Explorer Post 1010

TARC Team 13198

Rockville, Maryland

Team America Rocketry Challenge

Final Fly-Off Presentation

May 12, 2012

Our Team

Sharing failures and successes, the senior TARC team of Explorer Post 1010 designed, built, and tested many rockets over the past three years. Three of us have been to TARC finals before. We learned about physics, model rocket construction, but, most importantly, friendship and teamwork.

Daniel Roh
Grade 11 Walter Johnson HS
Connor Armstrong
Grade 12 Winston Churchill HS
Ben Fann
Grade 12 Thomas Wootton HS
Samantha Steckel
Grade 11 Home School
Daniel Du
Grade 12 Clarksburg HS

Rocket Design

Red Rocket (Crimson Delight)

- Crimson Delight was based on the idea of a circular stabilizing fin that augments the fins of the rocket.
- Software Tool: Open Rocket
- Motors Tried:
  - F24-7W Reloadable
  - F32-6T Single Use
  - E30-7T Single Use
- Recovery Tried:
  - Cargo Unit – 18” X-Chute
    Booster – 60” Streamer
  - Cargo/Booster Connected – 24” X-chute

Rocket Construction

Red Rocket (Crimson Delight)

- The Crimson Delight was built over a collective time of 7 days.
- The body tube was a BT-70 with a cylinder that acted as an outer fin. (The cylinder was cut from a plastic paint container.)
- The cargo unit that houses the altimeter was designed to hold different size weights.
- A commercial plastic nose cone was used to hold the eggs in a plastic dual egg container.

Problems in Construction

- There was difficulty in trimming the main fins so that they would fit within the circular fin.
- There was difficulty in finding a method to support the rocket before launch.
- There was a concern about the nose cone being big enough to hold a two egg container.

Data Collected

Red Rocket (Crimson Delight)

	Motor	Height (ft)	Weight (g)	Time (sec)	Comment
Test 1	E30-4T	575	484	33	Tumble recovery
Test 2	F24-7W	771	501	26	Late ejection charge
Test 3	F32-6T	931	519	55	Streamer failed
Test 4	F32-6T	989	551	57	Straight flight, too high

After launching Crimson Delight four times, the team decided that it would take too many launches to properly calibrate the rocket for this year's TARC competition requirements. We decided to try a simpler design.

Lessons Learned

Red Rocket (Crimson Delight)

- The Crimson Delight has survived a tumble recovery from 900ft without significant damage. The most damage resulted from a physical shock to the fin structure at ignition.
- The Crimson Delight survived a tumble from 900ft. The most damage resulted from the cylindrical fin flexing causing a glued seam between it and one fin to separate.
- The rocket flew straight despite relatively strong wind conditions. We believe the circular fin design helped this.
- This rocket was too new to be able to be calibrated in time for the qualification flights.

Rocket Design

Black Rocket (Stealth Delight)

- Stealth Delight is based on a simple design used in previous years.
- The cargo and booster sections were connected with shock cord.
- Continued to use Open Rocket
- Motors Tried:
  - E30-7T Single Use
- Recovery Tried:
  - 18” X-Chute
  - 18’’ Parachute
  - 24” X-Chute

Rocket Construction

Black Rocket (Stealth Delight)

- Due to the simple design, the rocket was built over a collective time of 3 days.
- We reused the cargo unit, nose cone, and egg container from Crimson Delight.
- The rocket's simple design allowed a 100g reduction in weight .

Problems during testing

- After the 1st flight, one of the fins became lose.
- The weight of the rocket mysteriously gains or loses 10g even after checking for missing or added items.
- We ran two tests to decide on the chute type and size. We tried an 18 inch X-chute but it came down too fast. We then tried a 24 inch X-chute but it came down too slow. We settled on an 18 inch standard thin mill chute.

