ISSUE 94 - DEC. 13, 2002

# APOGEE

## PEAK OF FLIGHT

## NEWSLETTER

APOGEE COMPONENTS
1130 Elkton Drive, Suite A
Colorado Springs, CO 80907 USA
www.ApogeeRockets.com
orders @ApogeeRockets.com
phone 719-535-9335 fax 719-534-9050

ISSUE 94 - DEC 13, 2002 APOGEE
PEAK OF FLIGHT

# How To Start A School Rocketry Program

By Tim Van Milligan

The Team America Rocketry Challenge has inspired a lot of schools to take up model rocketry. The questions that they ask are:

1. How do you start a rocketry program?
2. What is involved?
3. What should a program include?
4. How can it be tied to the regular curriculum?

In this article, I'll try to answer some of these questions, and give some suggestions on what I'd do that would make it easier for both the teacher and the student.

First, I suggest integrating the rocketry program in a series of small steps. Begin with something simple. Try dipping your toe into the water to see what rocketry is all about.

I'd suggest letting the students build a simple "kit" rocket, and launch it. This will teach the basics of rocketry, and how the rocket parts are arranged. It will also motivate the students, because nothing beats a actual rocket launch. It really boosts the excitement level in the classroom.

The rocket you chose here would depend on the age of the students. For younger children, I'd suggest a simple rocket that has pre-molded plastic fins. This will make it easy for them to put together, and insure a straight up flight when the rocket is launched. One rocket that fits this category is the Quest Viper rocket. (see our web page: http://www.apogeerockets.com/Viper.asp )

For middle school kids that need a rocket that has a little bit more of a construction challenge, I'd suggest something like the Pratt Hobbies Super Six kit (http://www.ApogeeRockets.com/six_pak.asp).

The Super Six has balsa wood fins that the students have to actually glue to the rocket tube. Because the rocket is lighter weight, it will also fly a little bit higher. This adds a bit of extra excitement to the launch.

When the student glues the fins on themself, they will learn the importance of making sure the fins are straight and securely attached. Otherwise, they'll learn (the hard way) how unbalanced aerodynamic forces will cause the rocket to fly in a unstable manner.

High School students may require a rocket kit with a bit more construction challenge. The Quest Courier rocket (http://www.ApogeeRockets.com/courier.asp) would fit this age group. While it isn't too difficult to build, it has more parts to assemble. As an extra bonus, it includes a large payload bay. This can be used to launch an egg into the air, or some other type of payload that would be appropriate to the curriculum.

While it is easy to just jump right into rocketry by building a rocket kit, I'd recommend that the teacher take a little bit of time to educate themselves in the basics of rocketry. You want to make sure the students are building the rocket properly and launching them in a safe manner. When you know a little bit about rocketry, you can spend more time on the education aspects and less time fussing over the trivial stuff like hooking up the igniters.

To get this basic information about rocketry, I highly recommend the Apogee video book: "Building Skill Level 1 Model Rockets." (http://www.apogeerockets.com/skill_level_1_video.asp) It will walk you through the construction and the launch of a simple rocket. The nice thing about the book is that you don't read it, you just watch it. This is important, as I'll now explain...

Think about one of the simplest tasks of all -- tying your shoe. Of course, tying your shoe is second nature to you now... BUT at first someone had to show you how to do it a few times. They had to actually take the time and demonstrate exactly how to make the loop, how to cross it over, how to pull the knot tight, etc. etc.

Go ahead and try explaining how to tie your show to someone without actually showing them. It'd be downright impossible (and super frustrating for both of you)!

It's the same with building and flying model rockets. When you see a master craftsman assemble a rocket right before your eyes, the techniques and procedures crystallize in your brain. This really is the closest thing to having me in your classroom sitting right next to you.

By watching the videos, you'll be able to then go right out and show your students the right way to assemble their rockets! You'll have the confidence to teach about rocketry, even if you've never seen one before.

## integrate the curriculum into the process

(Continued on Page 3)

**Archives of this Newsletter**

All the articles that have appeared in this newsletter are archived at http://www.apogeerockets.com/education/newsletter_archive.asp

## School Rocketry

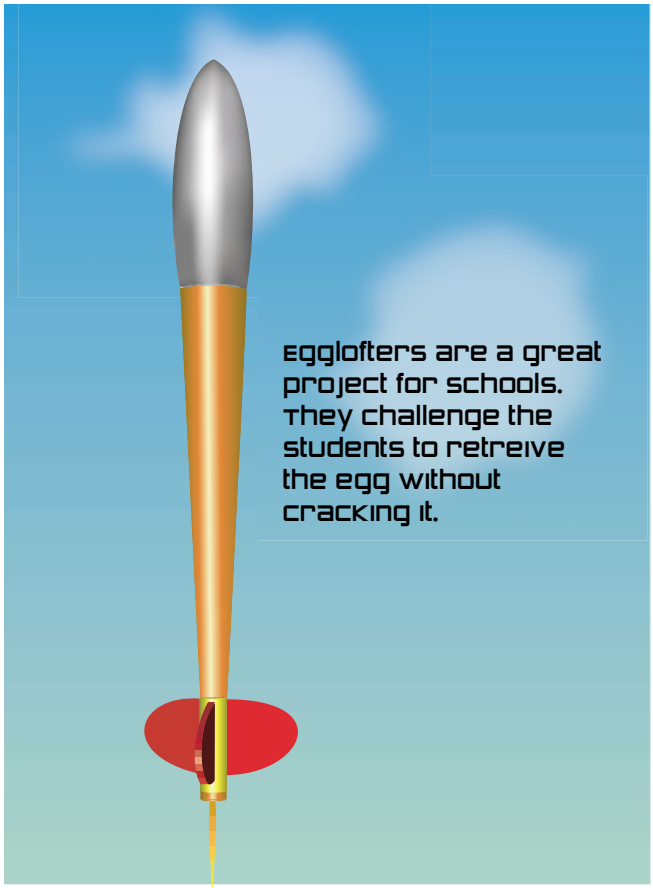
(Continued from page 2)

