

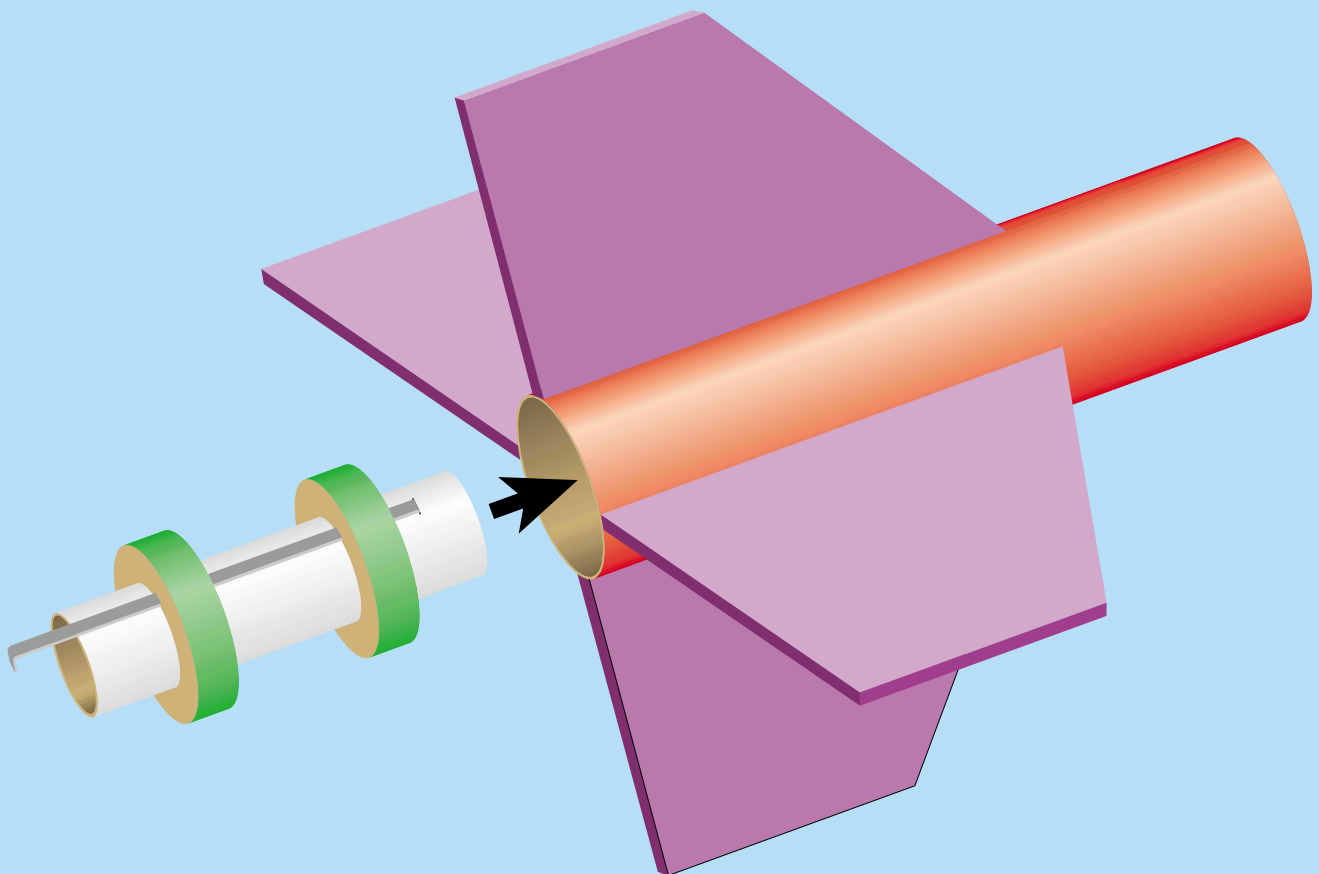
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PEAK OF FLIGHT

NEWSLETTER

How To Create “Subassemblies” In RockSim to help speed up the design process



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Subassemblies Explained: A little known feature in RockSim that can help speed the design process.

