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THE LAUNCH REPORT

by Kevin Harness

Boy those of you who didn't have a chance to attend the last two launches have really missed some treats. Truthfully, I am gonna have to write down stuff earlier for myself if I am gonna cover two months launches, so this article will thusly cover the last launch, mostly.

The last launch was a dual launch of the local NAR and Tripoli (us!) clubs, and as usual it was spectacular. Probably about the only dumb thing was that the Marines had the unmitigate gall to schedule the Airshow on the same weekend, despite my extensive wishes that they consult with me first (joke). I love the Airshow, and wanted to attend, but it just wasn't in the cards.

What WAS in the cards was enough fantastic flights in one weekend to keep up all talking for at least another 30 days, and a spectacular show put on by Ray Dunakin that left us clamoring for more more!

The Newton Second King for the launch was held by the Woerner duo, Andy and Joanna. They flew an unprecedented 4 (yes, I said FOUR!) M-motors at this launch, and of course a host of other fine flights. Let me get into Andy's and Joanna's flights: they did an M-drag race for their Level III certifications. Both rockets were beautiful, built like military tanks, and were on display for all to see. Andy and Joanna did an incredible job on the fin cans, Andy could probably write an article on THAT alone. The rockets were 8" diameter, His and Her rockets painted accordingly, and powered by Aerotech M-1315's (3" diam. motors). Andy's lit and came off the pad slightly before Joanna's, but not to be outdone, her sleek rocket caught up and seemed to pass the male counterpart on the ascent. Both



arced

over at about the same, time, but unfortunately that is where the similarities ended. Although both rockets landed in the nice cute mountain range behind our launch, Joanna's really was a hike, and several brave M-rocket recovery people went up the mountain and brought the bird back down..

Andy was approached by an individual who said, basically, Gee, Andy, that flew so nicely, what do you say to flying yours as a night flight if I buy the motor? I didn't hear the conversation, but I would be the hesitation in Andy's voice was next to zero. Andy therefore flew ANOTHER M1315 for a night flight in his Level III rocket. Man! it was a nice flight, but alas, the rocket realized it was a Woerner rocket and seemed to nearly go on its own to the mountain. We got it down the next morning.

Then came one of the most memorable M-motor flights in Ocotillo history. Andy had constructed a 13" diameter scale V2 rocket, and had an M1419 loaded and ready to go. It came off the pad reminiscent of the real thing, and unfortunately it also came in the same way. It came in down range, but was in full view, and when it came in ballistic at probably between 400-500 mph, the impact reverberated through the ground. It was tough finding pieces big enough to pick up. But still, Andy and Joanna had done it, flown the most M's in a weekend EVER at Ocotillo. So now we have to do five!



Jimmy Phillips came out and flew his modified fiberglass frame "Mach Fever" on a J570, but the stress of this motor had taken its toll. It had been flown the previous month and had sustained moderate damage, but came back eager to go. The previous month we heard two audible "mach pops" and saw the impact of the sound barrier on the smoke trail, but this month about the time it hit mach it decided that several directions

was more interesting than just one. It shredded a fiberglass frame, ripped kevlar strapping, and zippered a fiberglass nose cone.



Darrel Kelly flew his now famous Mad Max on a full Aerotech K motor, the K700. He and I hemmed and hawed about using this motor in this rocket, but all went well and the flight was absolutely perfect, and even with the blunted nose cone it was OUT OF SIGHT by the time motor burnout had occurred.

Val Derkach flew a tremendous array of rockets, my favorite of which was the DART. Man, this guy is just about as innovative as they come. He sustained a couple of crashes on some of his seasoned and favorite rockets, such as the Honest John, but I am sure he will rebuild those to awe us again. He is also working on a tremendous Level III project in his garage, and had pictures to prove it. He is doing his usual great job, and boy this rocket will fly like a champion. Then there was Ray Dunakin. Ray has had some hard flights while trying to qualify for Level II, but his success in the camera rocket world is way up there. He brought 8mm movies, a projector, and with some brilliant screen work from some of the SpaceDev boys, we had ourselves a movie theater. No, I am not kidding. We watched movies for probably an hour or so. Ray had TONS of good footage, some intentionally funny, many very impressive, and all entertaining. He vowed to do it again for the dual launch in April. Trust me, you DON'T want to miss that. I mean, good grief. We had incredible M flights, cool refreshments, incredible weather, and drive in movies! Probably 50-60 people sat down and took some time and watched movies, from little kids to the hard core fliers. There were scores of flights by many people that we can talk about at a later point, but I wish now to thank Andy Woerner and crew for his tremendous work on the TRA San Diego launch equipment. It is very very nice. SO nice, in fact, that I would like to organize a West Coast Launch for Ocotillo next October. What do you think? Do you wanna try it? It would be pretty cool, but a lot of hard work. If done right, we could have the Lucerne bunch, DART and the Ocotillo clubs, perhaps the Hemet club, and maybe even the Phoenix club. How many M's do you think we could launch in a single weekend? Eh? Anyway, feel free to get back to me on your opinion.

