ISSUE 150 - OCTOBER 24, 2005

APOGEE PEAK OF FLIGHT NEWSLETTER

Scale Rocket "Python 4"

INSIDE:

- Unleashing the Python
- Avoid Damaging Your Vaccuforms
- Website Worth Visiting
- Adding Fin Tabs in Rocksim 8

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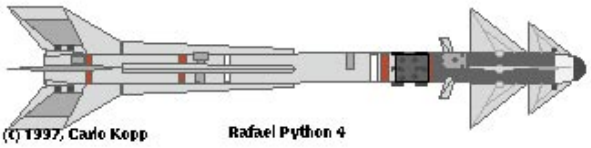
Python 4: The Rocket That Can't Fly... But Does!

by Drake "Doc" Damreau



Python 4 Artist Sketch

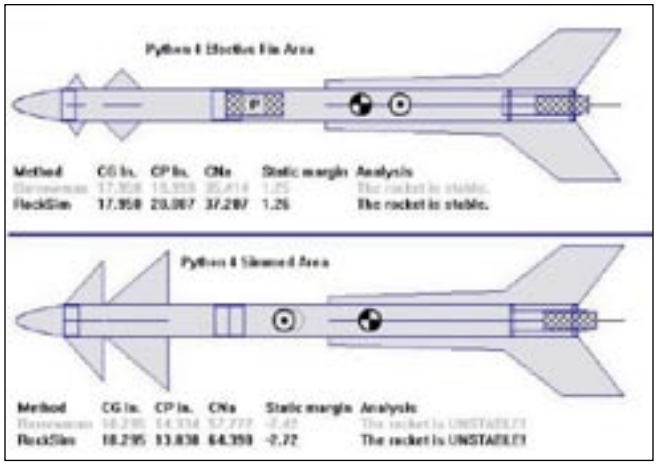
The Python 4 is an advanced fire and forget Air to Air missile with a fragmentation warhead used in the Israeli Air Force. The forward control fins set this apart from other weapons. They enable the missile to turn sharply in flight.

Since DESCON is a design contest, I decided to actually design something, rather than just build a rocket. This model is actually a prototype of a much larger one I am building. For this prototype, none of the dimensions were measured for scale. I just kind of eyeballed it, and sized things to fit what I had laying around. The goal was just to see if the idea worked. If it did, it would be an entirely new concept in rocketry.

Forward fins

This is the tricky part. These fins must pivot with no effort or binding. According to Rocksim, this design is nearly 3 calibers unstable. The picture shows how Rock Sim sees the rocket with both the effective fin area and the fin area if the fins were glued on. The reason this design works is that because they are allowed to move. Thus, they have little effect on the CP of the rocket because any force on the forward fins is dissipated by the fins moving. The total fin area forward of the pivot points, (times 2) is the surface area used in calculating the effective forward fin area. Because of the effective small canard area, no weight was needed in the nose. This concept opens up a whole new realm of possibilities for model rockets.

It's important to note that the pivot point must be as far forward as possible. The further forward the pivot point, the smaller the effective fin area will be.



Rocksim Design

Continued on p. 3

Dowels on Fins

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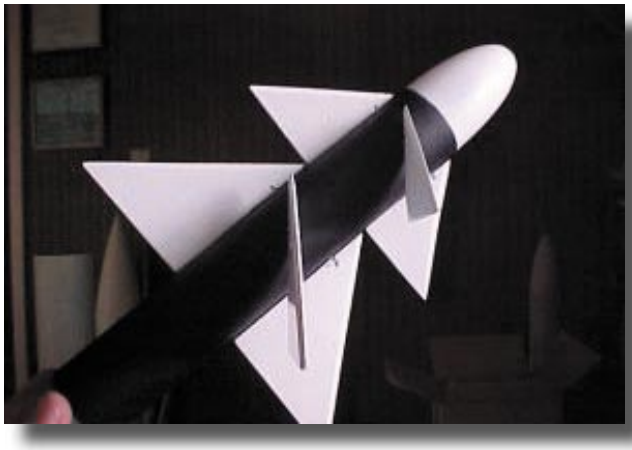


Movable Fins

Aft End of Python

I used the thicker balsa here so that the dowels had more material to "bite", making the joints stronger. There is no good way to orientate the grain here. Because they are not glued to the body, the fins will be weak in any grain orientation. You can see in the pictures that I orientated the grain horizontally. I stiffened them up with CA to make them stronger.

