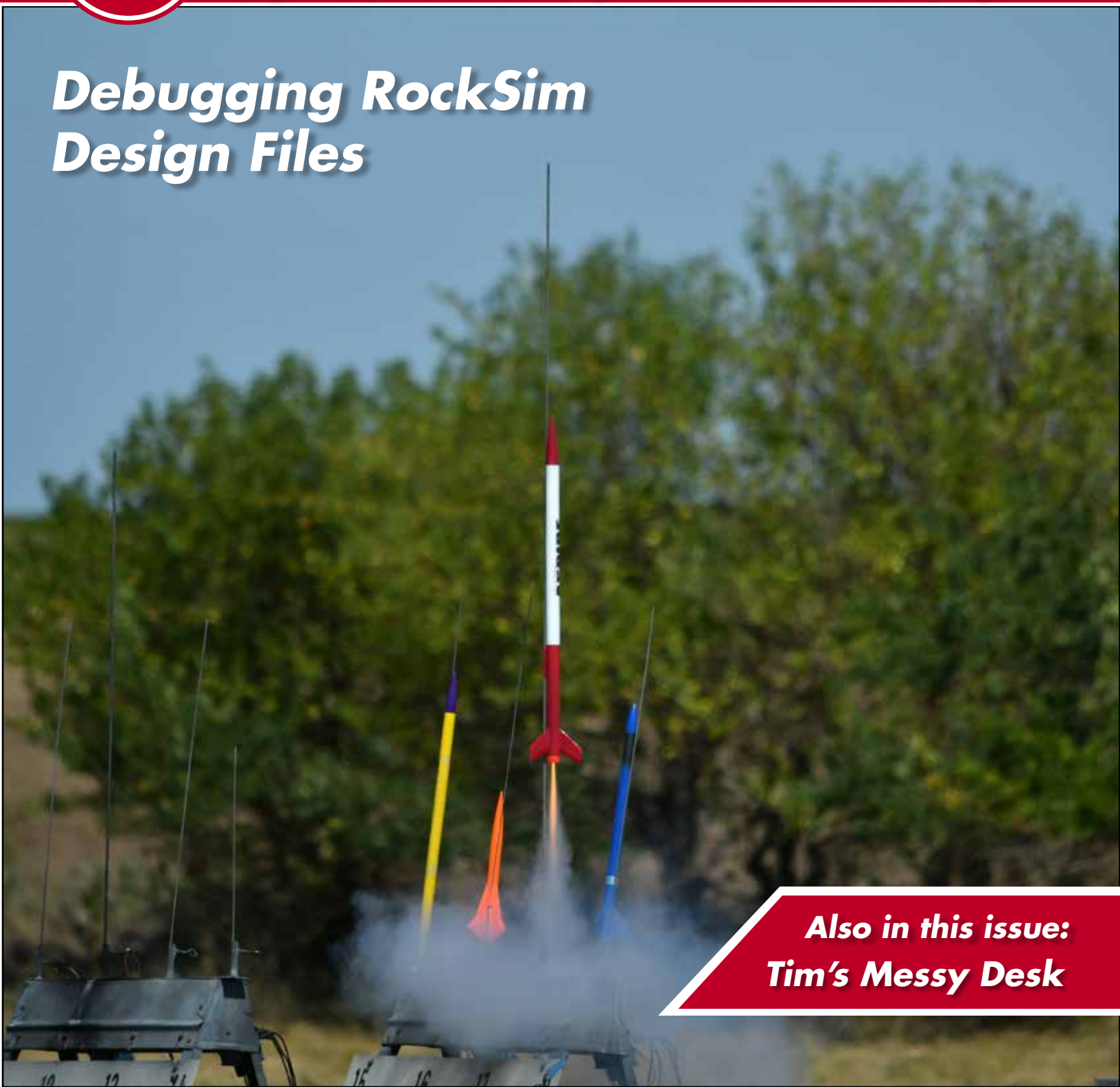
Issue 634 / September 10th, 2024

PEAK OF FLIGHT NEWSLETTER

Apogee Components, Inc. / ApogeeRockets.com / Colorado Springs, CO

Debugging RockSim Design Files



Also in this issue:
Tim's Messy Desk

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COVER PHOTO

Apogee Aspire

The Apogee Aspire is known for its graceful ascent. When powered by the long burn F10-8 motor it goes over a mile high. Weighing under a pound, it's legal to launch without special waivers, allowing enthusiasts to enjoy significant heights even at restricted locations.