As you're building the rocket and getting ready to launch it, you have ample opportunity to talk about rocketry and the space program. This is exactly why rocketry is such a powerful tool in the classroom. While the students think they are just having fun, you are integrating hard-core science into the discussion.

And you can really slip rocketry into almost any subject you are studying. It is a very versatile tool that can be used in nearly every aspect of education. I invite you to take a look at our article: "Projects with Model Rockets." You can read it free on our web site:

http://www.apogeerockets.com/education/Educational_Projects.asp

This article list other ways to tap into the power of model rocketry. And it will give you lots of examples on how rocketry can be used into nearly every school subject, including: history, music, and social studies.




### Don't stop after the Launch!

After you've built and flown the simple kit model, don't stop. You aren't finished yet. Why? Because, by this point, you've seen how rocketry excites and motivates the student.

It bothers me to see that many teachers use rocketry as a "end-of-school-year" activity. That wastes the power that rocketry has to keep the students engaged in the educational process. If anything, it should be done at the beginning of the school year.

As teachers, you should continue using its motivational power in other ways to keep students on the path of learning. Don't stop after just launching the kit rocket. Keep going!

While you're slipping "education" into the classroom, the students are now ready for more challenges. Many teachers have found that they can now let them start to design their own rocket creations.

I think the reason that many teachers stop using rocketry after the launch of the kit is because they are not sure how to go about letting the students design and build their own rockets. But don't worry. There are many tools you can use to prepare yourself and your students for the challenge of building their own rockets.

Start the design process by having the students draw their proposed rocket on a sheet of paper. Just a sketch is fine. But by putting it down on paper, their thoughts start to come together.

The most important question for the student should become: "will their proposed design be stable and safe to launch?"

To answer this question, I'd suggest you start including Apogee's RockSim software into the curriculum. (http://www.ApogeeRockets.com/rocksim.asp)

Not only will the software help them to find out things like: if their design is stable, and how high it will fly; but it also has many educational aspects of its own.

For example, using RockSim you can talk about:

1. Forces of flight (lift, drag, thrust, gravity)
2. Weather - how the atmosphere and wind will affect the launch
3. Reading Graphs
4. Units
5. Geometric patterns (nose cones and fin shapes)
6. Engineering - how things are designed for manufacturing

You can find a lot more educational uses for the RockSim software at:

http://www.apogeerockets.com/education/Why_use_RockSim.asp

## School Rocketry

(Continued from page 3)

### Is RockSim difficult to use?

No. But like any type of computer program, there is a little bit of a learning curve to determine what each button does. There are many different help manuals that can get you going, including a new movie that shows how simple the software is to use.

http://www.apogeerockets.com/education/downloads/first_sim.mov (8 meg)

The movie will show you which buttons to push to launch a simple simulation in RockSim. To view the movie, you'll need Apple's QuickTime Viewer software installed on your computer. You can download that free from the Apple Computer web site: www.apple.com/quicktime

You can download the FREE demo version of RockSim from that Apogee web site to see how easy the software is to use. The download is located at:

http://www.apogeerockets.com/rocksim_demo.asp

Your students are now ready to take the rocket sketch they've drawn, and start to input it into RockSim. From the software, they'll see what kind of parts they'll need to build their creation.

But before ordering the parts, have them run numerous simulations to make sure the rocket will fly straight on a variety of rocket motors and weather conditions. Wind really affects the flight of the rocket, and only RockSim can give you an indication of how it will behave. That is what makes RockSim the best software for educators.

Finally, have them go ahead and build their designs and get them ready for launch. At this point you may have to just get out of their way. The eager students will be roaring forward since they already have some building and flying experience. So concentrate on getting the "education" integrated into the process. They'll be having too much fun to notice that they're learning at the same time.

### Conclusion

The basic rocketry program described in this article can be expanded again and again to continue the learning process. I know this method works, since I myself went to a university where aviation and rocketry were the dominant methods for getting students to learn. It does work, because nothing motivates students like the thrill of the rocket roaring into the air. So go ahead and start your own rocketry program in your school.