The first thing that is done is drilling holes in the forward section to accommodate the dowel. You need to make sure that the holes for the dowels are square with the body. This ensures that the fins will pivot squarely. I did this by wrapping a piece of paper squarely around the body and drawing a line. Then just mark the line at 180 from each other. The other important thing here is that one set of holes is slightly higher than the other. This ensures room for the dowels to cross each other on the inside of the tube. The holes need to be coated with CA to make them clean and strong. You can glue the dowel to one fin and let it dry.

The second fin needs to be glued on after the dowel is placed through the holes. DO NOT use to much glue. If you glue the dowel to the tube it won't work. Do the forward most fins first, than the other set. Once the forward fins are in place, the nose cone is glued into place. To get the forward fins as far forward as possible, I cut most of the nose cone base off to make room.

Aft Section

The motor assembly and the aft fins were typical of any rocket. The fins were made in two pieces and glued while lying flat on a table. The picture shows the direction of the grain. I chose not to install a motor hook to facilitate various engines.

Recovery

A shock cord was glued to the coupler in the forward section using the Estes technique. Another shock cord was glued to the body using the same technique. The two cords were tied in the middle and a 24" chute was attached.

Finishing

The hardest part about painting this rocket was keeping a good finish on the body while the fins were attached. Care should be taken here if you attach your fins before painting. To avoid getting paint on the dowels and effectively gluing them in place, I wrapped waxed dental floss around the dowels. I did this after masking the fins. The loose ends of the dental floss were taped down to keep them from getting in the way during painting. Hind sight is 20/20 here. Not knowing if it would even work, I decided to build and launch it before finishing it. Painting the fins before assembly would have made for both easier finishing and a better looking rocket. If you decide to paint-

Dental Floss

Continued on p. 4

the fins before gluing them to the dowels, make sure you leave some bare wood for the glue to adhere to. I painted the forward section with a flat black finish. This would allow a less than perfect finish and hide most

Flight of the Python

I decided to try to fly it before finishing it. This way, if it was a disaster I wouldn't have wasted too much time on it. I didn't even have primer on it. I was going to launch this with a group of people, but than decided that if it didn't work, I'd look like a fool. So, I launched it alone. I launched it in my back yard. I let my wife watch because if it worked, I'd have a witness. If it didn't, I'd have someone to take me to the hospital. First flight was on a C11-3. While I was setting up the pad and getting it ready for launch, I was thinking of the theory and kept going back and forth, it will work! No it won't. Yes it will! No it won't. It left the pad as true and straight as any rocket ever has. As it arched over and the chute came out, I started shouting "It worked! I knew it would!" The second and third launches were during a TARC team practice launch. I also used it to discuss the CP of rockets. These too were on C's. The first flight this day went well, but the parachute stuck in the end of the tube and never deployed. The second attempt that day was a perfect flight with perfect recovery. I have already begun a 4 inch version of this rocket. Precision roller bearings and other hardware are on order to take this bird to the next level. This one will include a boat tail and a more accurate nose cone.

