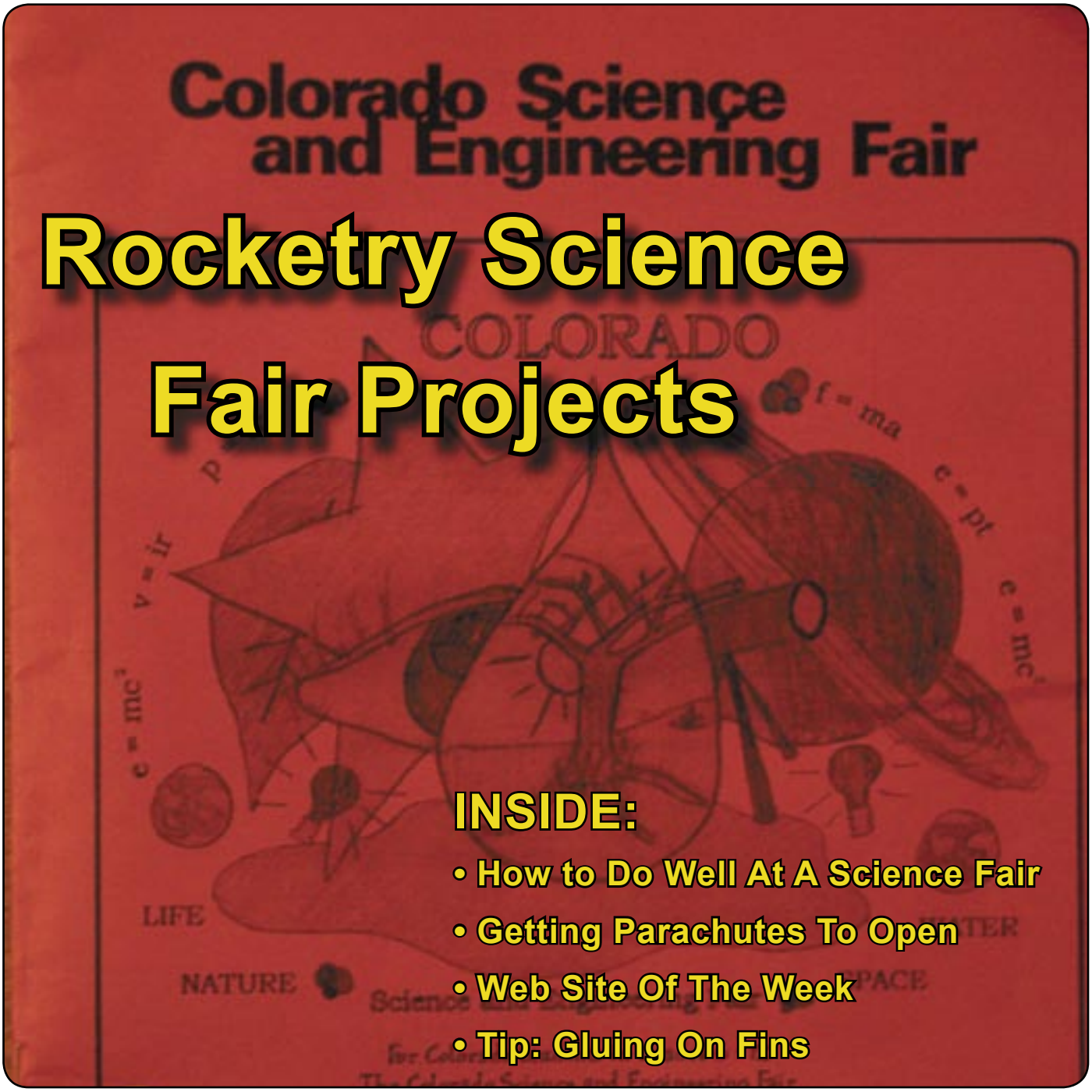
ISSUE 160 - APRIL 24, 2006

APOGEE PEAK OF FLIGHT NEWSLETTER



Rocketry Science Fair Projects

INSIDE:

- How to Do Well At A Science Fair
- Getting Parachutes To Open
- Web Site Of The Week
- Tip: Gluing On Fins

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Succeeding In A Science Fair

by **John Manfredo**

(Note: The cover for this issue was used on the cover for the program for this year's Colorado State Science Fair. The artwork was done by Allison McVey of Springfield High School.)

