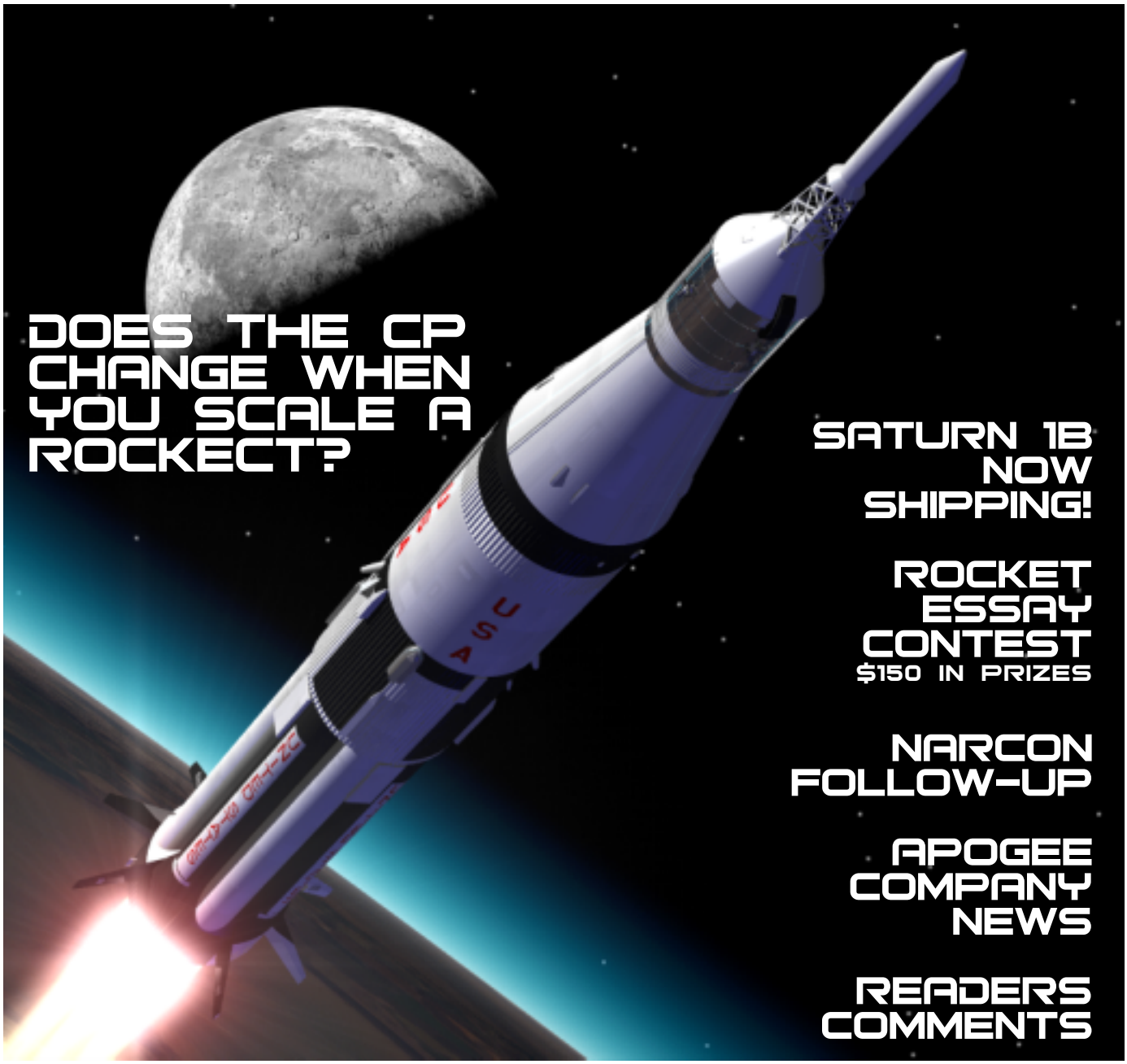
ISSUE 80 - MAY 3, 2002

APOGEE

PEAK OF FLIGHT

NEWSLETTER



DOES THE CP CHANGE WHEN YOU SCALE A ROCKECT?

