SHROUDLINES

A Dallas Area Rocket Society Production

Member of the National Association of Rocketry

Section #308

May/June 2014
Volume 23, Issue 3

What's Inside

Chuck Crabb sets up his LOC Athena with a little help from daughter Alyssa at the April Gunter launch. Photo by Nick Viggiano.

Ignition!

By Gary Briggs

People sometimes ask “why do you do this”, especially when they hear about things like PMC. Why do you want to build something that looks so nice and then risk completely destroying it with all the things that can go wrong with rocketry flight. It does seem a bit crazy when you think about it, but for some reason we find it to be fun. At a recent Gunter launch I heard Robert Vanover and William talking and they seemed to have a rehearsed routine about what to do if you crash your rocket. Basically it came down to if you couldn’t stand to take the risk, you might as well get into model railroads. No disrespect to those folks, or anyone else who builds static models, but rocketry does takes things a different direction and one that isn’t for everyone who puts in the work to build a spectacular model.

Ah, to be young with a really big rocket! Photo by Richard Gargus

In other random thought areas, I would like to thank Stuart Powley and John Dyer for their parts in supporting a great contest year and making it enjoyable for all who participated. We seem to have a growing group of folks getting involved in contests and it is one great way to expand your rocketry horizons.

Another big thank you goes out in this addition to Robert Watson and BuyRocketMotors.com. Robert has got his business up and running quickly and several of us benefited from his support at the May Gunter launch. Having an onsite motor dealer is a game changer for high power flying and if you were thinking about trying out the higher power motors it just got a lot easier. Between availability of motors on the field and the new AeroTech single use motors, eliminating the need for hardware, it has never been easier to fly high power with DARS. Also remember that the club has Aerotech and Cesaroni motor cases available for loan if you want to fly reloadables, but don’t have the hardware.

In this issue we have contributions from several members. Scott Cook gets us started with an article on his upscale Starship Vega that he has competed with in the Fall Classic and flown at several launches. From there, I provide an article on my yellow PML Quasar and its trials and tribulations throughout the years. Some would say this rocket is cursed and that you should just let it die, but for whatever reason, I keep coming back for more.... From there Chuck Crabb gives us a great overview of Loki Research rocket motors. Although they have research in the name, they are commercial motors and are competitive with the other major motor vendors although they are a very small company. From there, George Sprague rounds us out with some information on ejection charge holders for use with altimeter based flights.

That about covers it for this edition. I hope you have a great summer of flying and to see you August or September.

Bill's Something #9

By Bill Gee

A young company with a nondescript name, Estes Industries, sold something dubbed "model rockets" in ads appearing in mainstream magazines such as Boy's Life and Popular Mechanics. "Step into the real world of space," they would declare.

It was a heady time. America was going to the Moon. Each and every launch made notable progress toward that lofty goal. After a late start, we had become favored to beat the Soviet Union there. A good portion of the public wanted to be an astronaut or a rocket scientist. Model rocketry presented an accessible way for many to live that dream.

For a few dollars, you could build a miniature version of the machines which took man into space. And it would actually fly! Maybe not to orbit. Not even close. But it is unmistakably using the same physical principles as the big ones. It was pretty reliable. It was safer than it might appear. And it was big fun.

Another company, also with a nondescript name, Centuri Engineering, provided a somewhat similar but competing product line. Though some people preferred their designs of those of Estes, Centuri is now widely recognized for having foreshadowed the future of the hobby, large black powder and composite motors.

Other firms joined the fray, each with their own unique offerings, among them Flight Systems, MPC, MRC, Semroc, Space Age Industries.

Rocket clubs were formed in many cities and towns. The National Association of Rocketry grew by leaps and bounds. Model Rocketry Magazine chronicled the excitement.

Many who had been fortunate to enjoy the experience like to refer to that glorious era as the Golden Age of Model Rocketry.

After we had fulfilled President John F. Kennedy's challenge to put a man on the Moon and bring him safely to the Earth before the decade was out, our space program began to suffer from the "been there; done that" syndrome. The public did not want to continue to expend a king's ransom on space exploration; after all, there were many problems to solve here at home. NASA lacked vision and began to drift. Do we want to build a base on the Moon? Go on to Mars? Build a space station? Bootstrap space tourism?

Most people lost interest in anything space related, including model rocketry. Most of the companies involved with model rocketry went bankrupt, voluntarily shut down or were acquired by firms with deeper pockets in order to survive.

Fast forward several decades. Hobby rocketry is making a bit of a comeback. It is not because of anything NASA is doing.

Believe it or not, for the longest time, we were limited to a total of one pound at liftoff. After the deregulation of commercial aviation, the Federal Aviation Administration proved to be one of the easiest of the government bureaucracies to deal with. We began to be allowed up to 3.3 pounds, provided we notify all active airports within a five mile radius of the launch site. And rules were put into place allowing even larger rockets to be flown.

The decade of the 90's saw the widespread acceptance of high power rocketry. People who thought they had outgrown "little toy rockets" came back. New clubs were sprouting up and in many parts of the country, there was an organized rocket launch every weekend if you were willing to drive several hours.

