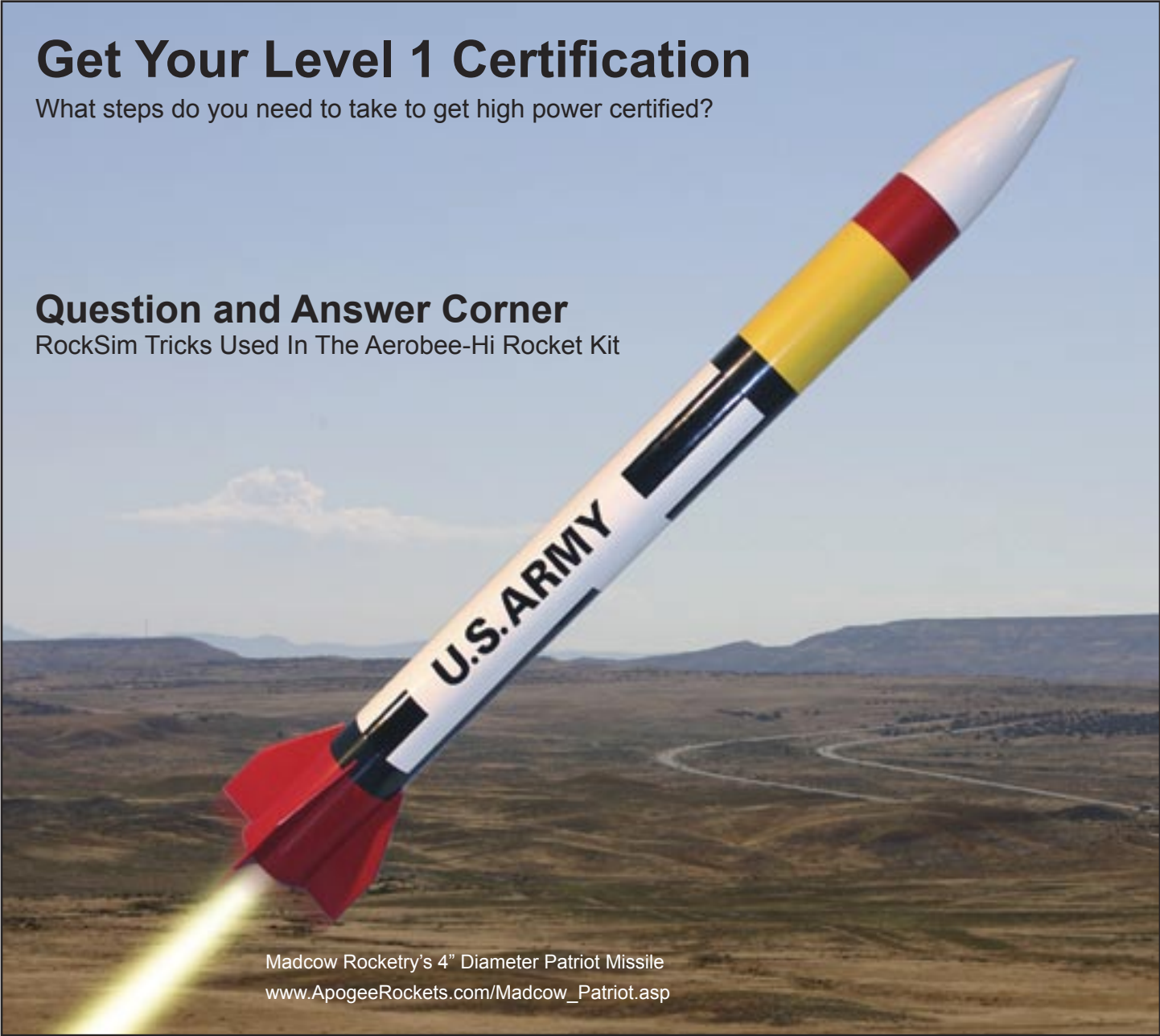


Get Your Level 1 Certification

What steps do you need to take to get high power certified?

Question and Answer Corner

RockSim Tricks Used In The Aerobee-Hi Rocket Kit



Madcow Rocketry's 4" Diameter Patriot Missile
www.ApogeeRockets.com/Madcow_Patriot.asp

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What is High Power Certification?