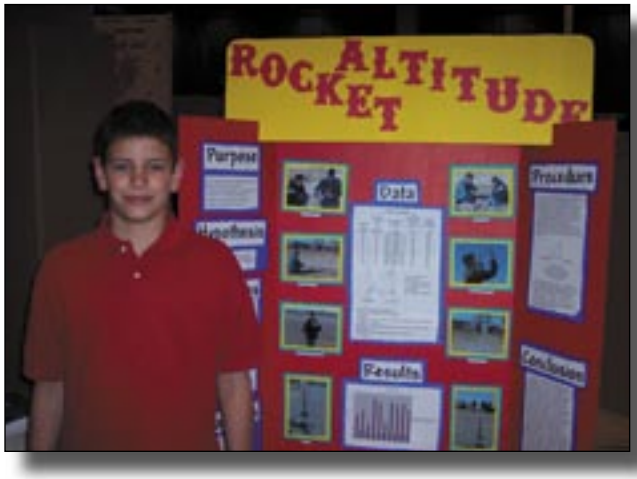
Greetings from the 2006 Colorado State Science Fair! My daughter Jennifer had the privilege to make it to the state level of the science fair for the third year in a row. The big news is that she wound up winning first place for her division of 6-8th graders in the state of Colorado! I'll talk more about that later. I thought this would be an ideal opportunity to delve into the topic of how to succeed in a science fair and increase your odds for going as far as you can in the competition.

The Science Fair Levels

When you get involved in the science fair, there are certain rules regarding how to advance from level to level. The different levels that you will find are the school, district, regional, state, and national levels. In order to advance from level to level, students are graded on a rubric in which they must score high enough to qualify for the next level. Typically, 6th graders and up (junior level) can advance past the individual school fair to districts and regionals, but not beyond that. This can vary a bit from area to area. You must be in the senior level in order to make it to the nationals. The senior level consists of grades nine through twelve.

State Rocketry Project

As I perused the projects around the ballroom, I was surprised to see that this year there was only one project that was rocketry-related. This was entered by Jake Fox of Eads, Colorado. Jake is an 8th-grader at Eads Middle School, which is located east of Pueblo in southeastern Colorado. His project was titled "Rocket Altitude" and involved discovering the differences in altitudes between mathematical calculations and what altitude the rocket actually reaches. To accomplish this, Jake used an Estes MaxTrax™ rocket. He started by measuring the distance from the launch pad to where



Jake Fox and his rocketry project

he would be tracking from. Then, he launched the rocket ten times and recorded the angle from the protractor after each flight. As seen in figure 1, Jake used the equation of the distance he stood from the rocket times the tangent of the angle measured equaled the height of the rocket. The MaxTrax™ has a built-in altitude tracker so that he could compare the differences between the two.

His results showed that his calculations were a lower altitude than the rocket actually achieved. He found out that he was too close to the rocket when he was measuring the distance from the launch pad to where he was taking measurements, which resulted in skewed

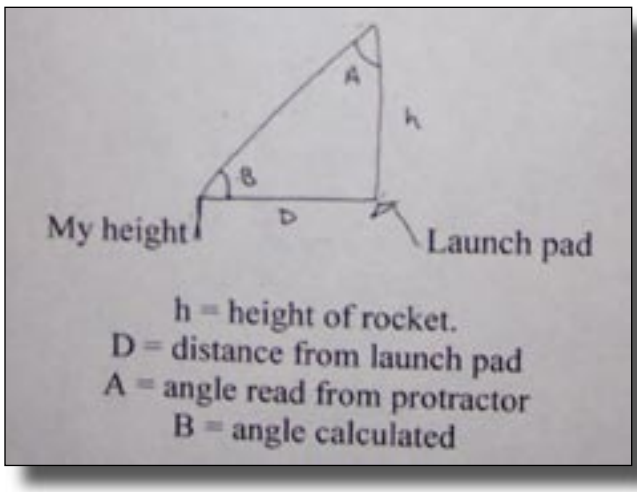


Figure 1

continued on page 3

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Close up of Jake's board

outcomes. This is "D" in the picture below. If you are too far away from the rocket the results will show higher and if you are too close the results will show a lower than normal altitude. One factor that may have skewed the results was that some of the flights were performed during windy conditions. There is also something else that could have altered his results. You need to consider how the MaxTrax™ electronics capsule works. There is a small switch that is held by the body tube. The capsule is reset while in this position. When ejection occurs, the switch activates a timer in the capsule. Then, when the capsule hits a hard surface it stops the timer and calculates the altitude based on how long it took for the rocket to fall.