The motion picture "October Sky" introduced the spirit of Sputnik to a new generation. Many who lived the original Golden Age decided to give rocketry a second look.

Balsa Machining Service and Totally Tubular supplied body tubes and nose cones for cloning favorite classic designs no longer readily available as kits. Tango Papa and Excelsior provided the finishing touch with reproduction decals. More companies than can be counted on both hands were formed to offer reproduction kits or original designs.

The national organizations, Tripoli Rocketry Association and National Association of Rocketry joined forces to fight the regulation of ammonium perchlorate composite propellant by the Bureau of Alcohol, Tobacco and Firearms as an explosive. After many expensive years, we won! APCP can now be enjoyed without any interaction with the BATFE.

The FAA reformed the rules for unmanned rockets. Model rockets can be up to 1500 grams and can be flown without their prior approval. High power is now part of the rules rather than an exception.

Electronics continue to get smaller. Gadgets for rocketry are no exception. High power rocketeers had been able to get in-flight video by lofting camcorders. That capability was extended to mid-power with video downlinks. Today, anyone can fly a self-contained video camera the size of a key fob using a B motor. Altimeters no larger than a finger can record performance parameters of a rocket flight. A larger rocket can literally tell its owner where it landed using GPS technology.

Many would say we are in a Second Golden Age.

But there are clouds on the horizon. NASA is still adrift. A tenacious recession has caused some participants to scale back their activities. Many of the rocket kit and motor manufacturers are either hurting or gone. The passing of Carl McLawhorn and the eventual closure of Semroc will leave a gap which may never be filled.

So has the Second Golden Age peaked?

If you would like to discuss this further, post your comments to the DARS-General Yahoo group at http://groups.yahoo.com/group/DARS-General or Ye Old Rocket Forum at http://oldrocketforum.com where I like to hang around

Upscale of Estes Starship Vega

By Scott Cook, Photos by Scott Cook, Gary Briggs and Stuart Powley

I had built an Estes version of the Starship Vega back in the 70's, and I thought it was very cool. A few years and a couple of grey hairs later, I decided to build it again. This would be another upscale of my childhood collection. I like to fly in the G and H range, so a 2.75:1 upscale was the best choice for me. I had purchased a conical nosecone several years ago, but never built anything with it. I looked at it one night and got the idea to build the Vega. The DARS Classic was around the corner and I decided to make a Vega for the event.

The body tube is a 2.56" with a 29mm motor mount. Fin material is ¼" fiberglass honeycomb, and the legs are 29mm tubes wrapped in fiberglass. I used a copy of the original build plans to make my patterns in RockSim. The honeycomb material is great stuff to work with, it's very light yet very strong. The fin leading edge is also very easy to make. With the parts all cut out, edges that needed to be rounded, were grooved using the edge of a ¼" dowel rod. This made a low spot in the fin allowing the dowel to be glued in place. Presto, an easy to sand edge that's the same thickness as the fin. This technique is used on many of my builds, even 1/8" thick.

The tube is slotted for the 3 main fins to be attached to motor tube. The 3 smaller fins at the base are glued on the surface only. The 3 upper fins are also only glued to the surface. The upper fins could be flexed after the glue had dried and the body tube

Photo by Gary Briggs

would distort easily when held. This was actually an expected condition during the build. I had designed an ejection baffle that was also my tube coupler for the upper section. Once the baffle was made and installed, the upper fins were as strong as through-

Photo by Scott Cook

the-wall types.

The centering rings are also made from honeycomb. The lower one has threaded inserts installed for a motor retention plate. The legs on the main fins have a working dual spring rate suspension. The legs are 3/8" dowel and have a series of centering rings and plates with 2 springs. One soft spring with about 2" of travel and one stiff spring with about 1" of travel. I had planned this from the beginning. The Vega's long legs looked like they would break too easy if

Photo by Scott Cook

they didn't move. When completed they worked great.

The flight design would separate at the mid-section of the rocket, with the nosecone being secured with 2-56 nylon screws. When I was installing the recovery system, I had discovered a mistake in the build. The bulkhead on the nosecone was glued in at the base. This took up valuable space inside the upper tube when it was installed. I had to learn how to pack a 52" chute and shock cord into a small space. After a few tries a solution was found.

Photo by Scott Cook

The launch rod guides were install at the root of the larger base fin. This allowed the upper guide to be installed at the root of the upper fin. With the additional triangular fins at the base, there was not enough room for rail buttons. The ¼" rod was the only simple choice.

Assembly was done with epoxy and went together very fast. The Vega was finally looking like a rocket. I primed and sanded a couple of times, then gave it a glossy white coat of paint. Now it was looking great, but no decals yet. The decals were made on my computer from scans of the originals found on the Net. I tweaked them in MS Paint, and scaled them up. By the time I had them all done, I had 6 pages to

print. With the decals in place she was a thing of beauty, and well worth the build.

