Issue 622 / March 26th, 2024

PEAK OF FLIGHT NEWSLETTER

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

New Features in RockSim 11

PEAK OF FLIGHT NEWSLETTER

Issue 621 / March 12th, 2024

COVER PHOTO

Feathered Flyer

Get ready for some high-flying fun with the Feathered Flyer Model Rocket Kit! Perfect for beginners and enthusiasts alike, this classic rocket packs a punch with its finny design and wind-cheating shape. Launch it over and over again with inexpensive motors and watch as it streaks into the sky.

FEATURED ARTICLE

New Features in RockSim 11

by Tim Van Milligan

With the latest update of RockSim V11 and RockSim-Pro v4, you'll have access to a wide range of exciting new features that make designing and simulating rockets easier than ever before. From automatic engine updates to airfoiled fins and an improved engine database search, these features will help you take your rocketry to the next level. Dive into the full text to explore all the new features in detail and see how they can enhance your rocketry experience!

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About this Newsletter

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The Catalyst rocket flying off the launch rail at the SCORE event in Pueblo, Colorado 12/16/2023. photo credit: Tim Van Milligan

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RockSim v11 and RockSim-Pro v4 Feature Updates

by Tim Van Milligan

We've been continuously working on new features for RockSim since version 10.5 was released in the fall of 2022. It took well over a year of effort to get it ready for you.

We didn't release the new version until we had built up a significant number of them to be able to make it worth the effort to upgrade. I really think these new additional features make the new RockSim 11 even more powerful and easier to use. It makes the best rocket design and simulation software even better.

All of the new features that we created for RockSim v11 are also in RockSim-Pro (RS-Pro). And since RS-Pro is a 6 degree-of-freedom program, it has a couple of additional features that take advantage of the three-dimensional nature of RS-Pro's simulation capability. We'll start with the features of RockSim first, and then tell you about the few additional features of RS-Pro.

Auto Update Rocket Engine Files

It never ceases to amaze me that motor manufacturers keep coming out with new types of rocket motors. You'd think that with over 1000 different rocket engines in existence already, that we don't need more. But yet, apparently we do.

Every year, motor manufacturers release dozens of new motors. What this means for RockSim users is that our database of motors is out of date almost as soon as a RockSim update is released.

To fix this problem once and for all, we've added an automatic update feature where RockSim will connect to the internet and search out the new motors on ThrustCurve.org, and download them directly to your database. It does everything for you, so basically, you can just let it do its thing and never have to manually interact with it.

The first time you load RockSim v11, it will start the search, so don't panic. It only takes about 20 seconds the first time it downloads motors. After that, it is much quicker.

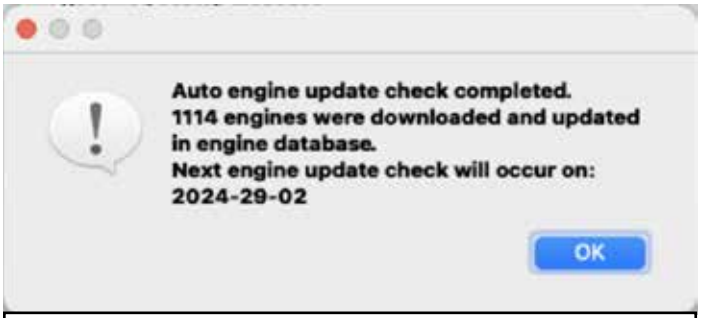
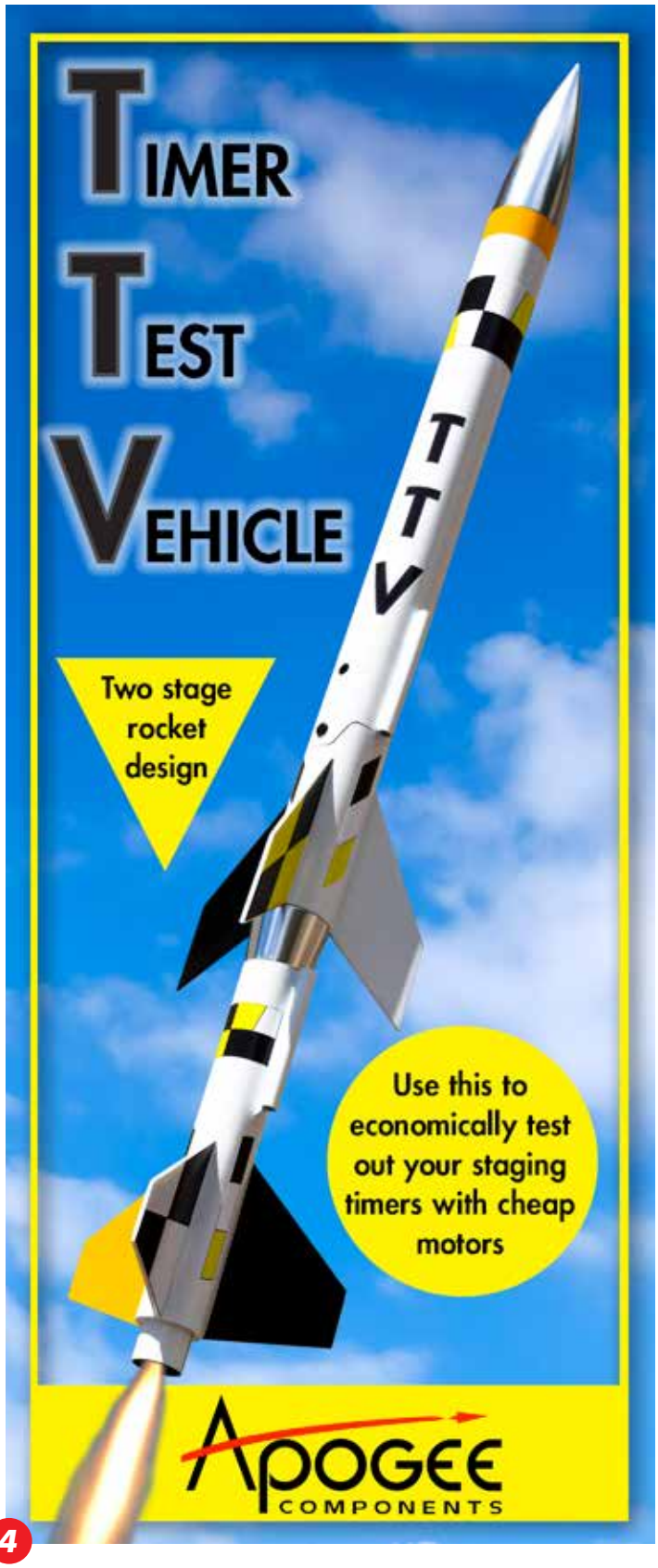


