COMPETITION STREAMERS

General

I'm a big advocate of making your own NAR competition streamers. Although many rocket companies sell Mylar, I have not seen any premade competition streamers, so in reality you have to make your own. Fortunately it is quite simple. I'm describing a 1mil (0.001 in) Mylar streamer that I usually make for NAR streamer ½ A to A motor impulse competitions. In the higher impulse events B to C I have found that 2mil or thicker Mylar is less prone to shredding and thus more suitable. These techniques incorporate what I have learned the last 5 years. 1mil Mylar is not easy to find. Most rocket vendors sell 2mil. Can you use 2mil? Yes, it will be slightly heavier but in the big picture that is OK.

The 1mil Mylar ribbon I used was cut out of a larger roll of "greenhouse film" I ordered online from Amazon (the website not the river :). The most notable feature is that competition streamers have a number of regular spaced folds or creases that break up the air increasing drag on the way down.

Dimensions

In NAR competition the length of the streamer relative to width has to be a minimum of a 5 to 1 ratio. In reality most streamers are designed around a 10:1 length to width ratio. I just made some 1mil streamers that were 4 in wide x 36 in length, a 9 to 1 l/w ratio, with a weight of 3 grams. The length is because my cutting board can handle that length and my aluminum angle for the straight edge. I will add Kevlar and fiberglass tape to attach to edge of the streamer and the final weight will be 4 grams.

Process

To create these creases, the Mylar is rolled tightly into a tube that is slightly smaller in OD than the body tube it will be inserted into. For a streamer that will fit in a BT-20 tube (Estes or equivalent) then the film is wrapped carefully around a BT-5 tube or dowel. The trick is to roll it carefully but not excessively tight as you want to slide it off the form, then placed between two flat pieces of wood, and tightly squeezed with metal C clamps or equivalent. I place this whole board clamp contraption then in my electric kitchen oven (have never used a gas oven but should be OK) and "bake in the creases". The resulting creases are called a "scorpion tail" fold.

What does the Heat do?

The baking process has several functions. **First** it sets the creases in the Mylar easily without time consuming folding. The creases are started when the two pieces of wood squeeze the tube down to a very thin rectangle **Second** the creases actually have an alternating zig-zag folds; convex then concave, then back to convex and repeating etc.. **Third** and very important is that the baking processes created a "memory effect" or a "natural spring action" that basically attempts to curl the streamer shut**. Finally** when the rocket and streamer are descending the motion of the air wants to flatten the streamer but the memory action really causes the streamer tail to flaps or curl inward (like a scorpion) on the way down, this motion further helps to slow down the rocket and increase the duration.

The formula I use is preheat your oven to 250 F for 10 minutes or so, Once the 250 is stabilized then place the board/c-clamps (or whatever you use) with the streamer material inside the oven. Bake for at least 10 minutes. If your spouse or significant other is baking cookies for examples (h'mm) use the hot oven after the cookies are done cooking. Finally remove your streamer apparatus from the oven to cool outside. After another 10 minutes or so unclamp the boards and "Viola" you have the base makings for a NAR or FAI style streamer with awesome creases. Hopefully perhaps some cookies! Many people have different heat settings and length of times use what works for you.

Completing the streamer

Next I attach a short length of 100lb Kevlar string for about 4 in along the long edge of the streamer with ¾ in fiberglass packing or strapping tape. This tape covers the Kevlar and is folded neatly around the front and back of the Mylar. Two pieces of fiberglass tape along two edges forming a very strong "L" attachment point. The creases were chosen initially such that the folder streamer will gently fit in a BT-20 body tube. This is the smallest diameter tube I am recommending for 1/2 A motors. Can it fit in a BT-5? Maybe but you need practice, the fold is tricky and needs more powder. It could get stuck.

The night before the contest unwrap the streamer and powder it with talcum powder. Then roll it back up. I place this inside a paper envelope ready for the contest the next day. Prepare your rocket as by inserting some flame proof wadding or cellulose "dog barf". Push it all the way down into the top of where the motor will be. Then take 2 or 3 squares of "Estes style flame proof wadding" and wrap this second piece around the streamer to protect it from the ejection charge. Note the edge of the streamer with the Kevlar and fiberglass tape should go nearest to the nose cone. Basically you are creating a little pouch or an enchilada for the streamer. Squirt some talcum powder and slide the streamer package in. Leave some room at the top for the nose cone shoulder and the rest of the Kevlar. Make sure you double knot the end of the streamer to the main Kevlar cord.

I'm a big fan of foam ejection plugs. Once you use them you will never go back to wadding. But you need an external shock or Kevlar cord to make this foam plug shoot forward to push out the streamer with minimal resistance. So the rocket needs to be designed with this in mind or modified to have an external foam plug.

As far as the Parachute portion of the challenge a competition style ¼mil Mylar chute kit that Asp rocketry and others sell is a great choice. A ¼mil drop cloth (painters) is another way to go but these are hard to find. Fold the chute the night before with talcum powder and place the shroud lines inside the chute. Again use the "enchilada method" to protect the chute.

What can go wrong?

Paradoxically Streamer duration which is considered a simple event has a very high DQ or failure rate? Failures include but are not limited to the following:

1. Kicking out your motor thus not ejecting the streamer. – **Answer** make sure you motor is taped in placed. I have found that Mylar tape works the best and stopped my spitting (of the motor).

2. Streamer packed to tightly did not eject. **Answer** use a 3 x 30" or a 4 x 40" for a BT-20 airframe that has 6 in of free space. Note for a ½ A competition the BT-20 is the minimum tube to use.
3. Nose cone is tight**. Answer** sand it down then practice by blowing it out from the motor end with no motor inside. Do the same with the streamer inserted it should be able for you to use lung power to push it out. If you cannot then the motor will not do the same. Make adjustments until this works all the time.
4. Streamer line broke or the knot gave way. **Answer** if you build the streamer as I describe it with 100lb Kevlar and the fiberglass tape it will not break. But be sure to double knot it and add a drop of CA. Double check the connection point to the main rocket Kevlar string and attachment point for the streamer.
5. Streamer got burned closest to the motor ejection charge**. Answer** you must protect the metalized polyester from hot gases. Use wadding as a primary plug closest to the motor, then wrap the streamer "enchilada" style and insert into the airframe with the Kevlar string nearest the nose cone. This **double method works for me**. Ultimately I prefer an external shock cord then I can use foam ejection plugs and skip the "enchilada".
6. My rocket took off on an angle. **– Answer** use the longest launch rod to minimize whip**. My 4 foot tower is available to all club members. The launch is much straighter.**

Resources

Our WOOSH website www.wooshrocketry.org has previous back- issues of the WOOSH POP that are filled with great competition articles or tips. Visit the NAR.org specifically the Competition Guide and check those contest web pages for the pdf articles some are written by our own Dan Wolf. Visit rocket vendors and check out the information they post. Search YouTube has numerous videos. Search the internet for streamer competition you will find presentations by Pavel Pinkas of WOOSH and Dan Wolf of WOOSH. If I left out someone let me know please.

Take your time. Start off simple. Have fun

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