# Cedar Park Homeschool

Post-Launch Assessment Review (PLAR)

## Motor/Flight Results

We Used the CTI K600 as our motor for our launch and our rocket went 5483 feet into the air. The flight was straighter than we expected and there was almost no weather cocking.

## Launch Vehicle

Body tube: We used a 4 inch diameter fiberglass body tube that was 5 feet long total that we are using for our top and bottom body tubes, they are secured together by a 9in length coupler that is connected by 3 #2 shear pins, the top body tube is 711.2 millimeters (2 feet 4 inches) in length and the bottom body tube is 914.4 millimeters (3 feet) in length.

Nosecone: Our nose cone is made out of G10 with a fiberglass shoulder and aluminum tip. It has a wooden centering ring with a bulk plate that is attached with 8 screws and holds the payload inside. The shoulder is 4 inches (101.6 millimeters) in length.

Fins: We have 4 G10 Fiberglass clipped right triangular fins with a thickness of 2.1mm, root chord and sweep chord lengths are 203.0mm, they are surface mounted and held on with west epoxy 105 and 206 fillets, the fins have a layer of carbon fiber over them to help strengthen them.

Centering rings: Our centering rings are made out of G10 and we had them custom made to fit our tube. They are 2.1 millimeters in thickness and are the width of a coupler and the inside diameter is 54 millimeters to fit our motor mount.

Bulkheads: We have Bulkheads made of G10 fiberglass that have a diameter of just under 101.6mm so that they can fit inside our body tubes and a width of 2.1mm, there are 2 of them close to the top of the bottom body tube about 3 inches from each other, there is a U-ring on the one closer to the top tube facing up with a quick link on it so we can connect it to the parachutes, they are also securing the motor tube by putting a Kevlar cord through a hole in both bulkheads and on the edge of one of the centering rings around the motor tube then securely tying off both ends.

Rail buttons: We have two 10/10 rail buttons 8 inches apart from each other attached to the bottom section. The first rail button is ¾ of an inch (19.05 millimeters) from the underside of the bottom section of the rocket. And the second rail button is 10 inches and ¾ of an inch (273.05 millimeters) from the underside of the bottom section of the rocket.

Motor mount: Our motor mount is a 7 inch (177.8 millimeters) section of a 54 millimeter tube. There is a centering ring attached to both ends of the tube the size of a 98 millimeter coupler and a centering ring fastened to one end of the tube the size of the inside diameter of the 98 millimeter tube and it rests up against a piece of coupler glued to the inside of the very bottom of the rocket. There is a piece of Kevlar fastened to the top centering ring the we then thread through the entire bottom section of the rocket and tie to the U-bolt at the top of the bottom section of the rocket. And twist the motor mount till it is held tight to the bottom of the rocket.

Piston: Our piston is 4 and ½ inches (114.3 millimeters) in length and is made out of a section of coupler for the 98 millimeter tube. There is a bulk head glued inside the piston with a 44 inch (1117.6 millimeters) section of 11/32 Kevlar running through the middle of the bulkhead.

## Payload

Design

The payload is a hollow 11.25 in length Fiberglass tube with a circular neodymium magnet attached to the bottom and top of it, the tube is outside of a 8.5 in length PVC tube with caps on each end and circular neodymium magnets secured inside each cap, the payload pod was placed in the top of the nose cone through a centering ring then the centering ring was covered with a wood bulkhead that has 6 screws going through it, There were two accelerometers, one in the middle of the interior tube to measure the supposedly dampened forces and another accelerometer mounted outside the tubes to measure the undamped forces.

Results

After the launch, we checked inside our nose cone to see how our experiment went and we discovered that the bottom and top caps on the payload outside tube were not attached to the tube anymore. The epoxy on the bottom cap had managed to break off whenever the rocket launched and the nylon screws on the top cap had disappeared. The wires on our accelerometers were broken so unfortunately we are unable to know the exact acceleration of the inside and outside tubes during the flight but we do know that the acceleration was strong enough to make magnets touch that each have 112 lbs of holding power hard enough to break epoxy and then go up in the other direction and break off nylon screws.

Summary of Overall Experience

We enjoyed being a part of NASA SLI this year, we learned what it is like to work on a project from start to finish, how to design a working rocket that will fly safely and then build that rocket, some coding and soldering from our payload electronics, and what the actual people working at NASA do and what their current goals are. Our rocket went higher than we expected, we thought that it would be 75-100 feet under our goal height. We didn’t expect that our payload tube wouldn’t be strong enough to handle the launch and it is unfortunate that because of that we were not able to record the accelerations of our tubes. We feel that the experience was very valuable because we learned things much closer to real life experiences of working with NASA than anything else we are able to do at our age, hopefully we will be able to finish with a team of more than two people if we do decide to do the NASA SLI next year.

Educational engagement Summary

We went to the Girl Scouts Homeschool STEM club on Friday October 28th 2016 and talked about our rocket, previous rockets the Cedar Park TARC team built, what NASA SLI and TARC are, and the kinds of things people to know that want to do TARC or NASA. And then showed them various pieces of rockets and of our rocket design

Budget Summary

Parts We Paid For:   $1907.57 2 vehicles 1670miles each x $0.54 / mile = $1803.60

Jarvis Provided Parts:  $800 Hotel:  $553.05 x 4 rooms = $2212.20

Total cost: $6,723.37 (including parts provided by Mr. Jarvis)