Figure 1 - Auto Engine Update will keep you current with new motors as the manufacturers certify them.

However, there is a small down side to automatic engine updates. That is the naming standard for engine files found on ThrustCurve.org. The motor naming system can be all over the place, because the files were generated by so many different rocketeers. So after you update your motor files, you'll see a lot of non-standard names. And unfortunately, we don't have a cure for the non-standard names.

The annoying thing is that now your database will have duplicate motors in it because the old database had one name for a particular motor, and the ones found on thrustcurve.org may have a different name. Since they have different names, then RockSim will assume they are different motors.



An example is the F25 and the F25W. They are the same motor from Aerotech, but just slightly different names (see Figure 2). Everything about them is identical. But having two identical motors in the database will eventually cause some confusion.

But we can make it somewhat easier for you to find what you're looking for.

Engine Database Search

Say you already know exactly what motor you're looking for in the database. Maybe you have the actual motor rolling around inside your range box, and you want to use it.

We added a new search bar to the motor selection screen, where you can simply type the motor's name into it.

For example, you might be looking for the F25 motor. Rather than searching through everything in the 29mm motor category, you can simply type in the name "F25" into the search bar and then hit the "TAB" key on the keyboard. When you do that, it will find all the motors with that name.

I recommend typing only the Letter and the number, and ignoring the propellant type after the end of the number. So for example, type "F25" and ignore the "W" on the end (which stands for White Lightning).

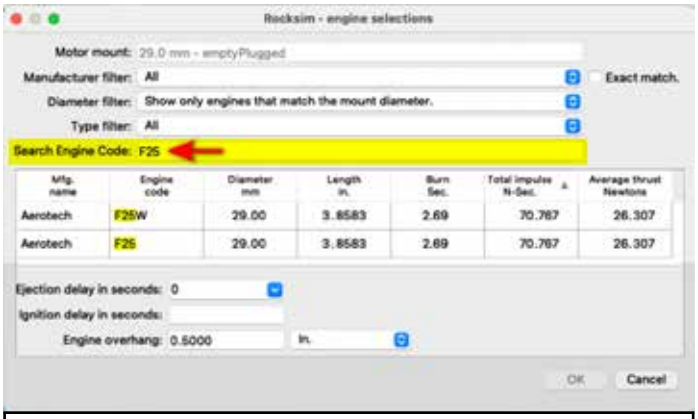


Figure 2: The new "Search Engine Code" field will help you quickly find a specific motor from your database.

The motor search bar will save you a lot of time finding motors. Just be sure to clear out the text the next time you go to load a new motor.

Airfoiled Fins

Another major feature that took a long time to complete, was displaying symmetrical airfoiled fins (tear drop shaped) in the 3D view of the rocket.

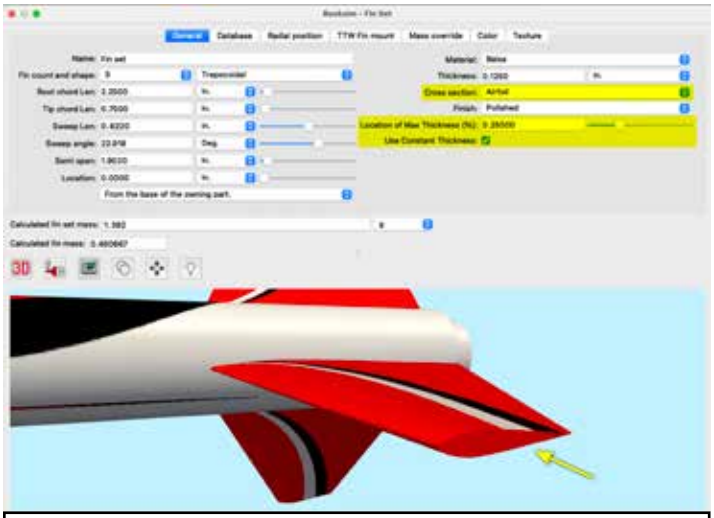


Figure 3: You can now see what the rocket will look like in 3D when you airfoil the fin. You can also change the location of maximum thickness.

There is so much here that is going on behind the scenes, that you may not realize how significant this is.

First of all, you have some control over the shape of the teardrop. You can put the maximum thickness anywhere from 15% of the chord, to 50% of the chord. In other words, if the fin is 1 inch long at the root edge, then the maximum thickness can be placed from 0.15 inches from the leading edge, to 0.5 inches back. The fin will be rounded at the tip, and come to a razor sharp edge at the trailing edge.