SATURN 1B NOW SHIPPING!

ROCKET ESSAY CONTEST
$150 IN PRIZES

NARCON FOLLOW-UP

APOGEE COMPANY NEWS

READERS COMMENTS

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SATURN 1B SHIPPING!

After nearly two years in development, I am pleased to announce the release of the 1/70th scale Saturn 1B model rocket kit!

We have a small number of pre-ordered kits to ship yet, but I've gone ahead and turned on the on-line system to take credit card orders for the kit. If you've been yearning to order one, you can now do it at:
http://www.ApogeeRockets.com/saturn1b.asp

SEE THE SATURN 1 B LAUNCH
visit at http://www.ApogeeRockets.com/saturn_1B_video.asp

The Saturn 1B is a real favorite among modelers because it has lots of external complexity that you don't often see in other scale rockets. This includes the eight fuel tanks in a big cluster, the unique transitioon section that conforms to the eight tank tubes, and eight fins — twice as many as any other NASA rocket. Plus it has lots of corrugations that give the rocket lots of surface texture. Finally, it has a complex paint pattern that makes it unique and eye appealing.

It has taken us a long time to briing this kit into production because we want to make sure our scale kit faithfully represented the real rocket. The real rocket is awesome, and we wanted to give modelers that same level of excitement with this kit.

From the tip of the escape tower, to the bottom of the engine nozzles, we wanted to create the most detailed version of the rocket ever made. And when you see this kit, you'll be amazed by its intricate detail. There is lots of "stuff" to hang on the sides of this rocket. It may have lots of drag, but it is knockout gorgeous! You'll love how your friends oogle it when

they first see it.

Although this is a Skill Level 5 rocket, we are confident that your own rocket will turn out awesome. We believe this because we engineered it to assemble trouble-free. We also did something unique with thist kit — the assembly instructions are on CD-ROM. We pioneered the video assembly instructions with our Saturn V kit; and this one is very similar. It has about 4 hours of video on the CD-ROM that you play on your Macintosh or Windows computer. You watch the instructions instead of reading them.

You may be apprehensive about this, but it truly works! You'll end up with a better looking rocket, and learn proper building techniques at the same time. Ask anyone that has built our Saturn V kit. They'll tell you how this form of instruction is absolute perfect for complex models like this. There is guess-

cont.pg.5

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SATURN 1B SHIPPING!

CONT. FROM PG.2

ing how to apply the wraps - we'll show you how it is done to get the best looking rocket possible.

The CD-ROM instructions also contain extensive paint patterns for the Saturn 1B, as well as where the high quality water-slide decals are positioned. These illustrations are almost works of art by themselves.

This kit features:

- Highly detailed injection-molded Apollo Capsule.
- Injection-molded engine nozzles.
- Cast-resin fins.
- Urethane resin details for the booster interstage section.
- Injection molded transition with fits perfectly over the cluster of fuel tank tubes.
- Miticulously detailed vacuum form wraps for the booster thrust structure, Interstage, and 2nd stage.
- Eye-poppingly detailed embossed wrap for the transition of the 2nd stage to the Service Module.
- Special "raised ink" wrap for the Service Module portion to bring out the raised panel lines on the rocket, and to aid in masking off the different color patterns.
- Injection molded Reaction Control System (RCS) nozzles on the Service Module.
- "Perfect Fit" body tubes.
- 29mm motor mount for E, F, and G rocket motors.
- Five-color water-slide decals. Includes markings for all of the various Saturn 1B missions flown by NASA.
- Four hours of video instruction. These not only show where to place the parts, but how-to put them together correctly. This gives a high quality fit and lightweight rocket.
- 10 pages of painting instructions and drawings show the colors sion cut cardboard centering rings — for a strong and lightweight rocket that fits together perfectly.
- Kevlar shock cords.
- High Strength rip-stop nylon parachutes. Includes a 24 inch and 36 inch diameter chute, which brings your model down nice and slow after a rip-roaring launch.
- 1/4 inch launch lugs.
- RockSim design file so you can pick which motors you'd like to fly, and to determine how well the rocket will perform with those motors.
- CP location charts, to show you how to balance the rocket if you choose the "spinning" model launch system.

