ISSUE 78 - MARCH 22, 2002

APOGEE

PEAK OF FLIGHT

NEWSLETTER

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FREE Rocket Plan from Shrox PAGE 07

NARCON Pre order now and pick up a Saturn V BACK PAGE

TEXAS TWISTER STIRS UP TROUBLE!

Redesigned for more fun. Features helicopter recovery!

PAGE 02

APOGEE COMPONENTS

650 Elkton
Colorado Springs, CO 80907
www.apogeerockets.com
orders@apogeerockets.com
Phone 719-535-9335 Fax 719-534-9050

Warning! A Twister is Coming!

Grab your children, and pay attention to this important announcement. A Texas Twister has been spotted moving toward your neighborhood.

This isn't a weather alert; it is a bulletin to make you aware that the Apogee "Texas Twister" rocket is back in production, and is available for immediate shipment to your mailbox.

The Texas Twister is a unique helicopter recovery rocket that is enjoyable to build and exciting to fly. The kit features precut kraft-paper tubes, die-cut balsa fins, an injection molded high-impact polystyrene nose cone, and a water-slide decal; all which make it a sturdy design -- plus a great looking rocket. It is truly worthy of joining your rocketry fleet. And it makes a great project for you and your family to build together.

But the launch is where the high-intensity aerial excitement happens. It starts with the rocket blasting off to incredible heights, thanks to its low-drag streamlined configuration. At apogee, when it is just a tiny speck in the sky, it flips outward its three canting fins; transforming it to a wildly whirling helicopter recovery beast It spins much faster than a Oklahoma tornado -- it's Texas sized!

If you enjoy innovative rocket designs, you'll love this very unique configuration. Besides its canting fins, it features a slip-n-slide piston arrangement that allows it to morph from ballistic rocket to a gyrating helicopter. Plus it has a special molded polyurethane-resin hold-down ring which locks down the canting fins in launch configuration.It is probably one of the easiest rockets to prep for flight -- just a few seconds. Just pop in a new motor, slide the hold-down ring over the canting fins, and blast off!

It can even be used for helicopter duration competitions, because it says in one piece from ignition to landing. Did I mention how light-weight it is? That makes a huge difference in competitions, because the rocket will fly higher and descend slower.

The newly improved Texas Twister rocket kit now comes with a standard-size 13mm diameter motor mount. This allows a wider variety of rocket motors to be used: from Estes' mini A's, to the high performance Apogee Components B7 and the super C6. This gives the rocket a "Crack-of-Thunder" sound and a brilliantly colored plume: thanks to its White Lightning(TM) propellant. It is truly an atmospheric phenomena that is rip-roaring from lift-off to touchdown.

The rocket is available for immediate shipment. For fastest delivery, you can order from our secure web site using your credit card.

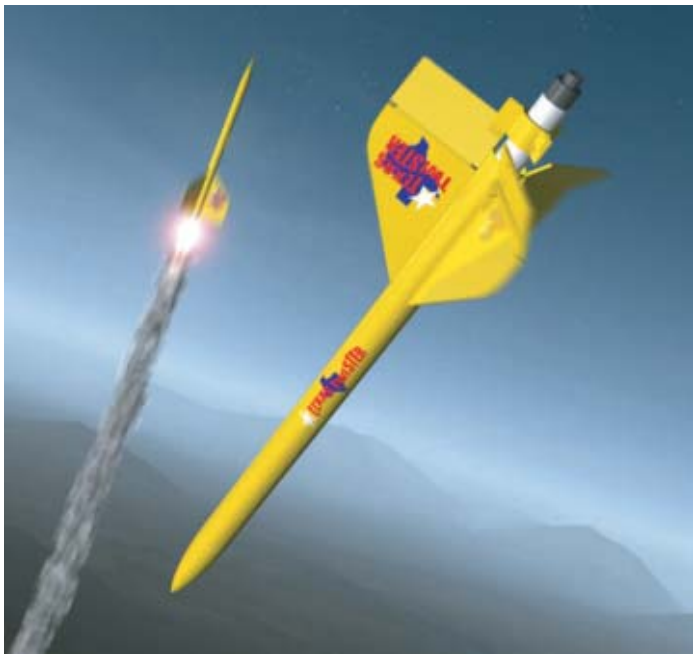
Go to: http://www.apogeerockets.com/texas_twister.asp

