EXPLORER POST 1010
POST-LAUNCH ASSESSMENT REVIEW

April 29, 2022

Team Name
Organization: Explorer Post 1010
Name: Flamingos

Motor
Cesaroni J357-14

Payload Description
Autonomous guided parafoil. After deployment, the lines of the parafoil are controlled to turn the payload section in the correct direction.

Vehicle Dimensions
69.685” long, 4” diameter

Altitude Reached
3513ft

Official Target Altitude
3750ft

Date of Flight
April 9, 2022

Location of Flight
Culpeper, VA (Tripoli Central Virginia Rocketry Club)

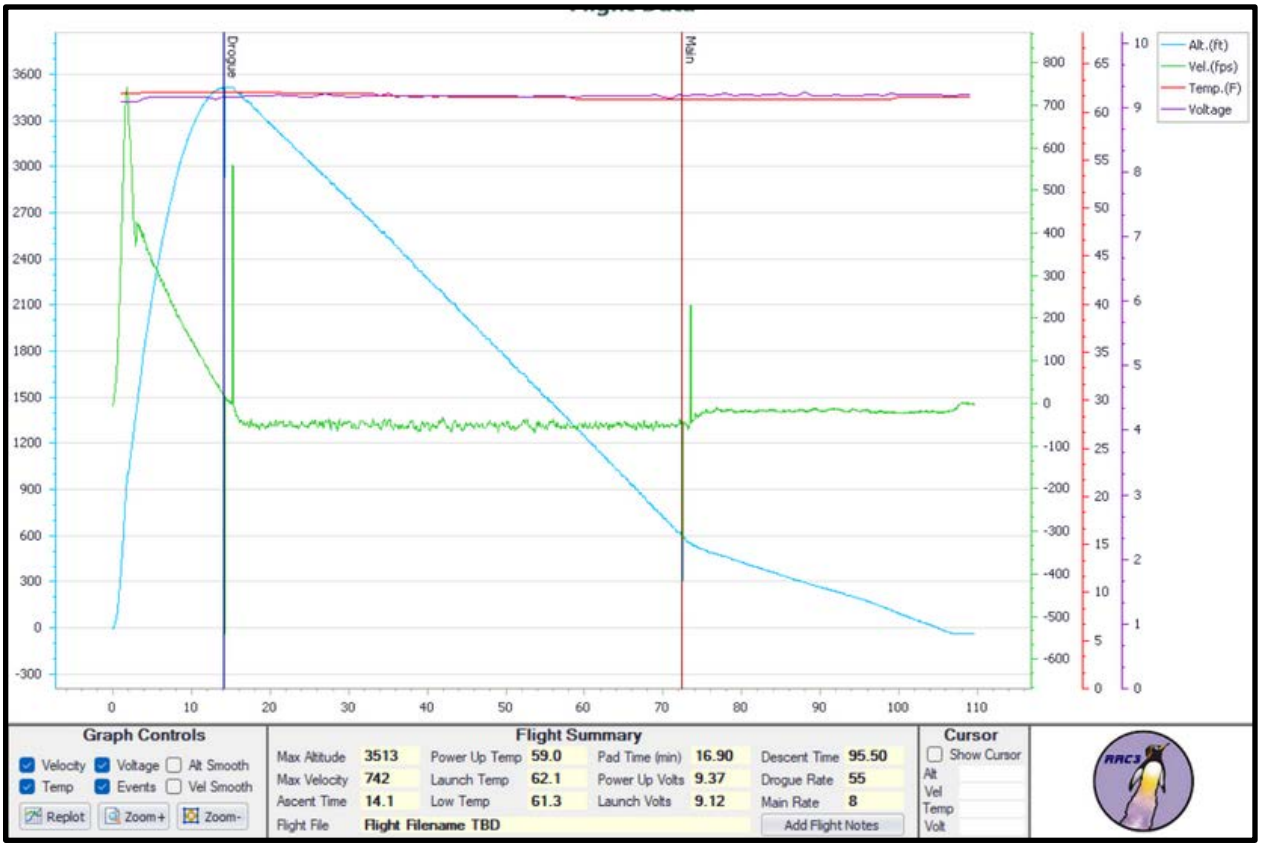
Other Flights
This is the fourth flight of our full-scale SLI rocket for 2022.
https://www.youtube.com/watch?v=tL2wY4uEGYw

Flight 1, Vehicle Demonstration Flight, February 12 – good flight
https://www.youtube.com/watch?v=lKMzuLIayEM

Flight 2, Payload Demonstration Flight, March 27 – payload deployment issue
https://www.youtube.com/watch?v=Y4CeAWdzo9c

Flight 3, Payload Demonstration Flight, April 2 – good flight
https://www.youtube.com/watch?v=hU8hdmgVB7Q

Altimeter Flight Data



Vehicle Summary

Size and Mass of Individual Sections

Upper Section: 4 in diameter, 24 in long, mass of 1.9 pounds.
Lower Section: 4 in diameter, 28 in long, mass of 1.8 pounds not including motor
Middle Section: 4 in diameter, 20 in long not including coupler, mass of 2.5 pounds.