FEATURED ARTICLE

Debugging RockSim Files

by Tim Van Milligan

If you find yourself with a corrupted RockSim file that's giving you trouble, don't panic! In this practical guide, we'll help you identify and fix the issue so you can get back to your rocketry projects.

Tim's Messy Desk

by Tim Van Milligan

Get up to date at the happenings at Apogee Components, and what is going on behind the scenes. This blog entry tells what Tim has been doing all summer long, and what is coming up in the fall.

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About this Newsletter

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Editor-in-Chief: Tim Van Milligan
Managing Editor: Michelle Mason
Content Editor: Martin Jay McKee
Layout Design: Tim Van Milligan

An Aerotech Mega Initiator takes off at Airfest, in Argonia, Kansas

Would you like to see your launch photo featured in the *Peak-of-Flight* newsletter? Submit your photo at apogeerockets.com.

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Debugging RockSim Design Files

by Tim Van Milligan

Occasionally, people send me RockSim files that have issues with them. They get corrupted somehow, and the modeler wants it fixed. In this article, I'll go through my process of fixing files. It is my hope that you'll be brave and try to fix them on your own after you understand the root causes of what causes the most common issue.

How Do Files Get Corrupted?

As I'm writing this article, I've been looking for RockSim design files that have issues with them. And this was the hard part of writing this article, because I couldn't find any corrupted files to use as examples.

What I'm saying is that having a corrupt file is a pretty rare occurrence. But I'm not saying it can't happen, as anything is possible. Someone will always find an exception just to embarrass me.

When I encounter corrupt files, I've observed a pattern. The original creation date of these files often coincides with the use of an older version of RockSim, specifically Version 9. This version, discontinued for over four years, had a history of saving certain complex files with issues. In contrast, the newer versions, both v10 (released in April 2020) and the latest v11 (released in April 2024), are considerably more reliable..

The files that have issues generally have one thing in common. They are complex models. By complex, I mean that they have some special components in them, either a "pod," or a "subassembly."

Pods and subassemblies are both "collections" of parts. Imagine a strap-on booster pod like on the sides of the SLS or the space shuttle like shown in Figure 1. These are made up of several parts like a nose cone, a body tube, and inside tube, and maybe even fins of their own. The point is that a pod is not one part, but several individual components that are joined together.

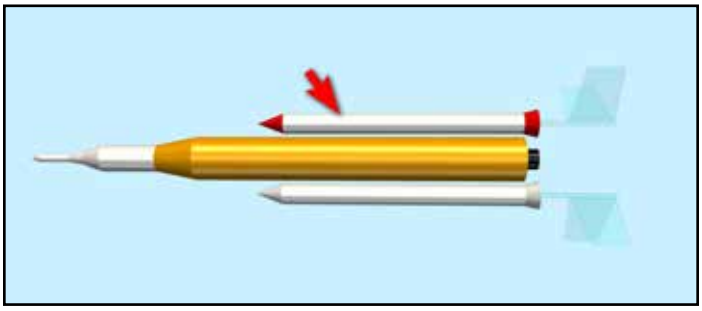

Figure 1: A Pod is a collection of parts attached externally on the rocket.

The difference between a collection of parts called a "pod" and the collection of parts called a "sub-assembly", is that pods are attached to the outside of a rocket, where subassemblies are internal components. And subassembly might be used for a removable engine mount adapter that allows smaller motors to be used in place of a larger diameter rocket motor.

In both pods and subassemblies, the defining feature is

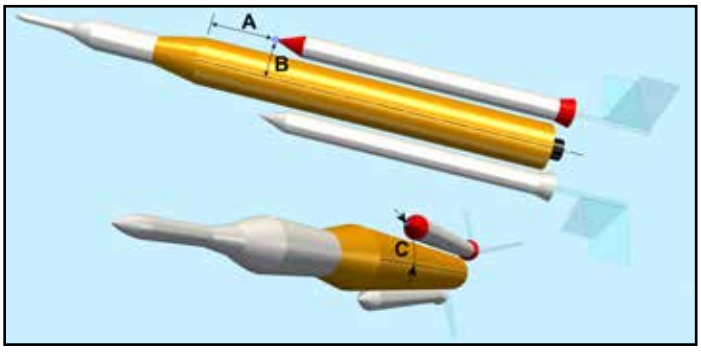

Figure 2: The location of the pod is defined by three measurements, that are relative to the part that it is attached to.

the use of "relative" location dimensions. This implies that one dimension is relative to another dimension elsewhere on the rocket. For instance, when constructing a pod, such as a strap-on booster, the initial step involves attaching a nose cone to the exterior of a rocket tube. The position of the nose cone's tip is determined relative to the tube in three dimensions.