By Tim Van Milligan

Many people have asked me “What is High Power Certification,” and “How does one go about getting certified?” In this article, I’ll try to answer those questions for you.

What is Meant By High Power Rocketry?

There is a clear dividing line between low power model rocketry and high power rocketry. That line is designated by the size of the rocket engine. High power rocketry starts with rocket engines that are classified as “H” size (160 Newton-seconds of power) or larger (see Newsletter 131 for a explanation of the engine sizes: <http://www.ApogeeRockets.com/education/Newsletter131.pdf>). To fly one of these bigger motors, you will need to go through the “certification process.”

Why Fly Bigger Motors?

Let’s be realistic here... The reason to fly bigger motors is not really to fly higher or faster. As hobbyists (i.e. non-professionals) building and flying big rockets gives us a sense of mastery. It is like getting your driver’s license. Once you have it, you are different from the kids that have to be carted around by their parents.

Bigger rockets are also like fireworks. Everyone that goes to a fireworks display is basically hanging around for the “big display” at the end of the show. We want to see that awe-inspiring display of pyrotechnics that rattles the bones and makes your muscles twitch. It is the same with large rockets!

I have written about the subject of “why we love rockets” in Newsletter 85 (<http://www.ApogeeRockets.com/education/downloads/Newsletter85.pdf>). I think you’ll find it interesting to be able to describe your passion for rocketry without using the words “cool” or “fun.” Check it out sometime.

Why is there a Certification Process?

There is nothing wrong with flying big rockets. We all need an outlet to express ourselves, and flying big rockets is one way of doing that. The purpose of certification is to



make sure that what we do is safe for those around us, and to protect the hobby.

You see, just one stupid person could provide the reason for the government to banish ALL forms of rocketry. For example, say a stupid person flies a big rocket high into the air, and an airline pilot sees it and freaks out; that could set off a fire-storm of controversy that might compel government officials make laws to keep the general public safer.

I have no patience for people that put our hobby in jeopardy. I do try to discourage them from taking up rock-

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About this Newsletter

You can subscribe to receive this e-zine FREE at the Apogee Components web site (www.ApogeeRockets.com), or by sending an e-mail to: ezine@apogeeRockets.com with “SUBSCRIBE” as the subject line of the message.

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etry. I've come to the conclusion that this hobby isn't for everyone. There are people who lack judgment and can't foresee the consequences of doing stupid things. Check out all those videos on YouTube to see these people in action.

And I've taken heat from people for this opinion. In 2004, I wrote an article (<http://www.ApogeeRockets.com/education/Newsletter135.pdf>) about making rocket motors, where I tried to persuade newbie modelers from going down that path. I received a lot of emails from seasoned rocketry veterans saying I was completely wrong. But I wasn't writing to the veterans, I was writing for newbies that come to my web site looking for formulas and recipes. Until they learn the proper safety aspects of rocketry and why it is important to protect the hobby from more government regulations, they don't have any business learning the formulas for making fuel. I don't think many of those veterans have any clue how big the problem is with newbies putting the hobby at risk. But I'm on the front lines every day, and I see it first hand.

The certification process is designed to educate modelers about the current government regulations and the necessary safety procedures for flying bigger rockets. If everyone follows the same rules, that will keep the hobby

secure for the next generation of modelers.

What are the levels of High Power Certification?

There are four levels of certification.

Level 0 : You are not permitted to buy motors greater than a G-size, nor are you permitted to fly high power rockets.

Level 1: You can fly rockets that use H and I-size motors, and you are authorized to buy those motors.

Level 2: You can buy and fly J, K, and L size motors.

Level 3: You can buy and fly M-sized rocket motors and larger.

Note that you can build any size rocket model that you want. But until you are certified, you can't start the process of buying the motors that will put them into the air.

What is the difference between Skill Levels and Certification Levels?

Many people confuse a rocket's "Skill Level" requirements with "Certification Levels." They do sound the same, but actually are completely different.

As mentioned above, certification levels are based on

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the size of the motors that the rocket uses. That's it – size of the motor.

