Competition Rocketry: Improve your reliablility in

STREAMER DURATION

by Dan Wolf

Chances are, if you have flown any model rockets at all, you've flown one that uses streamer recovery. If you're a typical rocketeer (assuming there is such a thing!), you probably have more successful recoveries using streamers than any other recovery method. After all, that's one of the reasons streamers are a good recovery choice for small or light rockets. Generally speaking, it's easier to get streamers to work versus other recovery systems (parachutes). Also, the rocket tends to drift less and so the chances of recovery are improved.

Why is it then, that at a typical contest the seemingly simple streamer duration event has a higher disqualification rate than events such as eggloft or boost/glide? The reason(s) was partially pointed out by a former member of my old NAR section MARS, Bud Piscini. Bud, primarily a sport flyer and scale aficionado, while helping to time at one of our club contests said, "You 'contesters' have ruined streamer recovery. The idea is to bring a rocket down quickly and near the pad!" This, after Bud had just timed a 1/2A-powered streamer model for over 2 minutes! In fact, to be competitive in this event one can no longer roll up a 3 foot piece of crepe streamer and put in your Astron Mark.

State of the Art

In the years 1976-86, there were investigations and studies (some of this work can be found in the NAR Technical Reviews available from NARTS) done on finding better streamer materials, determining the optimum length-to-width streamer ratio, and the best folding techniques to use to increase the descent time. While at first it looked like the material itself was important, it now appears that the weight of the material and how it is folded or pleated is more critical than the texture of the material.

Most competitors today use some type of accordion folds (with possible extra folds in the same direction at certain points along the streamer) for two-thirds or more of the length of the streamer. The widths of the folds are on the order of a quarter to three quarters of an inch, depending upon the size of the body tube.

The size of the streamer is usually as big as can fit into the body tube while maintaining a 10:1 length-to-width ratio. Sizes such as 6" x 60" for BT-20 (B or C SD), from 4" x 40" up to 6" x 60" (depending upon your packing abilities) for BT-5 (1/2A to B SD), and down to 3" x 30" for the 10.5mm Apogee micro engine tubes.

One key is to fold and attach the streamer so that during descent the top end of the streamer develops a "violent whipping action". This seems to increase the duration.

In more recent years, the emphasis in the event has been on weight reduction. On the Internats level this has meant super lightweight fiberglass airframes. On the national level, without the FAI minimum diameter restrictions, light weight vellum body tubes have become popular.

The net effect of all of the advances in this event since the mid 70s is that, when they work, SD models can stay up for a long time (much to the chagrin of my friend Bud). They are also easily influenced by thermal activity.

Unfortunately, however, all of these advances have seen reliability in the event decrease. Usually the failure is some type of separation. In streamer duration, all parts of the rocket must remain attached during the entire flight (except for wadding). The most common separation failures are spit engines, broken shock cords, and torn or stripped streamers.

No Spitting Allowed

Spit engines in streamer duration are often caused because the streamer is too tight in the airframe. With the streamer and wadding in place, you should be able to blow the streamer out of the tube. If you can't it is too tight. Better to go with a smaller streamer than to risk a DQ.

Another tip to prevent ejected engines is to use the "Lariat Loop" method that was introduced to the competition community in the first Apogee Components catalog. The idea is to attach the shock cord (in this case, it is usually a piece of Kevlar) to the engine via a slip knot (see figure 1). The idea is that if the engine starts to kick

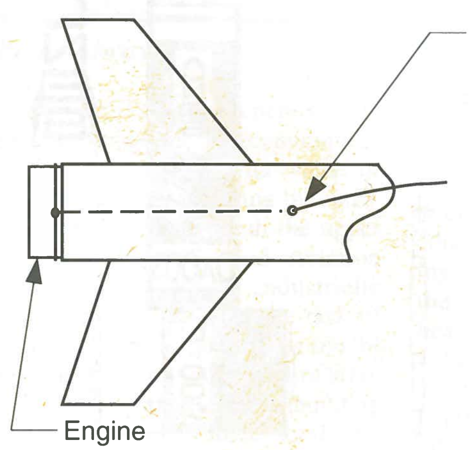

Figure 1. Apogee Lariat Loop Kevlar cord attachment technique. Note: Wrap 3/8" wide smooth tape around end of engine and body tube for additional positive motor retention.

out, the knot will tighten up and hold it in. A refinement I've seen many competitors use is that after the loop is in place, take a piece of smooth tape (mylar or clear tape) and wrap it around the end of the body tube and engine. It helps if the fins are positioned about 3/16" up from the end of the tube, not flush with the bottom.

Broken Shock Cords

Broken shock cords are caused by three reasons: First, using the wrong type of material; second, making them too short; and third, exposure to the engine ejection charge.

In terms of material, some of the manmade fibers that are quite strong are also very heat sensitive. A good choice that was made popular by Apogee Components is Kevlar. Regular Kevlar cord can be purchased from Eclipse and Pratt Hobbies. Other sources for Kevlar include Specialty Kite companies and fishing tackle stores. Beware however that some brands of Kevlar have a wax type of coating that makes them more heat sensitive. Usually the thinner material (35-50 lb. rating) is sufficient for the 1/4A through A sizes. However, inspect it carefully between flights as it seems to be more susceptible to heat damage and breakage do to abrasion.

A good rule of thumb for shock cord length is: the more the better. Two to three times the body tube length is not too much.

The Apogee Lariat Loop attachment method had the cord brought into the body tube through a hole alongside the engine. This works okay but exposes the cord to more heat. If the cord is tightly taped to the body tube at the empty engine CG, it can be brought straight back to the base of the engine and tied with a piece of mylar tape covering the whole thing. However it is done, try to avoid bringing the cord into the body tube forward of the engine to prevent it from being exposed to the ejection charge.

Streamer Materials

Stripped streamers are usually caused by the streamer not able to eject cleanly from the tube, or by using a material that is easily torn. Tissue paper (tracing paper) is a popular choice for streamers due to it being thin and lightweight. However, it is especially prone to tearing near the attachment point. Some people reinforce the first few inches of streamer with tape. Perhaps a better solution is to use a more "robust" material.

Although slightly on the heavy side, Micafilm, a lightweight covering for model aircraft, has proven to be a very good streamer material. It can be purchased at many hobby stores catering to R/C plane builders, or it can be purchased mail order from Tower Hobbies. The accordion folds must be ironed into Micafilm, but once this is done, the pleats will stay forever. Popular color choices include the red and the silver. This material is very tear resistant and if attached to the Kevlar cord properly, it will usually survive until the rocket thermals away.

Translucent (cellophane-like) thin plastic material that can be found in gift and card shops is also a popular choice. It is also relatively tear-resistant, and often lighter than Micafilm. One word of caution though, this material is heat sensitive, so make sure enough wadding is used.

Don't be afraid to make the rocket a few inches longer to allow ample room for the streamer, shock cord, and plenty of wadding. The QCR SD kits often have longer tubes that help facilitate this. As your experience grows, you can always cut them shorter. If using vellum tubes, the weight penalty for an additional inch or two of body tube is negligible.

In closing, I hope this article will help improve the qualification rate in streamer duration. **SR**

Sources:

Eclipse Components
570 Buckeye Dr.
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(719) 598-6105
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Pratt Hobbies
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@compuserve.com
WWW:http://ourworld
.compuserve.com/homepages/
pratthobbies

Source for Micafilm:
Tower Hobbies
(800) 637-6050

Competition Kits for Streamer Duration:
Apogee Components
1431 Territory Trail
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WWW: http://www.Apogee
Rockets.com