TEXAS TWISTER

Specifications: Skill Level 3 - Average Skills Required
Price: $11.95
Length: 36.5 cm (14.38")
Dia: 18mm (.736")
Empty Wt: 17.5 grams (.62 oz.)
Recovery Type: Helicopter
Recommended Estes 13mm motors:
1/4A3-3T, 1/2A3-2T, A3-4T, A10-3T \
Recommended Apogee Components 13mm motors:
B7-6, C6-7

Click here to download the RockSim design file to find out how high the rocket will fly with the motors you select.

(http://www.apogeerockets.com/education/downloads/apogee_texas_twister.rkt)



WEBSITES OF THE WEEK

http://www.WildHobbies.com/rocketry/techtalk/techtalk.asp

This web site also has a collection of articles on various aspects of rocketry. They are categorized by topic, making it easier to find the information you may be seeking. Here is the selection of articles that are linked to from this web page:

Introduction to Rocketry
WildHobbies intro to rocketry part 1
WildHobbies intro to rocketry part 2

Construction
Kerry's Common Construction Mistakes
Jim Ball's Fin Alignment Guide
Troy Monroe Stacey's Guide to building big nose cones (PDF)
Greg Lawson tells How To Build Short Rockets
Jay Ward shares his techniques on fiberglassing.
Steve Roberson explains how to put a camera in a rocket (PDF)
Kerry adds an article on Finishing a Nosecone
Carl Delzell shows how to make your own boattail
Recovery
Added Parachute Tips Article by Carl Delzell
Check out John Bolene's Descent Rate Calculator
Motors
WildHobbies Guide to common aft closure sizes
Eric Jackson shares some motor adapter tips
AeroTech Guide to Single Use Motors
AeroTech Guide to Reloadable Motors
Dr. Rocket Guide to common Reloadable Case Lengths
Software
Steve Roberson's quick guide to WinRoc (PDF)
John DeMar's Model Rocket Drag Analysis
Misc.
Hyam Sosnow presents Flying clusters for fun and profit (PDF)
Bruce Levison explains how to handle tube fin simulation using VCP
R.O.C. Experts shares tips for Reloadable Motor Systems
Kerry Garrison's Guide to Certification
Wolfram von Kiparski's updated Rocketry FAQ
N.A.R. Model Rocketry Safety Code
N.A.R. High Power Rocketry Safety Code

http://www.midsouthrockets.com/articles.html

This is a web site from a NAR section club that has several good technical articles. My favorite of them is "Rocket Rules of Thumb" written by Tom Savoie. This article gives a wide variety of simple guidelines that make designing, building, and flying rockets more successful. It includes things like:
Launch rod diameters for various size rockets.
Choosing rocket motors
Parachute sizing
How much recovery wadding is required
Achieving a proper fitting nose cone
Using piston ejection systems
and much much more.

"Rules-of-thumb" can be controversial and are often debated. But for the most part, these guidelines are sensible and will serve you well if you follow them.

The web site has several other articles that you might find interesting too. How to care for your parachutes is another good one to read.

Mass Override Options in RockSim

Feature Article

Andrew MacMillen asks:

"A question that has come up repeatedly for me and a few discussions: in RockSim, after building the rocket, is it better to override the final design with 1) the overall actual mass & CG; 2) a mass object positioned to achieve the measured CG; 3) or adjust all the parts to get the actual mass & CG? What are the pros & cons for each?"