Pros and Cons

Let's look at this project from a standpoint of what succeeds in science fairs and what doesn't. The subject Jake chose is a good one. As with all science fair projects, what you do with it is the key to doing well.

First of all, his science fair board looked nice. Looks are the very first thing the judges will see, so you want to make sure that your project board stands out in a crowd. The next thing that will make an impact is your title. This project tells the judges what it is about, but they also take into account how clever the name is. I noticed this time and time again at all levels of competition. The projects that did better were more often than not the ones that were titled with a subject as well as a clever angle.

For instance, a couple of years ago my daughter did a project on rocket altitude based around different payload weights. Instead of simply being titled "Rocket Altitude" she titled it "Weight - The Key to a Rocket's Altitude".

The next thing that occurred at the state level are the interviews. Students at this year's fair were interviewed on an average by about 9 different judges in addition to many special awards judges. They are very thorough and do a lot of comparisons to each other.

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During the interview process it is imperative that you exude confidence, presenting at a pace that is not too slow or fast, all the while being prepared to field questions by the judges. This goes for any level of competition, whether it is at the school level or all the way up to the state level. The rubric that the judges will go through

Altitude Calculations

Angle A (in degrees)	90-angle A =angle B (in degrees)	D(tangent B) =height (in feet)	My calculated rocket altitude (in feet)	Height recorded by rocket (in feet)
50	40	50(.8390)=42	47	504
40	50	150(1.1916)=179	184	598
44	46	150(1.0354)=155	160	331
50	40	100(.8390)=84	89	886
42	48	100(1.1105)=111	116	795
35	55	100(1.4279)=143	148	379
31	59	200(.6008)=120	125	830
26	64	200(.4877)=98	103	780
40	50	200(.8390)=168	173	820
38	52	200(.7812)=156	161	699

Jake's Results

while judging you and your project includes things such as knowing your project, having all your paperwork in order, and how you handle any questions they throw at you.

Ways to Improve

You can learn a lot while wandering around looking at projects at the science fair, especially at the State level.Let's use Jake's project for an example, since rockets are our main area of interest.

The first thing I would do is buy a copy of Tim's book *69 Science Fair Projects for Model Rockets* (http://www.apogeerockets.com/science_fair_book.asp). This book would be a great starting place and resource for anyone entering into the science fair with rocketry on their mind.

The second thing I think I would do would be to alter the title of the project to make it more attention grabbing for the judges. As shown before, adding something clever into the title will do a lot for the project.

The third thing I would do is to use our rocketry design and simulation program, Rocksim (http://www.apogeerockets.com/rocksim.asp), which is a Certified Educational Product from the National Space Foundation. Rocksim will give you an edge because judges tend to like technical, computer-based projects. It shows a higher level of sophistication when added to the mathematical equations. It would also add a third way to cross-check your results.

The fourth aspect would be to use a rocket with a payload section and add the Perfectflite altimeter (http://www.apogeerockets.com/Altimeter.asp). Not only would the actual altitude readings be accurate, but the optional download kit could be added to the project so that you have a graph to add to your project. It would compliment Rocksim very well in the presentation.

The fifth and most important feature of all is the real-life application! This is highly important. I can't stress this enough. If you do a project and are fortunate enough to make it to State, you must have a real-life application. It doesn't matter if you have the greatest data and information out of your project that has ever been achieved, if you don't have a good way to apply the results to the real world, then you miss the whole point.

Judges are looking for students who can take what they learn from their projects and figure out a way that the results can be used in life to improve something. In fact, the ones that really do well in the high school senior division are the ones that look into solving key problems. There are two that come to mind that are whisking their competitors to the International Science and Engineering Fair this year. One is a project on removing heavy metals from water.The other is an invention that allows someone with Carpel Tunnel Syndrome in the wrists to type with their hands in mid-air and have it transmitted wireless to their computers.