When making fins low drag, you want to keep the airfoil shape on the fin a constant. So it has the same shape at the root edge as it does at the tip. The thickness of the airfoil should be a constant percentage, based on the length of the chord. This means that the fin should actually get thinner as it gets closer to the tip edge. This is called a "radial taper." Actually sanding them is hard, and if you're interested in a tool to do so, see *Peak-of-Flight* Newsletter #271 at: https://www.apogeerockets.com/education/downloads/Newsletter271.pdf

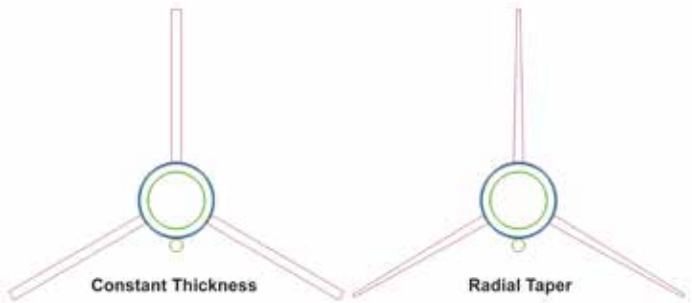


Figure 4: Fins with a constant thickness, versus those that get slimmer near the tip (called a radial taper).

This new version of RockSim automatically puts in the radial taper into the fin, so it does have a constant shape from root edge to the tip edge. You can see this most prominently if you make the root chord long, and the tip chord length short.

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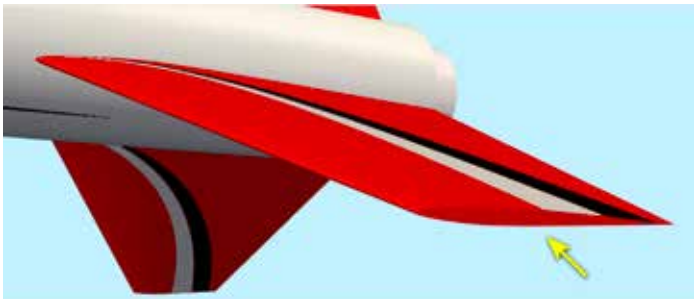


Figure 5 - 3D view of a fin with a radial taper. Compare this to Figure 3, which is the same fin, but has a constant thickness.

Since it is hard to sand, you have the option of making the thickness constant from the root edge to the tip edge. Turning it on is easy to do, just click the little checkbox that indicates “Constant Thickness” (see Figure 3).

While this changes the shape of the airfoil over the span of the fin, it is much easier to sand an airfoil into the fin. Figure 3 shows how most people sand fins, because it is faster and easier.

If you don’t want to hand shape your airfoils, we had a couple of articles in previous issues of the Peak-of-Flight Newsletter that dealt with automated shaping of fins, but they both had airfoils with constant thickness chords. See:

Streamlining the Shaping of Airfoils Using a Laser Engraver - **https://www.apogeerockets.com/education/downloads/Newsletter399.pdf**

Making Airfoiled Fins on a CNC Machine - **https://www.apogeerockets.com/education/downloads/Newsletter530.pdf**

We didn’t limit the airfoiled fins to trapezoidal shaped fins. You can also do both elliptical and “Custom Shaped” fins. These were harder to code into the software, but our programmers were able to do it. Imagine an elliptical fin that has a spanwise taper. You simply have to try RockSim v11 to see how this looks in 3D. It will amaze you.

The other thing about the airfoiled fins is that when you shape the fin, you’re actually removing material from the fin. In other words, the fin becomes lighter weight too. So we had to account for the lower weight fin in the mass of the rocket. You’ll see this just by looking at the fin weight and toggling the airfoil shape between airfoiled and square.

Figure 6 - The mass of the fin changes with the airfoil shape. Here is the mass of a square fin. Compare this to the mass shown in figure 3 for the teardrop shaped airfoil, which was 0.46 grams per fin.

Additionally, if you only round the edges of your fins instead of sanding a teardrop airfoil into them, RockSim allows that too (see Figure 7).

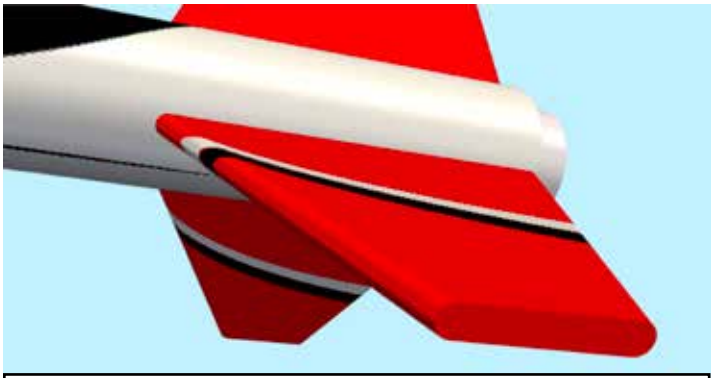


Figure 7 - Round edges on the fin.

Also notice from the images in this article, that any textures (decals) you apply to the fins will also conform to the new fin airfoil shape.

Can you do other shapes besides teardrop shapes? Unfortunately no. I'd love to have diamond wedge shaped fins, like you'd see on supersonic rocket fins, but we're not quite there yet.

What happens if you create a through-the-wall fins while having an airfoil shape? We've accounted for that too.

