PEAK OF FLIGHT NEWSLETTER

ISSUE 579 / AUGUST 2ND 2022

IN THIS ISSUE

PICKING MOTORS WITH THE LAUNCH VISUALIZER

Screenshot from the Launch Visualizer at https://www.RockSim.com

www.ApogeeRockets.com
4960 Northpark Dr, Colorado Springs CO 80918
Ph# 719-535-9335

APOGEE COMPONENTS

PEAK OF FLIGHT

Picking Motors with the Launch Visualizer

By Tim Van Milligan

If you don't have RockSim, how do you pick rocket motors? In this article, I'll go through the simple steps using a free membership on the Launch Visualizer. The advantage is that there is no software to install! And there is NO credit card information that will be requested.

What's not to like about that? Plus you'll be the rocketry expert that everyone looks up to. You'll know how to pick motors, while they don't.

At Apogee Components, we get calls all the time asking us what motor we'd recommend in a kit, or maybe in a home-brew design. Unfortunately, it takes a few minutes to make a motor selection, because we have to fire up the RockSim software. We don't pick a random motor from out of the air; we actually run computer simulations so the results are accurate.

When we tell people that they can also use the same process that we do to pick motors, a lot of them get an entitled attitude: "why should I, when you can do it for me?"

Unfortunately, we can't pick motors for everyone's rockets. While it would create a lot of good feelings, it is something YOU can do yourself. We want rocketeers to have this skill, because eventually they'll teach it to other modelers. And that grows the hobby. And besides, we're overworked too.

The response we get a lot is: "I don't have RockSim," or "my computer is too old to run RockSim," or "my trial expired." You get the idea… they have a lot of excuses for not wanting to do the process themselves. But you're different and special; otherwise you wouldn't be reading this.

This article is for the person that doesn't have RockSim, such as the person that used up their 30-day free trial. This is a common occurrence around here. The good news for you is we have a new tool, called the "Launch Visualizer."

You'll find it at www.rocksim.com.

The best part is there is NO software to download and install on your computer. The application doesn't even need a desktop computer. It uses any web browser, which means you can run it on any tablet or smartphone, chromebook, or any computer connected to the internet.

There are three levels of users on the Launch Visualizer - "Anonymous", "Basic", and "Premium". The anonymous and basic users are TOTALLY FREE! And that means you can pick rocket motors for free.

The difference between the anonymous-user and the basic-user is that the basic-user can upload their own rocket designs to our cloud server. The anonymous user doesn't require an email address, and is limited to just a few rocket designs that are preloaded into the app.

Here Is the Process of Selecting Good Motors for Your Rocket

Step 1: Sign up for a basic user membership account (no credit card required)

Because you'll need to upload your rocket design, you'll need a basic account. Good news… There is no credit card required. Just type in your name and email, and you'll get a confirmation email sent to you that you're signed up.

Step 2: Upload your rocket design into your account. This is the hardest step, because I know what you're thinking… I don't have a rocket design.

Again, good news… Most rocket kits already have a RockSim design file that you can use. All you need to do is find the file on the internet.

Check out our Facebook page
www.facebook.com/ApogeeRockets

Continued on page 3

About this Newsletter
You can subscribe to receive this e-zine FREE at the Apogee Components website www.ApogeeComponents.com, or by clicking the link here Newsletter Sign-Up

Newsletter Staff
Writer: Tim Van Milligan
Cover & Layout: Derek Villar
Proofreader: Michelle Mason

Picking Motors with the Launch Visualizer

Continued from page 2

Step 2a: Using your favorite search engine, type in the name of the rocket, followed by the two words: “RockSim file.” For example, it might be the “Apogee Zephyr RockSim File.”

The search engine will do its thing and return a link where you can download the RockSim file. Just click on the link and save the file to your device.

What if it is a homemade design that doesn’t have a RockSim file?

This is where you’ll have to do a substitution. You’ll just substitute a different rocket that is similar to your design.

So for example, if your rocket has 4 fins, is built using a BT-60 size tube, is about 24 inches long, and weighs 80 grams, you would look for a similar rocket that has a RockSim file already available. Instead of uploading your design, you’d upload the design of that other rocket into the Launch Visualizer.

Would this give exact performance? Probably not perfectly exact, but close enough for when it comes to selecting rocket motors.

That’s what we do as engineers… We make educated guesses. This substitution is a good educated guess.

In fact, if you were to call up Apogee Components on the phone, and ask us to pick a rocket motor for your home-brew design, this is exactly what we’d do. We’d find a rocket that was similar in size, configuration and weight, and see which motors it uses.

Where do you find a substitute rocket?

The Apogee website, of course.

We’ve built a nifty tool into our website that allows you to make a selection of a rocket based on basic physical parameters. We call it the “Sortable Rocket List”. This tool is at: https://www.apogeerockets.com/index.php?main_page=sortable_rockets_list&m=catalog

Start by clicking on the button on the top of the page labeled “Select Comparison Columns.” This will allow you to show only the parameters that are important to you. In this case, we only want Length, Weight, Diameter, Motor Size, and Fin Count.

FIGURE 1: FROM THE SORTABLE ROCKET LIST PAGE ON THE APOGEE WEBSITE, CLICK ON THE “SELECT COMPARISON COLUMNS” BUTTON, AND CHECK THE BOXES FOR: LENGTH, WEIGHT, DIAMETER, MOTOR SIZE, AND FIN COUNT.