At the DARS launch in Frisco, I was immediately greeted by Stuart Powley. I had razed him a bit about bringing a new upscale to beat his upscale in the DARS Classic. With rocket set up, Gary Briggs had an original in the Classic display, and it was set next to it for a photo. They looked good together. It was flown later that day using an Aerotech G64. Weather was great, lots of sun and the wind was low for Texas that day. The flight was brisk off the pad with a slow roll to the top. Parachute deployed on time with lots of cheers from the crowd, mine included. It landed on its legs with a little bounce, a successful flight.

Photo by Gary Briggs

The idea for the build came a short time prior to the Classic. Design was made, parts cut out, assembly, paint, and all those pesky decals. The entire build, from concept to a painted flyer, took the same amount


Photo by Stuart Powley

of time to complete as making all the decals. Total time 2 weeks, and yes, I still have a day job.

If you're curious if I won the upscale in the classic. Nope, but I did beat Stu. As of this writing it has had 6 flights, 3 with Aerotech G64 and 3 with Aerotech H128. First flight was in Frisco during the DARS Classic, and others at DARS events, including Gunter, and at AIRFEST in Argonia, Kansas. Thanks to all DARS members for showing me the way in rocketry. This born again rocketeer is having a blast.

Amado Pereira at Frisco filmed one of the Vega's flights. It can be seen on you tube with link. https://www.youtube.com/watch?v=q5eefT-FW-8

Scott Cook, BAR 2005, TRA L3

A Quasar Named Tweety

Words and Photos by Gary Briggs and Bill Gee

Well, it was a beautiful day in Gunter, and my most recent foray back into high power was turning out similar to some events in the past. It actually wasn't the high power thing so much as it was this particular rocket. It had been through the ringer and back a couple of times and here it was doing it again. I realized just before I launched the rocket that it had crashed on every high power field that DARS had used during its life and I guess it was just initiating this field as it had the others before it. As I watched the rocket spinning in the sky with flames and smoke coming out both ends, I started to think back to some of those previous flights. But, I am getting ahead of myself,… I guess I need to tell the saga of a PML Quasar named Tweety.

It all started in 1999, as I was looking to enter high power. I had built quite a few different models with my son Josh since getting back into rocketry in 98 or basically as soon as Josh could hold a glue bottle. I can't say that I flew that many mid power rockets although I was fond of slapping an E30, F21 or an F32 in my Estes Phoenix and listening to the fins whistle on the way up. I felt ready to make the jump to high power, and with money burning a hole in my pocket, and a link to the Public Missiles site. I picked the Quasar after considering the Sudden Rush. I was a little crazy and couldn't help to add weight,,,er upgrades, since I would obviously have this rocket forever and would need it to be capable of supporting every conceivable motor possible, even if I didn't own any hardware yet. I upgraded the fins from .062 to .093 and then went from the standard Kwick Switch to the extended (i.e. longer and heavier) Kwick Switch adapter. It was before the creation of Quantum tube so this rocket was all PML phenolic. It arrived in good condition and the adventure began. I built the rocket per the instructions, including the piston. It got really big fillets to go with the heavy fins. It was the biggest rocket I had ever painted and I didn't really have a grasp on a technique yet. I put something like 5 coats of Krylon yellow paint on it. Needless to say, it came out a bit heavier than your average Quasar.

A bit younger Jack Sprague and Gary Briggs @ Windom in 2000.

At the next high power launch at Windom (February 2000), I was ready to launch, preferably to certify. Looking back, I really didn't have a clue about much here. The day was somewhat less than ideal as it was one of those days that gave Windom its name, meaning it was windy (15-25 MPH). I worked with Bob Wilson as my certification resource as I knew him pretty from work at EDS as well as club meetings and other launches. We quickly decided that it wouldn't be a certification day based on the conditions, but we decided that we could try to launch it on a smaller motor. I acquired a G80-7 from Jim Turner who was the ever present motor vendor on the field back then. It would have lifted a standard Quasar, although the delay probably should have been a 4 either way. After securing the motor we set it up on the pad and fired it into the sky. The wind and gravity did their thing with the rocket only reaching a couple of hundred feet be for arching over and heading back down and planting itself in the fertile fields of Windom. PML phenolic did its thing and broke back to about mid tube.

I went home, ordered a coupler and another phenolic tube and put the rocket back together. I lost the piston this time but probably only offset the weight of the coupler and additional paint. It was still pretty heavy, but it was that configuration that flew at Justin on for my level 1 certification in April 2000 on an H128.