Sometimes the tab needs to retain its rectangular shape. It is being slid into a rectangular slot in the tube after all. For this type of situation, you might imagine your teardrop shaped fin with a separate tab that is glued on to the root edge before sliding it into the slot in the tube.

But there are times when it might be too hard to keep the root edge a rectangular shape while the rest of the fin is airfoiled. In that case, you can have the tab that extends through the tube have an airfoiled shape as well.

To have an airfoiled tab, you simply make the length of the tab the same length as the root edge on the outside of the tube. If the tab is shorter than the length of the root edge of the fin, RockSim will automatically make the tab have a rectangular shape instead of a teardrop airfoil (see figure 8).

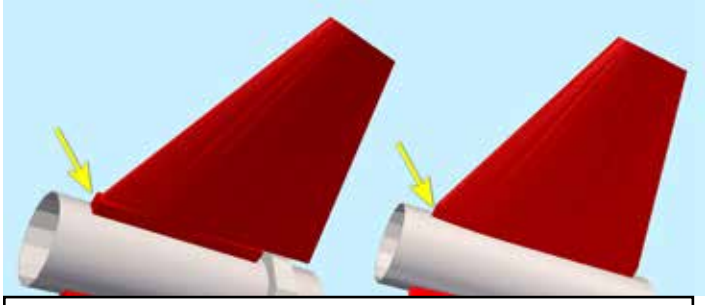


Figure 8: Squared fin tab (left), compared to an airfoiled fin tab (right side). The airfoiled through-the-wall fin tab happens when the tab length is the exact same length as the root edge of the fin.

Why did we put so much thought into the fin airfoil shape? The reason is that in RockSim, you can save the fins to a 3D format, so you can 3D print the fins on a printer. We've always had the ability to export and 3D print the fins since 2009, but having them with the proper airfoil shape instead of square edges makes so much more sense. And this includes the through-the-wall fin tab too. So if you want your airfoiled fins to have that nice rectangular tab to easily slide into the slot on the body tube, it is easy-peasy to accomplish.

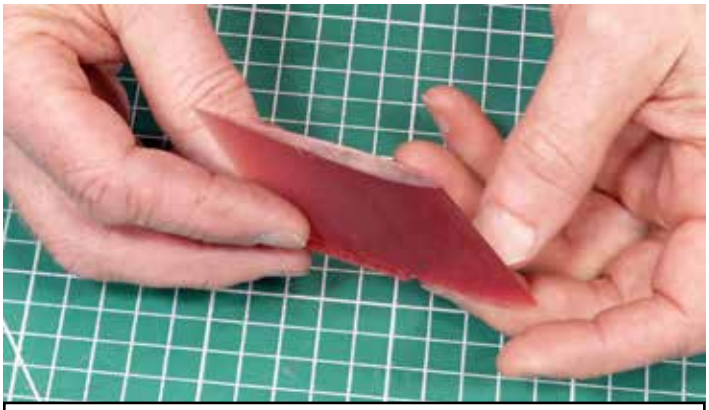


Figure 9 - 3D printed fin created by exporting out the .stl file from RockSim

Ejection Charge Calculator

If you're ever doing dual deployment using an altimeter to eject the parachutes, there is one chore that you always have. That chore is to figure out how much black powder (BP) you need to have for the ejection charges.

The way dual deployment works is that you need gas inside the rocket to pressurize the volume. It is this pressure pushing on the base of the nose cone that causes it to pop off the tube. We use black powder to create the gas. It burns very fast, and creates a lot of pressure inside the rocket to separate the parts at deployment.

In the past, you'd have to figure out how much volume inside the tube you need to pressurize, and then you'd have to go to an online calculator or spreadsheet to determine the amount of BP in the charge.

In RockSim v11, we made this task almost stupid simple. It now only takes a couple of seconds to get the amount of BP needed for successful deployment.

Figure 10 - Choose "Ejection Charge Calculator" from the "Rocket" drop-down menu.

From the "Rocket" menu, select the "Ejection Charge Calculator" (Figure 10). This will bring up a screen that shows the 2D side view of the rocket. On this view (see Figure 11), just click on the tube that you want

to pressurize. When you do that, RockSim will put a shaded gray box over the tube. Now just grab the ends and move them to adjust the length of the shaded gray box. Typically, you'd move the box so that one end corresponds to the base of the nose cone, and the other end to a bulkhead at the front of the ebay.

Instantly, while you're adjusting the length of the shaded gray box, RockSim is calculating the amount of BP needed to pressurize the tube.

From there, you have some other adjustments you might make, such as adding shear pins or changing the pressure inside the tube. Whatever you do, RockSim is calculating the amount of BP on the fly, so you never have to stop and do any calculations.

Figure 11: Click a tube, and adjust the length to show how much volume needs to be pressurized. The final calculations for the amount of BP are instantaneous.

The nice thing is that by having RockSim calculate the BP, you don't have to worry anymore if you are putting too much black powder into your rocket. That makes things safer for you and those other people on the rocket range. Rocksim v11 is now the fastest and easiest way to determine the amount of BP you'll need for dual deployment charges.

Quick Measure

There are times when you design your rocket, and then you come back and have to figure out the distance between two parts. Say for example that you have a payload bay in your rocket and you need to know the longest payload you can put into it. This is more complicated than it sounds, because you can't simply use the length of the tube. Normally, you have shoulders from

other parts that take up some of the length of the payload tube. For example, the shoulder on the base of the nose cone might consume a couple of inches, and the coupler in the back end of the payload tube might use up some length too.

The length you have available in the payload is the distance between the base of the shoulder on the nose, and the top of the coupler.