By Tim Van Milligan

This article will discuss a feature in RockSim that can help you speed the design process, particularly if like to create lots of different rockets. And what RockSim designer doesn't?

The feature is the "subassemblies."

A subassembly is a grouping of parts that you put together first, and then attach it to the main part of the rocket. Some common subassemblies are Engine Mounts, parachute ejection pistons, and fin cans. These are all assembled first, before putting them on or into the rocket.

As a designer using RockSim, you know that you're doing a lot of common steps as you go from design to design. One of the most tedious can be putting together an engine mount. Each time you create a rocket, you have to do the same steps over and over. That is where the "subassembly" feature comes in.

Using the subassembly feature, you can create an engine

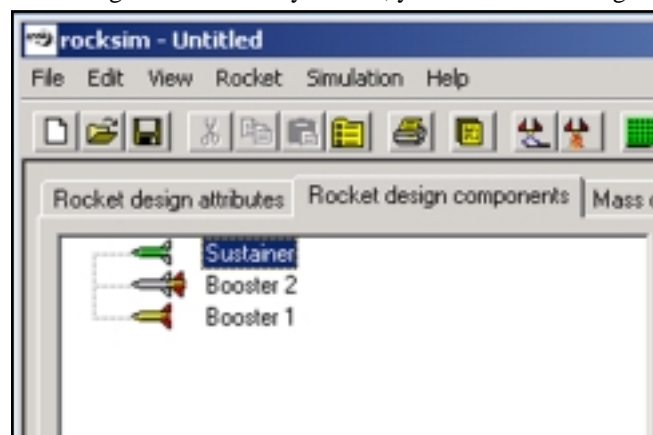


Figure 1: A "Placeholder," like these shown here, are a grouping of parts.

mount once, and use it in multiple rocket designs. That saves you time and effort.

There seems to be a little mystery surrounding how you create a subassembly, and then how you use it. So I'm going to walk you through the steps to create an engine mount subassembly.

The first thing to understand, is that when you push the

"subassembly" button, what you are doing is creating what we call a "place-holder." Now this is a technical sounding word, but it is easy to understand. It is just a grouping of parts that always stay together. You may not realize it, but you have been using place-holders in all your RockSim rocket designs.

If you take a look at Figure 1, you'll see a typical part's tree for a three stage rocket. The three stages shown are place-holders. All the parts you assign to the sustainer stage are under it's place-holder icon. It is the same with the booster and

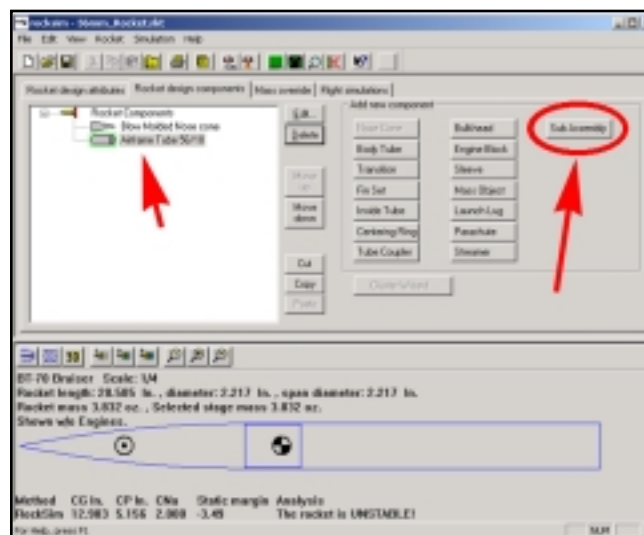


Figure 2: Select the part where the subassembly will go, and click the subassembly button.

the booster 1 stages of the rocket.

Now that you know what a place-holder is, we'll go ahead and start our design to create the engine mount place holder. To create an engine mount, we first have to put it into a tube. So quickly create a nose cone and a body tube. I'm going to create an "D"-size engine mount for a BT-70 size tube (A BT-70 in Apogee Component's part size = 56mm dia.).