It depends on how accurate you want your simulations. The simple answer is that more work you put into the design of the rocket, the better the results of your simulation will be.

The first way that Andrew asked about is the simplest way to tweak the final mass of the design. Just override the mass of the rocket by using the mass override for the entire rocket. Here is the procedure from the "Rocket Designer screen:" (see figure 1)

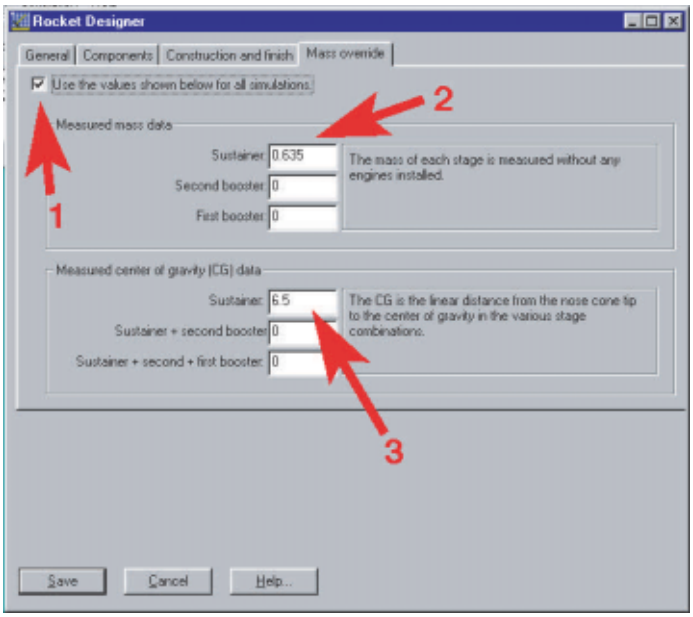


FIGURE 1 - Rocket Designer screen

Step 1: Click on the "Mass Override" tab. Mark the check box that says "Use the values shown below for all simulations."

Step 2: After measuring the actual "EMPTY" weight of the rocket, enter it in the "Measured mass data" section. You use the empty weight, because RockSim will add in the mass of the motor when you install it to run the simulations.

Step 3: Balance the rocket on your finger to find the location of the CG. Enter that location in the "Measured center of gravity (CG) data" area. If you don't put anything here, RockSim will put the CG at the tip of the nose.

As I mentioned above, this is the easiest way to add mass to the rocket. The second method is just slight more involved. In the second method, you add a mass object to the rocket. This mass object is the difference in weight between the actual rocket, and what RockSim predicts. The position of the weight is adjusted in the rocket so the CG comes out at the right spot.

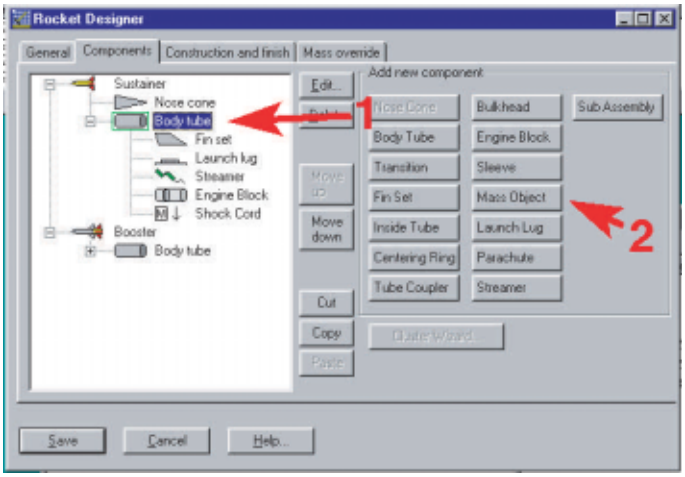


FIGURE 2 - Rocket Designer screen

Step 1: Click on a part where you intend to add mass. This hilites the part in the tree.