The new Quick Measure tool makes finding this distance, or any other distance quick and easy. Just select the measure button (see figure 12), and then click with your mouse the points you wish to measure. As fast as you can click, the software is determining the distance.

Figure 12: The "measure" tool is the fastest way to make a quick distance calculation between any points on the drawing.

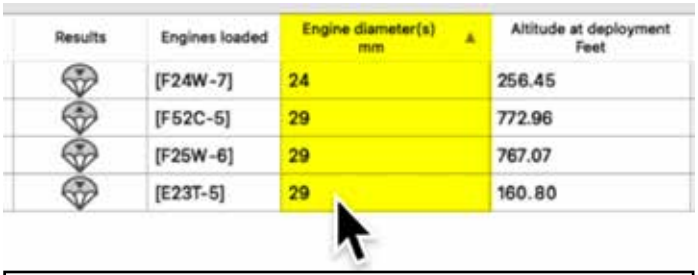
And it doesn't have to be in a horizontal or vertical line either. You can also do diagonal measurements, if you so desire.

Engine Diameter

We were requested to list the motor diameter in the summary screen by one smart RockSim user. So we did it.

Why is this useful and important? With many rocket kits, you have the option of using an engine adapter, which allows you to put a smaller diameter engine into the rocket. For example, if you have a kit with a 29mm diameter motor mount, there are many 24mm diameter engines that would safely lift the rocket. This could save you a bit of cash, because often 24mm motors are cheaper than 29mm motors.

In RockSim, you can use the "Recommend motor" feature (which came out in RockSim v10 in 2020) to find all the motors that could safely lift the rocket, including the smaller diameter ones.



Results	Engines loaded	Engine diameter(s) mm	Altitude at deployment Feet
	[F24W-7]	24	256.45
	[F52C-5]	29	772.96
	[F25W-6]	29	767.07
	[E23T-5]	29	160.80

Figure 13 - A new column can be added to show the rocket engine diameter.

But you had to remember which ones were 29mm in diameter, and which ones were 24mm. That takes too much mental energy. We simply added the ability to add a new column in the summary screen that lists out the diameters.

Adding this column is easy. There are two ways to do it. From the Preferences menu, click on the simulation summary tab. From that tab, you can add the column to show the engine diameter(s). The other option is to "right-click" on the column header in the summary screen on the main screen of RockSim. This will bring up a context menu where you can select the variables that you wish to display. In our case, it is the motor diameter.

Thrust-to-Weight Ratio

Another column we added in the summary screen at the request of another RockSim user, is the Thrust-to-Weight ratio (see figure 14). This column can be added just like the motor diameter described previously.,

While I personally don't use this number for determining if a rocket has enough lift-off speed, I know a lot of people do. In general, they like to see the value of this number greater than 5.

In our case, the number is calculated just as the rocket leaves the launch rod (or rail). That way, you know when during the flight the value is calculated. This is important, because the thrust constantly changes over the duration of the burn. At time zero, the thrust force is zero, and then it climbs from there to a maximum value. Where is the maximum thrust? It really depends on the rocket motor(s). For some motors, it is near the beginning of the burn time. For other motors, it could be at the end.

We choose to compute the value right when the rocket leaves the launch rod because this is a critical time during the launch. If the rocket doesn't leave the pad going fast enough, the fins may be ineffective at creating a restoring force that would be necessary to keep the rocket flying straight up.

Results	Engines loadec	Thrust to weight ratio at launch guide departure
	[F25W-6]	10.99
	[F20W-7]	9.40
	[E16W-4]	4.35

Figure 14 - Thrust to weight ratio column

To be honest, I'm not sure where (during the flight) other people calculate the Thrust-to-Weight ratio. They never say. I suspect that they are just taking the maximum thrust of the rocket motor and dividing it by the weight of the vehicle. But as mentioned, that might be way off because the maximum thrust might occur well into the trajectory of the rocket.

It's even worse when you are flying a cluster of motors, and one or more of the motors is air started? Again, when do you compute the number? You can't simply look for the maximum thrust of each motor from an engine chart and add them up. That would give you a high number, and all the motors may not be firing at the same time.

Personally, I'd rather use "velocity at launch guide departure" to determine if the rocket has enough thrust. RockSim calculates that number too. And I like to see the velocity being around 30 fps or higher. It isn't a perfect number, as some rockets can take off slower than that and still be stable. But it is a good rule of thumb if you're trying to determine if the motor(s) you have are powerful enough to lift the rocket into the sky.

Fin Placement Guides

When you build a kit, there is almost always a sheet of paper that you wrap around the body tube to mark it for the location of the fins. This is called the "Fin Placement Guide."

We added the ability for RockSim v11 to generate this wrap. That way, when you design your rocket, you can build it much faster because you know where the fins are placed.

Because RockSim allows so much versatility, you can create a lot of complex designs, with multiple sets of fins on the same tube. In addition, you can attach pods, launch lugs, ring tails, and tube fins onto the model besides just regular fins. The cool thing is that all these components can be included in the fin placement guide wrap that you can print out.

Figure 15: RockSim v11 now prints out fin placement wraps to make rocket assembly easier.

Just go to the print selections menu, and mark the box for the “placement guide wrap” and choose which external parts you want to have printed on your wrap.

The look of the printed wrap even includes the arrowheads and the overlap piece that is needed to wrap around the rocket.

Export Rocket Drawing at 100%

This is another feature we added at the request of users. Many wanted to print out the rocket onto a sheet of paper that is full scale so that they could get a better visualization as to the size of their rocket.