Continued on page 4

Picking Motors with the Launch Visualizer

Continued from page 3

Once you've selected the parameters, the chart will redisplay with only those columns showing.

What is cool about the sortable list table is you can click on the column headers to re-sort that column. For example, if you click on the diameter column, it will automatically sort from smallest tube to the largest.

Once the chart is sorted by diameter, you can scroll down to the rockets with BT-60 size tubes (1.6 inches in diameter).

From there, you can start looking at length and weight columns to find a rocket that is closest to your home-brew design.

In the case of our example, I found that the Agni rocket was the closest to our parameters of BT-60 size tube, 24 inches long, and 80 grams weight.

From there you open up the kit page, and find the RockSim file. The quick way is that there is a button bar just below the photo with a label "RockSim file."

When you click on that, the webpage will scroll down to where you can find the RockSim file. At this point, just download it to your computer.

When you download it, pay attention to where your computer saves the file on your hard drive. Normally, it is in a folder called "Downloads" but it depends on where you wish it to be stored. If in doubt, try to save it to your desktop so you can find it quickly.

FIGURE 2: ON THE KIT PAGE, CLICK ON THE "ROCKSIM FILE" MENU ITEM THAT IS NEAR THE TOP OF THE PAGE.

FIGURE 3: CLICK ON THE IMAGE OR THE TEXT LINK TO DOWNLOAD THE ROCKSIM FILE OF THE KIT.

Continued on page 5

Picking Motors with the Launch Visualizer

Continued from page 4

You've now done the hardest part of the entire process! If you can do that, everything else is a lot simpler.

Step 2b: Upload to the Launch Visualizer website.

Once you're logged into the Launch Visualizer app at www.RockSim.com, you simply click on the Upload button and find the file on your computer. It is really simple, and only takes a few seconds.

Start by clicking on the radio-button labeled "Upload New Rocket Design." The screen will change slightly, and there will be a big dark button that says "Browse." Click on that, and the app will open a finder window that will show the files stored on your computer. From here, select the rocksim file you've downloaded from the apogee website.

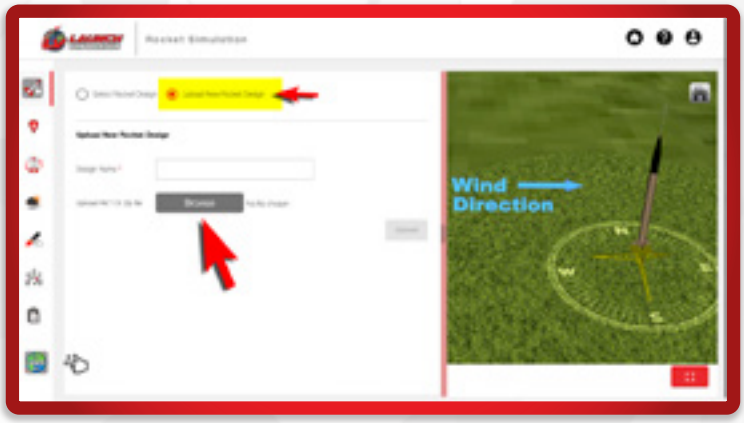


FIGURE 4: CLICK THE RADIO-BUTTON TO UPLOAD NEW ROCKET DESIGN, AND THEN THE BROWSE BUTTON TO FIND YOUR FILE ON YOUR COMPUTER.

Once it is selected, you only need to click the upload button on the screen. This will take the file from your computer, and save it to the server in your account.

You'll see a message saying "Design successfully added." When you click on the OK button, the Launch Visualizer will display a 3D image of the rocket sitting on a launch pad. There will be a compass below it, so you know how the rocket is oriented and aimed on the launch field.

Step 3: Pick your Launch Site

On the button bar, you'll see one that looks like a map pin. Click on that.

The screen will change again, and show you a default launch site, with a map on the right side. This default launch site is the S.C.O.R.E. club here in Colorado that I fly at. It is a big dusty brown launch site that is perfect for flying most rockets. But you'll want to pick your own home launch field.

The map on the right is fully interactive (see Figure 5). You can zoom out with the buttons, and get a picture of the world. You'll see a number of red, blue and green pins that indicate club launch sites. If you single-click on any of the pins, the name of the club will pop up.

Continued on page 6

Join Tripoli.org
Mention Apogee Components

Picking Motors with the Launch Visualizer

Continued from page 5

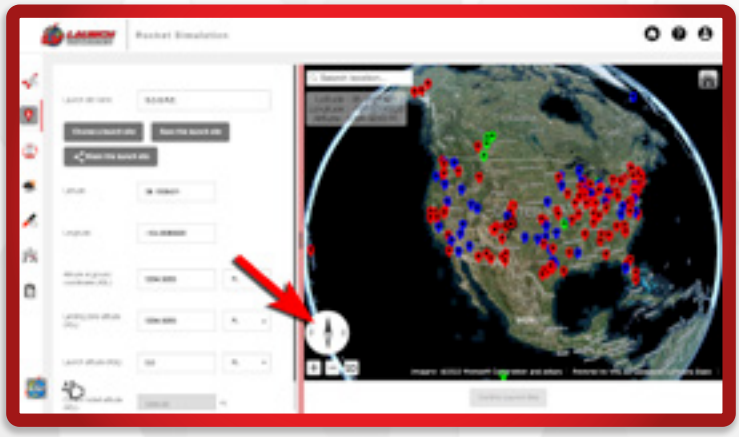


FIGURE 5: USE THE NAVIGATION CONTROLS TO FIND YOUR PARTICULAR LAUNCH FIELD.