“Skill Levels” are based on the how easy or hard it might be to put the kit together from a construction standpoint. A kit with a lot of parts is likely to be harder or more laborious to assemble than a kit with few parts. You can see how I personally classify a rocket's Skill Level by reading Newsletter 31.

A rocket's skill level requirements are not based on how big the rocket is. In fact, many high power rockets are very simple and are quick to assemble. For example, the big 4-inch diameter Madcow Rocketry Patriot Missile, which can get you to a Level 1 certification, is only rated as a Skill Level 3 rocket from a construction standpoint. Meanwhile, the Apogee Heliroc kit, which flies on a tiny 1/2A size motor, is a Skill Level 4 rocket.

What is the process to get a Level 1 Certification?

I personally recommend that you become familiar with model rocketry by building smaller rockets before jumping in to the bigger ones. From a Skill Level standpoint, you should be comfortable building Skill Level 4 rockets prior to starting high power rockets. I make that recommendation from an educational point of view. You need to be able to successfully pick rocket engines for your rockets without having the manufacturer tell you which motors are “best.” According to my ratings in Newsletter 31, this is a Skill Level 4 type of task.

Step 1: Pick your rocket kit. At Apogee Components, we sell several rocket kits that can be used for Level 1 high-power certification. Almost any of the models that use 29mm motors from Madcow Rocketry, Mercury Engineering, or Cosmodrome Rocketry are capable of handling an H size rocket motor.

As a beginner, the things you should look for in a high power kit are thick-walled body tubes, and through-the-wall mounting of the fins. These make the rocket kit stronger, to survive the stresses of high power motors.

If you've read my book *Model Rocket Design and Construction* (http://www.ApogeeRockets.com/design_book.asp), you will note that I personally think that most high power rockets are overly heavy. I still stand by this opinion, but I also realize that the people new to rocketry lack the good building and flying skills required to make lightweight rockets that can handle the bigger motors. I still encourage everyone to improve their skills so that they can make

lighter weight rockets. See Newsletter 209 (<http://www.ApogeeRockets.com/education/downloads/Newsletter209.pdf>) for more encouragement in this important area.

Step 2: While you are building your rocket, you have to start planning ahead. First of all, you must join either the National Association of Rocketry (<http://www.NAR.org>), or Tripoli Rocketry Association (<http://www.tripoli.org>). They are the only two organizations in the United States that can certify you for high power so you are authorized to purchase the larger rocket motors. You must be a member to be eligible for high power certification.

Step 3: Find a local rocket club. It is actually at a local club launch where you will make your high power demonstration flight. You must show the judges that you can successfully build and fly a high power rocket. The flight is considered successful if “the parachute is fully deployed, the rocket is safely recovered, the motor did not eject out of the rocket and the rocket IS FLYABLE AGAIN WITHOUT reconstruction or modification.

To get ready for this “certification flight,” you will first need to find a local club ahead of time. I've put together a map of clubs around the world that you can search through to find the one closest to you. You can download it from the

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Apogee Components web site at: http://www.apogeerockets.com/Launch_sites.asp.

Step 4: Contact the local club several weeks prior to making your certification attempt. You will need to do a couple of things ahead of time. First, find out when their next launch will be. Second, you have to make sure that they will have a certification judge there at the launch you will be attending. Third, you need to make arrangements to buy your "H" size rocket motor. At this point you are not eligible to buy the motor, but the officers in the club can make arrangements for you to purchase the motor on-site for your certification flight.

Step 5: Fill out the necessary paperwork to hand over to the certification judges. For the NAR, it is a simple one-page form that you can download from their web site at: <http://www.nar.org/cabinet/index.shtml>. You will hand this paperwork over to the judges prior to your certification flight. They will witness the flight and complete their sections of it and send it off to the national headquarters so you can get your certification card.

You might include an addressed and stamped envelope to put the certification paperwork in. This may help speed up the process.

What Happens After Level 1 Certification?

After your successful certification, you have now completed the first step in the process of buying high power motors. You're probably thinking "What the...? I thought the certification process was all I needed to do to be authorized to buy and fly H and I size motors."