Recovery system

The lower section is recovered by a 12” drogue chute and a 36” main parachute. The payload section is recovered by a guided parafoil.

Rail Size

1010, 96 in

Data Analysis & Results of Vehicle

- The igniter misfired before launch and had to be replaced.
- The vehicle flew straight and was stable during flight.
- The vehicle reached an altitude lower than the 3750ft target, but above 3500ft.
- Upon descent, one of the fins cracked.

Payload Summary

Our payload is an autonomous guided parafoil. Upon deployment, the rocket's GPS location is fetched and compared to the target GPS location to determine how the parafoil should steer. To steer, we use a servo to pull in/let out one line of the parafoil.

Data Analysis & Results of Payload

Immediately after deployment, an extension knot on one of the brake lines of the payload broke. The parafoil was not kept under tension and could not turn during descent due to the broken line. Despite this, from our second payload demonstration flight, we observed that the payload can turn and work under similar launch conditions.

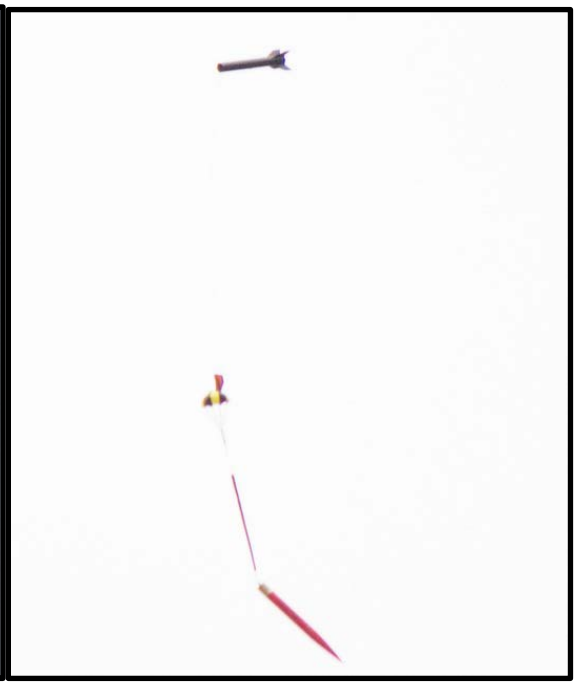
Scientific Value Achieved

The payload demonstrated that a descent guidance system could be built from low cost, off-the-shelf components. We believe with a little more development, we can have a payload fly back towards the launch site.

Visual Data Observed

The parafoil could be observed throughout its entire descent. We observed the rocket elements separate nominally with the main parachute and tracked both sections as they descended.

Payload during descent with a loose brake line



Rocket descending under drogue

Lessons learned

- We should have been more time efficient at building the payload and the rocket simultaneously.
- We should have followed a pre-prepared checklist more rigorously.
- We should not cut corners. For example, the entire brake line should have been replaced instead of being extended by a knot.
- It is important to check things before we go to launch to prevent having to fix it at the field.

Summary of Overall Experience

We are very grateful to have had the opportunity to participate in SLI. It was our team's first time working with high-powered rockets. The construction of the vehicle was distinct from our previous TARC rockets. We had to use additional components like an electronics bay, charge wells, shear pins (and shear plates). We also used new materials for the team like thicker wood for the bulkheads/fins, thick-walled tubes, and epoxy. Although our payload did not work as expected on the final launch day it did work as expected on its previous launch, and building the payload was a useful engineering experience. In addition, we obtained valuable experience in drafting and editing reports and presentations to display our progress.

Time Spent

Activity	**Hours Spent**
Proposal	**15**
PDR	30
CDR	50
FRR	50
FRR Addendum	3
PLAR	6
STEM Engagement	40
Social Media	1
Launch Activities	100

STEM Engagement Summary

5 engagement events were held, reaching 152 students. Topics covered include rocketry, programming, material science, astrophysics, and nanostructures.

Final Budget Summary

The final budgeting breakdown is below. We did not encounter any budgeting issues during the project and were able to reduce costs in some areas by borrowing equipment.

Item	**Description** (If applicable)	**Quantity**	**Cost**
Cesaroni J357-14 Motor	Rocket motors	3	250
Rocket Body Tubes	4-inch diameter paper body tubes	2	50
Coupler	4-inch coupler	1	8
Subscale Rocket Body Tubes	2.6-inch diameter paper body tubes	2	25
Main Parachute	36 inches	1	107

Drogue Parachute	15 inches	1	40
Parafoil	Ram-Air System	1	60
Payload GPS Unit		1	10
Featherweight GPS		1	375
PCB Fabrication		N/A	60
Jumper Wires	Male to Male and Male to Female Package	1	10
Teensy 4.1	Microcontroller	1	30
Servo Motor	Pulls Parafoil Lines	1	15
Batteries	9 Volt; Powers Electronics	2	40
Electronic Bay Sleds	For Main &Sub-scale Rockets	2	60
Altimeter	RRC3 “Sport”	2	150
Nose Cones	For Main & Sub-scale Rockets	2	50
Plywood	For fins & bulkheads	N/A	19
Epoxy	15-minute, 30-minute	2	35
Maintenance Expenses	General Repairs and Replacements	N/A	200
TOTAL			1594