THE TRIPOLI CORNER
by Kevin Harness, Prefect



Probably a keynote of any launch, big or small, is safety. I have been attending high power rocket launches for years, and have witnessed a variety mishaps that did not end up in disaster, and a few that did. Tracing back a bit I could find improvements in each situation that would have probably prevented the disasters. I am sure each of you is equally adept at looking back. The key is being able to look forward and foresee disaster before it happens.

It is a combination, probably, of common sense and experience, with a dash of intuitive thinking thrown in for good measure. I am sure each of us knows not to look up into the nozzle to see how the igniter is working, but I rarely see anyone strike the leads together to see if they are hot BEFORE they attach them to the igniter leads. A simple striking of the clips together may save you an intense burn, or at the least save you an emergency trip to the porta-potty.

Think about it. It might be kinda scary and even slightly humorous later if you ignite a Blackjack motor or a 1/2A motor when the clips are attached, but I can guarantee that you don't want to be next to a Blue Thunder K, L or M motor and have that happen! NO WAY! It would be a long, agonizing ride to the nearest hospital. So, let's think about it a bit when we're at a launch, and help our friends and family be safe, too.

As a second point, as of January 1st, 2001, we will be having a separate waived day on a separate weekend for any experimental or homemade motors, separate from the normal Tripoli sanctioned launch. I will be getting back to you with the dates in question. To answer any potential questions, this is an insurance issue, and is no longer optional, elective, or a quorum issue. Anything other than Tripoli sanctioned motors which are also California State Fire Marshall Certified will be flown separate from the normal launch.

OK, that is it for now. I welcome ANY questions you might have, any comments you wish to voice, and am willing to go the extra mile to find info for you as applicable. Just let me know at "kevroc54321@aol.com". Bye for now!

Construction techniques: fiber glassing

By Andy Woerner

When building larger rockets and using more powerful motors, it becomes necessary to reinforce the cardboard body tubes of model rockets. The most common method of reinforcement is to apply a resin and cloth, typically fiberglass, to the outside of the model. This serves to increase the compression strength of the tube and prevent folding or collapsing. The two components of this type of reinforcement are the resin and the cloth material. We will discuss each separately then close with methods for applications.

There are two primary types of resins, epoxy and polyester. Epoxy resins consist of two parts, a resin and a hardener. The two parts will remain fluid until mixed, then after a period of time, determined by the formula of the resin, will harden and become solid. Epoxy resins purchased in your local hobby store are typically used in structural applications, and are not well suited for fiber glassing. This is primarily due to the thicker viscosity and faster cure times of these resins. Epoxies that are commonly used for fiber glassing are called “laminating” resins, and are available from distributors of fiber glass. Jeffco and West Systems are good examples of laminating epoxies. Both of these work well for fiber glassing. These resins are typically mixed in a 4-1 ratio (4 parts resin to 1 part hardener). This ratio is absolutely critical in order to end up with a good and strong cure. Here are some common misunderstandings regarding epoxy resins:

Epoxy does not dry, it cures. This curing process results from heat generated from the chemical reaction of mixing the resin with the hardener. This process can be accelerated or slowed by raising or lowering the ambient temperature, to a limit. Adding more hardener does NOT make the mixture cure faster, it only weakens the final result. Epoxy, when properly mixed, yields a result that is very hard, sandable, and makes an exceptional finished surface. It is by far the best resin to work with when fiber glassing. The downside is the cost. A gallon of epoxy resin costs about \$75. This will be approximately enough to surface two eight inch diameter by nine foot tall rockets, double coated. The other type of resin that is commonly overlooked by modelers is polyester. This is actually the most common type of resin, used widely in construction of boats, surf boards, cars, etc. This type of resin is a single part resin that will cure completely by itself when left exposed to the air. This process will take several days at room temperature. The normal method for accelerating the curing process is to add a chemical agent such as Methyl Ethyl Ketone Peroxide (yeah, that’s a mouthful). This accelerator is commonly called MEK Peroxide. Unlike Epoxy resins, the curing time of polyester can be determined by the amount of the accelerator added, but remember, if you add too much, it will get very hot and can actually burn. A good ratio is about 50-1. This will give you about 20 minutes working time. A downside to working with polyester resin is the smell. Only use this in a well ventilated area, and PLEASE use a good respirator. Polyester resins offer a significant savings over epoxy, costing about \$25 per gallon. They can be found at a wider variety of locations, but avoid the stuff you find



