our problem-solving skills. We constructed our rocket with high-strength fiberglass and integrated a sophisticated recovery system, incorporating redundancy and a dual-deployment mechanism. During this phase, we put together a complex payload system for the SLOSH experiment, and after months of trial and error, settled on a payload design to integrate. Through testing, including real-life parachute simulations and multiple test flights, we refined our rocket to NASA Student Launch standards.

Our Takeaways

Our journey through this program was an interactive, engaging, and educational experience. It provided us all with engineering skills, real-world applications in problem-solving, an appreciation for the complexities of design, and much more. We all had a ton of fun through hardship and success, and will remember the skills we learned and our involvement in the program.

Lessons Learned

Testing is Essential: Multiple test flights revealed issues with the payload. Testing allowed us to identify and fix problems early to learn from the mistakes. For instance, the vehicle sustained a CATO on the first VDF flight, during which the motor nozzle ejected during takeoff, resulting in a target altitude 32% lower than we had hoped for. Rather than mentally viewing this as a failure, we analyzed the flight and payload data, leading to a change in payload weight distribution for better data collection.

Communication: Miscommunications among team members led to design errors and delays. Regular team meetings, clear role assignments, and structured problem-solving improved coordination and accountability.

Commitment to Safety: Throughout the design process, we learned to emphasize safety in the assembly and construction procedures. By prioritizing safety at each project step, we ensured the team's health and success.

Data Collection Skills: Our SLOSH experiment allowed us to gain and hone skills in advanced post-flight data analysis from high-quality video data, compare vertical and grid baffle designs to develop an understanding of the payload further, and use it to improve the design.

Documentation: Our team learned the importance of clear documentation during checkpoints in the journey. Developing documents as a team helped facilitate efficiency and collaboration during the writing sessions and helped us learn lessons and skills in teamwork.

Hours Spent on Student Launch

Team Member	Proposal	PDR	CDR	FRR	PLAR	STEM Engagement	Social Media	Launch Activities	Total
Total Person-Hours:	42	73	158	219	65	70	3	78	**708**

STEM Engagement Summary

We actively engaged in STEM-related outreaches as part of the project, sharing our knowledge and passion for rocketry and aerospace engineering with the community. Our team's STEM engagement efforts reached over 2600 students and community members in ten different outreaches, interacting through hands-on learning, presentations on past designs, and direct educational engagement. Through these outreaches, we fulfilled NASA's STEM engagement requirement, but more importantly, inspired a younger generation of students to explore futures in STEM-related fields.

Final Budgeting Summary

Our final budget totaled **$23,519.65**, covering all necessary expenses for construction, transportation, testing, payload development, project resources, and travel. This budget was managed through multiple fundraising methods, including fall raking, which raised over $9,000, bake sales, and community donations.

The following is our budget for the entire project...

Expense Area	Item	Size	Qty	Vendor	Unit Price ($)	Total Cost ($)
Scale Vehicle	Centering Rings G10 Stock	1 sq ft	1	McMaster-Carr	29.38	58.76
Scale Vehicle	Drogue Parachute 5"	12" skirted drogue chute	1	Wildman Rocketry	39.95	39.95
Scale Vehicle	Fiberglass 2" Body Tubes	33"	1	Wildman Rocketry	52.27	52.27
Scale Vehicle	Fiberglass 2" Body Tubing for e-bay	1"	1	Wildman Rocketry	52.27	52.27
Scale Vehicle	Fiberglass 2" Coupler Tube	4.5"	1	Madcow Rocketry	17	17
Scale Vehicle	Fiberglass Bulkhead Stock G10	1 sq ft	1	McMaster-Carr	29.38	58.76
Scale Vehicle	Fiberglass G10 Fin Stock	1 sq ft	1	McMaster-Carr	29.38	58.76
Scale Vehicle	Fiberglass Motor Tube 29mm	10"	1	Mach 1 Rocketry	7.5	7.5
Scale Vehicle	Fiberglass Nose Cone 2"	2" diameter, 12" long	1	Madcow Rocketry	40	40
Scale Vehicle	Main Parachute 27" Toroidal	27"	1	Manufactured by club	0	0
Payload	Custom PCB	PCBs	5	JLCPCB	12	60
Payload	3D-Printed Parts	N/A	1	Self_Made	100	100
Payload	3s 18650 battery	0.7" diameter, 2.5" long/cell	2	Amazon	19.99	39.98
Payload	Adafruit BNO085 9-DOF IMU	1" x 0.75"	3	Adafruit	24.95	74.85
Payload	Data Gathering Custom PCB	2" x 2"	5	JLCPCB	12	60
Payload	LED lighting bar	2.76" x 0.39" x 0.12"	3	Adafruit	2	5.85
Payload	RunCam Hybrid 2	1.1"x1.1"	3	Amazon	99.99	299.97
Payload	22.2V 6S 6000mAh 100C LiPo Battery	6.10" x 2.09" x 1.89"	1	Raceday Quads	130	130
Payload	Wire Connectors	1.62" x 0.32" x 0.32"	1	Anderson Powerpole	30	30
Full Vehicle	Drogue Parachute 12" Recon	12"	1	Wildman Rocketry	31.95	31.95
Full Vehicle	Eggfinder complete package	1	1	Eggfinder	155	155

Full Vehicle	Fiberglass 4" Body Tubes	66"	1	Wildman Rocketry	141.27	141.27
Full Vehicle	Fiberglass 4" Body Tubing for e-bay	2"	1	Wildman Rocketry	141.27	141.27
Full Vehicle	Fiberglass 4" Coupler Tube	9"	1	Madcow Rocketry	33	33
Full Vehicle	Fiberglass Bulkhead Stock G10	1 sq ft	1	McMaster-Carr	29.38	29.38
Full Vehicle	Fiberglass G10 Fin Stock	1 sq ft	1	McMaster-Carr	29.38	58.76
Full Vehicle	Fiberglass Motor Tube 54mm	20"	1	Mach 1 Rocketry	30	30
Full Vehicle	Fiberglass Nose Cone 4"	4" diameter, 24" long	1	Madcow Rocketry	97	97
Full Vehicle	Main Parachute 66" Toroidal	66"	1	Manufactured by club	0	0
Full Vehicle	Tubular Kevlar Shock Cord	38' of ⅜"	2	Giant Leap Rocketry	107.66	107.66
Full Vehicle	Centering Rings G10 Stock	1 sq ft	1	McMaster-Carr	29.38	29.38
Launches	Full-Scale Motor (Aerotech K1103X)	2.1" diameter, 15" long	5	Aerotech	167.99	839.95
Launches	Scale Model Motor (Aerotech G138)	1.1" diameter, 4.8" long	2	Aerotech	31.99	63.98
Launches	Test Launch Site Fees	N/A	5	Tripoli Wisconsin / NAR	15	75
Travel/Transport	Flights	Economy Tickets	16	American Airlines	606.78	9708.48
Travel/Transport	Lodging	5 Rooms	3 N	Embassy Suites	515	7737.86
Travel/Transport	Rental minivans for transport in AL	2 SUVs	6 days	Budget Rentals	408	2453.79
Travel/Transport	Other Costs					600
Total Cost						**$23,519.65**