If you're flying somewhere else, use your mouse to rotate the globe so your region is in the center. Double-click on the map, and you'll zoom in on that region. Just keep doing that until you find your own launch site on the map.

The last double-click you make on the map is important… Just below the aerial image is a button labeled "Confirm Launch Site." You have to click on that to tell the software this is the exact location where the launch pad will be to launch your rocket.

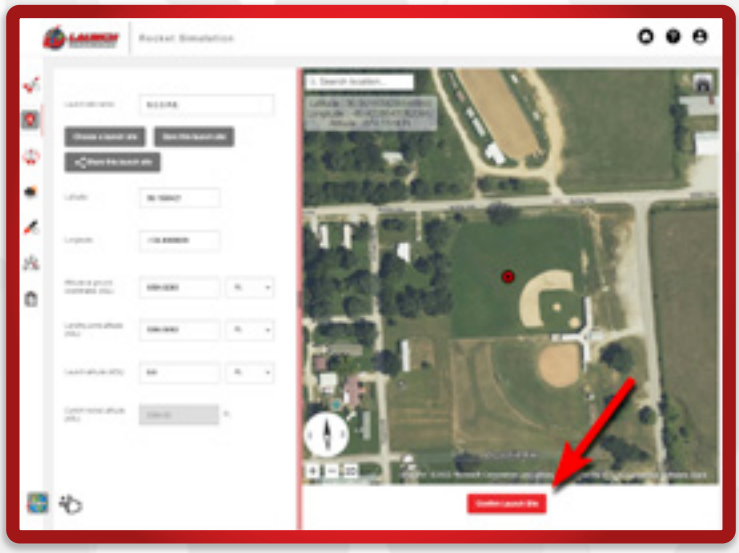


FIGURE 6: DOUBLE CLICK ON THE AERIAL PHOTO TO SET THE LOCATION OF THE LAUNCH PAD, AND THEN CLICK THE "CONFIRM LAUNCH SITE" BUTTON BELOW.

Once you confirm the launch site, the coordinates of that point on the earth are copied over to the left side of the screen.

Continued on page 7

Check out our Facebook page
www.facebook.com/ApogeeRockets

Picking Motors with the Launch Visualizer

Continued from page 6

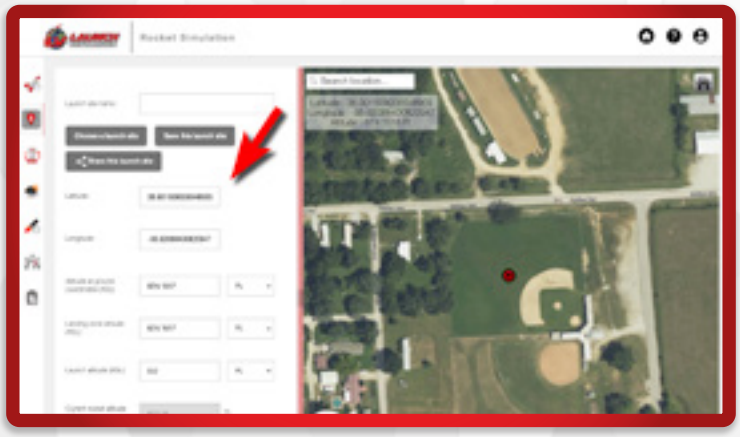


FIGURE 7: ONCE THE LAUNCH SITE IS CONFIRMED, ALL THE POSITION INFORMATION IS AUTOMATICALLY FILLED IN ON THE LEFT SIDE.

Now look at the map, and start planning how you'll be aiming your rocket. In my example (see Figure 7), I have some trees to the north and west. So if given a choice, I'll not be aiming the rocket in that direction. Right? You do want it back rather than landing in a tree?

From the main button bar on the screen, click the one called Starting State. This is where you'll control the direction you'll be aiming the rocket.

There will be a number of fields you'll be able to adjust here. The ones you'll want to adjust are the elevation angle (the launch rod tilt from vertical), and the azimuth angle (the compass direction). These are actually sliders, so if you just grab the arrows in the angle icons, you can drag them quickly to the orientation you want. Watch how the position of the rocket changes as you make adjustments to the position fields.

FIGURE 8: ADJUST THE ORIENTATION OF THE ROCKET ON THE LAUNCH PAD USING THE DIAL INDICATORS OR TYPING IN VALUES IN THE FIELDS.

When you get rocket oriented in the direction you want, you can now set the wind conditions from the "launch conditions" screen.

I personally leave the wind at the default values, but you can adjust it to what you feel will closest match the actual weather and wind conditions on your launch day.

The one field on this screen that you won't be able to adjust is the simulation end point. In the free versions, the simulation will always end at the apogee point of the flight - the highest altitude the rocket reaches. You'll need to upgrade to the premium version if you want to see where the rocket will land given your flying conditions.