See our web site for a list of tools, adhesives, and paints you'll need to build this rocket.

We predict that this will be one of your most favorite rockets of all time. Not only does it look great, but you'll have an enjoyable time building it.

To order, visit our web site at:
http://www.ApogeeRockets.com/saturn1b.asp

ROCKETRY ESSAY CONTEST

$150 IN PRIZES!

There is still time left, and since only a few entries have come in, you're odds of winning the prize is pretty good.

Shrox has been creating some awe inspiring rocketry artwork in the Apogee e-zine newsletter. You see examples of it with the free rocketry plans. I thought that the story behind the artwork is missing. For instance, what is the story of the rocket, and how did it get to the point where it is shown in the picture?

To find out, I'm holding an essay contest. Pick a rocket picture from the list below, and write a fictitional story about it. I know you daydream about these rockets, since I do it too. So just write down your story and send it in for your chance to win a cool prize!

SHX/TVM-01 - newsletter #73
Stonebreaker/AX - newsletter #75
Bolaero/Z - newsletter #76
Orion Luxury Shuttle - newsletter #78

There will be two age divisions: 17 and under, and 18 and older.

First Prize: $50 Apogee Gift Certificate
Second Prize: $25 Apogee Gift Certificate
Guidelines:
Maximum word count:1000 words.
Deadline for Entries: May 17, 2002
Format: electronic *.txt files.
Email the stories to: tvm@apogeerockets.com

Apogee Components reserves the right to re-print the essays in the free e-zine newsletter so that other readers can enjoy the stories too.

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NARCON FOLLOW-UP

Shrox and I have returned from NARCON in Austin, Texas. We had a wonderful time meeting with other rocketeers and sharing our unique insight about rocketry.

Both of us also were presenters, and gave seminars at the conference. Shrox's presentation was about the design philosophy that he goes through when he is creating awesome rocket plans. He's more artist than anything else, so the software he uses is a 3D rendering program. It allows him to draw shapes and to quickly merge them together into something that eventually looks like a rocket.

Shrox gave his design philosophy on creating artistic models. As he says, it is *"the dark art of model rocketry"*. But most folks in the crowd wanted to see his cool designs, rather than know how he created them.

I didn't have time to sit in on his presentation except for a minute or two. But in that time, I saw him take a image of the old Skylab space station, and then morph it into something that looked like it could possibly fly as a model rocket. It was, as many people say — "way cool!"

On the other hand, I'm more engineer than artist, and I feel more comfortable using standard rocketry software like RockSim and AeroCFD. So my presentation was a "how-to" session on using RockSim and AeroCFD.

Since a majority of e-zine readers weren't at NARCON, I'll hi-lite some of the new attractions that we are coming out in future versions of RockSim and AeroCFD.

In the immediate future, we'll be making some big changes to RockSim. I've kinda hinted at this in previous issues of this e-zine newsletter. The most significant change will be the file format of RockSim.

How does this affect you?

On the surface, you may not notice much differenece in how the new version will look and feel. The file format change will convert RockSim files into a XML format from a proprietary binary format.

You'll be affected because the new file format will allow other computer programs to access the huge amount of information that RockSim stores about a designI'll give you an example. Many people have complained that one reason that haven't done much with the AeroCFD program is that you have to design the rocket all over from scratch. It would be much more convenient if AeroCFD could just open a RockSim design. That way, you could get simulation results faster, and not have to worry about making design mistakes.

With the new file format of RockSim, programs such as AeroCFD will be able to open RockSim files directly.

A couple months ago, we announced this file format change to computer programmers, and solicited them to write software that made use of the new RockSim format. We had nearly 20 programmers come forward. Each one of them had neat ideas on what could be possible.

