Student Launch Projects Post Launch

Harvard-Westlake High School

Team Information

Name: Harvard-Westlake

Team Members: Ian C (captain)

Chase B

Monica C

Gabriel D

Spencer G

Brendan K

Richard L

Andrew W

Team Mentors: Mr. Hazard

Ms. Hutchison

Rick Dickinson (NAR L3)

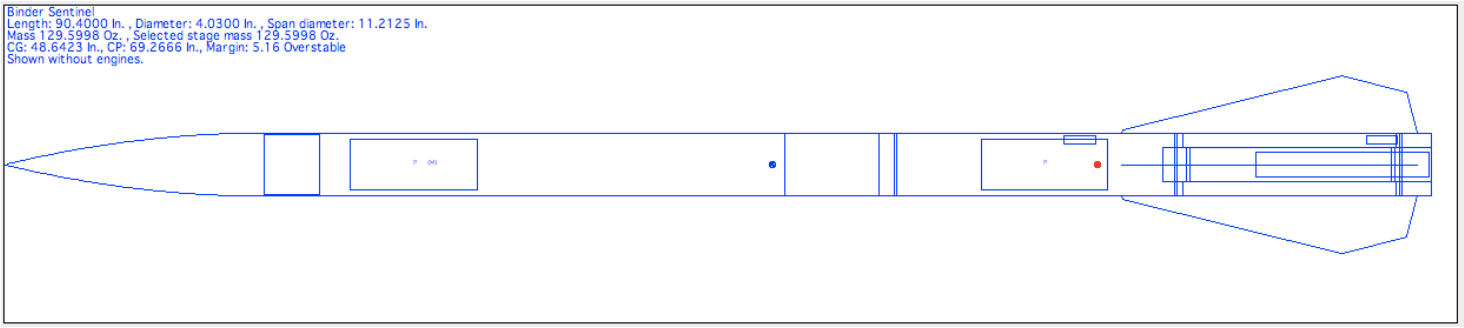
Vehicle Information

Motor: AMW K455

Height: 90”

Diameter: 4”

Weight: 20lbs



Apogee: 6000 feet (ARTS2 reporting)

5632 feet (PerfectFlite HA45K reporting)

Flight Analysis: The rocket experienced a near perfect liftoff, moving faster than expected. It hit apogee at about 5700 feet.

Brief Payload Description: Our payload was a pipette of the bacteria *Lactococcus lactis*

Payload Summary: Our payload was a sample of bacteria. The sample was drawn up into a plastic pipette. The pipette tip was scored so as to seal it and then held tight with a rubber band, and then wrapped in foam to protect and then deposited in the rocket. We took photographs of the sample before the flight, and then after the flight and compared the two. This was then compared to a control sample left on the ground. The difference in bacteria in each sample at the end of the flight could be used to determine difference in growth rate. Using this data, we examined the effects that the rocket's acceleration had on the growth rate.

Vehicle Summary: At around 5700 feet, the PerfectFlite altimeter deployed its main (1.5gram) black powder charge, releasing the 48" drogue parachute. One second later the ARTS2 deployed the 2gram backup charge. At 500 feet AGL the PerfectFlite ignited the primary 1 gram charge but the main did not deploy. The ARTS2 backup charge did not ignite, so the rocket landed on a single 48" parachute. Due to earlier safety

precautions and countless simulations, the single 48” chute brought the rocket down to a safe landing – no harm was done.

Results of Vehicle: The rocket accelerated to 536 miles per hour and pulled 27 g’s, enough to kill a human 3 times over (humans generally black out at 4-5 gees and die at 9).
The rocket survived without any damage.

Data Analysis,

Results of Payload: The procedure of analyzing lactococcus lactis was planned out by examining the visual data before and after flight. By examining the sample through a microscope, pictures could be taken to see what effect the altitude had on growth rate or mortality rate. We took pictures before the flight and confirmed that the before pictures were normal. Unexpectedly the pictures of the after sample were not of mostly dead cells but rather enlarged flattened cells. So while we attempted to examine the effects of the altitude, it seems that the acceleration of the rocket itself immediately killed the cells.

Scientific Value: By completing this experiment, we hope to obtain results of how space flight affects cells. Therefore, in future experiments, organizations would know the problems that need to be fixed before launching scientific experiments into space. For example, while we believed that the experiment would be affected by the

altitude, in reality, the greatest factor that we failed to realize was the acceleration.

Visual Data Observed: Before the actual flight, the test samples were observed through a microscope and recorded. As expected, there were hints of bacteria in the sample. The cultures could be noted by the green black spots that upon closer investigation seem to be bacteria. After flight, we retrieved the sample only to observe that under the microscope that all the samples had become enlarged or perhaps flattened. The pictures taken clearly show that the amount of visual data increased after flight.

Lessons Learned: The most important lesson we learned was to get started early. Projects have a tendency to bunch up at the end. In addition, we will do more full scale flight tests in future years with the scientific payload installed. Also, we will use 0.5grams more of black powder than we expect we will need to insure deployment of both the main and drogue parachutes.

Summary of Experience: Overall, the trip and project were both very rewarding. Regarding the rocket, everything went smoothly. The rocket had an excellent acceleration and altitude and everything worked accorded to plan. The only exception was when the

main chute did not deploy. However, this ended up being beneficial as the rocket would have drifted too far and its decent was still slow enough. The data obtained during the flight turned out to defy our expectations yet provided a good amount of data for analysis.

In addition to seeing our rocket launch successfully, it was a great experience to simply be building the rocket and touring a NASA base. By building the rocket, with a specific scientific goal in mind, we had a taste of what real engineers and scientists do. Along the way, various challenges presented themselves and we had to work past them or negotiate a change in the rocket, just as a true scientist would. So this proved to be a valuable learning experience for all of us, seeing as we are all interested in this field.

Another fascinating experience was touring the NASA base and truly seeing what goes on. This gave us another look at what it was like to be a NASA employee, whether in human resources, engineering, or design. All parts are forced to come up with creative solutions to problems that constantly arise, such as the Faraday cage to protect the electronics or the friction stir welding for a more efficient welding system. Also, being given the chance to see parts of the space station or future rockets being built was very exciting for all of us, as was seeing the rockets or models of years past.

All in all, the entire trip and process beforehand proved to be extremely engaging and rewarding. It provided us with ideas for what

the future might be and opened us up to ideas that we would have been completely ignorant of otherwise.

Outreach Summary: With the Harvard Westlake math and science faculty, the Harvard Westlake Rocketry Club coordinated an outreach event. For the event, club members taught and helped middle school children how to build a model rocket. The event consisted of an hour class in which basics of rocketry (stability, center of gravity/pressure) were discussed. Over the next hour, students built their own low powered rockets and prizes were given out. Also, the club did pre-flight inspection at the Santa Fe Dam Recreation Area. Overall, the club helped approximately 100 kids.