Apogee Components

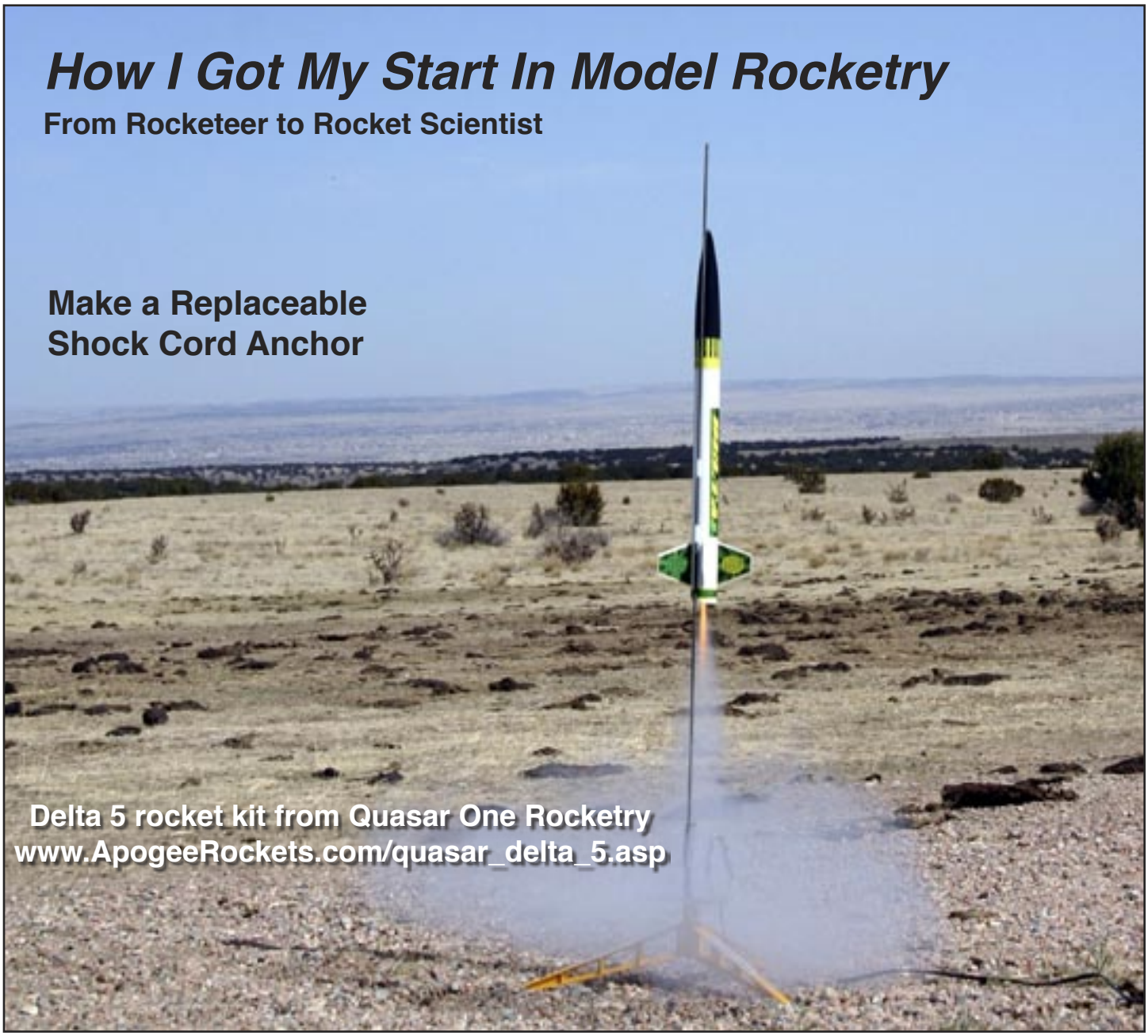
PEAK OF FLIGHT

NEWSLETTER

How I Got My Start In Model Rocketry

From Rocketeer to Rocket Scientist

Make a Replaceable Shock Cord Anchor



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How This Hobby Can Take You From *Rocketeer* To A High-Paid *Rocket Scientist* - Just Like It Did For Me.

By Tim Van Milligan

How would you like for your children to have a really exciting job waiting for them when they grow up? What investment would you make today to ensure that the exciting job is also a high paying one? Want to know a secret? That investment is pretty miniscule if you choose to get your kids involved in model rocketry.