After you have the nose and body tube created, you can go ahead and click the subassembly button as shown in figure 2. This creates the placeholder. You'll get a screen like the one shown in figure 3.

You can go ahead and fill in the description field. This is

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optional, but it helps other designers to see what the subassembly is used for.

Don't worry about writing something in the file name field. RockSim will fill this in by itself later when you save the subassembly to the database. As you will see, creating a subassembly requires you to come back to this screen later, and save it to the database. But we don't do that until we've attached all the components to the place-holder. For right now, just go ahead and click the OK button.

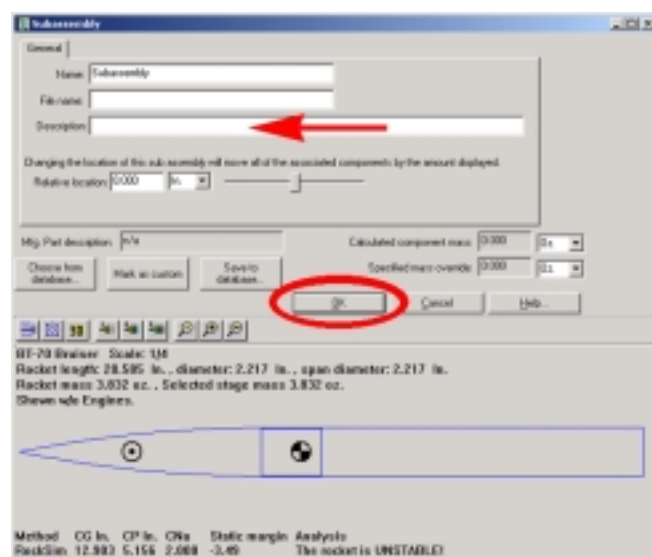


Figure 3: To start the process, write a description, and click the OK button.

In figure 4, I've gone ahead and added the parts that create the engine mount. As you can see, they are added under the Subassembly placeholder. I didn't go through the steps for adding each individual part, as a RockSim user, I'm sure you're able to add parts as necessary.

But there is one thing that I'd recommend. That is make sure you change the names of the parts as you create them. The generic names that RockSim uses don't tell you where they are located. For example, you could have two or more centering rings in the design. I suggest changing the names so

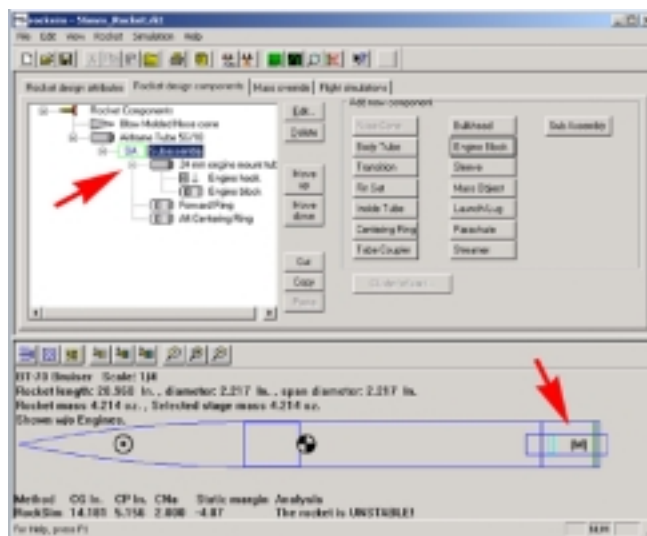


Figure 4: You'll add parts to the subassembly placeholder, which is positioned in the tube.

you can find out which is which, such as forward ring, and aft centering ring.