at auto parts stores or the products made for automotive repair. They have a much thicker viscosity and are harder to apply. There are post curing differences between epoxy and polyester resins. Epoxy will not shrink as much and is not weakened by exposure to the sun. I feel that these are not significant differences, as the shrinkage has never been measurable and I generally paint my rockets. As far as strength is concerned, epoxy is stronger, but not significantly. I have seen advertisements showing a person standing on a body tube they fiber glassed with an extremely expensive epoxy.

While this is very impressive, I have found that both hold up equally well in hard landings and being dragged over the lovely rocks at Ocotillo. I have NEVER seen a body tube survive a direct impact, ie coming in ballistic (not that Im an authority on that subject, but I have planted a few) When that happens, the rocket is going to break, I don't care what its made of. Now we are all experts on resins, lets talk about the fabric we will use on our rockets. Fiber glass is the first choice for surfacing cloth. I have heard of people using panty hose and other such things. .The problem with those materials is that they have NO inherent strength. They are made to stretch and flex, which is not exactly what we want our rocket to do. The combination of resin and fiberglass cloth yields a product that draws from both the structural engineering strengths of the two components to yield a finished product with one of the best strength-to-weight ratios available. Fiberglass cloth is sold by the foot or yard, and in varying widths. The cloth comes in a variety of thickness, and is sold by the weight per square foot



I prefer to use a 3oz cloth on smaller models and a 5oz or 6oz cloth on heavier models. There are several types of weave also. The two most common are standard weave and crows-foot weave. The crows-foot weave is much stronger and easier to work with, as it does not fray easily. It is also more expensive (usually about 25% more). On smaller models, I generally use one wrap of cloth, larger models get two. I seldom use more than two wraps, it's just not necessary. The cloth is cut with about one inch overlap on either end of the body tube. Always try to use a single piece of cloth for the wrap. I like to hold my body tube on a wood stick, supported in a vice. On longer rockets, I'll support the other end with a rope from the ceiling of my garage. I drape the cloth over the tube and start in the center. I paint the resin on the cloth and force it through the material using a 2" inexpensive paintbrush. Don't use a good brush, as you will be throwing it out. When you get the material saturated with resin, it becomes transparent. Work from the center outward, preventing the cloth from stretching or distorting. Work toward one end, and when you reach an end, keep edge of the material along the line of the rocket. Complete the wrap, insuring not to get air bubbles under the cloth. It is really not hard to do. After you complete the final wrap, turn the tube frequently while the resin cures. A coat of plain resin may be added after for surfacing. Pigment can be added to both epoxy and polyester resins, but use only pigments designed for them. I don't use a lot of pigments, as I paint my rockets to finish them. If anyone is interested in seeing this process, I would be happy to hold a class on it. Please contact me at 619-258-2537, or andy@tns.net. If there is interest, I will schedule it.

2001

Launch Schedule for Ocotillo

California Fire Marshall / Tripoli / NAR Certified Motors

January 6-7	July 7-8
February 3-4	August 4-5
March 3-4	September 1-2
April 6-8 (with DART)	October 5-7 (with DART)
May 5-6	November 3-4
June 7-8	December 1-2

Experimental and Non-Certified Motors

January 21	July 22
February 18	August 19
March 18	September 16
April 22	October 21
May 20	November 18
June 17	December 16

Launch Schedule for DART

(Fiesta Island)

January 14 (Sunday)	January 27 (Saturday)
February 10 (Saturday)	February 25 (Sunday)
March 10 (Saturday)	March 25 (Sunday)

The remainder of the yeay will be scheduled at a later time

October rocket launch

By: Ray Dunakin

In October I went to our Tripoli Prefecture's October launch. This was one of the two biggest launches we have each year, and we were joined by the members of DART, a local NAR model rocket club. I've just finished posting photos from the launch. You can see them in my online album: [Rockets \(New Uploads\)](#)

Saturday morning got off to a great start. Two of our busiest members, Andy and Jo Woerner, made their Level 3 launches simultaneously, flying twin rockets about 12 feet long and 10 inches wide, each powered by an "M" class motor. It's not everyday you get to see two large rockets such as these launched side by side! His was blue, hers was pink. The rockets reached an altitude just under 5000 feet. Jo's rocket landed about 3/4 of the way up the side of a mountain, and required considerable effort to retrieve it. I got some excellent photos of these rockets taking off.