Some of the new programs will be simple freeware applications. A programmer in Italy has created a program to draw out transition templates based on the RockSim design. It can be downloaded free from his web site at:
http://spazioweb.inwind.it/lbenassi/FinsFun/ cont.pg.5

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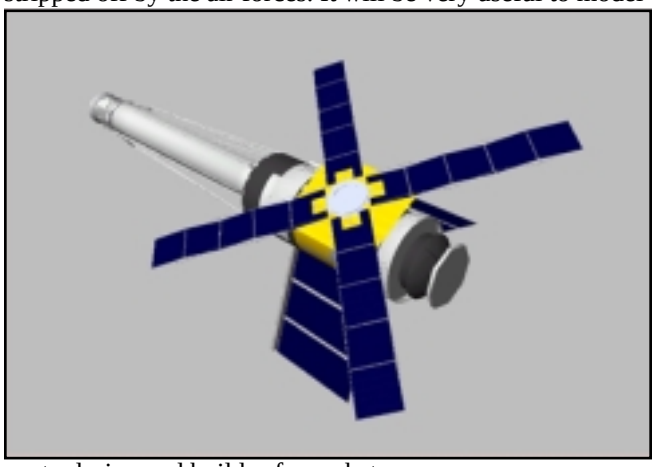
NARCON FOLLOW-UP

CONT. FROM PG.4

(until the new version is released, you won't be able to create the templates)

Another new program is coming from John Cippola (the author of AeroCFD). This new program will predict when a rocket's fins will begin to flutter, or when the fins will be stripped off by the air forces. It will be very useful to model-



ers to design and build safer rockets.

Finally, we'll be changing AeroCFD in the future too; so that it can interact directly with RockSim. This will make RockSim's flight prediction simulations more accurate.

To conclude, the new version of RockSim that we're working on may not have a lot of snazzy features, but because of the file format change which allows new software to become available, it will have a greater impact on rocketry than any previous version of the program.

AeroCFD

imagination is the light at the end of a rocket

RockSim

APOGEE COMPANY NEWS

What a hectic month it has been. Lots of stuff going on, including a move to our new building -- which is just down the road. By the way, the new address is:

Apogee Components, Inc.
1130 Elkton Drive, Suite A
Colorado Springs, CO 80907 USA

The new building is about 2,300 square feet, which is almost double the amount of space we had in our old building. The building is a little newer, and has more office space. We have to put Shrox somewhere...

To assist Shrox with the workload I've dumped on him, I've also hired Michael Glockson. He isn't a rocketeer yet; but I'll have him excited about the hobby in no time. The extra room in the new building will definitely be filled in no time.

In other news, Shrox and I both attended the National Retail Hobby Store Association (NRHSA) convention in Las Vegas on the 23rd and 24th. Our goal at this convention was

cont. on pg.6.

About this Newsletter- Apogee Components Rocketry E Zine Newletter is a FREE optional newletter about model rocketry We have and we'll comtinue to discuss a lot of different rocketry topics including rocket design philosophy computer simulations construction techiniques rocketry in education happenings in the rocket industry competition strategies and new product announcements.

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APOGEE COMPANY NEWS

CONT. FROM PG.4

to find hobby stores willing to carry our rocket products.

Let me tell you truthfully — this is tough work. A lot of stores have minimum space, and they aren't easily convinced to take a chance on another rocketry manufacturer. They don't want stuff sitting idle on the store shelves. I don't blame them at all. I wouldn't want stuff gathering dust on my shelves either.

To break into the hobby store market, it is going to take hobbiests to ask the store owners to carry our products. If you can, please tell your local store owner about Apogee Components, and the neat products we have. Make sure to let them know how we are supporting the hobby and trying to make it grow with things like this e-zine newsletter.

In a respectful way, keep up the pressure on them. They won't carry Apogee products unless they are repeatedly told about us. You have to burn it into their memory, and eventually, they'll consider ordering stuff from us.

In the end, we hope that you'll be able to buy our products locally, so you'll get your items quickly. After all, rockertry is the fastest hobby on the planet; so speed is everything.

want to shape the future? we need you to make ROCK SIM the best!