The next crash came in McGregor at a Hotter Than Hell Launch in June 2001. It was an adequately hot day with temperatures in the upper 90s. The previous day I had flown the rocket on an H210 Redline. I now wanted to try out my new 38 mm hardware, so the motor of choice was an H123. Motor construction went as usual. Now this was before they gave you those handy red caps that go over the forward closure. In those days Aerotech's only provided option to hold your ejection charge in the well was the circular sticker, so I used it. Now on days where you are sweating, have suntan lotion on your hands, and then add in a little motor grease, and adhesion to metal could be a little tenuous. I most likely lost the ejection charge into the body tube on the way to the pad. The rocket lifted off looking great, but then came screaming into the ground from 2000 feet up. Fortunately it was well down range and also clear of the cows. (For future reference, use the caps or add tape to the equation here). The nose cone required actual shovel recovery as the ground was pretty hard, but that didn't stop the nose cone from being planted 2-3 inches below the bottom of the shoulder. Inside the hole was a fair amount of powdered phenolic. The

body tube was destroyed all the way back past the top of the extended Kwick Switch motor mount top, so that piece was also history. At this point I shifted all my attention to my level 2 rocket, and the Quasar sat on the shelf for a while.(see Level 2 for Free here).

The last rebuild occurred while I was mostly flying my L2 rocket in the remainder 2001 and into 2002. As I was flying my level 2 rocket mostly in dual deploy mode, it was time to convert the Quasar into this approach. And since the last crash had taken it down to not much more than a fin can and motor tube, it seemed to make sense to make the Quasar dual deploy capable. As I had done with the Tomahawk, the rocket would be convertible between dual deploy and single deploy based on whether it had an altimeter bay or standard coupler installed in the middle and whether it was attached to the fin can or not. Since I had picked up some Quantum tube along the way, it became my tool of choice

this time around. It ended up being an important choice years later.

After I completed my level 2 flight at the Amarillo LDRS in July 2002, I acquired another H123 from Sharon Turner for a high power launch later that year or possibly early in 2003. I flew the Quasar that last time before the ATF and the Aerotech fire made getting high power motors very difficult. I focused my attention on smaller rockets, clusters, and, contests.

Well, the 'goes up' part started out looking very good. Things deteriorated quickly from here….

Flash forward several years to May 2014. After considering ordering motors from a few suppliers as we started flying in Gunter, along comes Robert Watson to change the rules of the game again to one we use to know. Once again DARS has a high power field AND a on field high power motor provider. Now we are talking. I had been to 2 previous launches at Gunter and was interested in putting some more power back in my flying. I had also picked up a brand new H180 case at a fire sale price at a club meeting where a previous member was selling out his gear. I had an Aero Pack 29 to 38 adapter that I had been flying in my Short Endeavor, and after giving the Quasar a couple of good once overs, I decided that it was flyable. I loaded it up the night before with a Nomex chute protector, Kevlar shock cord, and a Rocketman 4' parachute. On the field I retrieved the H180 that I purchased from BuyRocketMotors.com, the day before and assembled the motor on the field.

Well, back to where we started….nice day in Gunter… rocket spinning in the sky spewing flames and smoke. The good news here was that it ejected the recovery gear out of the rocket pretty early in this transaction, getting it clear of the flames. Kevlar and Nomex are wonderful things and did their jobs in this case very well. In the end the motor case and adapter came out of the rocket landing on the field and although mostly burned out, it still got a bath of water to ensure no fires got beyond the landing spot. The fire managed to weld the adapter to the motor case and blew a hole through both of them. I believe the issue started with me reversing the O rings in the assembly. All that was really salvable from the motor assembly was the forward closure, which was relatively unscathed. I learned that getting casual with motor assembly still has a cost and it is best to get out of your system with as small of a motor as possible.

The rocket itself really didn't suffer that much damage considering the ferocity of the event. The inside of the body tube was somewhat scorched and sooty, but there was no real damage there. Quantum tube is pretty forgiving stuff. The fin can only suffered damage at the rear of the motor tube where it burned through. If it wasn't for that hole the tube generally was solid, but I have decided to disassem-

ble this component and rebuild this last portion of the rocket, making the nose cone and fins the only original components.

So there you have it. The storied tale of a rocket that has seen a lot of DARS history and some of its own. Don't be surprised to see it again someday, just hopefully not on a different field….

Photo by Bill Gee

Photo by Bill Gee

Photo by Gary Briggs

Photo by Gary Briggs

Loki Research, an Alternate Choice in Motors

Words and Pictures by Chuck Crabb

Based on the number of questions I fielded during the April high power launch, I thought I'd write a quick article on Loki Research motors and highlight some of the reasons you might want to consider using them. The question that was asked most often, was "Why Loki?" That's a pretty simple question that has a slightly complex answer. To answer this, I will cover what I consider to be the pros for Loki motors, as well as the cons. For the purposes of this article, I will limit motor considerations to two, 38 and 54 mm, which are more suitable for our current fields in Frisco and Gunter.

First, let's discuss the positives. Probably the most valuable benefit of Loki motors is the number of loads that can be shipped without a Hazmat fee. All of the 38/120, 38/240 and half of the 38/480 loads can ship standard surface mail with no Hazmat fee. This covers motors ranging from G to I, and can be a huge benefit if you are not placing an order with a large number of motors to spread the $28.50 fee across. (Of course, if you are purchasing an AeroTech motor from our new on-site vendor, the Hazmat question is moot. I recommend supporting our local vendors, when possible.) If you are purchasing a CTI motor, this is an important consideration. Another benefit is the ease of assembly, at least compared to AeroTech. The motors are very easy to put together and utilize only 2 sizes of O-rings, so you don't have to worry about putting the wrong one in the wrong location causing a failure. This will be covered in more detail later. Cost per reload is another area that Loki Research shines, especially compared to CTI. The table below shows price comparisons for comparable size loads for Loki, AeroTech and CTI.