Flight Testing

Black Rocket (Stealth Design)

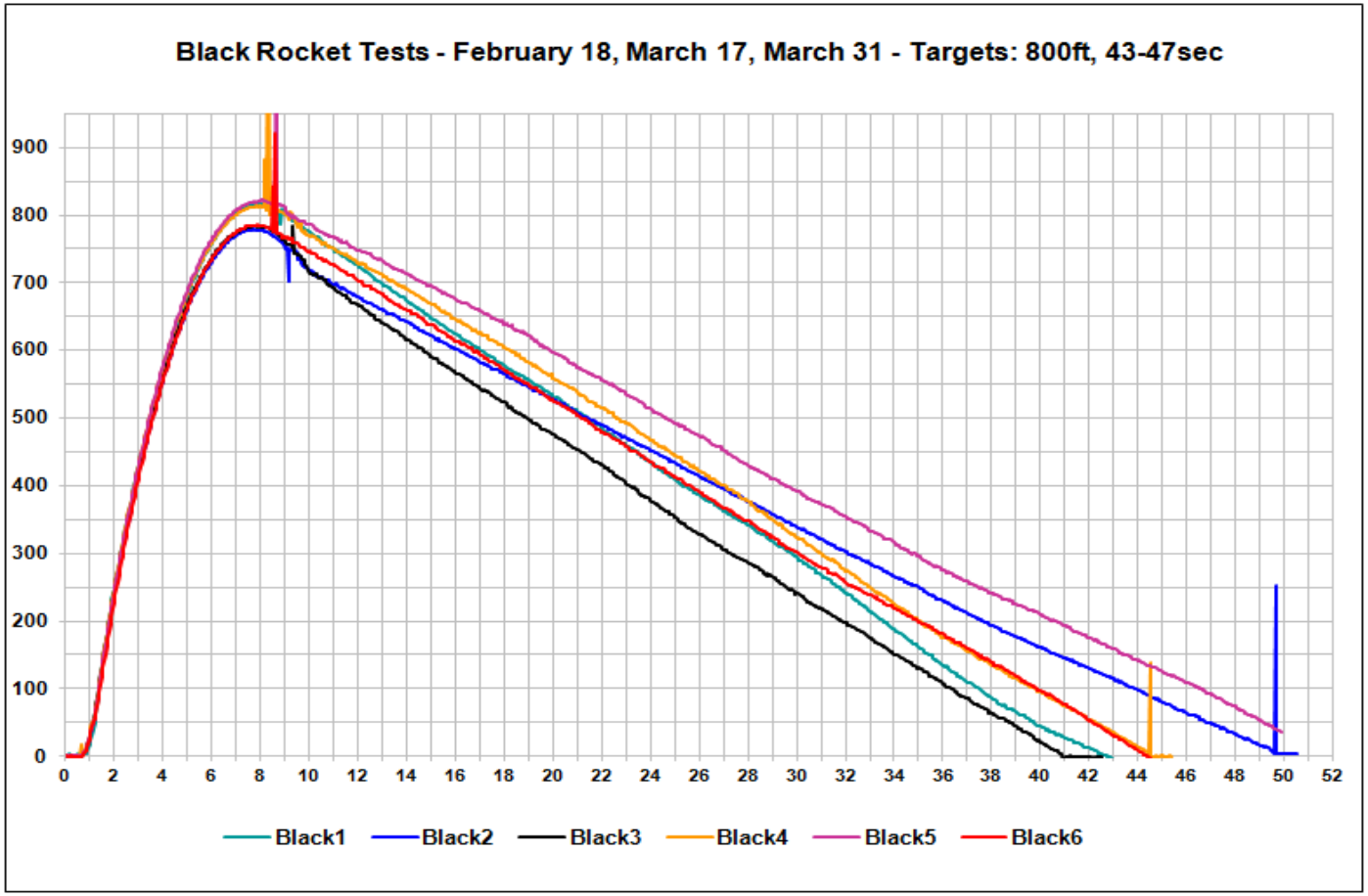
	Height (ft)	Weight (g)	Time (sec)	Qualification
Test 1	816	391	42.23	18.31
Test 2	778	390.8	48	No
Test 3	782	380.7	40	No
Test 4	812	375	43.57	12.00
Test 5	821	386	51	No
Test 6	785	380	43.46	15.00

In testing, the qualifying scores were consistent (18, 12, 15).

Lessons Learned

Black Rocket (Stealth Delight)

Simple, known designs may not be exciting, but gave good performance.



Teamwork

Besides building and launching our rockets together, we had fun helping others with model rocketry:

- Helped our junior teams with building and launching their rockets.
- Supported NARHAMS rocket launch at Rockville Science Day.
- Staffed and conducted a two day TARC exhibit at the USA Science & Engineering Festival.

"The Explorer Post volunteers, as usual, were knowledgeable, enthusiastic, and GREAT. Kudos to Connor Armstrong, Daniel Roh, and Samantha Steckel. It was a pleasure working with them and they made everything so much smoother. "

- Ed Pearson, NARHAMS, at Rockville Science Day

Thanks for a great year!