Because we don't know how to tile the image together on your printer, we just export out the image as a vector drawing (.svg), but it is at 100% size. If you actually want to print it out, you'll need to open up the exported drawing in a vector graphics program (see: https://www.apogeerockets.com/education/downloads/Newsletter619.pdf).

To get the 100% drawing, you will go to File>Export>2D Model (100% scale) menu. This will then bring up a dialog box on where you can save the file on your computer.

Display Component Mass in the Parts Tree

This next new feature is great for helping to diagnose problems with your rocket. This is the ability to display the mass of each component in the part's tree of the rocket.

Why might this be necessary? There might be a situation where you look at the total mass of the rocket, and you think… "This doesn't look right. My rocket shouldn't be that heavy." At that point, you need to look at each component in the design and evaluate if the weight is appropriate. Seeing the masses of all the components quickly is ideal, and that is what this new feature does.

You can turn it on or off in the preferences of RockSim. Just go to the "units" tab in the preferences screen, and mark the box "Show Masses in Component Tree." You'll then see all the parts, and their individual masses (see Figure 16).

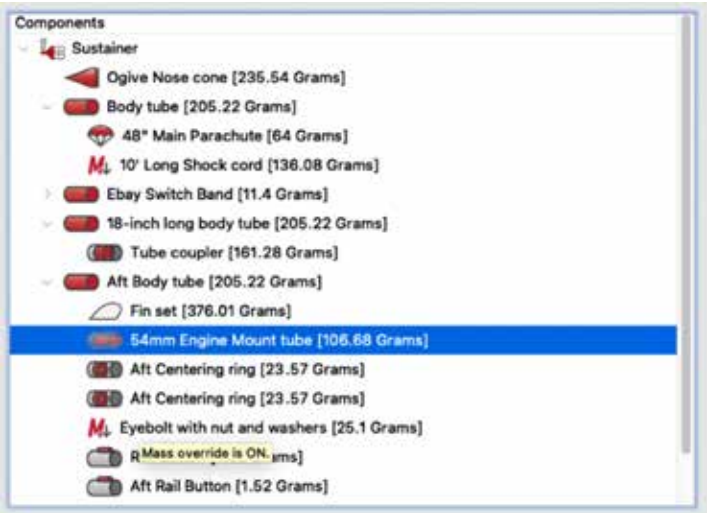


Figure 16 - You can display the mass of each component in the parts tree to quickly find the one that might be entered wrong.

Sometimes, a part might have a user-specified mass. For example, you might actually weigh a nose cone and input that mass directly into RockSim as a “mass override” on the component so that the entire rocket is more accurate. But say you want to know if you added a mass override. RockSim will let you know how the mass was entered just by hovering the mass over the component. It will then display if the mass override was turned on or was it off and RockSim estimated the mass itself.

I often find mass mistakes were caused by my own fumbling thumbs when I enter the mass override value. So this new feature makes it much faster to correct the issues.

What’s more, is that if you have a component like a pod (which is a collection of several components), if you hover the cursor over the pod, it will display the mass of all the parts when combined.

Again, the whole purpose of this new feature is to make it easier to find parts in the design you made that might be the reason the overall weight of the rocket isn’t correct. If seeing the mass isn’t needed, then just toggle off the feature in the preferences.

Auto Removal of Unnecessary Files

After you downloaded RockSim from the Apogee website and have gone through the installation process, you’re usually left with a huge file on your computer. RockSim will now automatically remove the unnecessary EXE and DMG files from the Update Download folder to reduce memory usage. It does this just to keep things tidy and free up disk space on your computer.

RockSim-Pro Additional Features

The new version of RockSim-Pro (also called RS-PRO) is labeled as Version 4. It has all the new features that were listed above. And since it is a 6-Degree of Freedom simulator, it has a couple of other new features that take advantage of the advanced simulations. Below are specific new features in RockSim-Pro v4 that are NOT available in Rocksim v11.

In previous versions of RockSim Pro, you could change the fin cant angle and the pivot point location. However, the image of the rocket didn't change at all. So after you canted the fins, they would still look straight in the 3D view of the model. It is similar to adding the airfoil on the fins - that didn't change either.

Until now, that is.

In this new version of RockSim-Pro, when you change the fin cant angle, you can see what this will look like in your rocket. There will be no doubt when you look at the rocket that the fins are canted over (see figure 17).

Figure 17 - You will see the fins canted now in RockSim-Pro v4.

Additionally, they will also be displayed as canted in the 2D drawings of the rocket as well (top view, side view, and base view).

Furthermore, you can change where the pivot point is on the fins as a function of the length of the fin. So you can have it pivot at the midpoint (which is typical), or you can move the pivot point anywhere along the root chord. I don't know why you would do that, but it is possible.

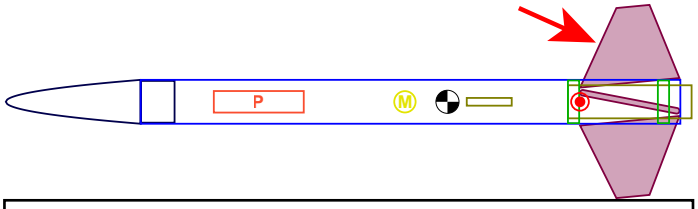


Figure 18 - The canted fins are also reflected in the 2D side view, top view, and base views.