Step 2: click the mass object button.

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Mass Override Options in RockSim cont.

Step 3: Add the mass to the part. Then specify a location of the new mass -- this is measured from the front of the part, not from the tip of the nose cone.

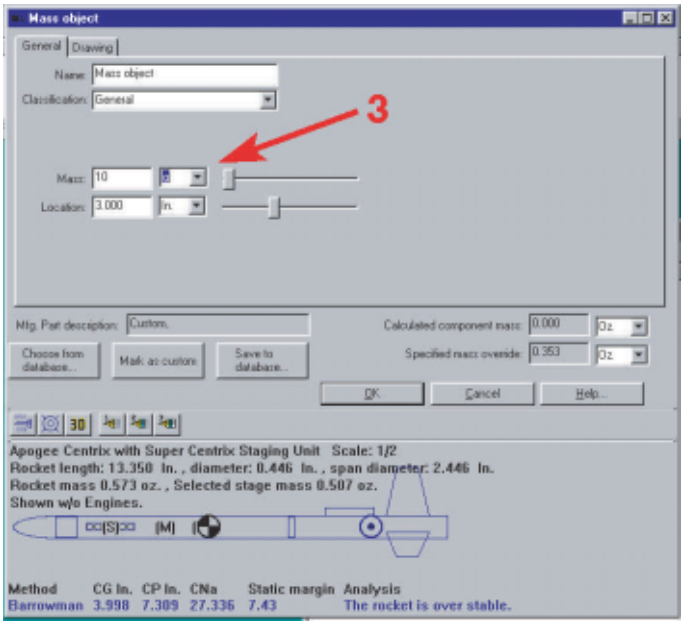

FIGURE 3 - Rocket Designer screen

The "mass object" is considered by RockSim as a physical object, and is indicated on the drawing as a (M).

The third method is the most labor intensive. In this method, you physically have to open up each part in the design, and override it's mass. See figures 4 & 5.

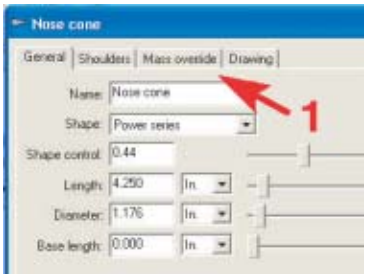

FIGURE 4 - Rocket Designer screen detail

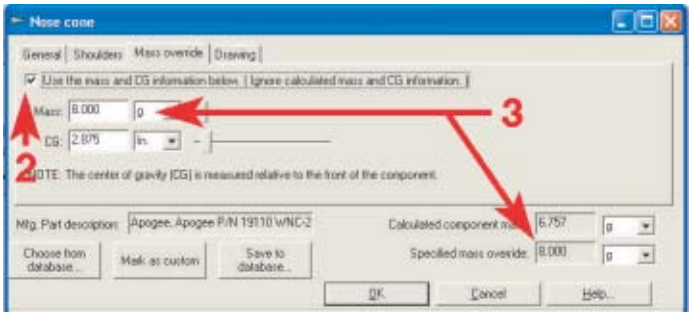

FIGURE 5 - Rocket Designer screen detail

Step 1: Each part has a mass override tab. Click it.

Step 2: Click the check box that says "Use the mass and CG information below." This will tell RockSim that it should use this information instead of the values it calculates.

Step 3: Enter in the mass and the CG location for the particular part. You'll have to repeat these steps for every part in the design. The moreparts you have in the design, the longer this will take.

But getting back to the original question -- which is the most accurate? The answer is that it depends on if the simulation will include any "wind."

Essentially, if you plan to run a simulation with no wind, then it won't matter which method you use. They'll all give you the same result.

As a demonstration, I performed some simulations using the Apogee Aspire rocket kit. Essentially, I first ran a simulation using method 1 - setting the empty mass of the rocket at 55 grams, and the CG location at 15.375 inches from the tip of the nose. This was simulation #0 that is shown in figure 6. The altitude using an Apogee Components F10-8 motor was 5,108.02 feet.