Are you a computer programmer that has wanted to crack open the RockSim file format? Maybe you've wanted to use the RockSim files for some type of unique application such as saving the flight summary data to a PDA computer. In any case we're looking for programmers to test out a new RockSim file format. The new XML format we're proposing will allow application developers to use the RockSim files for any number of new rocketry software products. It is a text based format that is easy to read and stores not only the rocket designs but also flight simulation data. If you are a programmer contact me at: tvm@ApogeeRockets.com and I'll send information on the file format.

READERS COMMENTS

I can't disagree more with much of what you claimed in your last E-zine. You said that as you increase fins thickness, BOTH the lift forces and drag forces go up. Also, you claim that increasing a fins thickness will increase the overall drag of the model. Really?

You make no mention of how an airfoil can combat the short comings you state with increasing fin thickness. Sort of like writing down a salad recipe without the dressing ;)

I would recommend you go back and re-read your Tech. Pub. #16

Respectfully,
Kevin K.

While the article did not mention the good effects of airfoils sanded into the fins, I assumed that people would realize their importance.

The point of the article was that when the fin (airfoil) thickness increases, the CP does move reward. That will happen regardless of the airfoil used.

It is always a good idea to increase the fin's effectiveness by sanding an airfoil. As you mentioned, a good place to learn more about this is Technical Publication #16; which can be read for free from the Apogee web site at:
http://www.ApogeeRockets.com/technical_publication_16.asp

There are many factors that go into a high efficency design. The fin thicknessand the airfoil used are just two. I hope to cover more topics like this in the future editions of the e-zine so stay tuned...

Tin Van Milligan

archives of this newsletter

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

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FEATURE ARTICLE:

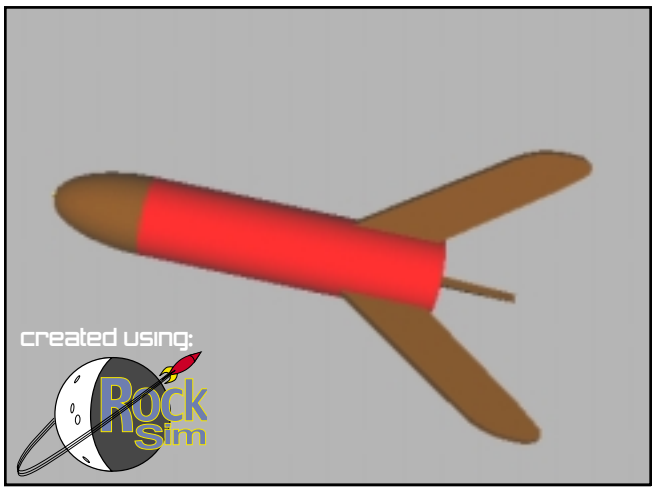
DOES THE CP CHANGE WHEN YOU SCALE A ROCKET?

BY: TIM VAN MILLIGAN

There was a question on rmr recently about what happens when you upscale a smaller rocket into a bigger one. Specifically, does the relative location of the CP change?

It is a really good question, and can teach us a lot about rocketry aerodynamics.

The common belief is that the CP location will be the same. For example, if the Center-of-Pressure was at 0.7 of the total length (70%) of the rocket for the small rocket, then it will be 70% for the larger one as well. After all, that is what the Barrowman Equations say will happen.



In reality, it actually depends on how small the original rocket was to begin with; and how big the upscale version will be.

What most people forget is that CP is dynamic. Its position is constantly changing based on the speed and orientation of the rocket.

By definition, the CP is the balance point of the aerodynamic forces acting on the rocket. When the rocket is not moving, there are no aerodynamic forces, hence there is no CP location.

The CP location is dependant on the distribution of forces acting on the rocket. If the fins start producing more forces than the tip, then the CP location moves rearward.

The forces acting on the fins of a small rocket are different than the forces on a big rocket (even if they have a similar shape). When all is said and done, that means that the CP locations of the two rockets are going to be different.

This is important. The reason is that there are two sets of formulas that are used to predict the forces on the rocket. One set of formulas governs low Reynolds Number flight (small fins, and/or low speeds), and the other one governs larger rockets (big fins, and/or high flight speeds).

Airflow in low Reynolds Number flight is much different than for high RN flight. It has to do with laminar vs turbulent airflow. The same wing will generate different forces depending on what type of airflow it is in.