Continued on page 8

Picking Motors with the Launch Visualizer

Continued from page 7

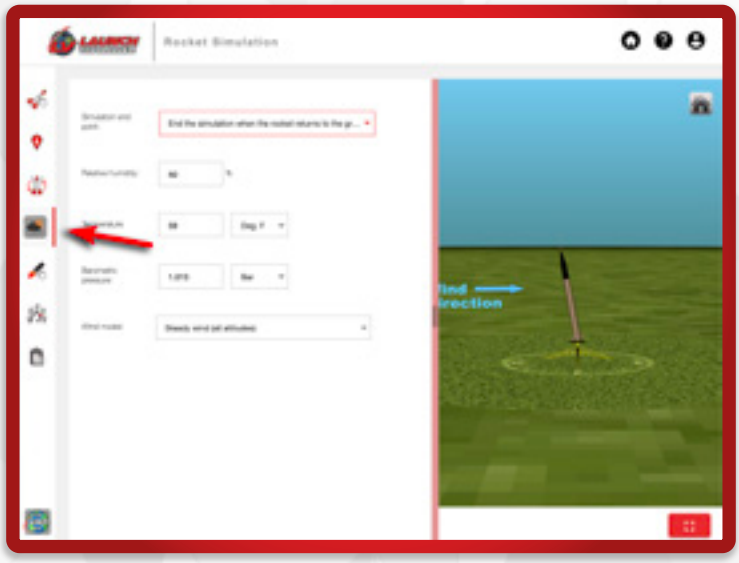


FIGURE 9: YOU CAN ADJUST THE WIND, BUT WITH THE FREE MEMBERSHIP, YOU WON'T BE ABLE TO ADJUST THE "SIMULATION END POINT."

But even with this limitation, you'll still be able to select rocket motors for FREE using the Launch Visualizer. All you're probably concerned about is how high it will go, and what delay you should select.

Seeing where the rocket will land is probably something you'll eventually want to see, which is why you might consider subscribing to a premium membership at some future date.

Once you have the rocket orientation like you want it, you'll now be doing motor selection. Click on the "Select Motor" button.

FIGURE 10: ON THE SELECT MOTOR SCREEN, CLICK THE BUTTON TO "CHOOSE ENGINE."

You'll see that the Launch Visualizer has displayed the motor mount. At the bottom of the screen is a red button labeled "choose engine." Click that.

This will bring up a list of rocket engines you can select from. By default, the diameter filter is set to only show the motors that will fit the motor mount tube. But you can have it show all the engines in the database if you wish.

Here is the part where you start picking the motor for your rocket. When you see the entire list, it can be daunting because you just don't know where to start. But fear not. It doesn't hurt to pick the wrong rocket motor when you're running a simulation. At this point, we're just learning and

Continued on page 9

Picking Motors with the Launch Visualizer

Continued from page 8

experimenting to narrow our choices. I guarantee to you that you'll enjoy the process - it is a lot of fun seeing how the rocket will fly on a poor choice as it is seeing it fly on a great motor choice.

You'll be learning about YOUR rocket flying from YOUR field.

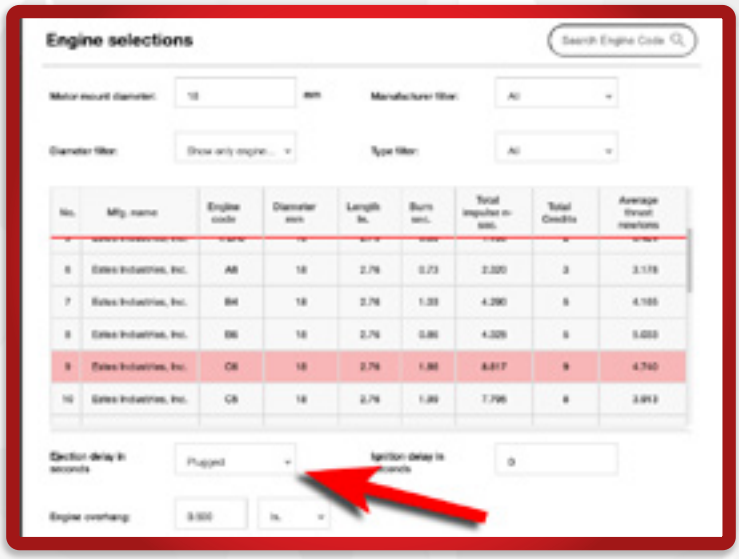


FIGURE 11: FROM THE ENGINE SELECTIONS SCREEN, YOU CAN PICK ANY MOTOR. THEN SELECT THE "EJECTION DELAY IN SECONDS" MENU.

The last thing you'll need to do when selecting a rocket motor is to pick the ejection charge delay. Again, you may not know which rocket delay to pick. But don't worry. In this case, you just pick the longest time delay from the drop down menu (see Figure 12).

FIGURE 12: SELECT THE LONGEST EJECTION DELAY FROM THE LIST.

By choosing the longest delay, you'll make sure that your rocket will fly as high as possible, and not be stopped short of reaching its true potential.