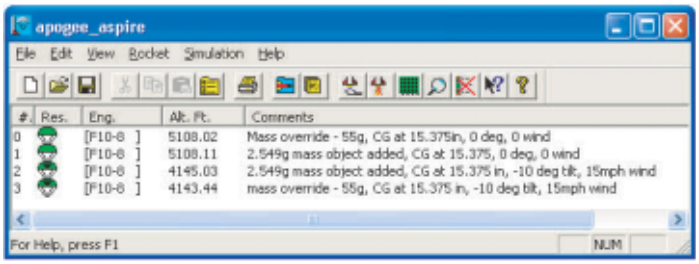

FIGURE 6- Rocket Designer screen detail

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Mass Override Options in RockSim cont.

Adding Wind

When you add wind, it will change the results of the simulations. In figure 6, compare simulations #2 and #3. They are close, but you can definitely see a difference. With wind, the method that you use will make a difference in the simulation results.

The reason for the difference is because of how the mass moment of inertia of each part affects the flight dynamics of the rocket. It sounds pretty technical, so I'll try to explain what happens.

Let's start by stating that one property of mass is that it has "inertia" -- that resistance it has to a change in motion. A small mass has less inertia than a big one, so it can be pushed around more easily.

How does this relate to a rocket?

Think of a rocket as a very long pole. Stick a ball on one end of the pole, and lift it into the air by holding it at the other. It is easy to move around if the ball on the end of the pole is lightweight. However, if it is a heavy ball, just picking it up can be difficult.

Once you have the pole balanced in the air, you'll notice something interesting -- it is easier to keep the heavy ball upright and balanced. That is because the forces trying to push it around first have to overcome the inertia of the heavy ball. When they do, and the pole starts to topple over, you'll have a difficult time trying to prevent the pole from hitting the ground. Now you have to overcome the inertia of the moving ball to right the pole again.

This is a very similar situation to what happens to a rocket. If the mass of the rocket is concentrated more at the ends (having a heavy nose cone & heavy fins), then it has high inertia. It would become difficult for a disturbing force to change the orientation of the rocket.

This is a good situation. Once we aim the rocket, we want it to follow the correct path and to resist disturbing forces; such as wind. A rocket that has a lesser moment of inertia will be easier to change trajectory -- such as a rocket with a thick, heavy-duty body tube, and light weight nose cone.

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The important thing to understand is that each component has its own inertia, and that will determine how the rocket is affected by disturbing forces.

When we just assume all the mass is concentrated at a single point (such as method 1), it is easier for the rocket's trajectory to change; which is why it will sim at a lower altitude. Compare the altitude results in Figure 6 of simulations #2 and #3. Since simulation #3 was considered as a point mass, it had a lower altitude than the method where we added a mass object. The mass object's inertia is added to the inertia of the rest of the components.

I didn't go through the effort to simulate a design using a mass override for each component; but I'm confident that the design will be more accurate. And as I mentioned at the beginning, the more effort you put into the design, the more accurate the simulations will be.

How do you decide which method to use?

The criteria in selecting the method is how accurate you want the simulation to be. If you can live with some small percentage of error, you might as well use a quicker method.

There are some inherent errors in any simulation anyway. It is impossible to predict every disturbance and even the Cd of the rocket with high degree of accuracy. So you should remember that the final results of any simulation will have some error in them anyway.

A good alternative is to use the second method - just add a mass object as a last step in the design process. This works good for most rockets, and the results of the simulations will be good enough. But if the rocket is very long, I would probably break the mass object up into two smaller parts; sticking one near the front of the rocket, and one near the rear. This would more likely mimic the high moment of inertia that a long rocket would have.