First, It is measured from the top of the tube, second from the centerline of the tube, and third at some angle with respect to the tube (like the 12-O'clock position or the 3 o-clock position). All of those three locations are relative to the part to which the nose is attached.

Now you start adding other parts to that nose cone. There are a lot of relative dimensions that have to be tracked by RockSim. The more parts, the more the relative dimensions have to be tracked, and the complexity increases.

What could be even worse though, is a second pod that is attached to the first pod. This makes for some very interesting rocket designs, like the Orbital Transport shown in Figure 3. But there are so many dimensions and angles that have to be accounted for. Additionally, if you move the first pod, every location and dimension of every component in the pod has to be tracked and updated internally. The more they were moved around and tweaked, the more chances there were for the geometry to get confused.

Figure 3: This complex rocket design has numerous pods. There are pods attached to pods.

In old RockSim v9, we noticed that parts seemed to lose their location dimensions. This would manifest as parts appearing at odd locations on the rocket. Another thing that would happen is that RockSim couldn't run a flight simulation, even if the parts looked like they were located correctly..

Results	Engines loaded	Manufacturer(s)	Max.altitude Feet
	[G250VM-14]	Cesaroni Technology Inc.	0.00
	[G250VM-0]	Cesaroni Technology Inc.	4075.03

Figure 4: This symbol tells us that the simulation did not run, and the rocket didn't leave the pad.

How does wrong geometry affect flight simulations? When RockSim runs a flight simulation, one of the key values it has to compute is the moment of inertia (see *Peak-of-Flight Newsletter 192* at **https://www.apogeerockets.com/education/downloads/Newsletter192.pdf**). If it can't compute that value because it doesn't really know where a part is located in the rocket, it throws up its hands and gives up on trying to run the simulation. And this is where users would reach out to us and say that something was wrong.

How to Find and Fix the Issue

As mentioned, the problem, particularly with version 9 was pod or subassembly parts losing their locations in the brain of RockSim. We did a lot of improvements in version 10 and version 11 to better track the parts, so this isn't as much of an issue as it was in the past. That's why I'm not able to find examples to use to show you how to trouble-shoot the issue.

Therefore, the first way to fix the problem is to load the rocket in the latest version of RockSim. Currently, that is version 11. It seems to get everything back in its geometric locations.

If you are still in version 9, then what we have to do is track down the parts that are misplaced, and correct the issue. Now this is where some philosophy comes into play when it comes to the actual process.

I'm a butcher (not a surgeon) when it comes to finding the part that is out of sorts. If a simulation doesn't run and the rocket has pods or subassemblies, then I have a hunch that it is a part that has lost its geometry. So if I can find and delete the part that is in the wrong location, the simulation should run. And this process does work!

My methodology is just that: delete a part from the pod - then run a test simulation to see if it gives a result. If it still doesn't run, I hacked off the wrong part. So I'll delete

another and try to run a simulation again. I start at the extremities and work up to the torso. It is a process of hacking off limbs to save the patient.

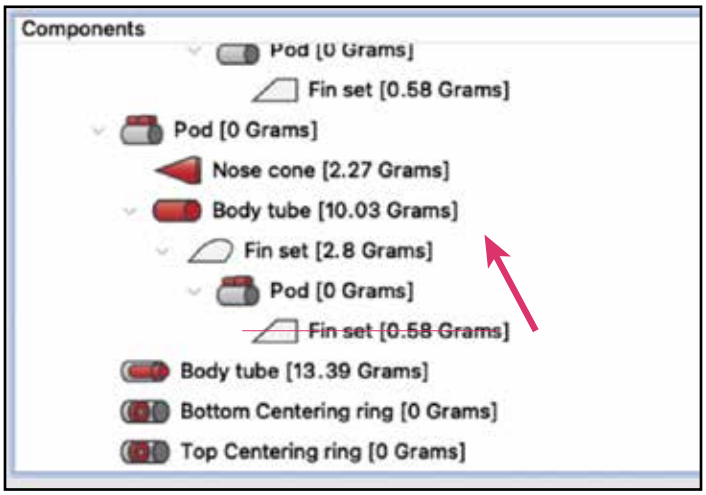

Figure 5: Delete the bottom most part from the pod, and work upwards until the simulation runs fine.