At this point, the rocket is ready to launch. Note that we're ignoring the "Flight Events" screen. For most simple rockets, there is only one parachute/streamer in the rocket, and by default, the Launch Visualizer is pre-set to deploy it at the maximum ejection delay time built into the rocket engine. So the parachute will be deployed when the ejection charge goes off. If that happens after apogee, you won't see it with a free membership account. If it is

Continued on page 10

Picking Motors with the Launch Visualizer

Continued from page 9

before the apogee point, that is where the simulation ends anyway. That's why we want the longest ejection time when selecting the rocket motor.

Just click the launch button from the buttons on the screen. You'll see a little animated finger pointing at it. It wants to be clicked.

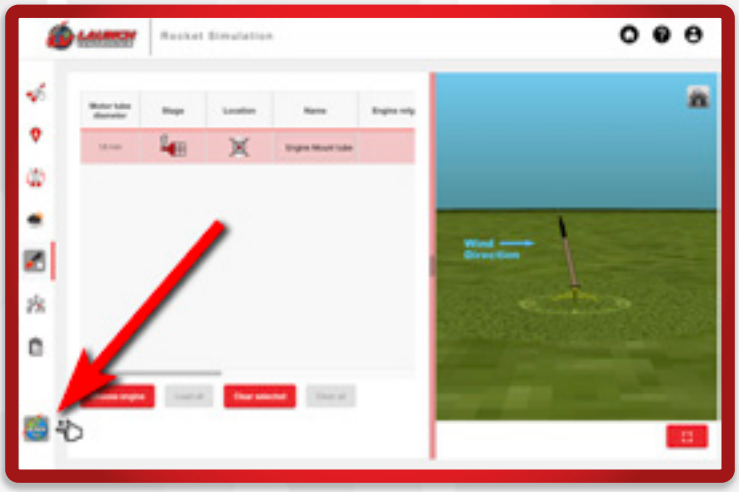


FIGURE 13: CLICK THE LAUNCH BUTTON TO START THE SIMULATION RUNNING.

Once you click it, you'll see a pop-up showing how many credits the launch will consume. Don't worry about it… you're using a free membership. It doesn't cost you anything!

Just click the "simulate" button to see the simulation.

When it is finished computing the trajectory, you'll see your rocket sitting on the launch pad, in YOUR field. Get ready for the fun!

There is a "Play" button on the bottom right corner of the screen. This will begin the animation of your rocket. As it takes off, you'll see the flame and smoke trailing the rocket as it zooms skyward.

When the rocket reaches apogee, it will loop back to the beginning and just relaunch the rocket again.

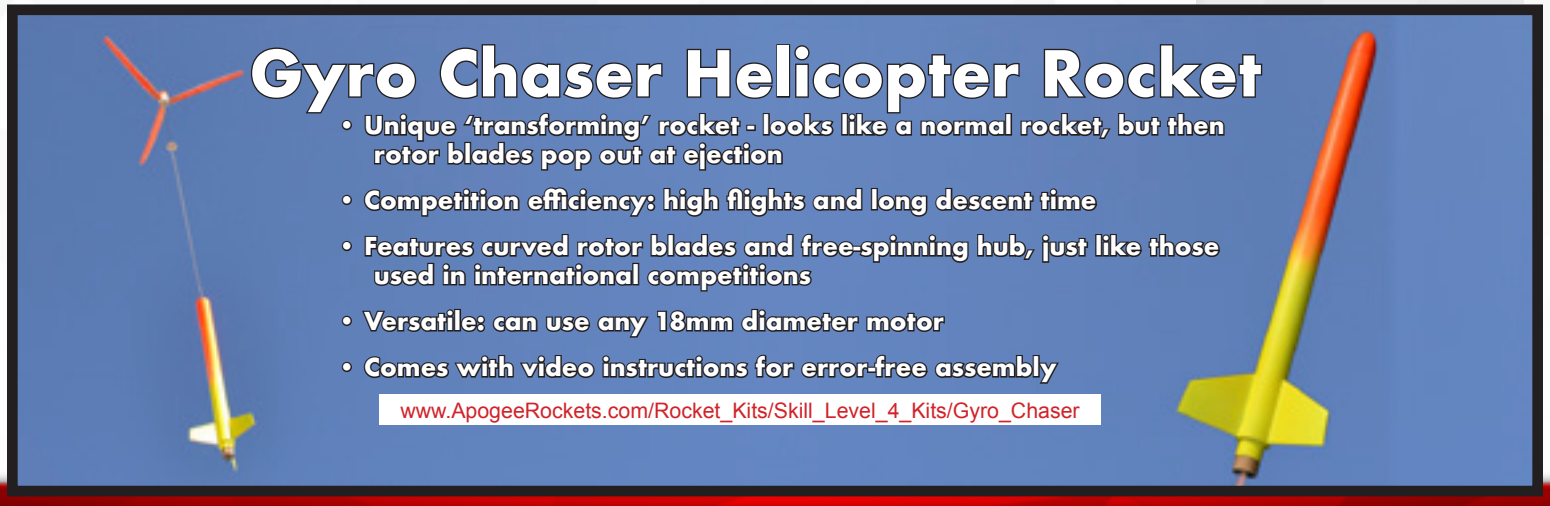
On the bottom of the screen is a time-slider bar. You can grab the handle and move the time to any point in the flight to see the position of the rocket.

The map screen showing the trajectory is also fully interactive. That means you can use your mouse to orient the scene and look at it from different angles. You can pan, tilt, zoom, and change the way you're looking at the trajectory.