On the other hand, if you have a short stubby rocket, like a Fat Boy, I'd just use method #1. This rocket would have a low moment of inertia anyway, so this would probably be OK.

Author Information: ----------
Tim Van Milligan is the owner of Apogee Components and the new rocketry education web site: http://www.apogeerockets.com/education. He is also the publisher of the FREE e-zine newsletter about model rockets. You can subscribe to this e-zine at the Apogee Components web site, or sending any message to: ezine@apogeerockets.com with "SUBSCRIBE" as the subject of the message

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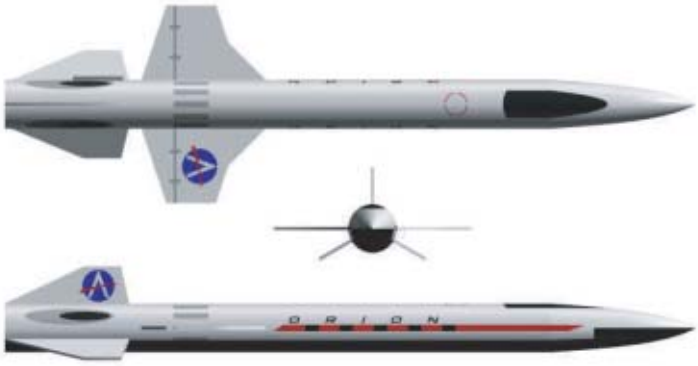
ORION Luxury Shuttle by SHROX

DOWNLOAD THE ROCKSIM PLANS AND DECALS

The data file you will need to the high ground above Earth is reserved at:
http://www.apogeerockets.com/shrox/orion.asp

These are the parts you need:

1- 19400 - Apogee Nose cone - PNC-24A
1- 10099 - Apogee Body tube - 24 mm x 11 "
1- 10085 - Apogee Body tube - 18 mm x 2. 3/4"
1- 13029 - Apogee Engine block - CR 13-18 ring
2- 13031 - Apogee Rings - CR 18-24 ring
1- 29005 - Apogee Streamer 36"x2"
1- 13051 - Apogee Launch lug - "1/8"" X 1"
1- 29505 - Kevlar 10 in. line
1- 12 in. Shock cord and mount
3/32 in. Fin stock (balsa or basswood)



Get what you need by phone!
Call Apogee at **719-535-9335**

NARCON 2002 We are so there!

Hosted by AARG

Tim and Shrox will be in attendance at NARCON-2002 in Austin, Texas on April 5! Come meet us in person, and lets talk rockets. Then stick around and hear our presentations on how to design cool rockets.

We'll also be bringing along a selection of our products to show off and sell. You're welcome to drool over the Saturn V and the Saturn 1B display models. If you're going to buy a Saturn V kit at the conference, please let us know in advance, so that we can bring enough of the kits. The Saturn 1B kit is not ready yet, but pre-orders will be taken.

NARCON is the biggest indoor model rocket convention in the world. You'll get to see numerous rocketry displays, and hear a variety of sessions covering topics like: high power rocket construction, building scale models, rocketry education, and rocket design. There is usually 4 different sessions going on at all times. We highly recommend attending if you get a chance. The official web site is at:

http://www.narcon2002.org/

If you're going to buy a Saturn V kit at the conference, please let us know in advance, so that we can bring enough of the kits. The Saturn 1B kit is not ready yet, but pre-orders will be taken.
Phone us at 719-535-9335 - Fax 719-534-9050 - email : orders@apogeerockets.com

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(719) 535-9335 (voice)
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Shipping and Handling Fees

Subtotal	Domestic	Foreign
Under $35	$3.75	$12.00
$35 to $70	$4.75	$15.00
$70 to $100	$5.80	$20.00
$100 and up	$8.05	$25.00

All payments from foreign customers must be made in USA funds in the form of Cash, an International Money Order, or a bank draft drawn on a US bank. Motors are shipped via surface mail.

4/13/00

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