You might be thinking that by deleting all these parts will make more work by having to add them all back later. Of course I'm not that dumb. Before I start hacking off parts, I make a quick duplicate file of the design. That way you're not permanently affecting the design.

Once the offending part is isolated, I open up the copy I had previously saved, and make the changes there.

Potential Problems with SubAssemblies

As mentioned, Sub-Assemblies are similar to pods, except all the components are internal to the rocket. I personally don't use sub-assemblies for my own designs. I just make a different version of the rocket with all the extra components added directly into the file.

So for example, if a rocket has a motor adapter, I'll just save the rocket design file with a new name, and add the components directly to it. I'll look on my hard drive and find two files with names like:

```
RocketA.rkt
RocketA-with-24mm-adapter.rkt
```

For me, having multiple files on my hard drive is easier than adding and then removing the subassembly if you want to simulate the rocket without the adapter.

When writing this article, I did find one file on my hard drive

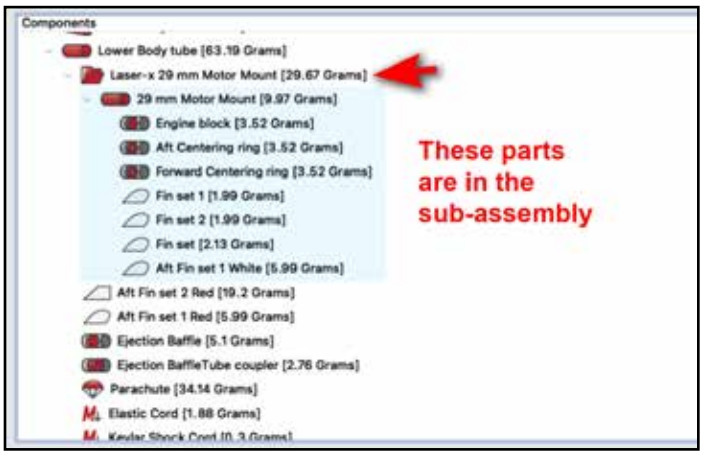

Figure 6: A sub-assembly is designated by a file-folder icon.

that had an issue with a sub-assembly. In this case, the collection of parts in the sub-assembly was a "decorative fin can" on the bottom of the rocket.

When I loaded the motor into the rocket, it spit out an error that it wanted me to load a motor into the rocket (see Figure 7). Wait? What? I just put the motor into the rocket, and it wasn't seeing the motor in the rocket.

So what I did to troubleshoot the rocket was to find the motor mount in the parts tree, and then edit it. I was looking for the little check box in the corner that says: "This is a motor mount tube." The box was checked already. So I turned it off by unchecking it. That would prevent Rocksim from putting a motor into that decorative fin can.

But I still needed a motor mount, so I added a new one to

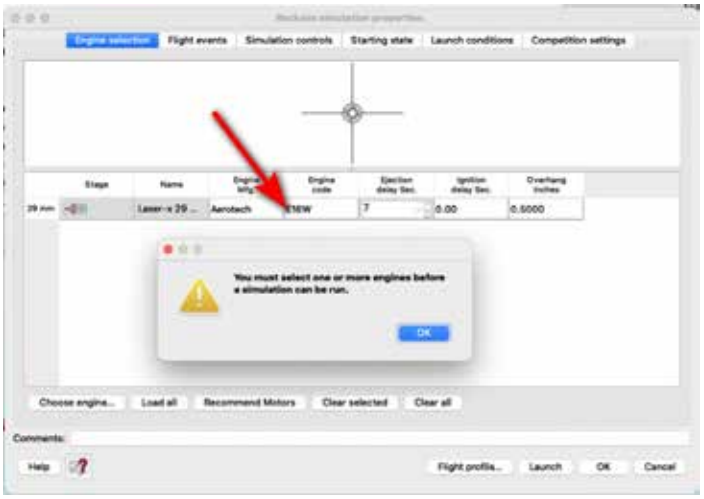

Figure 7: There is a motor loaded into the rocket, but I was getting an error that an engine needed to be selected. That shouldn't be possible…

