

Dave O'Bryan's 30 mm Model for S3A/S6A

Andrew Tomasch , January 2002

For the new junior flyers who are trying to cover a number of FAI spacemodeling events for the first time, I suggest using David O'Bryan's highly successful 30 mm design in the S3A (parachute duration) and S6A (streamer duration) events. This model is well proven, winning the S6 individual bronze medal for Dave in 1994, and thereby contributing to the team silver medal in S6 as well. I used the design with good success for my rookie debut at the 2000 WSMC, and was certainly competitive with it. Of course Dave O! beat me, and with the same design. Clearly I can't blame losing to Dave on the model!

The accompanying drawings show the required mandrel and fin shape. The model is a simple cylinder-cone-cylinder, with the fins mounted to the tail tube. The fin leading edges are aligned with the cone/tail tube interface. Here are the dimensions for the two classes:

| Part | Length for S3 (mm) | Length for S6 (mm) |
|-----------------|---------------------|---------------------|
| Nose Cone | 41 | 41 |
| 30 mm Tube | 260 (10.25") | 200 |
| Transition Cone | 75 | 75 |
| Tail Tube | 40 | 40 |
| Total | 416 (260/416=0.625) | 356 (200/356=0.562) |

The length of the 30 mm section for the S3 model is dictated by the requirement that a 36" diameter parachute be folded over only once requiring 9" of bay. Allow 1" for the foam ejection plug and 1/4" for additional clearance and you get 10.25".

The fins are ellipses with a 33 mm root chord and 33 mm span, made from 1/32" balsa. These should be covered with Japanese tissue for a smooth finish and additional stiffness. Clear dope is fine for adhering the tissue, while a resin and tissue finish is even better, but not necessary. The fin roots **must** be filleted with epoxy, since the CA used for attachment will become brittle when exposed to the heat of the engine. I use the West System resin applied sparingly with a syringe for, this and it works well. Be sure and consult Dave's excellent online article describing the fiberglass tube fabrication. I recommend Esaki Japanese tissue outer wrappers for all sections, since the tissue is very

forgiving and easy to work with, and gives a good colorful finish without additional sanding, right off the mandrel. The nose cone is available from Apogee Components.

A few important points to ensure competitive models:

- 1) You **must** use foam plug wadding, crumpled paper wadding **will not work** in these models. The piston action of the wadding is essential for proper deployment, particularly for parachutes.
- 2) You **must** attach your fins using a jig. Eyeball alignment is **not** satisfactory. Straight fins are essential from a drag standpoint. Slight misalignments, which will not cause erratic flight, will still rob precious altitude. Jigs are simple to make. An Estes fin jig with a 10.5 mm motor casing installed is adequate. Just use the 1/16" fin settings and use shims under the fins to put them on the centerline. You can see my fin jig at:

<http://yellowjacketsystems.com/alway/tomasch.htm>.

This is easy to make and once aligned, will get the fins on straight every time

- 3) With regard to S3, it is more important to deploy the parachute **every** time than it is to deploy the largest parachute. Dave O! and Phil Barnes can consistently open a 36" diameter parachute from a 30 mm airframe. I assure you that this is an art, and I can't do it consistently. I flew 34" diameter parachutes at the 2000 WSMC because my practice flying had shown that this was the largest parachute I could get open **with certainty**. Even 32" diameter is fine, and a good place to start. In this regard the junior event is more demanding. For senior S3B, we continue to use 36" parachutes in a 40 mm diameter airframe, giving almost double the packing volume. Be sure and practice and gain confidence with the parachutes you are using, and don't be afraid to go to a smaller size to gain consistency. Remember, you have to hit lift to win under most circumstances, and a smaller parachute is not a big disadvantage in lift. A parachute which does not deploy is a big disadvantage under any circumstances! Finally, attach your shock cord externally to a fin root, and then attach it again near the top of the airframe with Mylar tape. Don't balance the model to hang horizontally. This arrangement allows the airframe to pick up speed and help snap the canopy open. I've observed this a close quarters on 1/4 A motors many times, and it really does help get them open.
- 4) With regard to S6, weight is critical. Build as light as you can and still have confidence that the model will hold together. S6 is really a black art. I tend to favor a more robust model since I hate to shred in public. But I'm not a very competitive S6 flyer. For S3, weight is **not** nearly so critical, and it is better to have a model that is a little more robust which will better survive flight and recovery. Shoot for weights in the 5-6 gram range for an empty S3 airframe.

- 5) For parachutes I favor ¼ mil thick aluminized Mylar canopies, 12 sided. These are available from Aerospace Specialty Products (<http://www.asp-rocketry.com/>). A good strategy is to buy 36" diameter canopies and cut them down as necessary for smaller sizes. Be sure and buy the special locking snap swivels from ASP too. For shroud lines I favor the light Kevlar thread sold by Edmund Scientific (<http://www.edmundscientific.com>). Search their web site for Kevlar thread. To attach the shrouds use clear plastic Avery re-enforcement rings sold in stationary stores for use with three ring binders (part number 05721). These come in a little paper box, which serves as a dispenser. Cut six shroud lines three times the parachute diameter and attach them in loops to the 12 points along the perimeter, just like building an Estes parachute. The final shrouds will then be 1 ½ diameters long. For example, a 36" parachute requires 6 lines 9 feet long. That's 54 feet of thread in one parachute! To attach the shroud, pass it through the center of the sticky ring and around the back of the ring so it will be held underneath for the entire ring diameter. Press firmly, and never ever allow any of the adhesive ring to extend beyond the edge of the parachute! Pass a piece of scrap thread through the loops to gather them together, and then pass the thread through the snap swivel to pull the loops through the narrow swivel opening. Groom the shrouds to eliminate tangles (or push them up against the swivel) and then tie an overhand knot in the shroud bundle a couple of inches up from the swivel to lock everything up. I store my parachutes in quart Ziploc bags, after carefully folding them into thirds. I include printed paper tags stating the diameter and any special construction features, such as shroud line type.

- 6) For streamers, most flyers favor Mylar film about 1 mil (0.001") or slightly thinner. Aquabee 515 tracing paper can also be used, but is not as durable and is not waterproof. It is easier to crease however and can be bought in very large rolls at a reasonable price in art supply stores. Streamer folding and rigging is the subject of another entire article, which should be written by Ross Hironaka and or Kevin Kuczek! Typically streamers are 5" X 50".