Currently, there are some government regulations that you must also wade through to legally buy and store rocket motors. The Bureau of Alcohol, Tobacco, Firearms and Explosives (abbreviation: BATFE) has mistakenly classified motors with more than 62.5 grams of propellant as "explosives." Because of this, you will also need to get an "Low Explosives User's Permit (abbreviation L.E.U.P.) from the Feds. There are many excellent "how-to" tutorials that will walk you through this process. You can do a Google search on the internet using the search terms: "LEUP Rocket Motors." Here are a couple of them that I recommend reading:

<http://www.tulsarocketry.org/LEUPTutorial.htm>

<http://www.lunar.org/docs/LUNARclips/v10/v10n1/leup.shtml>

<http://www.victorinc.com/LEUP.html>

http://www.marsclub.org/new1/LEUP_Info/LEUP_FAQ/leup_faq.html

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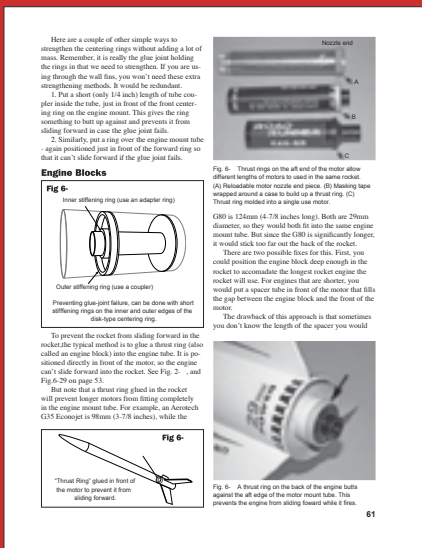
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The good news is that there is a lawsuit brought by the NAR and Tripoli against the BATFE for overstepping their legal authority and misclassifying composite propellant motors as "explosives." Rocket propellant doesn't explode. In fact, it burns very slow. If the NAR/Tripoli wins the lawsuit, then the requirement to have a LEUP will go away.

When will we know the outcome of this lawsuit? Don't hold your breath. It is one of the longest running court cases currently in the federal system. It has been going on over eight years. And the BATFE has dug in their heels on this case, and if they lose, expect them to appeal all way to the U.S. Supreme Court. The lawsuit isn't going to go away anytime soon.

I personally have a stake in this case, since it affects my business here at Apogee Components. I've been holding off getting into carrying high power rockets because of the burden that getting a LEUP puts on our customers. I feel I've lost hundreds of thousands of dollars in sales because of it.

Level 2 and Level 3 High Power Certification

The process for getting Level 2 and Level 3 certifications are similar to the Level 1 process. The biggest differ-

ence is that you'll also have to take a written test prior to launching your certification flights.

For more information, see the NAR and/or the Tripoli web sites. They have sample tests that you can look at, including all the answers to them.

About The Author:

Tim Van Milligan (a.k.a. "Mr. Rocket") is a real rocket scientist who likes helping out other rocketeers. 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 a 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 the curator of the rocketry education web site: <http://www.apogeerockets.com/education/>. He is also the author of the books: "Model Rocket Design and Construction," "69 Simple Science Fair Projects with Model Rockets: Aeronautics" and publisher of a FREE e-zine newsletter about model rockets. You can subscribe to the e-zine at the Apogee Components web site or by sending an e-mail to: ezine@apogeerockets.com with "SUBSCRIBE" as the subject line of the message.

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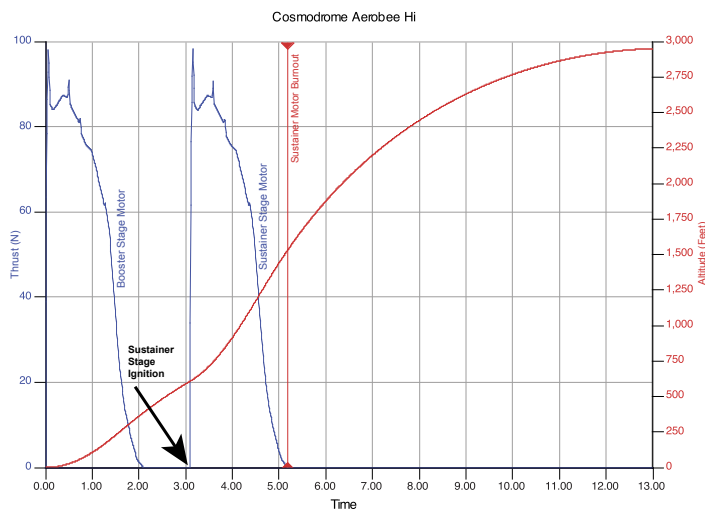
Explanation of Some Unique RockSim Tricks for the Aerobee-Hi Kit