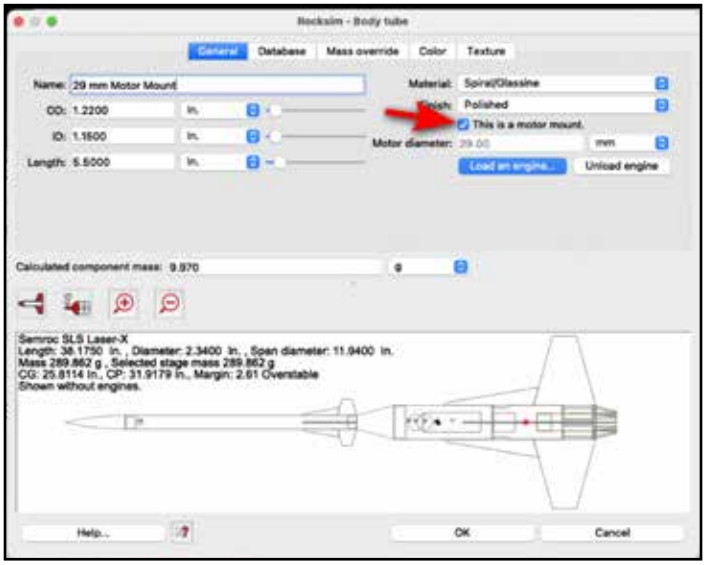

Figure 8: Unchecking the box prevents RockSim for allowing a motor to be installed in this particular tube.

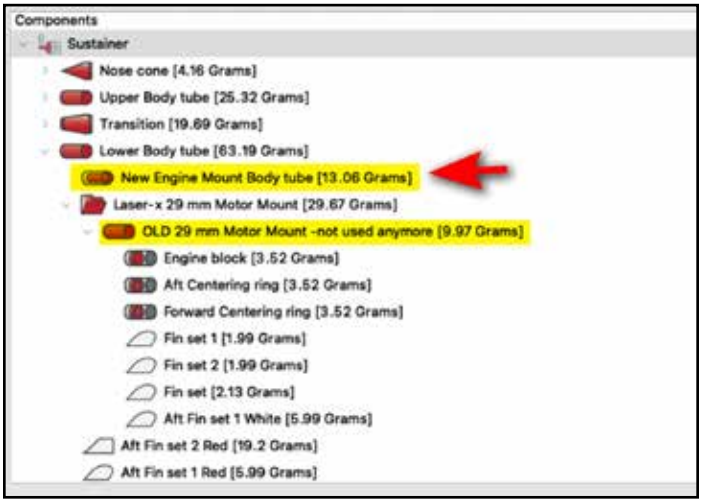

Figure 9: I added a new engine mount tube, and the simulation ran fine. This is an "inside tube" and is NOT in the subassembly.

the design that was outside of the sub-assembly. As soon as I did this, the software was able to run the simulation just fine. The problem was fixed.

I don't know how the design file got corrupted, but the first place I looked was the parts inside of the Sub-Assembly, because I know that rockets with sub-assemblies can cause issues.

The problem with Disappearing Motors

In version 11, we added a major new feature of automatic engine updates. What this does is to keep the user's motor database current with those motors that are brand new and just released by the motor manufacturers.

What RockSim does is to automatically go to the website Thrustcurve.org and ping its database for new motors. If it finds any new ones, they are automatically loaded into the user's local database.

While this is an exciting new feature, it did open up RockSim to some problems. The big issue is the naming convention used to identify a rocket motor. The files stored on Thrustcurve.org are made by many individual rocketeers, and each one has a slightly different way of giving them identifiable names. For example, you could call a motor a F27R or a F27. The R indicates the color of the flame is red. But other than that, the motors are identical.

RockSim has to try to figure out if these two names are the same motor, or are they different. It does a pretty good job, because it looks at the Total Impulse and the burn time of the motors. If they are both the same, it is reasonable to assume that they are the same motor.

But another issue is that the manufacturer's name in the motor file is often different too. For example, in one motor

file, the F27 might have a manufacturer of “AeroTech” and another one, might be “AT” (shorthand for AeroTech).

So if the user is in RockSim, and they want to only search for Aerotech motors, this abbreviation of the manufacturer’s name can cause problems. It may display motors with Aerotech, but not those with AT. What this means, is that some motors disappear.