Model rockety has been very good to me. I consider it to be the one activity that I had as a kid that put me on the path to an exciting, challenging, and well-paid position as a real rocket scientist working for McDonnell Douglas.

The story I'm about to tell you is not atypical. It has happened in a similar manner to thousands of my colleagues. If you're a parent wishing the best for your children, then this may give you some hope.

Many people have asked me to write a little autobiography and tell how I got started in rocketry, what it was like working on the Delta II rocket at Cape Canaveral, my years at Estes Industires, and about how I got involved with running Apogee Components. I've always resisted, because my story doesn't seem very exciting.

If you want to hear a great story, someday I'd love to tell you my dad's story. He was forced to drop out of school to take care of the family farm while still in the sixth grade. Later he was drafted into the Army as an infantryman during World War II. He was wounded in combat by an artillery shell, and when he returned to his unit, he did some amazing things. For those acts of bravery, he won the Silver Star with Oak Leaf Clusters (which is given in lieu of a second Silver Star). He never talked about them, and I really didn't find out about them until he died in 2005. I thought that all servicemen got medals, because he didn't seem to care that I played with the medals like toys when I was a little kid. But I digress...

In this article, I'll tell you how I got my start in rocketry and some events that got me to where I am today. It is a fairly long story, so I suspect it will take several newsletter articles to cover it all. I don't think I'll write them all in succession, as that would be really boring. In this particular article, it is my hope that you'll see that model rockets played a big part in my early life and led me to my current occupation. So let's start at the beginning...

Early Childhood

I come from a big family. How big? Really big. I was the tenth child in a family of eleven kids (eight girls, three boys). Obviously, my dad worked long, hard hours to feed, clothe, and shelter us kids. He worked all of his adult life in an assembly plant that made heavy industrial machinery. It was a blue-collar job and didn't pay much (sixth grade education, remember?). Add into the equation the eleven kids, and you'd be right to say that we didn't have a lot of money. So when something broke around the house, dad fixed it with chewing gum, baling wire, or whatever it took. I suppose I get my mechanical bent from that philosophy.

When Neil Armstrong and Buzz Aldrin walked on the moon in 1969, I was about 4 years old. I can't say that I remember that particular event, but I do have vivid memories of watching the TV and seeing the splashdown of some Apollo missions. I suspect those were of later Apollo missions when I was a little older.

My oldest brother, who is nine years older than I, was really into the space program during the 1960's and early 70's. He followed the missions and was a collector of newspaper clippings of the Gemini and Apollo spaceflights. Because he was so much older than I and got to boss around my older sisters (remember, there are eight sisters, and they pestered the youngest brother to no end), I suppose I idolized him quite a bit. I wanted the power he had. Therefore I followed him around like a puppy dog and tried to imitate him. Those things that he liked, I liked, whether they were the Beach Boys or his tastes in clothing. Since he liked the space program and constructing plastic models of the rockets, I liked them too.

When I was about 11, my brother had gone off to college and was out of the house. But the imprint had been made, and I still liked rockets. In fact, by that time I had

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About this Newsletter

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decided that I wanted to be an astronaut when I grew up.

Astronaut Dreams

I was told by my mom and dad that to be an astronaut you had to be smart. Really smart. Problem was--I was just an average student, and about the only subject that I liked in school was science. I knew astronauts had to be good in science, but I really didn't see the need to apply myself to language arts, geography or history. So I squeaked through most grade levels.

There was a feature that I had that I thought was my one astronaut Ace-card. I found out through reading a library book that all the Mercury, Gemini, and Apollo astronauts had one thing in common. Want to know what it was? They were short. If you were taller than six-feet, you had little chance of being an astronaut in the 1970's. Since I was one of the short kids in class, I had a good feeling that I wasn't going to burst the 6-foot tall barrier.

Blasted Space Shuttle program… They let anyone in, no matter how tall they were.

In the sixth grade, I joined a boy's group at our church. It was very similar to the Boy Scouts, where we got to do projects and earn Merit Badges. One of the badges was for model rockets. How cool was that? Up to this point, I never knew there were rockets that actually flew into the air. My older bother only built plastic models that sat on a shelf. He never told me about nor ever had a real flying model rocket.