NEED A PARACHUTE? APOGEE HAS THE ONE YOU'RE LOOKING FOR!

www.ApogeeRockets.com/Building-Supplies/Parachutes

Continued on page 11



Picking Motors with the Launch Visualizer

Continued from page 10

FIGURE 14: WATCH THE ROCKET IN THE LAUNCH VISUALIZER WINDOW. ROTATE IT AROUND USING THE CONTROLS IN THE BOTTOM LEFT CORNER. ALSO NOT THE COLOR OF THE APOGEE POINT IN THE SKY.

This is a really good way to get a perspective on your launch that you've never had before. A rocket's flight is more than "just how high it flew." You want to see how high the peak point is in relation to the objects on the ground, as well as how the rocket interacts with the wind and other weather conditions you've set.

Because the flight is more than just a "peak altitude number," calling us up and asking for a motor recommendation is silly if you think about it. We don't know the criteria you'd use for determining if the launch will be successful on your field with your weather conditions.

What criteria should you use to determine if the flight was successful?

This is the part of the simulation where you dial in on the success of your flight. Now you've run a simulation, let's determine if the motor we selected was OK.

Criteria Number 1 - What color is the apogee point in the image?

If it is green, then the rocket went more UP than sideways (see Figure 14). This is GREAT! It means it probably had enough oomph to get off the pad and didn't weathercock too much.

If the apogee point in the Visualizer is colored "red," then the rocket went too far sideways and not enough upward.

We need to figure out what went wrong. For starters, let's first confirm or set the launch angle to straight up (0° from vertical), and run the simulation again. If you angle the launch rod, of course it is going to have some horizontal travel. So by setting it straight up, we eliminate the possibility that we've aimed it wrong.

If it is still red colored after aiming it straight up, this is our first indication that the motor is not a good choice. We need the rocket to take off faster, so we need a motor with more thrust for the weather conditions we're launching in.

The rocket may not need a bigger motor, like going from a C-engine to a D-engine. It needs more thrust. You

Continued on page 12

Picking Motors with the Launch Visualizer

Continued from page 11

want to pick a motor with higher average thrust. This is the number after the letter in the motor name. For example, if you started with a common motor like an Estes C6, you may need to try a Quest C12 or a Quest C18. With higher thrust, the rocket will take off faster, and weathercock into the wind less. So it will go straighter and hopefully the color of the dot in the Launch Visualizer indicating the apogee point will be green instead of red.

This first criteria is the main one you'll be most concerned about when picking a rocket motor for your rocket. It is all about safety.

Criteria Number 2 - Was the lift-off speed at least 30mph?

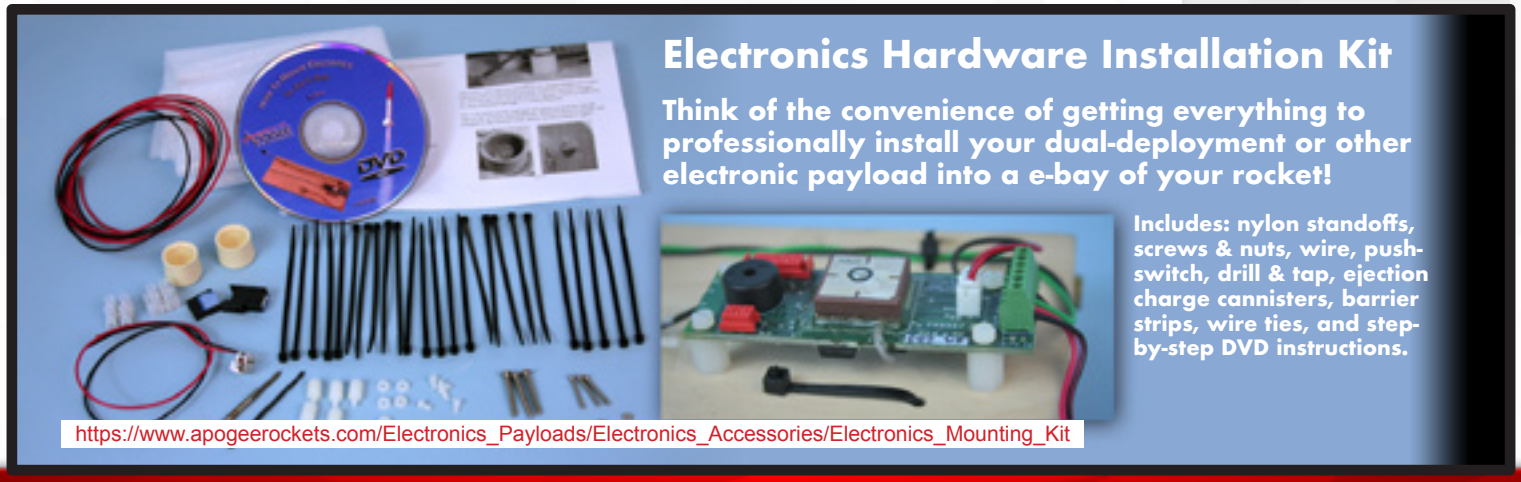
On the Launch Visualizer, we're going to next minimize the trajectory view of the rocket, and look at the summary screen. To minimize the trajectory view, click on the red button in the bottom right corner of the web browser. The symbol on the red button is the standard one to minimize a window, and sort of looks like a square with dashed lines.