Around noon on Saturday I attempted a Level 2 flight, making the first launch of my new camera rocket, the HAKO X-1. This rocket is my first to use an altimeter to deploy the parachutes.

I actually made two attempts. The first was to be powered by an ancient J125 motor, from a currently uncertified manufacturer. The motor blew up on the pad, lifting the rocket about 6 feet into the air. The motor remains banged up the launch pad, and did some minor damage to the interior of the rocket. The rocket fell on the ground and received some scrapes and dents, but nothing serious.

Kevin Harness, our club Prez, kindly offered to loan me one of his reloadable J motors. I bought a J275 reload kit and quickly prepped the motor and rocket for another shot. This time the rocket took off great, but shortly after motor burnout, while the rocket was still coasting upward, the altimeter fired the ejection charges, deploying the chutes prematurely. The payload's chute was torn loose, and the payload suffered some major damage on impact. Luckily the camera was uninjured, and the payload capsule is repairable.

I brought out my Super 8 movie projector and showed some of my rocket movies on Saturday night, using a motor home's large awning as a movie screen. I had several movies taken by cameras onboard rockets in flight, and also had a number of slow-motion closeups of rockets taking off. In some cases the camera was positioned directly under the launch pad, looking up, and in other cases it was mounted on a pole above the pad, looking down. It's been a long time since I've even looked at these films, and seeing them again got me interested in shooting some new stuff. I'm refurbishing my old slo-mo and in flight cameras for use at the next launch.

After the movies, we were treated to an “M” motor night launch, using one of the rockets from the dual flight. You haven’t lived until you’ve seen a big night launch like that! Once again, a good flight ended with the rocket on the side of the mountain, where its strobe light could be seen blinking all night long. It was recovered in the morning.

Andy made yet another “M” flight on Sunday morning, this time flying his awesome scale model V2 rocket. A great flight, going up to at least 4000 feet, but then the parachutes failed to eject despite the use of two separate altimeters with redundant charges. Seeing and hearing that massive rocket screaming toward the ground at 400+ mph gave everyone a good dose of adrenaline, and a taste of what it must have been like during a London air raid in WW2! The rocket’s remains were scattered over a wide area, at least 30 feet in all directions from the impact site. Nothing was salvageable, not even the parachute.

Shortly afterward, I launched my Tri-Star rocket. This is the one that has two small camera rockets mounted on the sides, which take off in mid-flight. I used an I211 motor in the booster. This was the first time I’d flown this rocket with an I motor. The two smaller rockets were each loaded with a G80 motor.

At ignition, the main motor sputtered a bit, and for a moment I was afraid it wasn’t going to ignite. But then it took off, and shortly after liftoff one of the smaller rockets ignited, separating from the booster and flying alongside it for some time. A second or two later the other small rocket also took off, reaching a significant altitude. (I’d guess maybe 2500 feet.) Deployment was perfect, with all six chutes being ejected at the rockets’ various apogees. Due to the excellent, windless conditions, we had no trouble tracking and recovering all six components. The reloadable motor casing in the booster rocket was also (unintentionally) ejected along with the chutes, but luckily it was recovered intact and undamaged.



LOCAL ROCKET COMPANY RESEARCHES HYBRID MOTORS

by Kevin Harness

SpaceDev, Inc. is a local rocket company located in Poway, CA, originally formed by a core group of General Dynamic rocketeers several years ago. That coupled with SpaceDev acquiring the rights, patents, and information from AMROC Co. of hybrid motor fame, the sky is literally no longer the limit. SpaceDev has recently received grants to research and develop hybrid rocket motors to move 50-100 kg payloads from one orbit to another. Over the last few months, we have done several static motor firings, the last two being on Dec 1st and 6th. Many aspects of the motor must be tested, and that is just for the static firings. It is a whole different matter to design a lightweight space vehicle intended to perform in a vacuum. But that is just what SpaceDev is doing. The most recent test firings were centered around nozzle design and material, affected by motor burn duration. The recent two firings were 10 and 14 second burns, respectively. What makes hybrid the “Hot Item”? Number one is that the motor must be re-startable, and throttleable, and with solid fuels that just isn't feasible. With regular liquid rocket motors, it is, but there is a heavy cost factor and an inherent safety factor (liquid hydrogen can blow up big time!).