I spoke with Carol Crossley, the Southern Colorado Regional Science Fair Director, who gave me more insight into what students should be gearing their project toward. She said, "The project abstract is critical in respect to being done thoroughly. Creativity and originality are very important when choosing a science project; you want to make sure that you are not doing something that everyone else has done before. Also, it is so important to have a mentor, whether that is someone at school, parents, or ideally both".

Carol's statement about the abstract being done properly is right on the money! My daughter was shuttled to the Scientific Review Committee at the state competition before she could even check in, due to one date being out of sync with the rest. They look at everything so you have to have all your ducks in a row!

Parental/Mentor Involvement

One of the key aspects to success in the science fair is parental involvement. We as parents need to be involved in our child's education as much as possible. Of course, not to give the answers, but to provide guidance in the right direction. My wife, for instance, spent countless hours guiding our daughter on things she could do to make her project better. This included

continued on page 5

everything from the look of the board to making sure that all the paperwork was in order and properly done to help with the computer and help with arranging the subjects for her experiment.

In addition, parents need to be there for the students in an emotional support role. This kind of competition can get very stressful. In general, make sure that you are showing support and interest in what they are doing; it makes a huge difference!

Jennifer's Contestant Perspective

I asked my daughter to give some advice to students so they would have the perspective of someone who's been there. She told me, "If you want to succeed, there are many things that you need. First of all, you need to have an experiment that can have a real-life application. You also need to have a project that is accurate. For example, one project I know of is about color psychology. The students doing the project played different kinds of music and then had the subjects tell them what color they saw in their mind. Something like that isn't very accurate because the results are subjective rather than objective.

"You also need to have more than one trial for your experiment. It's more accurate to have three or more trials and average them than to have one trial and have it be a fluke or something. You should have a good-looking board because a messy board makes it look like you put hardly any time into it and you will not go very far. Students should dress nicely for science fairs too, regardless of the level they are at. You should be polite to the judges and do the best you can. Act like you care about what you're doing and just talk to the judges. They don't want to hear a memorized speech. They just want to talk to you about your projects. This doesn't mean you can't look at your board, but don't just read the board during the whole judging time. These things are my advice to all junior and senior division students. Follow this advice and you will most assuredly succeed."

Conclusion

As far as Jennifer goes, I am extremely proud of her! At this point, I must brag a bit on her. Her awards in the science fair are as follows:

Middle School Science Fair
First place in the Medicine/Health Division
Best of Show over the entire 7th and 8th grades
Perfect Score
She received a medal and a certificate.

District Science Fair
First place in Junior Medicine/Health Division
Best of Show over all 7th - 12th graders in the district
Perfect Score
She received a medal, a ribbon, and a certificate.

Regional Science Fair
First place in Junior Medicine/Health Division over 7th - 8th graders from three counties
Best of Show over all 7th - 12th grades from 3 counties
She received a medal, a ribbon, and a certificate as well as a special optical cash award from an eye surgeon.

State Science Fair
First place in Junior Medicine/Health Division over all 6th - 8th graders in the state
She received a medal and a certificate

Jennifer and her project

There were also fifty-six special awards that are given out by various companies and organizations. She received an award from the Rocky Mountain Chapter of the Human Factors and Ergonomics Society, which was another certificate and cash award.

In addition, she qualified to enter the "Discovery Channel Young Scientists Contest". This is a contest in which students in 5 - 8th grades from around the country are chosen to compete in Washington, D.C. for cash prizes. Keep in mind that she and 2000 other students will enter, but only forty finalists are chosen. To see what projects won in 2005, see http://school.discovery.com/sciencefaircentral/dysc/finalists/winners.html.

Good luck in your future projects, and don't be afraid to shoot for the stars! If your project will be related to rocketry, please let us know if we can help! We can't just give you the answers, but we will provide you with guidance to find the answers you seek.

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QUESTION AND ANSWER CORNER

Question: "Besides the way I pack my parachute, is there anything else I can do to ensure that the 'chute will open properly?"

Answer: One other thing that can be done to help out in this situation is to open your parachute to the inside/underside. Then take some baby powder and shake some out so that the surface of the chute is covered by enough that will allow you to spread it out. You should dig in with both hands and spread the powder all around the inside surface. After that, go ahead and pack your parachute as usual. You also might dust the outside a bit before putting it in the rocket. This will aid in promoting the parachute's hasty exit from the body tube at deployment.