FIGURE 15: MINIMIZE THE LAUNCH VISUALIZER WIDOW BY CLICKING THE RED BUTTON IN THE BOTTOM RIGHT CORNER. THEN CLICK ON COLUMN CONFIGURATION IN THE SUMMARY SCREEN.

The Summary screen will tell us a lot of useful information. But it may not be displayed by default on your screen, so you may need to click on the button labeled "Column configuration."

When you click on it, you'll be presented with choices of what launch parameters are displayed in the summary screen. The important ones for selecting rocket engines are: Optimal Delay, Velocity at launch guide departure, Max. altitude, and Engines loaded.

Continued on page 13



Picking Motors with the Launch Visualizer

Continued from page 12

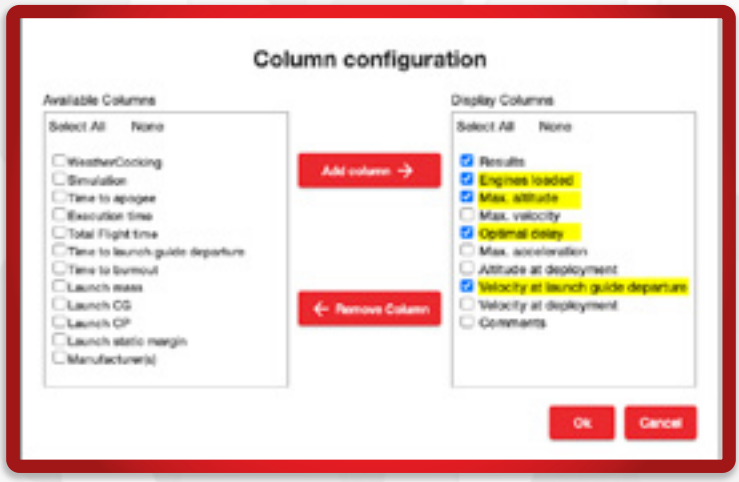


FIGURE 16: DISPLAY THE PARAMETERS: ENGINES LOADED, MAX. ALTITUDE, OPTIMAL DELAY, AND VELOCITY AND LAUNCH GUIDE DEPARTURE.

Once those options are selected, look at the last simulation you just created, and see if the lift-off speed was at least 30mph (see Figure 17).

We want to see the rocket leave the launch pad at this speed (or higher) because it is a good rule-of-thumb for making sure the rocket stays stable. The fins need air flowing over them to stabilize the rocket, and we know from 60 years of experience that 30mph is a good number. Slower than this, and the rocket could go unstable coming off the launch pad if there were a sudden and unexpected gust of wind. When we run our simulations, we're assuming the actual launch conditions are about what we set up… but that doesn't mean a sudden gust of wind can't come from out of nowhere. That's why, even though the trajectory is indicated as good by the green dot at apogee, we still want the lift-off speed to be 30mph or faster.

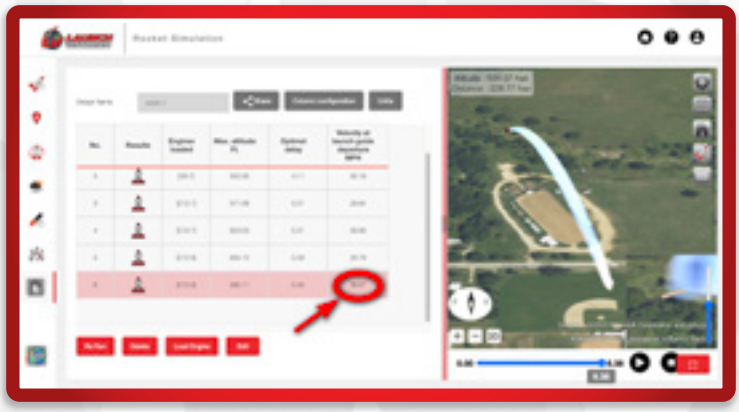


FIGURE 17: CONFIRM THE LIFT-OFF VELOCITY IS AT LEAST 30MPH.

Criterial Number 3 - Did it go too high?

Only you can determine if the rocket went too high.

This criteria will eventually imply how far of a walk you'll have to go on in order to retrieve your rocket. The free membership plan of the Launch Visualizer won't tell you how far you'll walk or whether or not it will land where trees are plentiful. But if you call us up on the phone and ask us how high a rocket will go, we also won't be able to tell you how far it will drift either.

Here you have to use your best judgment. A lot of people (especially kids), just want to fly the rocket as high

Continued on page 14

Picking Motors with the Launch Visualizer

Continued from page 13

as it will go. But that usually ends with the launch report after the flight: “the rocket was lost.” It went so high that when the parachute came out, it drifted out of sight where the rocket couldn’t be retrieved.

I want you to get your rocket back. So I urge you to fly it only to a reasonable altitude compared to the size of your launch field. The typical rule of thumb is that the altitude you want is about the same as the length of your field. If your field is 1000 feet long and 1000 feet wide, then try to limit the peak altitude to be about 1000 feet up.

If your rocket goes too high, you’ll need to drop down a motor letter-size. For example, drop from a D-engine to a C-engine.

On the other hand, if you want to go higher, then choose a bigger letter for the motor size. Say a C-size to a D-size.