Python Launch

Python Under 'Chute

Drake "Doc" Damreau

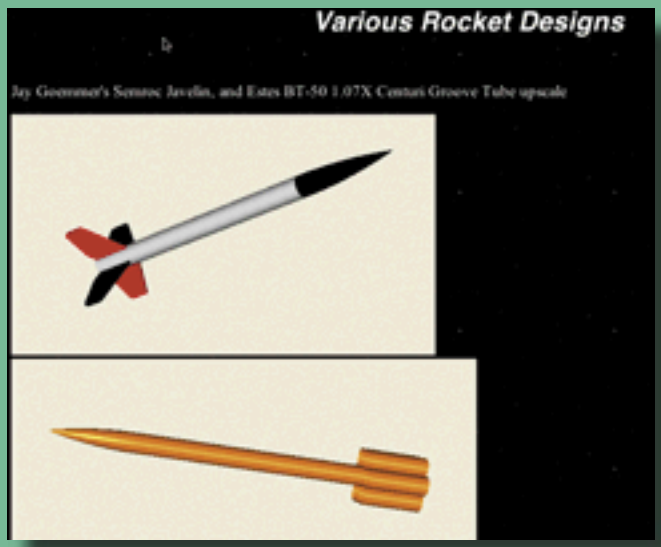
Drake Damreau has been in the hobby since 1973 and is currently President of Northeast Pennsylvania Rocketry Association (NEPRA); NAR Section 614, L3CC member, and TRA 9934 L3. He is shown in the above picture with his favorite rocket; the DG&A Armageddon. He is the Plant Metallurgist and Laboratory Director of Chamberlain Manufacturing, operating contractor of the Scranton Army Ammunition Plant. As such, he is capable of testing various rocket related materials in his laboratory. He has done some extensive strength of materials testing on various body tubes, fin materials, shock cords, and yes, even glues.

{Ed.-This article comes courtesy of Drake and it has been extremely interesting to learn about this strikingly unique rocket. It's nice to see rocketeers who get off the normal path and try something a little more challenging.}

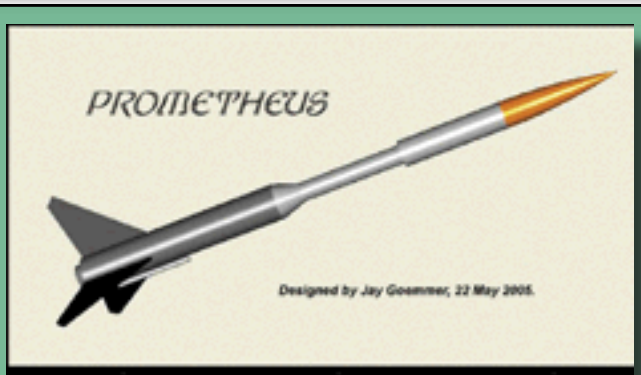
WEB SITES WORTH VISITING

Our website that we would like to highlight comes by e-mail from Jay Goemmer at http://home.earthlink.net/~gomero/rocketdesigns.html . Jay has some really cool designs that he's come up with! Although they are not all original per se, they are interesting in the fact that he has taken some designs from old Estes, Centuri, and many others and started working them up in RockSim.

Some are upscaled models, which are ones that are made larger than the original designs were. The information he gathers is from Jim Z, which he supplies a link to. Now, I want you to understand that Jay doesn't just recreate old designs but also has some original ideas in his head. At the right you will see two of the designs that he has done. One is the "Pometheus" and the other is the "Tau Zero". Incorporating transitions and tubes with intersecting fins makes a pleasing combination. I would be interested in how these designs fly! If you have a website that you think our readers would enjoy, e-mail me at johnm@apogeerockets.com.



