Terrier - Sandhawk

Plans for 10% scale model
Introduction

In my version of the Terrier Sandhawk, I will be using a cluster of three B or C motors in the booster (the Terrier) and they will stage to a single 24mm motor in the sustainer (the Sandhawk). The Terrier booster will be BT-60 based and have 2 true booster motors (i.e. B6-0) and one motor with a delay (i.e. B6-2). The purpose for this is that by itself, the booster is stable, and when the rocket stages, it would fall to the ground and lawn dart. The three 18mm motor tubes run the entire length of the booster, then in the transition, there is a channel that directs the hot gases from the two booster motors to the sustainer motor.

Then, in the other side of the transition, there is a ¾ inch dowel that plugs the other motor tube and holds the recovery device in. Upon staging, the two booster motors burn through and light the sustainer, then between 2 and 5 seconds later, the ejection charge ignites and deploys a small parachute or streamer. You will have to choose what delay to use by trial and error. I recommend that you get a custom basswood transition and a nose from Gordon Agnello of Roachwerks Rockets for a quote. I have e-mailed him with plans for the transition, so he will know what you are talking about.

Prototype Terrier - Sandhawk Scale Data

Terrier (booster) -
Diameter - 18"
Length - 152"
Fin Span - 62"
Fin Root Chord - 33.5"
Fin Tip Chord -13.4"
Airfoil Shape - Front Half is a Sharp Shallow Wedge and the Rear Half is a Long Taper.

Sandhawk (sustainer) -
Diameter - 13"
Length - 296.5"
Nose Length - 34.875"
Payload Section Length - 55.66"
Main Body Length - 205.97"
Fin Span - 53"
Fin Root Chord - 45"

Model Scale data
Sandhawk (9.8% scale)
Length - 29.65 inches
Nose Length - 3.48 inches (3.4:1 ogive)

Payload section length - 5.56 inches (I went with 1/16th over 5.5 inches)
Main body length - 20.59 inches (one 18" piece of tube and another short 2.5 inch piece)
Fin Span - 5.3 inches
Fin Root Chord - 4.5 inches

Terrier (11% scale)
Diameter - 1.8 inches
Length - 15.2" (I went with 15.25)
Fin Span - 6.2"
Fin Root Chord - 3.35"
Fin Tip Chord -1.3"

Parts Needed:
Tubes and rings:
2 - 18 inch BT-55 tubes
1 - 18 inch BT-60 tube
3 - 18 inch BT-20 motor tube
3 - 18mm motor blocks
1 - 24mm motor block
1 - 9 inch length of 24mm motor tube (BT-50 works great)
2 - 50-55 centering rings
2 - BT-55 coupler tubes

Wood:
1 - 4 x 36 x 1/4" balsa sheet
1 - 3 x 36 x 3/32 basswood sheet

Miscellaneous:
1 - balsa ply nose block
2 - screw eyes (3/16ths I.D.)

Notes on Construction:

The Sandhawk portion of this rocket, the sustainer, is basically a 4FNC rocket with some scale detail. I opted to leave the antennas OFF on my version, since to model them correctly I would have to buy some steel wire that is about .01 inches in diameter. I did make it look like I modeled the antenna by modeling the main attachment point with a piece of black electrical tape. I used epoxy fillets on the fins which I then covered with Elmer's Fill and Finish to even it out. It came out quite good, and added a little weight to the model which will be helpful when I decide to put the model up on a E9-8 but don't want to lose it. That is basically all that is important to note when building the Sandhawk.

The Terrier portion of this rocket is a lot more complex than the Sandhawk, but don't let that scare you. What you are going to need to do is cut down the BT-20 motor tubes to 14.25 inches OR extend short (Fliskits stock 12" pieces) pieces with extra motor tube by cutting 1 inch pieces of tubing, slicing them down the middle carefully, and then inserting

it into the motor tube, making a coupler, then using CyA to clamp the coupler together, then using yellow glue to attach the coupler and the extra short piece of tubing. Then the motor tubes get thrust rings, and then they are glued together in a triangle fashion so that they fit in the BT-60 main body. The fins on my version are 1/4 inch balsa with a simple wedge formed in them. I was going to use a complex built up style of fin, but time constraints forced me not to.

The recovery system for the Terrier is quite complex. What I had to do was use a short balsa plug that fit into the motor tube, drill a hole through it, feed a length of Kevlar line through it, the put a few drops of epoxy in it to secure the Kevlar shock cord. Then, to attach the shock cord to the transition section, I made a big ball of FIXIT clay, embedded the short free end of the shock cord in it, and pushed it into the transition in one of the three holes that was drilled out for the booster gases to pass through. On the long free end of the shock cord, I made another small ball of FIXIT clay, embedded the shock cord in that, then used a pencil to put the mount on the far side of the coupler so that it would not interfere with the ejection. I then attached a Fliskits 8" parachute to the shock cord, not for true recovery purposes, but just to slow the Terrier down so that it would not break a fin on landing.