earthrise

The Canadian Association of Rocketry Newsletter

Volume 3, Number 2

November, 2002

Election Time

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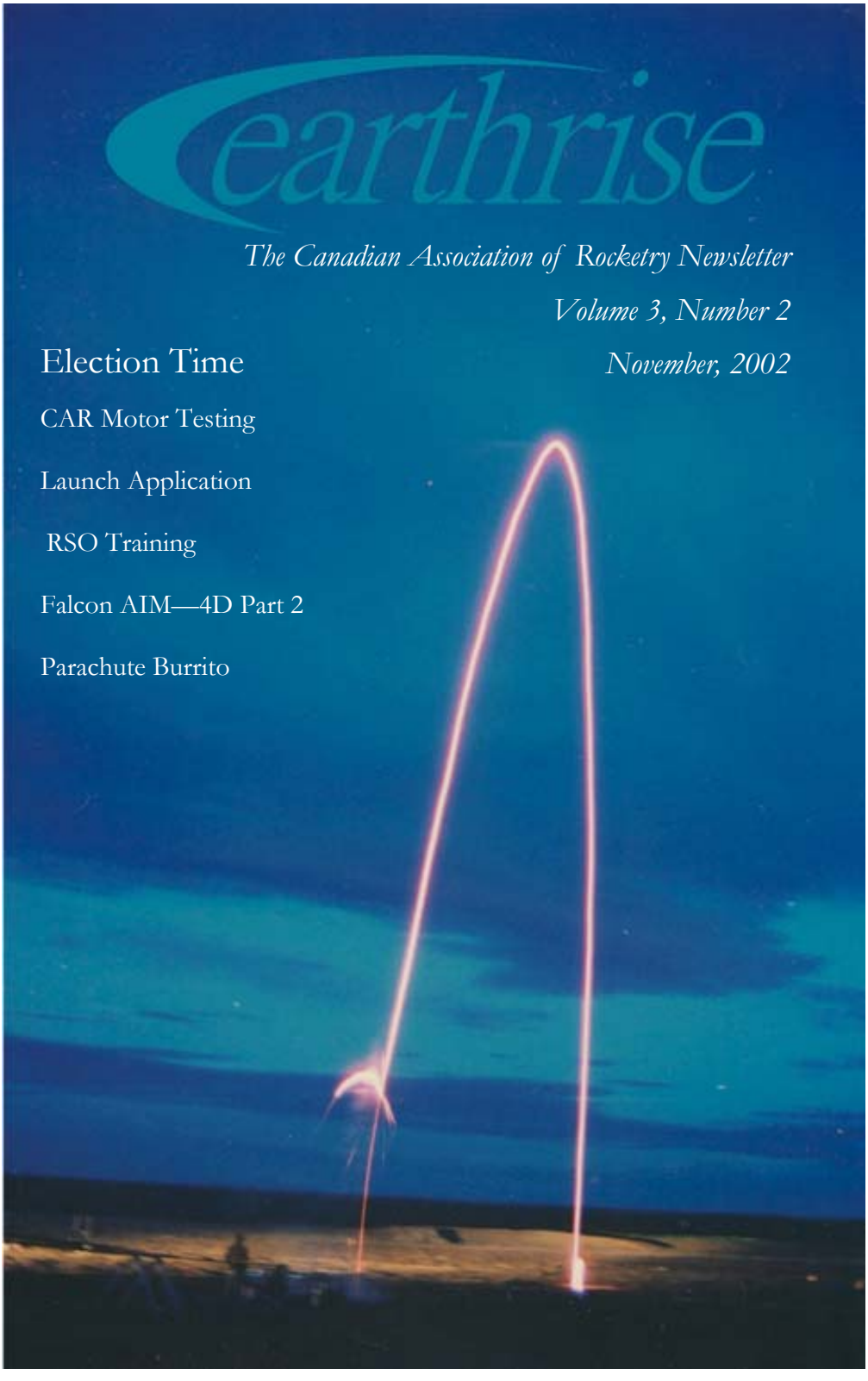
Parachute Burrito



Content

Send your articles and photos to the editor by mail or the Internet.