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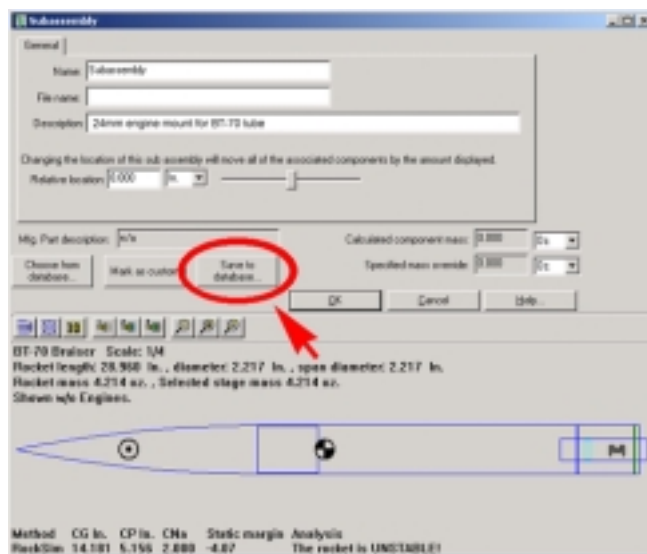


Figure 5: You MUST go back and edit the subassembly part. The purpose is to save it to the database so you can use it in other designs.

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Subassemblies

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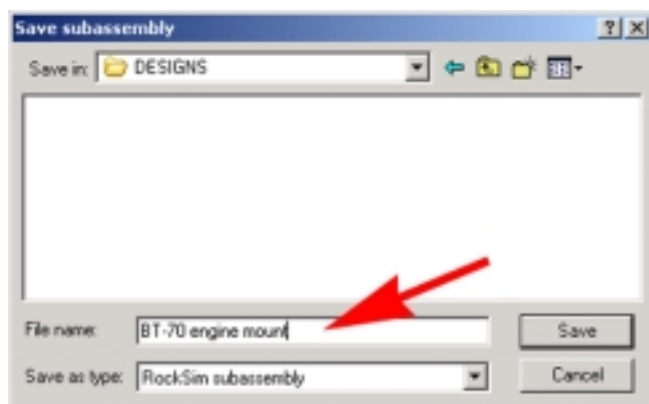


Figure 6: When you save the subassembly, remember to note when it is located.

IMPORTANT: Once you have added all the parts to the subassembly place-hold (as shown in Figure 4), you need to select the subassembly placeholder, and click the **EDIT** button (or just double-click on it in the parts tree).

Once you have opened up the subassembly part, you will get the screen, like shown in Figure 5.

We are now ready to save the subassembly to disk, so that you can use it in other designs too.

Make sure you have a description of the file, and then go ahead and click the "Save to Database" button. This will bring up a screen like the one shown in Figure 6.

Go ahead and name the file, and note where RockSim is

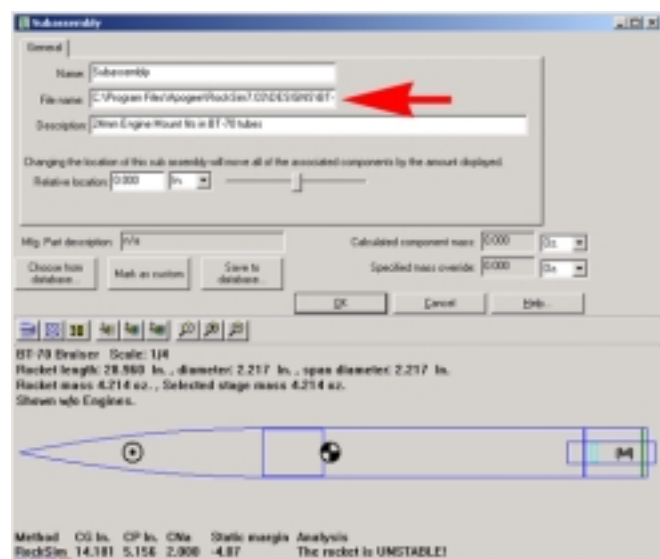


Figure 7: RockSim fills in the file name for you.

storing the file. The default location is the DESIGNS folder. Then click Save. It will bring you back to the subassembly screen as shown in figure 7.