### About the Author:

Tim Van Milligan is the owner of Apogee Components (http://www.apogeerockets.com) and the new 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 the FREE e-zine newsletter about model rockets. You can subscribe to this e-zine at the Apogee Components web site, or sending any message to: ezine@apogeerockets.com with "SUBSCRIBE" as the subject of the message. This article may be reprinted as long as this paragraph is also included.

FREE Demo Version
Download It NOW!

RockSim v6.0 - Just $95

**RockSim Makes Designing Rockets Easy, Accurate, and Affordable**

- Easiest Software To Learn, And Fastest To Use.
- Create Templates and Patterns to Build Your Rockets.
- Generates The Most Accurate Simulation Results.
- Saves You Money By Preventing Design Errors and Launch Mistakes.
- Used By More Rocketeers - Because It Is Reliable.
- Expandable And Compatible with Other Programs: AeroCFD, FinSim, HyperCFD.
- "The Best Value For Your Money!"

*Visit the Apogee web site for more information:*
www.ApogeeRockets.com/rocksim.asp

# Answers To Your Team America Design Questions

*I've gotten a few questions about the Team America Rocketry Challenge competitions. I think they may be common questions, so I'll share them with everyone in this newsletter.*

**Question:** One of the motors which does not appear in the Rocksim v5 database is the Estes E9 series: E9-0,4,6,8,P. Where can I get this motor file?

**Answer:** The reason it is not in the database is because Estes released the motor after v5.0 was already released. The motor file can easily be installed into RockSim. You will find instructions and the motor file at:
http://www.apogeerockets.com/education/newsletter11.asp

**Question:** Do you know if Aerotech has Booster stages, and if so, what is the designation for a booster motor on rocksim?

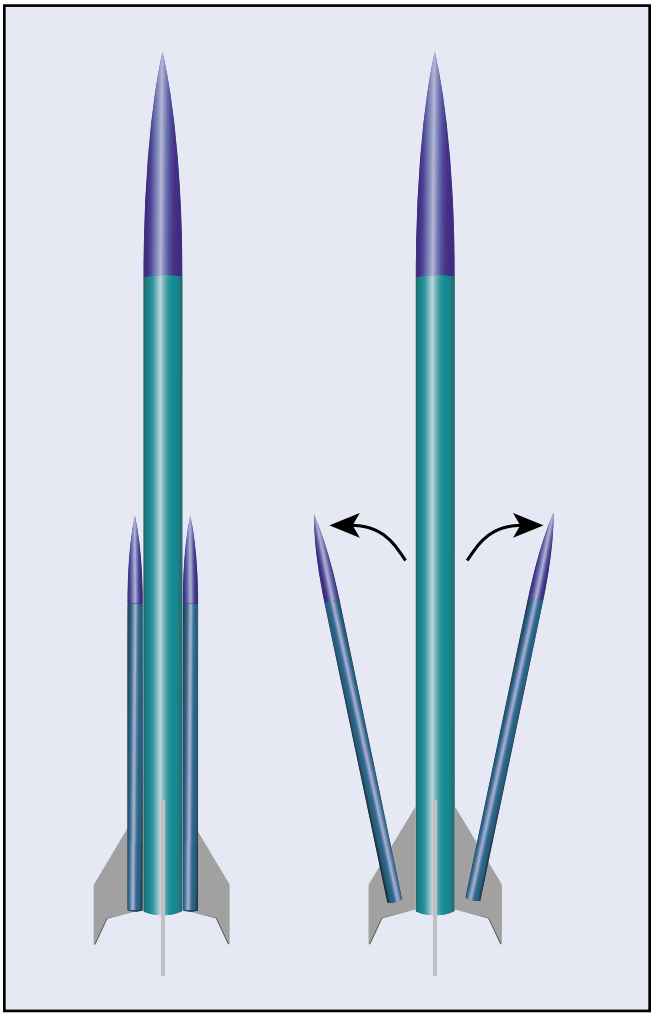
**Answer:** I've covered this topic before. The quick answer is "no." For more information, see the article at:
http://www.apogeerockets.com/education/newsletter49.asp
Also, "booster" motors will always have a zero after the dash. Like a D12-0 or a C6-0.

**Question:** I had a question about parallel staging. On page 167 of the NAR's Handbook of Model Rocketry, there is a picture where there are two small boosters attached externally to the rocket. (Like SRBs on the shuttle) The handbook says that these boosters need to burnout and fall before the core motor finishes burning. I was wondering how these motors could fall off. The book says air drag may work, but what does that mean?

**Answer:** If the air drag on the external pods is greater than the drag on the core rocket, then the pods will fall off on their own when the motors burn out. However, it isn't really reliable for model rockets.
For more information on external pods, check out the photos on this web site:
http://albums.photo.epson.com/j/AlbumIndex?u=3009006&a=30253388&f=0
They show the type of mounting hardware you might need if you use external pods.

**Question:** Is this external booster method any better or worse from clustering?

**Answer:** It is a form of clustering. The difference is that the boosters are arranged on the outside of the rocket, and it requires some "hardware" to keep them attached. Because of this, you'll find that it is a bit more complex. But it is an option you can experiment with.



parallel staging. The side boosters fall off after the motors burn out.