Hybrids are a blend of solid and a liquid rocket motors (hence the label, “hybrid”). In this case the liquid oxidizer is nitrous oxide (“laughing gas”), and the fuel is solid plastic, regular ole plastic. Cheaper, much cheaper. Enter SpaceDev! You can find out more about this up and coming company by logging onto www.spacedev.com and checking out their website. Heck, you can even buy stock in the company (it is publicly traded!). Several of our Ocotillo members are employees of SpaceDev and I am thankful they are part of our amateur group.

DART / Ocotillo have new launch equipment and launch schedules for 2001

by Andy Woerner

Having maintained the launch equipment for DART for a couple of years now, it had become increasing more difficult to maintain the older equipment. The old equipment had given us many years of great service, but with constant use, it was getting tired. Since I handle equipment for both the DART and Ocotillo clubs, I decided to build new gear that could be used for both clubs. To avoid any conflicts or problems for dates that both sites have launches, I elected to purchase all the equipment myself. With a lot of assistance from Paul Kusal, we spent over two weeks building the new

equipment. There are a few technical changes from the old design that should be noted:

All equipment is interchangeable. The relay boxes and firing boxes are all identical, as are all the cables. This makes maintenance a lot easier.

There are no more screw terminals at the launch pads for connecting igniter leads to. This was a significant cause of current loss and intermittent operation. Now we use plugs for the igniter leads.

Single blast deflector vice smaller blast deflectors. This helps to keep the equipment from being exposed to rocket blast, which is a rather caustic substance.

We now have continuity indicators both at the launch rods and at the firing boxes. This saves time and effort by allowing flyers to check their igniters and connections prior to hiking back to the firing boxes.

We are using sealed relays vice open ones, and the current rating on the new equipment is 30A vice to 10A older equipment. The older pad was only capable of supplying 6-8A to the igniter leads, the new equipment will provide the full 30A to the leads.

New batteries. This is primarily for me, because the old RV and car batteries were HEAVY. We now use motorcycle batteries, which provide up to 90A of current (for those who want to launch 45 rockets at once). I have tested the capability of the new gear to fire multiple igniters. I was able to fire 12 Davey-Fire igniters in parallel on one channel. There is PLEANTY of power for all the cluster crazy people (like me). We now use ultra bright LEDs for indicators rather than light bulbs. The reasons are; they are brighter, they draw far less current, and they don't burn out nearly as often. Also, the current it takes to light the continuity indicator using a standard 12V light bulb could fire an igniter (it actually happened to me, fortunately, I was away from the rocket). Now, not only is there much less current used to check continuity, but it is only present when the "TEST" button is pushed. A much safer situation.

Use of the equipment

The equipment will be available to both clubs for any event. If there is a launch scheduled on the same day for both clubs, I will typically be going to Ocotillo (I like big rockets). I will split the gear up, one pad for DART, two for Ocotillo on days of conflict. Someone must either get the gear from me or arrange it ahead of time on these dates. Ray Kelly has been bringing the old DART equipment on the last couple of times we have had a conflict.

When using the new equipment, PLEASE DO NOT HOLD THE FIRE BUTTON DOWN MORE THAN 2 SECONDS. If the leads are shorted, they will melt.

We have taken up cleaning the equipment up fully after each launch. This reduces the amount of maintenance and keeps the equipment in better shape for all to use.

Regarding launch schedules

I have been working with Kevin Harness (Ocotillo), Lee and Mimi (Hemet), and Jim Huzenga (DART) to try to coordinate a synchronized launch schedule to allow more flexibility and less conflicts regarding the launches for all three clubs. Thanks to the efforts of the aforementioned people and with the cooperation of the members of the OTR, we have managed to arrange the launch schedules with no conflicts for the first part of 2001. Ocotillo is on the first weekend of the month, DART in the second, Hemet is the third, and DART is the fourth. *Andy Woerner*



<p>DART</p> <p>FIESTA ISLAND Launch Hours: 8:00 am - Noon</p>	<p>Soboba Reservation Hemet, California</p> <p>HEMET VALLEY ROCKET CLUB</p> <p>LAUNCH EVERY THIRD SUNDAY Launch hours: 8:00 am until 2:00 pm CONTACT: Lee Pouse: (909) 658-6581 www.ivic.net/~lem1/</p> <p>NAR Section #567</p>
<p>TRIPOLI San Diego</p> <p>For more info, call Kevin Harness at (619) 267-5133.</p>	<p>ROC (Rocketry Organization of California) Lucerne Dry Lake</p> <p>LAUNCH SECOND SATURDAY OF THE MONTH</p> <p>We try to begin around 8:00 am and launch until the wind comes up, or until we run out of rockets! More info call Ron Brimmer: 909-245-2098.</p>