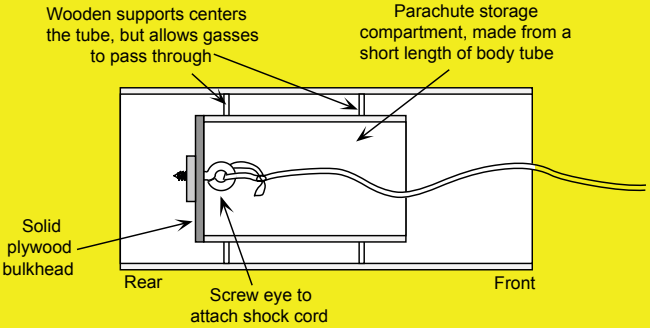
Estes Upscales



Original Designs

DEFINING MOMENTS

Parachute compartments can be incorporated into a design in order to minimize the chance of burning your recovery system up. As seen in the drawing at the right, this system allows the hot ejection charge gasses to pass around the tube that holds the parachute. At the same time, it protects the parachute from these hot gasses so that you will be more assured of a positive deployment and recovery outcome for your rocket.



Question and Answer Corner

Our "Defining Moments" from the last issue was about "Through-the-wall" fins. That got me to thinking about a question that comes up with Rocksim 8.0. Users will ask, "How do I make "through-the-wall" fins in my design?". The answer is simple, though not easily seen right away. Once you find it you kind of wonder, "Why didn't I see that before?".

To start off, open up the design that you would like to put tabs on your fins and go to where the design components are. Either double-click or highlight the fin set to enter the "Edit" screen for this component as seen in

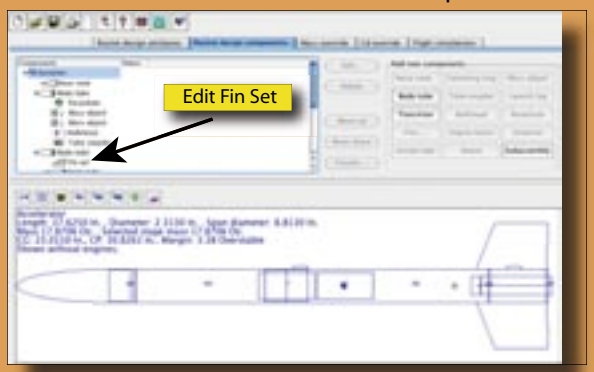


Figure 1

figure 1. After entering the edit screen for the fins you will find yourself on the "General" tab for the fin set. There are a variety of tabs up at the top to choose from. You will see the "Database", "Radial Position", "Mass Override", "Color", "Texture", and of course, "Through-the-wall Fin Mount" (TTW Fin Mount). You will see these in figure 2. Go ahead and click on the "TTW Fin Mount" tab, which is where you will find the area to add fin tabs to your model. Also in figure 2 you will notice that there are no fin tabs at the present time in the 2-D drawing of your model.

Now you can start adding the fin tabs to your design. You have 2 options on the "Depth" aspect. You can either set this manually or you can have Rocksim caculate it for you automatically. I prefer the latter, myself. As shown in figure 3, simply click on the "calculate

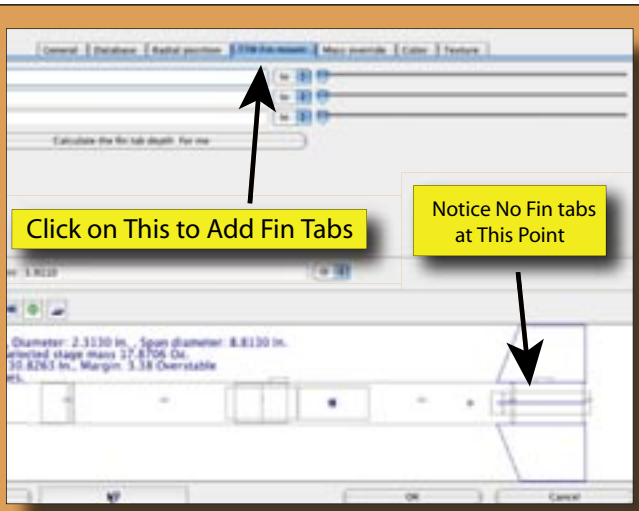


Figure 2

fin depth" button and Rocksim will set this measurement for you! Now you can go in and either punch in numbers for the "offset and length or you can use the slider bars to get the general measurment and then tweak it until they are the appropriate measurements. As you complete the measurement entry you will notice that the 2-D drawing is now showing the fin tabs going through the wall of the body tube and butting-up against the motor mount tube. Hopefully, this will help make your design