At this point, the subassembly has been saved to disk, and can be used in other designs. The File location will (see Figure 7) is now automatically listed.

You can now close out the window and the design.

Using the subassembly in other rockets

In Figure 8, I've now created a completely new rocket

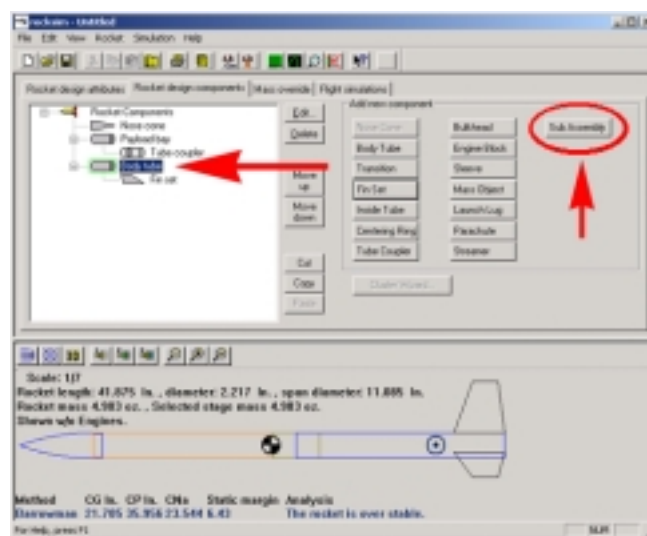


Figure 8: This is now a completely new design. Select the part where you want the subassembly to go, and click the button to add it.

design. To start the process of using the new subassembly, highlight the tube into which you want the subassembly to go.

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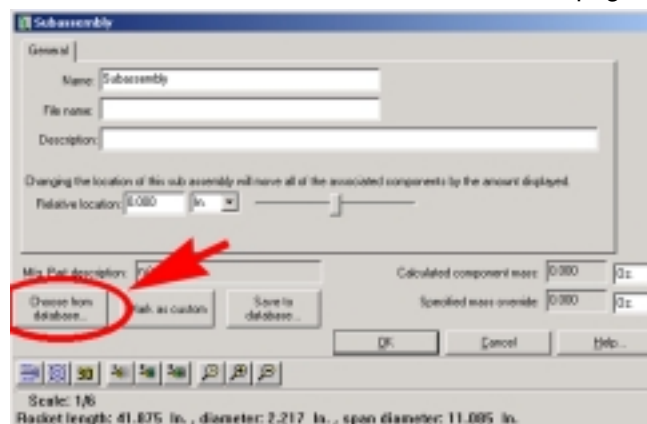


Figure 9: To load our subassembly, select the "Choose From Database" button.

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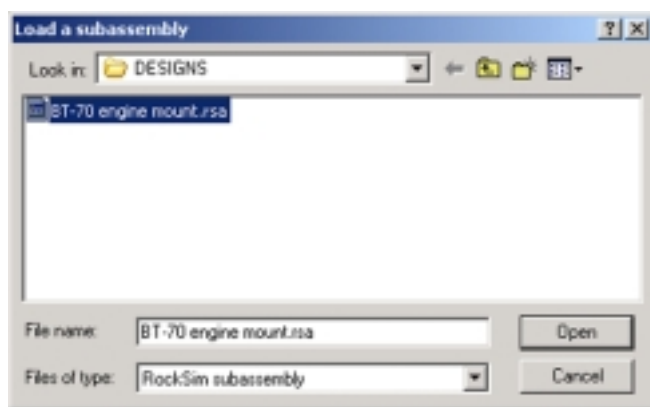


Figure 10: Navigate to the location where you store your subassemblies, and click “Open.”

In this case, it is the aft body tube.

Now, click on the subassembly button to the far right.

You'll now see the familiar subassembly screen which is shown in figure 9. This time, we want to select the "Choose from Database" button.

This will bring up the screen to select which subassembly you want from the database. See Figure 10. Since we only have one subassembly in our DESIGNS folder, it is easy choice.