Hardware costs for 38mm motors are higher compared to CTI, but are quite a bit lower than AeroTech/Rouse-Tech for similarly sized cases. However, the cost of the reloads quickly makes up for the price difference in the hardware. Once you have purchased 3-5 motors for a given case, you have made up the difference in the hardware cost. When accounting for the Hazmat fee, one motor is enough to make up the difference. For 54mm, CTI is far less expensive than Loki or AeroTech. That said, Loki hardware is second to none in quality. The 54mm cases are drawn-over-mandrel (DOM) tubing, which provides tighter specs than pipe tubing and less machining to bring the raw material into final shape. With raw material at the needed dimensions, the only machining that really needs to be done is to cut the grooves for the retaining rings and chamfer the ends of the case. Less processing allows for helping offset some of the costs of DOM tube and provides extremely consistent products. The machining is first-rate and the anodizing is beautifully done. With the low profile thrust ring on current production cases, Loki cases fit almost all motor retainers, including the Slimline retainers, with the exception of the 54/2800.

The most important pro to me is that Loki Research is truly a David competing against Goliaths. Loki

RELOAD PRICE COMPARISON		
Loki	**AeroTech**	**CTI**
38/120 - $17-19*	38/120 - $18-22	Pro 38 -1 - $23-25
38/240 - $25-30*	38/240 - $24-30	Pro 38 -2 - $31-34
38/480 - $40-45*	38/480 - $47-56	Pro 38 -4 - $48-51
38/740 - $52-55	38/720 - $58	Pro 38 -6 - $60-67
38/1200 - $80-90	38/1320 - $85	No direct comparison
54/1200 - $75-78	54/1280 - $93-120	Pro 54 -3 - $86-93
54/2000 - $110-115	54/1706 - $113	Pro 54 -5 - $128-138
54/2800 - $165-175	54/2800 - $175	Pro 54 -6xl -$166-200

***USPS shipping** All pricing for Loki Research product from LokiResearch.com. All pricing for AT and CTI from WildmanRocketry.com.

HARDWARE PRICE COMPARISON		
Loki Research	**AeroTech/Rouse-Tech**	**CTI**
38/120 - $60	38/120 - $86	Pro 38 -1 - $28
38/240 - $70	38/240 - $96	Pro 38 -2 - $33
38/480 - $80	38/480 - $110	Pro 38 -4 - $46
38/740 - $90	38/720 - $116	Pro 38 -6 - $57
38/1200 - $110	38/1320 - $160	No direct comparison
54/1200 - $140	54/1280 - $145	Pro 54 -3 - $105
54/2000 - $160	54/1706 - $180	Pro 54 -5 - $131
54/2800 - $180	54/2800 - $230**	Pro 54 -6xl- $147

All pricing for Loki Research product from LokiResearch.com. All pricing for AT and CTI from WildmanRocketry.com unless noted.
****-pricing from AeroTech**

Research is run by Scott Kormeier, who is the one and only employee. With rocketry being a relatively small, niche hobby, having more, viable vendors is extremely important, and a challenge for the smallest of them. Supporting the little guys makes rocketry stronger by providing more options and keeping them all innovating new products. Also, the level of service Scott provides sets the standard for the industry since he has over 20 years of customer service experience. He has invested quite a bit of time and effort to source all of his raw materials from US sources, and improve the quality and consistency of Loki products.

One last pro, is that the snap ring style cases are basically a requirement for research motors. This is vital for those who are interested in that branch of rocketry. While there are other snap ring cases out there, since Loki cases fit motor retainers with little difference from AeroTech or CTI, one rocket can fly commercial loads as well as research loads which adds even more dollar value to Loki Research hardware.

As I mentioned earlier, ease of use is one of the strong suits of a Loki motor. The hardware consists of 3 major parts – the case, the nozzle and **the** bulkhead, with 2 snap rings and a stainless steel washer rounding out the parts bill. A 38mm reload is made up of 2 large O-rings, 6 smaller delay grain O-rings, a liner, the proper number of grains (1-8 depending on the reload), the delay grain, and the ejection charge. The 54mm motors omit the ejection charge and have a tracking grain with a single O-ring in place of the delay grain and 6 O-rings. Assembly of a 38mm motor takes approximately five minutes, although Scott says it takes him about half that. The description below makes it sound far more complicated than reality. Scott has an excellent video available on YouTube for both the 38mm and 54mm motors.

Contents of an I405 White reload with the 38/480 hardware

1. Grease all O-rings. I use Super Lube or synthetic disc brake grease. Other alternatives are Dow 111, Vaseline, or other similar greases. Remem-

ber, all you need is a light sheen on the O-rings. Big globs of grease are to be avoided.