So in that church group, I built my first model rocket. I remember it was a simple rocket, but it seemed like something awesome to me. I painted it gloss black. The paint was terrible, with lots of runs in it. That didn't matter to me. It was cool looking, and I was proud of it.

As part of the merit badge, before we could fly it, we

Photo 1: Tim as a 13 year-old. Baseball was another passion.

had to display it in a craft show. My group's counselor collected my rocket along with the rockets of the other boys in our class and took them off to the show. That was the last I saw of my first rocket.

Somehow the rocket and my other badge projects never made it back from the craft show. They were lost, and I was crushed. All my hopes for that first launch were dashed. And I never got the merit badge either, because we didn't get to fly it.

I don't recall buying my second rocket; I had a newspaper delivery route when I was in grade school, which is probably how I got the money. I do recall that it was a two

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stage rocket. And again, I painted it black.

Back in those days, the rocket motor igniters were junk. They were not like the great ones we have today. They were just a length of nichrome wire with some crumbly gunk in the middle. You were supposed to bend it in half, and wedge a piece of wadding between the legs as you jammed it into the nozzle of the motor. I distinctly recall that the first day we went out to launch the rocket, nothing happened. It never fired off. Failure... Blasted igniters!

My friend and I went back to the hobby store and found some green canon fuse. It is a miracle that we didn't burn our fingers off using a match and fuse. On the first attempt, the fuse burned up into the motor, and snuffed out. Arrgh. I remember my buddy sticking a lit match up the nozzle trying to get that stupid motor to ignite. Another miracle in that a tragedy was averted…

After that attempt, I scraped out the burnt canon fuse residue, and stuck a new piece into it. It must have cleaned it really good, because this time, it finally worked!

Oh that first flight was awesome. I can still see it vividly in my mind. Arrow straight, and blazingly fast. I was a C-size motor that we stuck into that small little rocket, which obviously made it roar out of sight. We may have lost the rocket, but it was so cool to see. I bet your first rocket launch was probably something similar. Am I right?

Hooked on Rockets

After that first flight, I was a hooked rocket junkie. Rocketry was way too cool. It has smoke, fire, loud noise, high speed and a hint of danger. How could a boy not love it? And what's not to love? Even the tall athletic kids in my class thought rocketry was cool. So I knew I wasn't going to be classified as a geek if I flew rockets. Now I knew I really

Photo 2: The hand-drawn rocket poster of America rocket, and some other space memoribilia.

had to be part of the space program when I grew up.

From that point on, I spent countless hours at the local public library reading about the space program and particularly about rockets. I wanted a picture of all the rockets in the space program, so I traced pictures from books to create my own wall poster. I still have many of those drawings, as corny as that sounds.

During the warmer months of the year, I would build a lot of rocket kits, and eventually build some of my own designs. My first home-brew design went unstable and chased me around the field. But eventually, I figured things out and got good at it. There are lots of fond memories that I have of building and flying rockets. There are even memories of the stupid things that I tried, like launching mice and toads. I discourage that sort of thing now, as it really doesn't serve any point. The high acceleration forces almost always kill the animals. Insects make much better payloads because of their strong exo-skeletons.

You can do a lot more creative and cool things with rockets today than I was able to do when I was a kid. The amount of information and cool rocketry items is so much

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greater, that I really believe that right now – at this instant in time – is the golden years of rocketry. It gives me goose-bumps to think of what future kids have waiting for them because of their interest in rocketry. One of my customers here at Apogee will be the first human to walk on the surface of Mars. I really believe that.

Conclusion

My childhood really isn't that out of the ordinary, and I'm betting that yours was much more interesting than mine. The point I'd like to make is that you don't have to have a life like Homer Hickam that gets turned into a movie to end up doing great things. Getting involved in rocketry has to be the one turning point in my early years that led to a career in engineering and working in the space program.

And I'm not in the minority. Model rocketry really does lead to bigger things. I know that a high percentage of our customers here at Apogee Components have high-tech job, (the kind that are recession-proof; since our customers are still buying). This is a testament to the investment that their parents made to encourage them in rocketry. I even saw a statistic once that there is a high portion of NASA astronauts that flew rockets when they were kids. Because of this, I believe that rocketry is a great hobby to have as a kid, because it seems to lead to a good career and an exciting future.

