Water Rockets Tips

1. Stiff fins are the best fins. Flexibility decreases the effectiveness of a fin.

2. If using wood for fins, bass wood (not balsa) is recommended. Place the grain of the fin perpendicular to the bottle. This will make the fin stiffer and stronger.

3. Do not sand the bottle prior to gluing. It will get you disqualified and is not necessary.

4. Best glues for fins: PL Premium - available at Home Depot or Lowes, Goop - available at most hardware stores, Shoe Gu - available at shoe stores and sporting good stores, 100% GE Silicone Glue - available everywhere. All hold well, PL Premium is the stiffest, probably the most toxic, Shoe Gu and Goop are both fairly stiff, GE Silicone is less toxic, but more flexible. Contact Cement or Rubber Cement can be used to glue on paper fins. You should be in a well-ventilated area and wear latex gloves when using PL Premium, Shoe Gu, and Goop. It will usually take fins about 2 hours to cure enough to put on another fin and about 2 days before launching.

5. "Swing Testing" is a quick way to determine if a rocket has reasonable stability. This test is done by tying a string around the rocket at its center of gravity (balance point) and swinging the rocket around.

6. Fins cause very little drag and do not weigh very much. A non-stable rocket that is flying sideways is creating a lot of drag. Non stable rockets have a lot of problems with pre-deployment of their parachute.

7. The cost of non-vertical flight is tremendous. A flight that is 5 degrees off vertical can loose 10% of its potential altitude.

8. Parachutes are more efficient with more shroud lines. Shroud lines hold the shape of the parachute and keep air from burping from the chute.

9. Parachutes should be as large as possible while still meeting overall length requirements and efficiency standards.

10. Parachute efficiency is improved by using the correct shroud length. Shroud lengths should be between 1.2 to 1.5 times the parachute diameter.

11. The best parachute material that I have found is dry cleaner bags. Trash bags may also be used.

12. The best material for shroud line is nylon upholstery thread.

13. How much water? 1/3 of the capacity of the bottle will get you close. Use simulator provided for a more precise answer for your design.

14. When humidity is low and there is no chance of rain, you can use talc to keep the chute from having static cling.

15. The best folding technique for passive deployment is to zig zag fold the cute, starting from the top to bottom. When you fold the chute to the shroud lines, gently make a couple of wraps with the lines. You want to use as few wraps as possible so that the chute will deploy quickly.

16. The parachute should be attached securely to the rocket. It can be glue or tied. If glued, you should reinforce the bond with fiberglass reinforced packing tape. This also applies to the cord that attaches the cone to the bottle.

17. Deployment at apogee and a quick opening parachute are essential to increasing hang time.

18. If the rocket arches through apogee and does not slow down, wind drag will not allow the cone and body to separate even with active deployment.

19. Make sure that your cone sits securely on the rocket.

20. Beware, bottles expand under pressure. The expansion can upset a cone if the rocket is not designed to deal with this problem.

21. You can design a cone that fits loosely on the bottle. It will need to be supported by a ring or pegs. Both pegs and rings (butter tub seal) can be glued to the rocket with PL Premium.

22. Many competitors use poster board paper or banner paper to make their cone. See: http://hometown.aol.com/powerdeployment , for procedure to make a simple cone.

23. Practice whenever you can and check results against simulation data.

24. How heavy should my rocket be? That is a good question. The weight that would give the rocket the best loft may not allow it to reach the highest altitude. Go for stability first, loft second, altitude third. Try to reach a good compromise.

25. How much air pressure do I use? Easy question, all that is allowed. The more stored energy, the higher you go.

26. Use this flight simulator to determine the best amount of water. http://www.et.byu.edu/~wheeler/benchtop/sim.php or http://www.ag.ohio-state.edu/~rockets/cgi-bin/design_zone.cgi or try the software simulator provided on your computers.

27. Check the opening of your bottle, a standard piece of 1/2 inch, Schedule 40 PVC pipe through the nozzle of your rocket. If it will pass through the opening, it will launch from any standard launcher.

28. With rocket designs where a tall cone sits loosely on the bottle, the cone mass can do little to correct an initial flight stability issue. Why? Because when the fins attempt to correct the instability, the rocket can bend in the middle where the cone sits on the bottle. If you notice that you are getting a lot of pre-deployments, you may attempt to move some of your cone mass toward the base of the cone or you may choose to shorten your cone.

29. Try not to use paper, cardboard or wood components in the rocket. If you do, attempt to waterproof them.

30. Know the launcher that will be used at the event you are going to attend. This is a particular concern for rockets that have fins that are swept below the flange on the bottleneck. Many launchers including the typical "Bent Fork Launchers" and the NERDS launcher will not launch rockets with swept fins.

31. I recommend a fin jig be used for installing fins with precision. A fin jig is a necessity when using slow set glues.

32. To measure your water, build you own custom measuring device from a 1 Liter Bottle. Mark it for just the right amount of water for your rocket. This will help eliminate measuring mistakes.

33. Mark your rocket with the correct water level as a double check.

34. If you are going to be launching off a launcher where you will have to tip your rocket, rather than the launcher tipping for loading, always put in a little too much water. As you tip your rocket you will always lose a little water. You can lift up on your rocket gently to let out a little water while on the pad. (Don't get too bent out of shape if you don't have exactly the correct amount of water, a few ml of water will not make that much difference)