If you ever have any rocketry questions, please don't hesitate to e-mail me at johnm@apogeerockets.com or call 719-535-9335 9 a.m. to 5 p.m. MDT.

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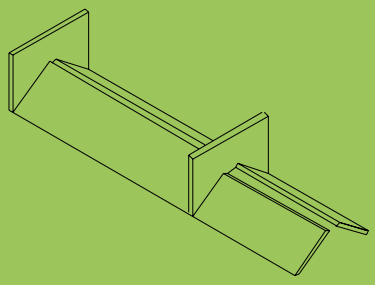
TIP OF THE FIN

The tip for this issue is how to give yourself an easier time gluing fins onto a body tube. More specifically, how to make those fins stay upright and vertical so that they don't fall over while they are drying. You could use a fin alignment tool by itself (as seen below left) or you could use this in conjunction with the following method.



To start off, I prefer to use either wood glue or a thick, white glue such as one like Weldbond. Regular white glue like Elmer's doesn't work as well because it takes a lot longer to set up. Start by spreading a thin layer along the root edge of the fin. Then let it sit for a couple of minutes so that it can thicken up and dry a bit. After that you can attach it to the body tube of the rocket, position it, and the fin should grab hold enough so that it will not fall over. Once it is fairly dry, you can repeat this technique for the other fins. If you have a tip and we use it, you'll earn a 58" ripstop nylon parachute as your reward! Simply send your tips to: johnm@apogeerockets.com.

WEB SITES WORTH VISITING

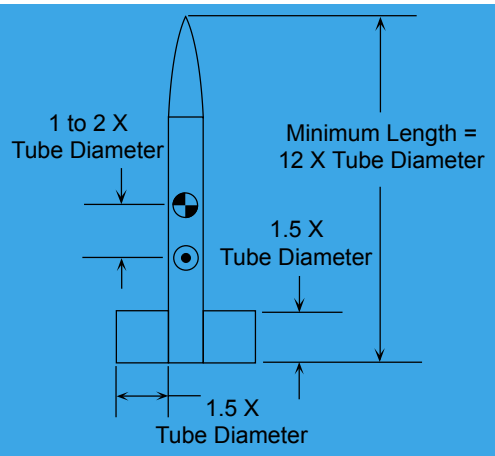
In keeping with the science fair theme of the newsletter, take a look at Intel International Science and Engineering Fair (ISEF) site: http://www.intelisef2006.org/. Even though this is geared toward senior level students, there is a lot of good information that students and parents can learn about what to expect from science fairs in general. If you click on the link shown at the right, which is on the main page, it will take you to an area that will allow you to see information on science fairs in general.

Intel ISEF brings together more than 1,300 young scientists and inventors. Students from approximately 45 states and 40 countries compete for $3 million in awards and scholarships. There are more than 500 Intel ISEF affiliated fairs around the world and 800 individual student and team awards are presented at Intel ISEF. In addition to awards from Intel Foundations there is approximately $1.5 million in scholarships, summer internships, scientific field trips & lab equipment from nearly 70 other corporate, professional and government sponsors. The more than 1,000 judges must have a Ph.D. or six years of experience in a field equivalent to that being judged.

There is information for students such as learning about the scientific method, a science fair checklist, and advice from those who have been there. Teachers have a section where they can learn about getting more students involved, preparing to be a science fair coordinator, and how to recruit volunteers. This site also has all the needed forms available for download in Adobe Acrobat format.

DEFINING MOMENTS

In the last issue we talked about what stability is. Now that we know that the CG always needs to be in front of the CP (see issue 159), this issue's topic is **Basic Rocket Design Criteria.** This refers to what basic dimensions you choose for your design and how they should relate to one another. As seen in the illustration to the right, the basic parameters for a design show that everything relates to the body tube. The main airframe should be your very first consideration when designing. After that, everything else can be added in accordingly. The minimum length needs to be 12 X the BT diameter. That will help you in choosing the proper nose cone. Fin dimensions are done the same way.



Basic Rocket Design Criteria

From *Model Rocket Design and Construction*
www.ApogeeRockets.com/