You'll notice that the file extension is ".rsa". This stands

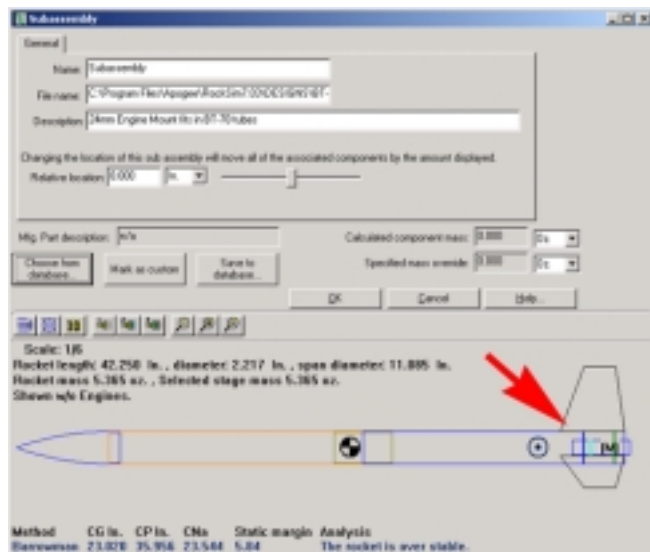


Figure 11: After you click “open” in Figure 10, RockSim loads the engine mount subassembly into your rocket design, as shown here.

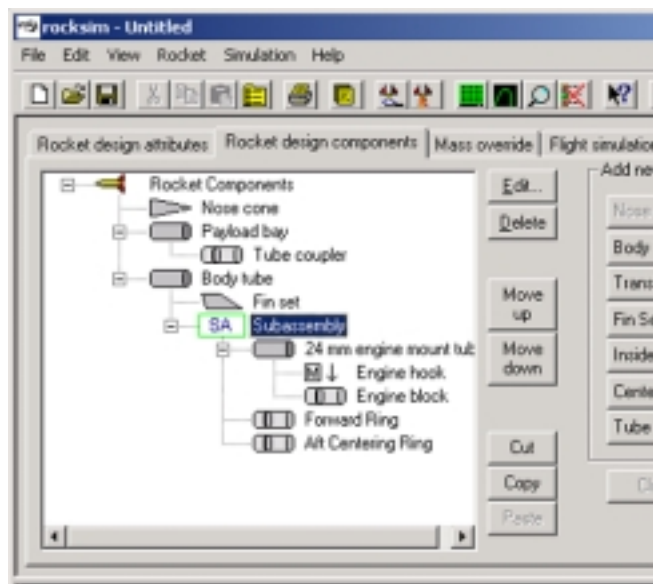


Figure 12: The parts tree with the new sub-assembly loaded. Compare to Figure 8.

for RockSim SubAssembly.

Figure 11 shows the rocket now with the subassembly added. That was simple, wasn't it?

Figure 12 now shows us the parts tree that includes the new subassembly. All the parts were added, along with the locations, and their colors.

With a subassembly, it greatly speeds the design of a rocket, as you have just seen. You make the part just once, and

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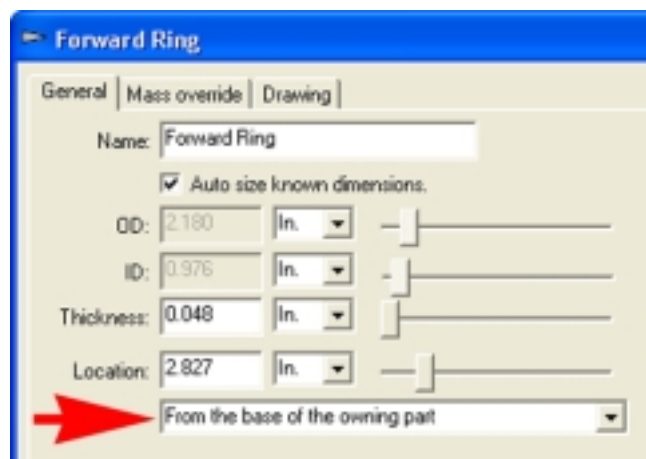


Figure 13: As you create the subassembly, make sure you reference all the parts from the same location, as shown here for this ring.