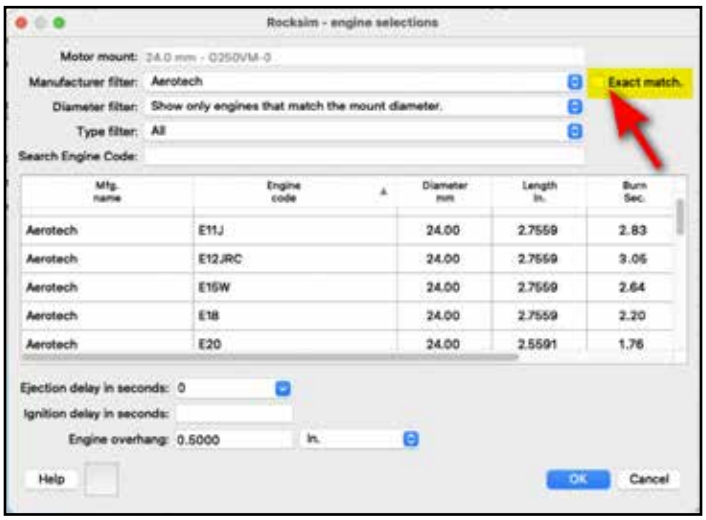

Figure 10: The exact match checkbox can sometimes be toggled to get motors to show up again.

We’ve been working on this issue too.

The temporary solution we have for this problem is to toggle off the check-box “Exact Match” next to the search field for the manufacturer filter (see Figure 10).

Installation Problems

Currently, an issue that customers face with RockSim is with installing it onto their computers. And actually, it is isolated to a few users that are using the Windows operating system. It isn’t all Windows users, just a small number of them.

These are related to the specific computer that the user is operating and the error code is 28 (network adapter error), so they are much harder for us to fix. It is an issue that we’re working on, and if you have that issue, please reach out to us to help troubleshoot the problem.

Conclusion

In conclusion, debugging RockSim files requires a sys-

tematic approach. Most issues revolve around designs with pods or subassemblies. By understanding the relative location dimensions, we can track down and correct issues that prevent flight simulations from running. And when issues do arise, employing a systematic approach—such as duplicating files for safety and carefully examining component properties—can lead to successful resolutions. Whether it's deleting and re-adding parts, troubleshooting subassemblies, or navigating the nuances of motor naming conventions, with patience and persistence, we can optimize our rocket designs and ensure successful flights.

It is my hope that by following the steps outlined in this article, you'll be well-equipped to tackle even the most challenging RockSim file issues and get back to designing and flying your rockets with confidence.

About The Author:

Tim Van Milligan (a.k.a. “Mr. Rocket”) is a real rocket scientist who likes helping out other rocketeers. He is an avid rocketry competitor and is Level 3 high power certified. He is often asked what is the biggest rocket he’s ever launched. His answer is that before he started writing articles and books about rocketry, he worked on the Delta II rocket that launched satellites into orbit. He has a B.S. in Aeronautical Engineering from Embry-Riddle Aeronautical University in Daytona Beach, Florida, and has worked toward an M.S. in Space Technology from the Florida Institute of Technology in Melbourne, Florida. Currently, he is the owner of Apogee Components (http://www.apogeerockets.com) and also the author of the books: Model Rocket Design and Construction, 69 Simple Science Fair Projects with Model Rockets: Aeronautics and publisher of the “Peak-of-Flight” newsletter, a FREE ezine newsletter about model rockets. You can email him by using the contact form at https://www.apogeerockets.com/Contact.

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www.ApogeeRockets.com

Tim's Messy Desk

by Tim Van Milligan

What is going across my messy desk? What an action-packed summer it has been. Whew. I'm worn out. Where do I start?

Ashley preps on of her FAI models for the flyoff competition.

NARAM was in our back-yard in early August, and was hosted by S.C.O.R.E., our local club down the road in Pueblo, Colorado. So of course I had to go.

As part of NARAM was the selection process for the US Team that will be going to Serbia next summer for the World Space Modeling Championships. My daughter Ashley really wanted to try out for the team again, so we built a lot of models and did a lot of test flights in May and June after she got home from college. She just finished up her freshman year at the University of North Texas, where she is enrolled in the Biomedical Engineering program. She loves it, and I'm happy to report that she is earning good grades. She even got an A in Differential Equations, where I struggled when I was taking engineering courses in the 1980's.

Anyway, the "fly-offs", as the team selection process is called, was held the weekend prior to NARAM. And Ashley was prepared, and did well enough to make the team in two events: S6 (A-engine, streamer duration) and S9 (A-engine, gyrocopter duration). So she will be going to Serbia, and I'll be traveling with the team as a supporter. So I know what I'm doing next summer.