Unfortunately, you won't see this in RockSim. The reason is that it is governed by the Barrowman Static Stability equations. The Barrowman Equations are not dependant on the air flowing over the rocket.

But you can see it in AeroCFD http://www.ApogeeRockets.com/AeroCFD.asp-- because it computes the actual forces on the rocket. Although it always assumes laminar flow conditions for the tube, it does have seperate turbulent flow equations for the fins (which is the important part anyway).

Rocket size	CP/L	C_d
1X Mosquito	.871	1.014
20X Mosquito	.993	1.289

Even if you don't own AeroCFD yet, you can get a hint of what happens if you look in RockSim. Start by looking at the Drag Coefficient numbers of big rockets versus little ones.

cont.on pg.8

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FEATURE ARTICLE:

DOES THE CP CHANGE WHEN YOU SCALE A ROCKET?

BY: TIM VAN MILLIGAN

CONT. FROM PG.7

For example, take the standard Estes Alpha rocket. RockSim computes a C_d of it around 0.3. When you upscale it a few times, the C_d makes a dramatic jump to around 0.6. Obviously, if the C_d changes, the total drag forces on the rocket will also jump up more than just by the scale factor.

RockSim does have two sets of equations for the C_d of the rocket. One for low Reynolds number flights, and the other for high Reynolds number flights. However, it doesn't have seperate equations for the Lift force - which is typically far more important when it comes to determining the CP location on the rocket. As we mentioned in Apogee E-zine Issue #79, the pivot arm for the Lift Force is much greater than that of the Drag; so even a tiny bit of Lift on the fin will have a huge impact on the flight of the rocket.

AeroCFD is a super program for this type of thing. It computes all the forces on the rocket, and therefore we can see exactly what happens to the CP of the rocket when we upscale.

The chart on page7 shows the CP location for a small Mosquito type rocket. The CP location is indicated as a percentage of the overall length of the rocket. The CP was determined at 80mph, and 3° Angle-of-Attack. As you can see, when the size of the rocket was increased 20 times, the CP did move to a new location.

To our advantage the CP location moved rearward. So even if we relied on the Barrowman Equations, there probably wouldn't have be a situation where the rocket might have gone unstable.

To sum things up, the CP location is not a static number. It is constantly changing and will shift when we make scale changes to a design. The only computer program to really show this is AeroCFD. If you recall, in issue #79, we showed that AeroCFD is also the only program to predict CP movement when the thickness of the fins is changed too. I hope that more people will realize the many benefits of AeroCFD and purchase it. I believe it is well worth the money.

Author Information:

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.