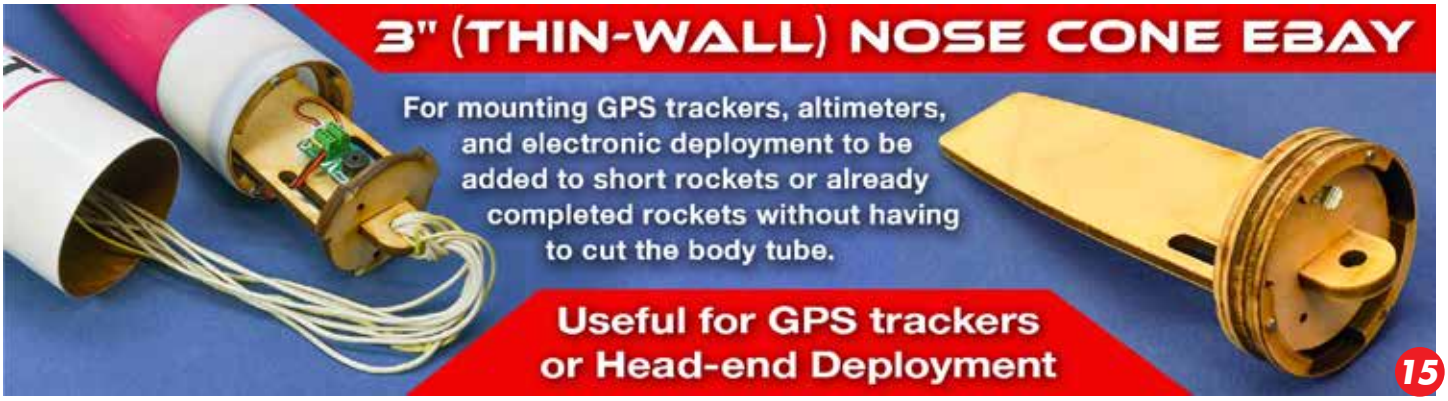
The one drawback to the canted fins in RS-Pro is that the root edge remains straight, and hangs off the edge of the tube. Normally, in real life, you'd like the root edge to extend down to the curvature of the tube to maximize the contact area so that it remains strong.

Default Icons in Google Earth Plot:

This is more of a fix, than a new feature. But it has been broken for so long, that it seems like a new feature.

In RockSim-Pro, you could always export out the trajectory to Google-Earth. We needed that before we had the Launch Visualizer which we added to RS-Pro v3 a couple of years ago. The Launch Visualizer image is animated, so you can see the movement of the rocket during the flight. It will pitch, yaw and roll as the rocket takes off, and you want to see that information to really know how your rocket flies in the wind. You can't get that from the static trajectory of the rocket shown in Google Earth. It only shows the path of the rocket, not how the rocket actually flew in real time.

But one thing that Google Earth allows us to do is to overlay all the landing points that are possible if you do an uncertainty run. You can see where the zone of probable landing points is likely to be based on the conditions you set up in an uncertainty simulation.



Before, the uncertainty points weren't showing up properly in the Google Earth plot. But now we added them back, so you can get a better idea of where the rocket might land (see Figure 19).

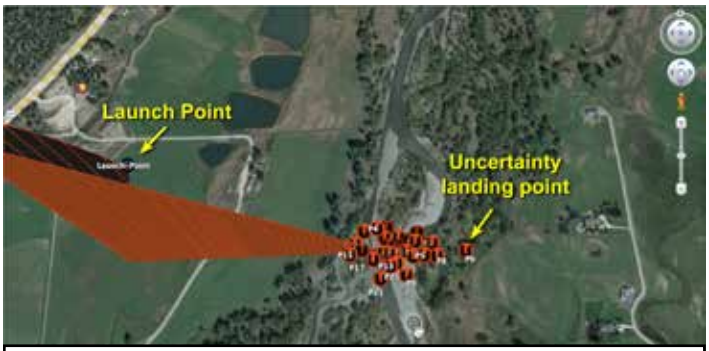


Figure 19 - The uncertainty landing points are now showing up correctly in the Google Earth plot.

Conclusion

In summary, the latest version of RockSim, both the standard and Pro versions, has undergone significant improvements to enhance your rocketry design experience. New features such as automatic motor updates, being able to airfoil the fins, fin placement wraps, exporting rocket drawings at 100% scale, and displaying component masses in the parts tree, make it easier and more efficient. Additionally, RockSim-Pro v4 offers specific new features that take advantage of its 6-Degree-of-Freedom simulator, such as visual changes to fin cant angles and pivot point locations, as well as providing more detailed and realistic simulations. With these advancements, RockSim becomes an even more valuable tool for rocket enthusiasts and educators, which enables them to design and simulate rockets with greater accuracy and ease.

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 e-zine newsletter about model rockets. You can email him by using the contact form at https://www.apogeerockets.com/Contact.

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.