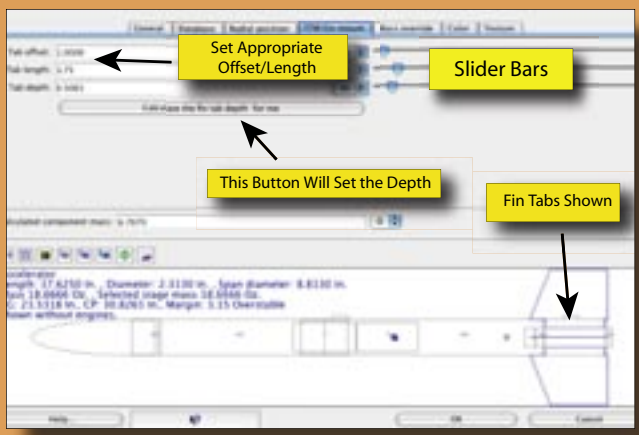


Figure 3

process a little bit easier. As you use and become familiar with Rocksim 8.0 it gets easier each time and the designs just start coming a lot quicker!

If you have a question, please send me an e-mail at johnm@apogeerockets.com.

TIP OF THE FIN

The tip for this issue comes from Matt Linke, who bought one of Apogee Components' Saturn 1B scale kits. He found out quickly that he did not want to risk slicing and dicing the beautiful plastic wraps that come with this wonderful model. To start off, this series of images shows how someone can practice cutting out the vaccuform wraps by using one of those thin plastic pots that many plant centers sell garden plants in. It has the same consistency and handles the same way as the rocket parts. After cutting out a piece as seen in picture 1, you can use the existing lines and features of the pot to practice scoring along. As shown in picture 2, once you score the plastic, it breaks just like the model parts by folding back and forth. You can see the scored and folded piece. It shows the lines in the plastic which are used to give the pot its rigidity. These lines make nice edges to practice scoring along. Picture 3 shows that there are many ways that you can practice cutting various shapes and sizes to get the hang of what technique it takes in order to cut the plastic without making horrible mistakes on the real product for your favorite design.

Pictire 1: Practicing scoring

Picture 2: Breaking apart on the lines

Picture 3: Cut various shapes and sizes

Thanks again to Matt for sending us this handy tip and the photos for us to share with our readers! As a 'thank you', Matt will be receiving a beautifully made, HUGE 5-foot diameter printed nylon cloth parachute as seen below! If you submit an article, plan, or rocketry tip to our newsletter and it gets published, we'll send you one of the parachutes, too! Please send your submissions to: johnm@apogeerockets.com.

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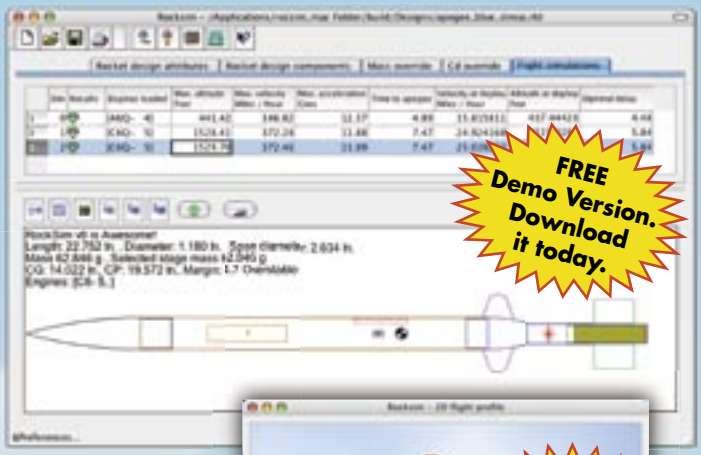

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