By Tim Van Milligan

Roger Coppock writes: *I was looking through the Rocksim file on the Aerobee-Hi (<http://www.ApogeeRockets.com/education/downloads/Aerobee-Hi.rkt.zip>) and have some questions.*

Q1) *Your simulations load the booster with a G64-0. I did not know that this motor was made. Did you modify a G64-4 reload to make one?*

A1) No. I used a zero second delay just as a RockSim



With composite motors, you must use electronics to control the ignition of the sustainer stage motor. The delay in the booster just ejects the parachute.

trick. I wanted to simulate what would happen if the model drag separated after booster stage burnout. In other words,



Aerobee-Hi kit has a gap between the two stages. This kit can be found at: http://www.ApogeeRockets.com/Cosmodrome_Aerobee-Hi.asp

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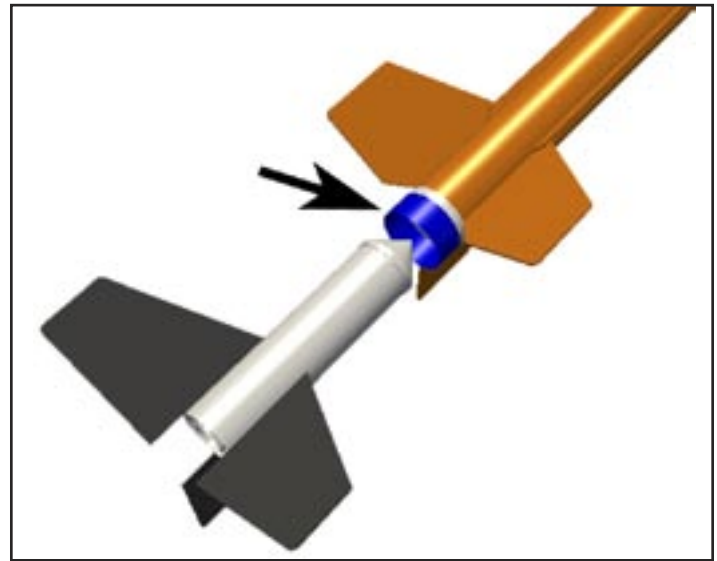
Question and Answer Corner

the upper stage will coast a little ways from the booster stage before it ignites. Another reason to do this is because the upper stage is being ignited with a timer (http://www.ApogeeRockets.com/Staging_Timer.asp) set for 3 seconds from lift-off. If you look on the simulation, you'll see an ignition delay of 1 second for the upper stage motor. If the booster stage burns for approximately 2 seconds and you add one second for the ignition delay, you'll get the 3 seconds that the timer is set for.

Q2) What is that part in the design called "FAKE tube Separation" for?

In this particular rocket kit, there is a gap between the stages where the little vertical struts are. These struts can't be simulated in RockSim. But I wanted to make sure the distances between the stages were correct, so I had to use a tube to accomplish this. That extra distance between the stages will move the CP of the rocket further back and make the rocket more stable. I wanted to make sure that I had everything correct from a stability standpoint.

Because the tube really isn't there, that's why I used the "color" option to make it invisible (the part's 2D color is the same as the background color, and in 3D mode, the part is set to 0% transparent). I probably should have used the "Mass override" to get the part weight right, but the tube



is fairly small, so it's mass is probably insignificant.

Q3) Rocksim, it seems, is more than just a simulation tool, it's a language to describe model rockets.

I never thought about it that way, but you're right in that observation. A rocket is more than just a shape and a weight. It is a collection of parts, each has to be in its proper location. RockSim allows you to define a rocket this way, which makes it possible to run accurate and realistic simulations prior to launch.

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Battery, battery connector, mounting board and igniter are not included.

www.ApogeeRockets.com/Staging_Timer.asp

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