PEAK OF FLIGHT NEWSLETTER

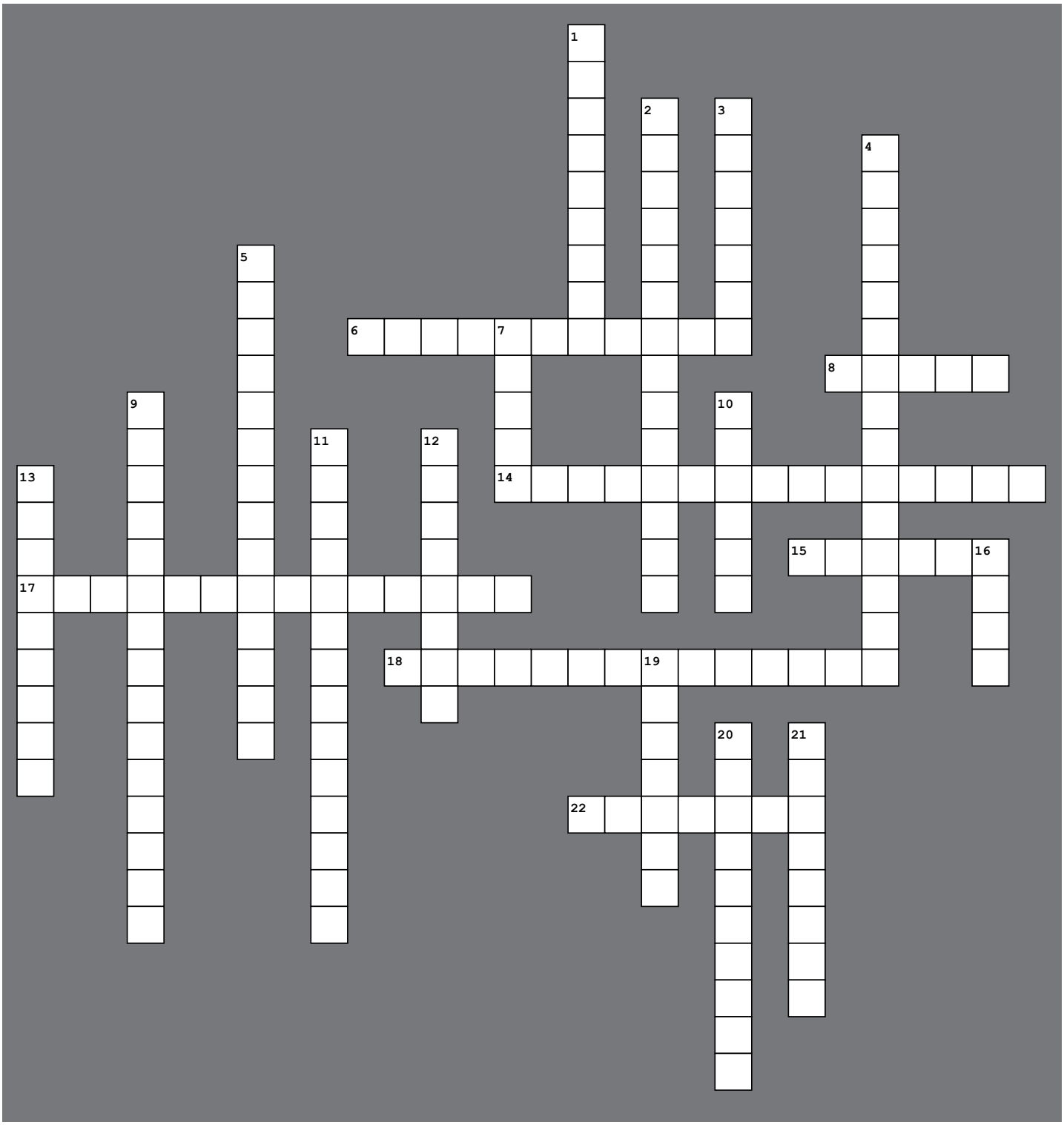
Issue 622 / March 26th, 2024

www.ApogeeRockets.com

RockSim v11 and RockSim-Pro v4 Feature Updates

by Tim Van Milligan

CROSSWORD



ACROSS 6. CHAD staging 8. Ogive 14. Bernoulli Effect 15. Waiver 17. Through The Wall 18. Monopropellant 22. Booster

DOWN 1. Scale Data 2. Composite Motor 3. Wadding 4. Missing in Flight 5. Ejection Charge 7. Squib 9. Drag Coefficient 10. Fillet 11. Krushnic Effect 12. Red Baron 13. Prototype 16. Rail 19. Payload 20. Kitbashing 21. Parabola

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QUESTIONS

ACROSS

6. A simple technique used to make a multi-stage rocket out of a single stage vehicle

8. A shape defined by the intersection of two circles

14. Moving air will have a lower pressure than the still air around it

15. The term used to describe the official permission given by the FAA allowing rockets with more than 113 grams of fuel or weighing more than 1 pound to be flown into FAA controlled airspace

17. An HPR fin attachment technique which provides much greater strength than the typical surface mount used in model rocketry

18. Single Base Propellant

22. On a multi stage rocket this refers to the sections (stages) which drop off in mid-flight

DOWN

1. Drawings, photos, dimensions, and descriptions of a prototype (q.v.) rocket used in making a model of that rocket

2. The term used broadly to cover solid fuel rocket motors using propellants other than black powder

3. Any flame retardant material used to prevent the scorching of the recovery system do to the heat of the ejection charge

4. A rocket that disappears with no sign of the recovery system deployment, and no other obvious failure mode

DOWN (continued)

5. A small quantity of black powder used to generate gas pressure within the rocket to deploy the recovery system

7. A small explosive device used to detonate larger explosive charges

9. A dimensionless number used in aerodynamics to describe the drag of a shape

10. A reinforcement of the joint between the fin and the body tube of the rocket to improve the rocket's aerodynamics and to strengthen the fin mount

11. A very dramatic phenomenon where your rocket makes a tremendous amount of noise and smoke but doesn't go anywhere

12. A boost glider which has tangled with the streamer or parachute of the booster pod

13. An initial, development design used to test out principles and concepts but never intended to be a finished or production design

16. Launching on a rod or a _ _ _ _ .

19. Anything carried aloft by the rocket that is not part of the rocket itself

20. Taking two (or more) kits and combining ("bashing") them into a new design

21. A shape produced by the formula y=x^2

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