I was also mentoring a young junior from Nebraska, as she was trying out for the team too. While it didn't take as much time as helping my own daughter, it was still another project that kept me busy this summer. As you probably know about me, I don't do things 50%. I gave her all the support that she needed to get ready for the flyoffs. And I'm happy to report that she did OK also. She didn't qualify in her desired event, but she did make the team in the parachute duration event.

Then after the Fly-offs, we attended the full 5-days of NARAM. Now I have to say that we weren't totally prepared for NARAM as we would have liked to have been. The priority was the fly-off events, so we did the NARAM event strictly for fun. My daughter Ashley, plus Martin (our designer here at Apogee) and I, formed a team and did everything together. I have to say that being on a team is a lot different from when I flew as an individual when I did contest flying years ago. It is a lot more relaxing. Ashley is a machine

Tim V.M. and Vern Estes. Vern is holding a model called the "Gleda May," which was made and named in honor of Verns' wife who passed away erlier this year.

when it comes to flying rockets. She doesn't waste any time, and she did most of the prep-work getting the models on the pad and ready to launch. I got to sit back and take photos of her and just enjoy the launches and do recovery of the rockets. I have to say that we didn't lose any rockets… We did have a helicopter fly away on us, but fortunately someone found it a day later and brought it back to us.

The entire Van Milligan family attended NARAM.

We did however have a lot of DQ's of our rockets. We were plagued by separations, such as shock cords ripping out of models. It was quite a learning experience. Notice I didn't use the word *"embarrassment."* Semantics is important when talking about the mishaps you have when flying rockets. If you use the word embarrassment, you might quit rocketry for the shame it causes you. But if it is a "learning experience," then you made the flight something that had value.

So I did re-discover that I have a lot to learn about keeping the parts of our rockets together. It is something that I'll be concentrating more on in the future (stay tuned to this newsletter and our videos). Nobody likes to have their rocket come down without parts having a recovery device to prevent them from coming down fast. I'm the same.

After NARAM, I had a few weeks to recover from the constant building we did prior to August. But I wanted to attend AIRFEST at the end of the month. AIRFEST is held by the Kloudbusters club in Argonia, Kansas. It is their big high power event that they do every summer over the Labor Day weekend. It draws hundreds of flyers and spectators from across the USA, and this year was no exception.

This is just a sport flying high-power event, so I only had to dust off some rockets we had around the shop. I flew a few prototype models, like the Nike-Hercules and the Invicta, plus some of our other popular models like the X-15, Kronos, and Hiroc. The hit of the show was the Nike-Hercules, which is a two stage with a cluster of four 29mm motors in the booster stage, and a single air-started 29mm motor in the upper. For my flight, I used E16-4 motors in the booster, and a CTI F32 in the upper stage. The upper stage was ignited by the Featherweight Blue Raven Altimeter. I could have used the Apogee Simple Timer in place of the Blue Raven, but I had already installed one in the Invicta two-stage model.

They all flew pretty nicely, and I got a lot of comments from spectators. If anyone has good video or still photos of my rockets taking off, please let me know. I'd love to see them and maybe use them in our website.

However… there were a few models that suffered separation problems (again). I'm still having a "learning experience" in this regard.

What's next: Chili-Blaster!

The Chili-Blaster is the high-power fun fly that S.C.O.R.E. hosts every fall. It will be the 3rd weekend in September this year, in case you're in Colorado. It is the same launch field as NARAM.

For us at Apogee, we're going to do something a little different for Chili-Blaster. We're going to have our first on-the-field building session. It is kind of like a build-and-fly that you might see at other launches. But we want to do

The prototype of the 1/10th scale Nike Hercules missile takes to the sky at AirFest under the thrust of a cluster of four E16-4 motors. It was electronically staged to a CTI F32-7 motor in the upper stage.

something a little different and try to get adult modelers to learn a new skill. So we'll be building a boost glider, instead of a simple parachute model. The model we'll be building is the Mini-Condor boost glider, which is relatively a quick build, but flies great.

We'll also try to demo fly the Nike Hercules. It is a real joy to prepare and launch, and the crowd loves it, because it produces a visual spectacle.

After Chili-Blaster, we'll be into the school year and getting ready to release those new models that you've been waiting for. Right now, we're working on the Invicta (a two-stage rocket), and the Nike Hercules. Our original plan was to do the Invicta first, but after showing both of them at AirFest, the overwhelming response was to do the Nike Hercules first. So I've changed my mind, and we'll go full steam on getting that one out the door ASAP.