Then do the launch simulation again. Remember though, whenever you make any motor change, you have to always revert back to the first criteria - what color was the dot that indicates the apogee point in the flight? (refer back to Figure 14)

If you do want to push the limits of your field by going as high as you possibly can, then I would suggest you upgrade from the free membership to a Premium membership in the Launch Visualizer. When you do that, you’ll have more control over the launch parameters, and you can really dial in the initial conditions of the launch so you maximize the altitude while minimizing the chances of losing the rocket due to it drifting out of sight or where it can’t be retrieved easily.

Criteria 4 - Picking the Right Delay

Now that you’ve got a good motor, the final step is to pick the ejection delay. And this is easy in the Launch Visualizer.

Again, looking at the summary screen, just look at the number in the “Optimal delay” column. This number indicates the perfect delay, where the parachute would be deployed at the peak altitude of the flight.

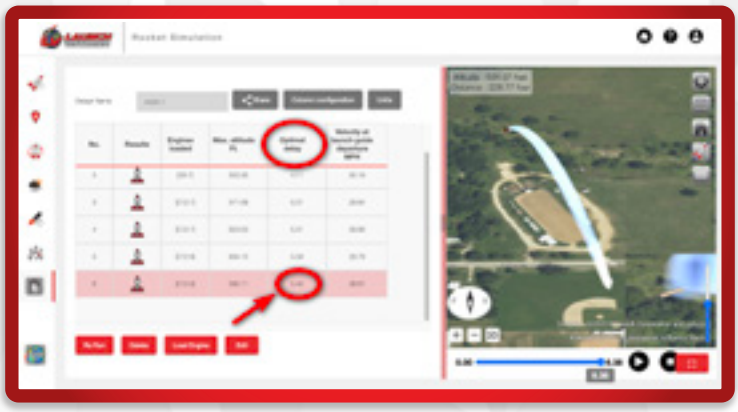


FIGURE 18: NOTE THE OPTIMAL DELAY FOR THE FLIGHT WITH YOUR LAUNCH CONDITIONS.

It is always a decimal number. For example, 5.40 seconds. But in real life, you won’t find a rocket motor that has a delay value this exact. You’ll need to round the number off to a single whole number.

Continued on page 15

CHECK OUT THE APOGEE YouTube PAGE
CLICK OR SUBSCRIBE HERE FOR OUR HELPFUL
AND INFORMATIVE HOW-TO VIDEOS
ON MODEL ROCKETRY
https://www.youtube.com/c/apogeerockets
Apogee Components

Picking Motors with the Launch Visualizer

Continued from page 14

Next, we have to see what delay values are available from the manufacturer for the particular motor you've selected.

You can use the Launch Visualizer to find out. When you loaded the motor initially, the drop down menu showed you the available delays from the manufacturer (refer back to Figure 12).

I would suggest you round down to the next shorter delay. For example, if the optimal delay for a rocket that had a C6 motor was shown as 6.7 seconds, I'd choose the C6-5 motor instead of the C6-7 motor. Even though the 6.7 could be rounded off to 7…

The reason is again for safety reasons. Say for example the rocket got hit by that unexpected, sudden gust of wind, and it went unstable. Wouldn't you rather it ejected a little bit early in this case?

As you gain experience in rocketry, you'll become acquainted with your own rockets. You'll know which rockets are solid and stable, and which ones are more risky. When you gain this information about the rocket, at that point you can decide if rounding "upward" to a longer delay would be OK. But if you're not sure, always round downward.

You've done it!

You've gone through the simple steps of using the free membership on the Launch Visualizer to pick a rocket motor for your rocket.

It was a lot of fun, wasn't it? You got to see how your rocket will look like flying from your own launch site. It was a whole different perspective than simply looking up a number in a motor selection table. It was a lot more valuable, because seeing the flight is always going to give you more information.

What's Next?

Once you've experienced the power of the Launch Visualizer, you may want to try out RockSim, which allows you to more closely match your own home-brew rocket design. The simulations will be similar, but a bit more accurate. Right now, RockSim is only available on desktop, so you will have to download and install software on your computer. But it has lot of simulation features that aren't in the online version of the Launch Visualizer.

The important feature is the ability to pick rocket motors much faster. Instead of doing one motor at a time, RockSim can run every single available rocket engine with a single click of a button.

At that point, you'll discover that there are a lot of rocket motors you can fly in your design that will work ok. How cool is that?

Conclusion

This article showed that you can select rocket motors on your own, and totally for free, by using the Launch Visualizer at RockSim.com. There is no software to download, and you can even do it on your phone or tablet, which makes it convenient for when you are away from home.

Continued on page 16

www.apogeerockets.com/Rocket-Kits/Skill-Level-2-Model-Rocket-Kits/SkyMetra

Picking Motors with the Launch Visualizer

Continued from page 15

The best part is that you'll have a lot of fun doing it, because playing with the Launch Visualizer is a lot of fun. It is almost like a game.

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.

www.ApogeeRockets.com/RockSim/RockSim_Information

www.ApogeeRockets.com/Building_Supplies/Motor_Retainers_Hooks

Check out our Facebook page
www.facebook.com/ApogeeRockets

www.ApogeeRockets.com/Building_Supplies/Parachutes_Recovery_Equipment/Parachutes