2. Before you clean your hands, rub a light coating of grease on the inside of the case, only at the ends inside the snap ring grooves (see picture). Also rub a thin layer of grease on the inside of the delay bulkhead.

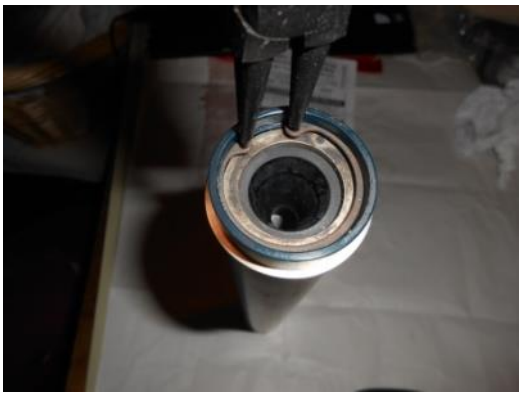
Snap ring groove

3. Place one large O-ring in the groove on the nozzle, and one in the groove on the bulkhead.

4. Clean your hands of any grease. I highly recommend baby wipes.
5. Load the grains into the liner.
6. Place the nozzle into the liner, making sure the shoulder of the nozzle slips into the liner.

7. Slide the case over the nozzle/liner assembly until the nozzle slips past the snap ring groove.

8. Install the nozzle washer and snap ring.



9. Stack the delay O-rings on the delay grain. This is easiest done by pushing the delay grain down into the center of the delay O-rings one-by-one. Once done, leave the delay grain with O-rings standing on the table and press the bulkhead onto the delay grain.

10. Using a Loki/CTI-DAT tool, adjust the delay to the time needed. Alternatively, use a ¼" drill to remove 1/32" for each second of delay. Per the reload instructions, do not remove more than 3/8".
11. Press the bulkhead into the case, below the groove for the snap ring. Add the top snap ring. Then pull the bulkhead up against the snap ring.

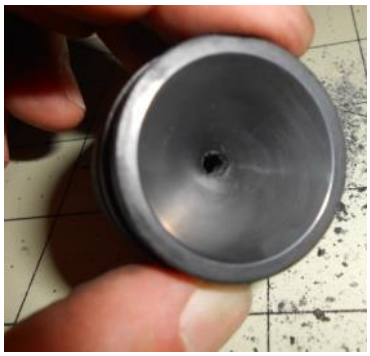
12. When ready to fly, add the provided ejection charge and cap (38mm only).

Cleaning is almost as easy. The only real change from any other motor is cleaning the nozzle, since this gets reused on these motors.

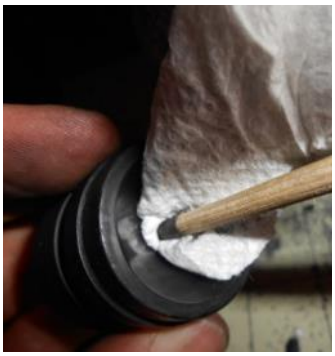
1. Allow the motor to cool enough to handle.
2. Remove the snap rings, push out the nozzle and spent liner using the bulkhead, then push out the bulkhead. I use a 1" dowel for this.
3. Wipe down the case and bulkhead using a baby wipe.

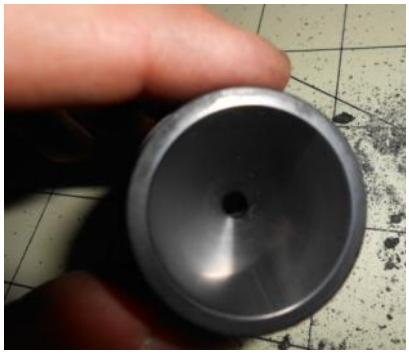
4. Using a non-marring tool (small screwdriver, bamboo skewer) remove the O-rings from the bulkhead and nozzle.
5. Wipe the nozzle with a dry paper towel.

6. Most of the slag from the motor firing will come off with this wipe. Clean the nozzle throat using the paper towel and a small dowel. If needed, a razor blade and a small jeweler's screwdriver can be used to gently pry the slag from the surface of the nozzle, both entrance cone and throat. To do this, carefully work a corner of the blade under the edge of the slag. Slowly work around the nozzle lifting the ring of slag as you go. Be careful not to scratch or gouge the nozzle. If this happens, a quick (and gentle) rub with 600 then 1500 grit sand paper can be used to smooth the nozzle surface.

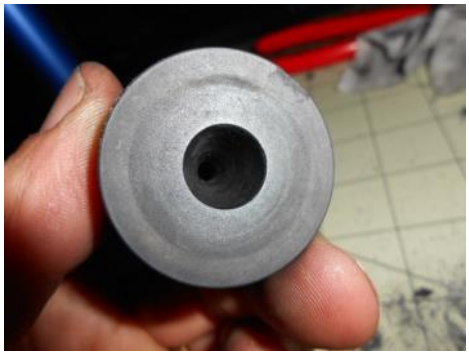


7. Clean the nozzle throat using the paper towel and a small dowel





8. A quick wipe with the paper towel and dowel will have the nozzle ready for the next motor.



I know what you're thinking - these things sound like the best thing since sliced bread, so what's the catch? There are a few minor negatives to the Loki motors, and by sheer count, it would appear they outweigh the positives. However, none of the items I count as negatives are serious, and some are in the process of being alleviated.