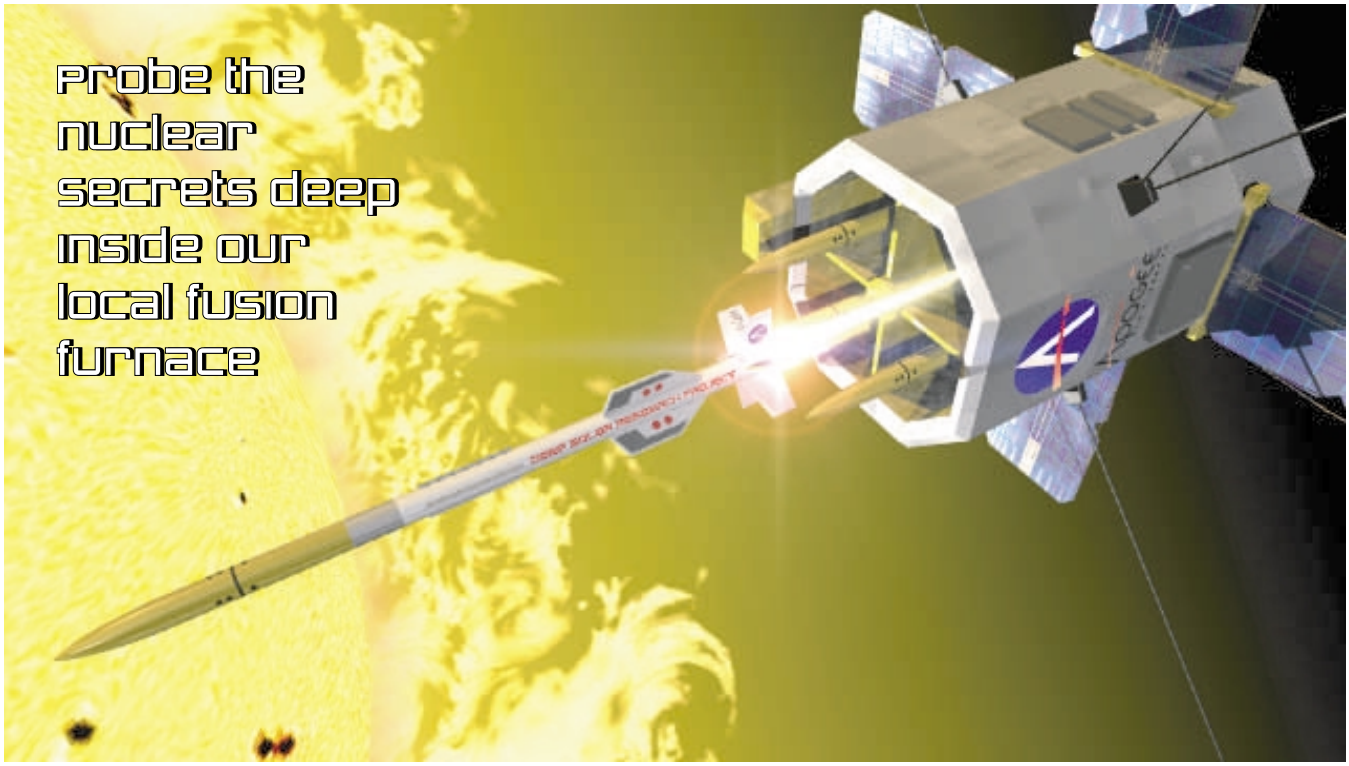
How To Make Your Advertising More Effective

Would spending less advertising money and getting more sales be appealing to you? If you have a model rocket product or service that you sell, I'd like to tell you how to make your advertising 100 times more effective. By more effective, I mean that you'll make more sales by spending less or even zero money!

There are many places to spend your advertising dollars. Based on my own experiences with Apogee Components, I can tell you that most of yield very little in return for the money invested. But I've discovered a little secret that has paid off in incredible benefits.

Drop me an Email at: tvm@ApogeeRockets.com, and I'll send you a packet of information that will help you make more money.

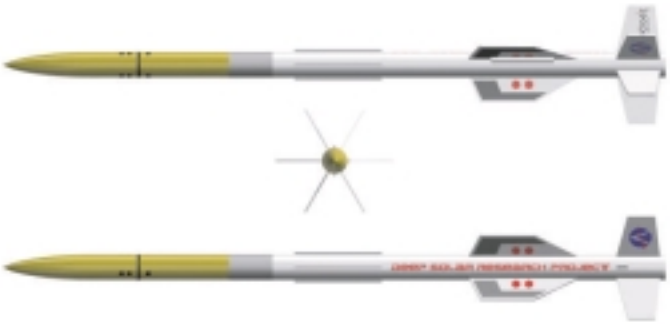
HELIOS/DSRP BY SHROX



DOWNLOAD THE ROCK SIM PLANS AND DECALS

The data file you will need to investigate the heart of cur star is waiting at:
http://www.ApogeeRockets.com/shrox/helios.asp

These are the parts you need:
1 - 19110 - Apogee Nose cone - WNC-29A
2 - 10110 - Apogee Body tube -20mm x 13'
1 - 13008 - Apogee Coupler - 29 mm x 2.3/4"
1 - 13035 - Apogee Engine block - CR 24-29 ring
1 - 29005 - Apogee Streamer - 56'x2'
2 - 13051 - Apogee Launch lug - "1/8" x 1
1 - 29505 - #300 Kevlar 36" line
1 - Shock cord mount
3/32 in. Fin stock (balsa or basswood)



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