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I can scan photos, but if you mail your article, please send it in an elec-

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ON THE COVER

Brian Cole caught this night launch CANAROC Cato at Roc

A Word From the Big Chair

Dave Ross

Election Time

Yet another year has come and gone… and although this one was dismal for Earthrise, (no in-season issues), by and large, it was a good year for CAR;

Transport Canada has proposed new legislation that may come into effect in the new year, that officially recognizes the Canadian Association of Rocketry, the programs that CAR administrates (Flier Certification and RSO Certification) and returns the "Requirements for flying HPR" document to CAR administration. This is great news for CAR and reflects the respect that CAR has earned in our government's eyes. We look forward to publishing a "Legislative" issue of Earthrise outlining the details and implications when they are known in the new year.

In typically Canadian fashion, CAR Motor testing fashioned closer ties with both TRA and NAR despite their historical and mutual dislike for each other. Egos and politics aside, this sort of bridge building can only benefit rocketry participants and stakeholders in all associations, on both sides of the border. We look forward to working more closely than ever with these groups to unify standards for motor testing and promoting rocketry in general.

Much needs to be done in the upcoming term… Returning the "Requirements to launch HPR" document to the "we shall…" from its current "Thou shall …" format. Rewriting the website and all the relevant documents, including the certification exam and study guide to reflect the new legislative reality. Expanding the RSO certification program to properly oversee the ever expanding range of impulse and technology in use. Making Earthrise a sustainable and regular feature of CAR membership. Making sure all rocketeers, regardless of preferred impulse, find value in CAR membership. The list is long but not insurmountable, in light of the terrific people we are blessed to have "on board".

With that in mind…this is officially the "Election" Issue. Here is your chance to exercise the wonders of democracy and make changes where you desire. Nominations for any and all positions are being accepted by our elections officer, Mr. David Buhler (AKA Database Slave) until the end of December. All nominations must be a) accepted by the person nominated and b) seconded. A vote will take place, if necessary, in January for those positions that are to be contested.

The following list represents the current crew who help to make CAR happen.

....A Word From the Big Chair

Executive: (Elected)

Chairman	Dave Ross
Vice-Chairman	Max Baines
Past Chairman	Vince Chichak
Treasurer	Tim Rempel

Regional Representatives: (Elected)

Ontario	Bill Wagstaff
Alberta	Ken Latam
B.C.	Allen Upward
Sask.	Peter Meier
Manitoba	Rex Lee
Quebec	Yves Lacombe
Maritimes	Kevin Dryson

Volunteer Positions:

Database Administration	Dave Buhler
CAR web Administration	Ian Stephens
Transport Canada Liaison	Bill Wagstaff
Natural Resources Canada (ERD) Liaison	Mike Dennett

In addition, Mr. Bill Morgan (Past Treasurer), Mr. Terry Rea (Past Webmaster), and Neal Hickey (Past Earthrise Editor) all spent personal time during the past term contributing to the betterment of CAR.

On behalf of all CAR members I extend our collective thanks.

I have recently contacted each of the currently elected members and asked if they wish to

HISTORY

The origins of the newest endeavor for CAR can be traced to a phone conversation between myself and Anthony Cesaroni. This came during a highly frustrating time for CTI as they impatiently waited over 5 months for TMT to issue certification paperwork on a new series of Hypertek motors. In a fit of frustration Anthony pronounced he was convinced CAR could put together a motor certification committee from scratch in less time than it took Tripoli to certify some motors. Innocently (I thought) I concurred that this might be possible and we moved on to a new topic and I promptly forgot the conversation.

A few weeks later, shortly after CTI had paid to fly TMT East up from the U.S. to certify some new Pro 38 motors, Anthony asked me how CAR MC2 was coming. I had to answer truthfully that it wasn't.....

Yet, the concept made sense. Cesaroni Technology had a large number of new motors in the works, Propulsion Polymers was nearing completion of their R & D work, TMT was months behind in completing certification work and the NAR S&T was not a viable option for either large motors or hybrids: and at this point we hadn't even heard of West Coast Hybrids. A Canadian Testing authority, geared primarily for Canadian manufacturers but using Tripoli's testing procedures, would:

a) speed up the time for Canadian manufacturers

b) reduce the cost

c) help out TMT with their backlog

d) provide a valuable service to Rocketeers everywhere.