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call it up whenever you need it.

When you share design files with your friends, it is NOT necessary to send them the Subassembly file. All the parts in the design are saved with the RockSim file. So your friend will have everything he/she needs.

Helpful Hints

There are some helpful hints that you should be aware of when you create your subassemblies the first time. First off, make sure you reference all the parts to the same location. As shown in Figure 13, when I added parts into the subassembly, I referenced them from the base of the owning part. The owning part, is the BT-70 tube that they were placed into.

If you have some referenced from the back, and some referenced from the front, your subassembly will import with parts located all over the place. It will look strange. But, it is simple to fix. Just edit the part that is mis-located, and shift it into its proper location. This is why it is important to give each part in your rocket a distinctive name. Otherwise, you have to go through each ring, and figure out if it is the one that is mis-located.

Here is a neat feature of the subassembly. Say you created the 24mm engine mount as we just created in this article. You are not limited to using it in just BT-70 size tubes. You can use it in almost any size rocket.

For example, say we want to use the subassembly in a BT-80 size tube, which is larger than the BT-70. We import it as described above.

When it imports the subassembly, the two centering rings will be undersize. But, just click on them to edit them. As soon as you do, they autosize to the correct diameter to fit the BT-80! So while it isn't as convenient as having them the perfect size, it is just two extra steps to make them fit. It certainly is a lot faster than creating the engine mount from scratch.

This also works if you were putting the engine mount in a smaller tube than the BT-70 (see Figure 14). The rings just have to be opened, and they'll autosize to the correct body tube diameter.

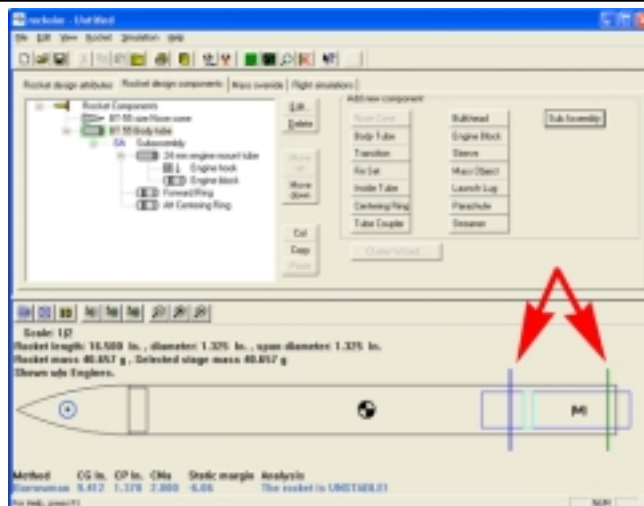


Figure 14: If you use the subassembly in a smaller rocket tube, the rings will appear to stick out. But as soon as you edit them, they are automatically resized to fit the new tube.

Restrictions for Subassemblies

There are a couple of restrictions when it comes to subassemblies. In RockSim v7.03 and older, subassemblies cannot contain outside body tubes, and transitions.

Therefore, at the current time, subassemblies work good for engine mounts, ejection pistons, and fin cans (you can use the sleeve tube to slide over your body tube), but they don't work at all for payload bays. We'll be adding that feature to a future version of RockSim.

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Tim Van Milligan is the owner of Apogee Components (<http://www.apogeerockets.com>) and the curator of the rocketry education web site: <http://www.apogeerockets.com/education>. He is also the author of the books: *Model Rocket Design and Construction*, *69 Simple Science Fair Projects with Model Rockets: Aeronautics* and publisher of the FREE e-zine newsletter about model rockets. You can subscribe to the e-zine at the Apogee Components web site, or sending an email to: ezine@apogeerockets.com with "SUBSCRIBE" as the subject line of the message.

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