My oldest daughter took a model rocket she built to school a couple of months ago, and it instantly made her a celebrity among her classmates. I couldn't be prouder… And like I said before: "*goose-bumps.*"

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.

Make A Removable Shock Cord Anchor

By Dr. Roy F. Houchin II

Several months ago my good friend James Wentworth sent me an interesting email with an innovative solution to a fairly common dilemma: "Two things that have always bothered me (after spending a lot of time and effort finishing and painting a rocket)" he said, "are the fragility of the shock cord and the difficulty of replacing the shock cord anchor in a much-flown model that has ejection charge residue on the inside walls of the body tube. Replacing the shock cord anchor is especially difficult in minimum-diameter rockets that use 13 mm diameter mini-motors and 18 mm standard motors."

He had a single solution to both of these problems!

A shock cord anchor could be made of several materials: (flameproof) resin-impregnated Centuri/Estes-type fiber fin stock, (flameproof) resin-impregnated fiberglass fabric (or resin-impregnated carbon fiber fabric or Kevlar fiber fabric), or thin sheet steel or tin. (For 13 mm mini motor rockets using the Apogee AT-13/18 tube, identical to the Estes BT-5 body tubes, thin steel wire would suffice.) Because I had it readily available, I selected lithograph tin. (NOTE: If the removable shock cord anchor is made of resin-impregnated material, the strip is bent upwards *before* the material is impregnated with resin.)

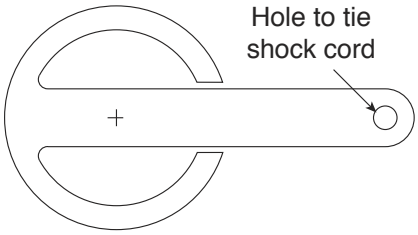

Figure 1: Typical pattern of the removable shock cord anchor. Size to fit the tube of your rocket.

Figure 2: Carefully cut out the pattern using a small scissors.

Here is how it's built. Start by cutting the pattern (shown in Figure 1) from the paper…Don't worry about following the lines of the anchor, just cut a rectangle around the anchor pattern. You'll make more precise cuts in a moment. Cut a similar rectangle from the lithograph tin and, using a glue stick of your choice, apply glue to one side

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Model Rocket Design and Construction

By Timothy S. Van Milligan

New 3rd Edition Now Shipping!

This new 328 page guidebook for serious rocket designers contains the most up-to-date information on creating unique and exciting models that really work. With 566 illustrations and 175 photos, it is the ultimate resource if you want to make rockets that will push the edge of the performance envelope. Because of the number of pictures, it is also a great gift to give to beginners to start them on their rocketry future.

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Make a Removable Shock Cord Anchor

of the tin rectangle. Place the paper shock cord anchor pattern on the glue side of the tin rectangle. Now, following the lines of the anchor pattern, cut the anchor from the tin rectangle (Figure 2).

Once the inner semi-circles of tin have been cut from the anchor, use a hand drill to create a small hole out of the tongue. Bend the tongue up to form a 90 degree angle as shown in Figure 3. Tie the appropriate length of Kevlar® cord (www.apogeerockets.com/shock_cord.asp) to the tongue through the small hand-drilled hole. Tie a length of elastic cord to the Kevlar if you decide to use that type of cord.

Figure 3: Bend the tongue up at a 90 degree angle to the circular base.

After the thrust ring is glued into the body tube (or into the motor mount tube in a larger-diameter rocket) and the glue joint is dry, the free end of the Kevlar cord is fed through the body tube from the rear, followed by the tongue of the shock cord anchor. The flat ring is then inserted into the rear of the body tube (or motor mount) and is pushed up against the thrust ring using an empty motor casing or an expended 18 mm motor. The tongue passes through the opening of the thrust ring, and the Kevlar cord is now several inches away from the hot and abrasive blast of the motor's ejection charge.

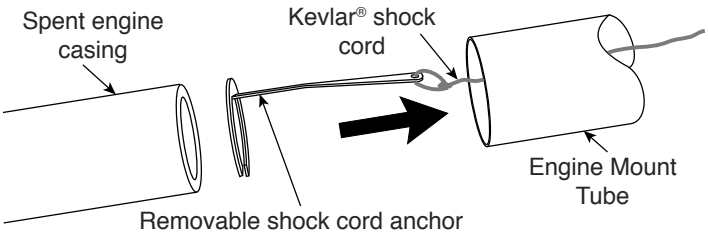

Figure 4: The shock cord anchor is inserted into the engine mount using a spent engine casing.

