Practice Tips: Water Rockets

CONSTRUCTION GUIDELINES and ADVICE:

Water rockets should be primarily made by students. The basic design is very simple, since the rocket must consist of a single 2-liter plastic bottle. The challenge is to improve performance by adding fins, nose cones, and parachutes!

We offer a Building Session each year where students (and parents) can get some practical advice on these matters. You may also want to consult some of the excellent YouTube videos that provide ideas. (We have several listed below.) Please keep in mind that your rocket must adhere to ***our rules***, and online videos may ***not*** reflect these! Science Olympiads at the Middle and High School levels also feature events called "Water Rockets" that have ***different rules***, so confusion is common. Be sure to refer ***only*** to the event description that we provided directly to your Head Coach in our 2020 Event Packet and to the 2020 Event Clarifications that Fernbank Science Center maintains on its website:

http://fsc.fernbank.edu/scienceolympiad.htm

USEFUL WORDS TO KNOW:

Here are some representative words you should know.

Fins	Energy	Force	Pressure Gauge
Nose Cone	Momentum	Pressure	Compressor Pump
Seal	Aerodynamic	Friction	Air Resistance
Parachute	Deployment	Altitude	Propellant

LAUNCHERS:

For the DeKalb Olympiad, we use launchers purchased from this site:

http://ez-launch.com/

Our launchers are mounted on plywood boards to keep them flat on the ground.

Fernbank Science Center
Where Science Becomes an Adventure

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USEFUL WEBSITES: **We verified these in February of 2019.**

Here are some nice videos from Tom Clauset:

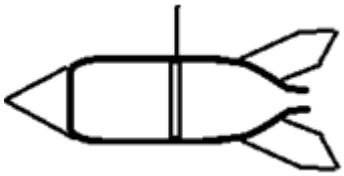
Getting started:	https://www.youtube.com/watch?v=HvBwpYUNiD8
Fins:	https://www.youtube.com/watch?v=VguGsKeDWns
Nose cones:	https://www.youtube.com/watch?v=b9AfA-85osM

This video series by Kyle Ferguson describes parachute construction and operation:

Nose cone and weight:	https://www.youtube.com/watch?v=m2ui8ITPlU8
Wind flaps:	https://www.youtube.com/watch?v=_-qjTHr-gqo
Nose cones:	https://www.youtube.com/watch?v=yka9f7Dlfdk (We ***do not allow*** the use of glue on our bottles!)
Parachutes:	https://www.youtube.com/watch?v=jsytoMrWock
Release Mechanisms:	https://www.youtube.com/watch?v=z1OUs0hUIuk (We ***do not allow*** the use of glue on our bottles!)

DESIGN and OPERATING CONSIDERATIONS: **Try at home with a parent.**

1. **Should the *Center of Mass* be closer to the tip or the end?** The Center of Mass is the balance point for the empty rocket. For a long stick, you can easily find this point by balancing the stick on your finger. For something short and squat like your rocket, you might need to hang it from a string to find the balance point.



   Put a long rubber band around your bottle so that it is tight but does not crimp or pinch your bottle. Loop a string through the rubber band and suspend it. You can find its balance point by moving the rubber band on the bottle until the bottle hangs perfectly level. Does your rocket fly better with the balance point closer to the top end or the fins? How could you change where the balance point is?

2. **Does the amount of water you use make a difference?** Try launches with very little water (or none) and compare those to half-full, or almost completely full. Which level works best?

3. **Should the nose cone be really tight or really loose?** A nose cone helps to make your rocket more aerodynamic, so you want it to stay on while the rocket is launched. If you tuck your parachute under the nose cone, however, the nose cone needs to come ***off*** so the parachute can deploy! What is the best fit?

RULE CLARIFICATIONS: These apply only to DeKalb's Olympiad.

1. We require a parachute.
2. We do ***not*** require a straw on the side of the rocket.
3. We have a 1-meter maximum height
4. We do ***not*** allow the use of PVC pipe tips.
5. If your rocket has a nose cone that separates as the parachute deploys, it must stay connected to the main rocket with a tether or lanyard. Any small weights / objects in the nose cone must be ***completely*** encased (in clay, for example) to prevent parts from falling out.