As mentioned in the use and cleaning, the nozzle for these motors has to be cleaned after each firing in order to reuse it. However, this is making a mountain out of a molehill. The residue left by the white and blue motors is cleaned with a quick wipe of a paper towel. My first thought after cleaning a nozzle after firing these motors was "Wait, I must not be cleaning well enough. That was too easy." Red motors can leave a bit of slag to contend with, but only takes a few extra minutes to clean. The Spitfire motors (sparky type) are apparently the worst, but since these are not likely motor selections for our current fields, I have no experience with cleaning this particular kind of motor residue.

Since the nozzles are reused, they will wear out and must be replaced. The nozzle will last 10-25 firings, per the Loki Research website. When the throat erodes 1/64" (.016") past its original diameter, it can no longer be used for the given case. This is best measured with a pair of calipers with extended jaws, a set of pin gages, or a telescoping plug gage. For those of you who don't have access to one of these, a drill bit will allow for a decent eyeball approximation. At this point, the nozzle can be returned to Loki for refurbishment. What this means, is that the throat will be bored to the next larger size, so you will end up with an almost new nozzle for the next size case (i.e., 38mm #10 nozzle bored to #16. This nozzle can no longer be used for the 38/120 case, but can be used for the 38/240 or 38/480 case.)

Another, less frequent, failure mode for the nozzles is cracking. This is typically caused by pieces of the casting tube being spit at the end of the burn which is more common with research reloads, or by being accidentally dropped. A crack is easiest seen from the inside to the outside of the nozzle. These are not repairable and must be replaced.

Another negative is the relatively limited motor selection. Loki Research currently has no commercial loads available in 29mm. It also only has 4 motor varieties, white, blue, red and Spitfire. However, 2 new propellant formulas, Blue Ice and Violet, are currently in development. Within each case size, there are varying numbers of reloads available for purchase. The lowest number of available loads (2) belongs to the 38/120 case, which is the largest size we can fly on our Frisco field. For this particular field, there is only one motor choice, the G80 White. The Blue Ice and Violet formulas are in the development and certification process for this case.

Igniters are not currently included as part of the reload kit. While this is not a problem if you dip your own, it could be a show stopper if you do not. Scott has reported he is working on adding igniters as part of the reload kit. However, with igniters being a regulated item, these are unlikely to be added to a kit in the foreseeable future. I know AeroTech and CTI provide igniters or E-Matches in their kits, but they have attorneys on hand to be able to handle whatever problems they may have. Scott does not have the resources to fight these fights. So for the time being,

Loki G80 White in a scratch built 3" rocket

he recommends QuickBurst Twiggy's for G-H motors and Slim Gems for H-K motors.

Loki H90 Red in a 2.6" scratch built rocket

What is probably the single biggest drawback is the need to purchase a tool. What, buying a new tool is a negative? How? I'm not sure, but you should be aware that you will need a GOOD set of snap ring pliers for these motors. The cheap set from Harbor Freight you might have for working on your car won't cut it. Trust me, I know. Ask me how I scratched up the anodizing on my 38/120 case. Loki recommends the Knipex brand available from McMaster-Carr (part number 5449A92 for the 38 and 54mm motors) and says they will be the last pair you ever need to buy. Some flyers have reported using a set of needle nose pliers with good results, but I haven't tried this.

Last, but not least, what I reported as the most important positive aspect of Loki Research can also be viewed as a negative. This is a small, one man company. While Scott is working hard to keep Loki as a viable third motor company, it is a challenge. While AeroTech has released 9 new motors as of May 30 of this year including the new Economax motors, Scott has not yet released any new loads since taking over Loki Research; however, this is to change very soon. He has released new hardware over the last 2 years (bulkheads, improved nozzles and cases), but the big challenge is new motors. This is an expensive and time consuming process, and a small company doesn't have deep pockets or man power to get multiple motors certified at one time. However, the more support a small company has, the quicker and more easily they are able to grow and develop their product line.

To sum it all up, Loki Research is a very worthy alternative to the "Big Two" and well worth a look. First class hardware, outstanding motors, and fabulous customer service are the hallmarks of the Loki Research line. When you fly Loki, you support a small business without sacrificing quality, performance, or the all-important "street cred". With the understanding that there are a few minor drawbacks to using Loki motors, they are an excellent choice for your rocketry motor needs.

Loki I405 powering a LOC Athena

Eject!

By George "The Other" Sprague

Yes, eject the parachute, and to do this an ejection charge is commonly used. Motor based ejection charges are common, both in single use and reloadable motor systems. Now then, what about altimeter based ejection?

Lately we have seen several Level 1 High Power certifications. As sure as the day is 24 hours long at some point many of these flyers will get the itch to fly higher and use altimeters to fire off the ejections charges – dual deployment altimeters release a drogue parachute at apogee, bringing the rocket down in a controlled fast manner, then, at some pre set altitude, the main parachute is released, and hopefully the rocket will land closer.