While not as protective as an ejection baffle, this greater distance from the ejection charge provides somewhat of a buffer of cool air for the Kevlar cord and its anchor point. More importantly, however, this removable shock cord anchor can be easily pushed backwards out of the rocket so that the Kevlar cord and/or the elastic shock cord can be inspected and replaced when necessary. The condition of both cords can also be easily checked between flights by shining a penlight or a small flashlight into the rocket.

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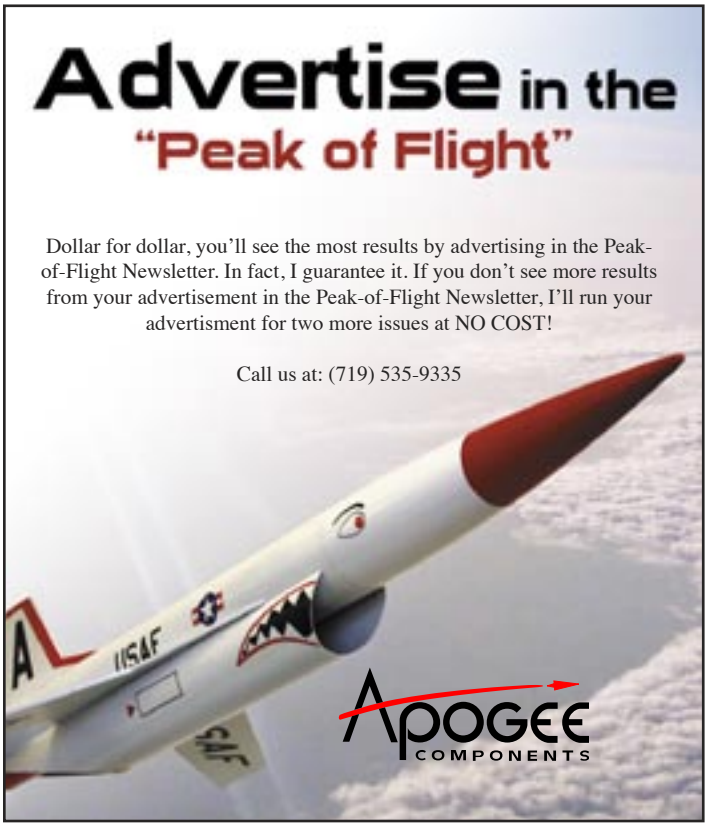
Make a Removable Shock Cord Anchor

This removable shock cord anchor could be retro-fitted into any existing model rocket that uses friction-fit motor retention or, when using lithograph tin, it could also be retro-fitted into many, if not most, rockets using motor clips.

In addition, the use of this removable shock cord anchor enables the builder to easily replace the elastic upper portion of the cord even if it is tied to the Kevlar cord *below* the top end of the body tube. Doing this prevents the thin, abrasive Kevlar cord from "zippering" (cutting into) the upper edge of the body tube, as sometimes happens with late or particularly energetic ejections.

Figure 5: Insertion of the anchor into a small rocket.

About the Author

Dr. Roy F. Houchin II joined the faculty of the Air War College in 2006 following his retirement from active duty with the Air Force. He has taught previously at the School of Advanced Airpower Studies, Air Command and Staff College and in the Department of History at the US Air Force Academy. While on active duty, Dr. Houchin served as Director of Operations and Chief, Combat Operations, 607th Combat Operations Squadron, Osan, South Korea. He also held various air battle management assignments in the Tactical Air Command, Air Force Space Command, Air Combat Command and HQ USAF. He is the author of US Hypersonic Research and Development: The Rise and Fall of Dyna-Soar, 1944-1963, Taylor and Francis Publishing, 2006, several chapters in edited works and numerous articles in professional journals. He is the Military Space editor for Quest: the History of Spaceflight Quarterly. He is also the historian and archivist for the former Atlantic Research Corporation (now a part of Aerojet). Dr. Houchin holds a B.A. and M.A. from Western Kentucky University, and a Ph.D. from Auburn University. His areas of interest and expertise are history of technology and military history (particularly space and World War I), as well as airpower history, theory and doctrine.