All the parts for the Nike Hercules are now finally available. The final "bits" were the 30 small injection molded details that adorn the surface of the rocket and give it all the scale craftsmanship points. These came in right before I left for Airfest.

What work has to be done yet to get it ready? The instructions are the big thing. This is a Skill Level 5 rocket in terms of complexity. There are a lot of pieces that have to be cut out and put together. That requires a pretty intensive set of instructions. I guarantee this will be our largest set of instructions we've ever done for a kit.

Also, I will have to do a series of videos showing how to build it. Like some of our other complex models, watching it being put together makes your job a lot easier and enjoyable. It gives confidence to people to see what should be done, and how to correct things should there be some flubs by the person in the videos. I just started filming those, and expect it to take a few weeks to complete.

After that, we'll get to the **Invicta rocket.**

So that is what is going on in my world. I hope your summer was just as eventful.

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SUBMITTING ARTICLES TO APOGEE

We are always looking for quality articles to publish in the *Peak-of-Flight* newsletter. Please submit the "idea" first before you write your article. It will need to be approved first.

When you have an idea for an article you'd like to submit, please use our contact form at **https://www.apogeerockets.com/Contact**. After review, we will be able to tell you if your article idea will be appropriate for our publication.

Always include your name, address, and contact information with all submissions. Including best contact information allows us to conduct correspondence faster. If you have questions about the current disposition of a submission, contact the editor via email or phone.

CONTENT WE ARE LOOKING FOR

We prefer articles that have at least one photo or diagram for every 500 words of text. Total article length should be between 2000-4000 words and no shorter than 1750 words. Articles of a "how-to" nature are preferred (though other types of articles will be considered) and can be on any rocketry topic: design, construction, manufacture, decoration, contest organization, etc. Both model rocket and high-power rocket articles are accepted.

CONTENT WE ARE NOT LOOKING FOR

We don't publish articles like "launch reports." They are nice to read, but if you don't learn anything new from them, then they can get boring pretty quick... Example: "Bob flew a nice blue rocket on a H120 motor for his certification flight." As mentioned above, we're looking for articles that have an educational component to them, which is why we like "how-to" articles.

You can see what articles and topics we've published before at: **https://www.apogeerockets.com/Peak-of-Flight?pof_list=archives&m=education**. You might use this list to give you an idea or two for your topic.

Here are some of the more common articles that we reject all the time, because we've published on these topics before:

- How to get a L1 Cert
- How to get an L2 or L3 Cert
- Building cheap rockets
- How to 3D print parts
- Building Low Cost Launch Equipment (pads and controllers)
- Getting Back Into Rocketry After a Long Hiatus
- How to Build a Rocket Kit
- How to Build a Computer (too technical)

ARTICLE & IMAGES SUBMISSION

Articles may be submitted by emailing them to the editor. Article text can be provided in any standard word processor format (MS Word, Libre Office, etc.) or as plain-text. Graphics, meanwhile, should be provided in either a vector format (Adobe Illustrator, SVG, etc.) or a raster format (such as jpg or png) with a width of at least 600 pixels for single column images or a width of 1200 pixels for two-column images. If possible, it is generally preferable for images to be simple enough to be readable in a two-column layout, but special layouts can use the whole page width if required.

Send the images separately via email as well as showing where they go by placing them in the word processor document.

ACCEPTANCE

Submitted articles will be evaluated against a rubric (available here on our website). All articles will be evaluated and the results will be sent to the author. In the evaluation process, our goal is to ensure the quality of the content in *Peak-of-Flight*, but we want to publish your article! Resubmission of articles that do not meet the required standard are heavily encouraged.

ORIGINALITY

All articles submitted to Peak-of-Flight must not have been run in another publication before inclusion in the *Peak-of-Flight* newsletter, but it may be based on another work such as a prior article, R&D report, project report, etc. After we have published and paid for an article, you are free to submit them to other publications.

RATES

Apogee Components offers **$300** for a quality-written article over 2,000 words in length. Payment is pro-rated for shorter articles.

WHERE WILL IT APPEAR?

These articles will mainly be published in our free newsletter, *Peak-of-Flight*. Occasionally some of the higher-quality articles could potentially appear in one of Tim Van Milligan's books that he publishes from time to time.

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