There are several manufacturers that offer ejection charge holders or canisters in various sizes, some pre wired with an electric match or electric match substitute. Additionally, there are ways of making your own, and here are a couple of suggestions.

The igniter needs to have a combination of sensitivity and low energy firing, in accordance with the altimeter parameters (refer to the manufacturer's suggestions). Guess what? There is a product which, at this time, is not being manufactured but we are told it will be available soon (whatever that means). I am referring to the Quest Q2G2 igniters. These little gems will work for just about any altimeter, *however*, I strongly suggest you test them with your altimeter (s) using a vacuum chamber – look for an article on how to make one in the next issue.

To hold the 4F Black Powder (why 4F and not 3F? 3F grains aren't as fine as 4F grains, therefore they take longer to burn up – 3F can be used in a pinch, just do some ground testing before flying) there are several items you can use, like BT-5 body tubes, plastic containers of the same (or similar) diameter as BT -5, even plastic floral water tubes!

Cut to the desired length that will hold the needed amount of 4F BP (there are calculators available on line – ground test!) Especially if using shear pins. Adding .5 to 1 gram extra to REALLY blow that chute out is a good idea, as opposed to a fizzle that barely moves the nose cone or body tube!).

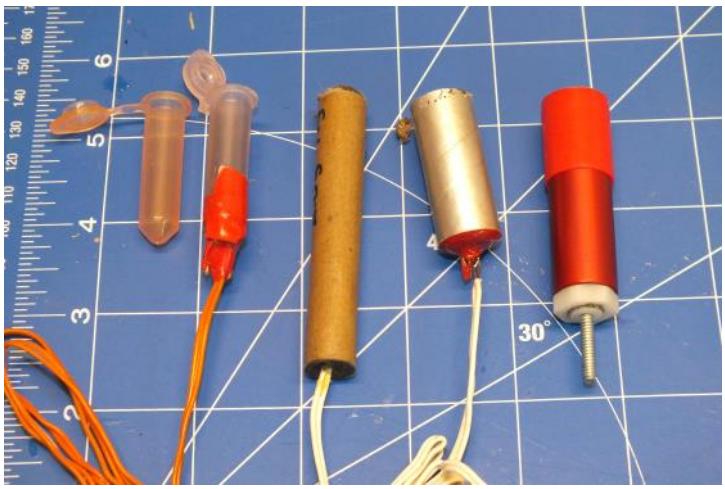
I like to leave an additional ¼ inch to the length of the tube; you'll read why in a bit. Drill an appropriate size hole at the bottom of the plastic tube, and slide the igniter from the top, lead end first, that way you won't scrape off any pyrogen. If using BT-5, insert the pyrogen end first, crimp the tube.

You'll need to seal the igniter in place. Hot glue or silicone sealer work well. IMPORTANT: the igniter head needs to be completely covered in the 4F BP, but not buried way down at the bottom, as this could blow part of the 4F BP out unburned. GROUND TEST!

OK, ready to use, add the 4F BP, then add some recovery wadding using a wood dowel to tamp down. You want the 4F BP to be good and tight so it burns with a pop, not fizzle. Next, secure everything with strips of masking tape, again tamping down with the wood dowel until you get a good tight seal.

And there it is, your very own home made ejection charge to be used with your altimeter of choice. Remember, ground test prior to flying!

Here's a variety of ejection charge holders. All would be usable with Q2G2 igniters. Note the containers on the left look a lot like what comes with Aerotech motor reloads. Which certainly would work. The one on the far right is called an Ejector and is no longer manufactured by BlackSky. The 2 in the center are standard cardboard tubes.. Photo by Gary Briggs.



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We all share a love for the rocketry hobby and all have different experiences and expertise to share. You don't have to be a Pulitzer Prize winner to write for this publication. Anyone can do it!

Submissions can be in the form of plain text files, emails, or MS Word documents. Pictures can be of most any format, but .jpg files are generally the norm. Keep the content family friendly and free of political discussion; just rocketry.

We publish every 2 months so we need your content submitted by the 15th of an even numbered month (.i.e February 15, April 15, June 15, etc.). You can submit via the contacts page on dars.org or direct to the editor at garyb2643@att.net.

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7/12	**DARS Business Meeting @ Coppell**
7/19	**Monthly Launch @ Frisco**
7/28	**High Power Launch @ Gunter**
8/2	**DARS Business Meeting @ Coppell**
8/16	**Monthly Launch @ Frisco**

The Dallas Area Rocket Society is a non-profit chartered section of the National Association of Rocketry ("NAR"). Its purpose is to promote the hobby of consumer rocketry in the Dallas/Ft. Worth metropolitan area.

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The club normally meets on the first Saturday of each month at 1:00 p.m. and the current meeting location is in Coppell, just off the Sam Rayburn toll way and Denton Tap Road.

Visit the DARS website for the meeting location: www.dars.org