In discussions with CAR Chairman Dave Ross we agreed to move forward with the concept and see what developed.

The first step would be to write a manual. Mike Dennett, Propulsion Manager for CTI, was the only person I could think of who had actually been a part of a Motor Certification. And his 15 plus years in the hobby rocket industry gave him an insight as to the history of motor testing that no-one else in CAR had. After a few conversations, not only did Mike agree to be the first recruit to the fledgling committee, but he also undertook to write the first draft of the manual.

(Continued on page 6)

...CAR Motor Certification Committee

The manual, for those who haven't seen it, is a HUGE undertaking. Thanks Mike!!!

Following completion of the manual, Dave Ross opened the door to discussions with TRA president Bruce Kelly, and then he and I had follow-up discussions with TMT Chairman Mark Clarke. I have had several discussions via e-mail with NAR S&T Chairman Jack Kane, and have eventually asked assistance of long-time CAR supporter and past-Chairman Taras Tataryn to open discussions with NAR President Mark Bundick.

In the end we have a committee made up of some of the most experienced rocketeers in Canada, combined with some less experienced but highly enthusiastic members.

THE PRESENT

The first few months of CAR MC2 were incredibly busy, and not without its challenges. We have, to date, already certified 6 new Pro38 Smoky Sam motors, 2 new U.S. spec Pro38 J reloads, 4 new Propulsion Polymers 38 mm hybrid motors (H through J) and certified a new manufacturer, West Coast Hybrids, and their 38 mm I motor. In addition, we have inadvertently opened a can of worms with the certification of CTI's Pro 98 M2505 and the 3 Pro75 K thru L "Brand A" compatible Smoky Sam reloads. For those of you lucky enough to have attended Roc Lake 5, you saw almost everyone of these newly certified motors fly, and as Canadians we have much to be proud of our 3 manufacturers. These motors ROCK!!!!

We have Pro-54's in both regular and Smoky Sam, the balance of West Coast Hybrids 38mm series, Propulsion Polymers 29mm and 54mm, and the "biggie", CTI's 6 inch Pro150 O motor. And this is what we know of today-- wait until tomorrow!!

The challenge has been to create an atmosphere where CAR MC2, as the official certifying committee, MUST take a hard-line attitude with any shortcomings, whether real, regulatory or other reasons. The mandate of the Committee is consumer safety, and this even includes trying to make the user instructions compliant. At the same time, this committee is very committed to working with the manufacturers, offering suggestions and advice on how they can improve the product and make future certifications easier and faster. The balance between these 2 focuses is taking on almost an art-form, but I believe all Canadian manufacturers to date understand us when we say "no", but with these changes and modifications, we can change the no to YES.

Because our test stand is located in Toronto most of the testing duties will fall to Taras Tataryn, Robert Jones, Peter Cook and Bill Wagstaff. As Chairman I will be seeking the advice of Mike Dennett on regulatory issues, while Dave Ross has already demonstrated a real expertise in both hybrid technology and an ability to work with manufacturers to overcome any issues which arose during testing.

...CAR Motor Certification Committee

The last component is our CARweb webmaster. Ian Stephens has done a great job of getting the certifications up on the web in very quick order. A new feature is the "Report a failed Motor" report. Ultimately, should problems arise in the field with Brand X motors, it is up to the organizations which issued the Certification to conduct the review, and if necessary, suspend the certification pending the review process. Tripoli has a similar link on their web-page, and any failed motor reports they receive on motors certified by CAR will be sent on to us.

The FUTURE

CAR Launch Application Procedure

Wayne Gallinger

The procedure for applying for a High Power Rocket launch in Canada is straight forward, but if you have not done so before there are some steps that you may not be aware of. This document is designed to help with the process. There are 5 basic steps that are listed below along with some tips for each that should make the first application you do go more smoothly.

1) Secure a launch site. Your application must include:

A signed letter of approval from the landowner.

If the land is Crown owned then you need signed letters from the area land use board and the lease holder.

If the adjoining land will be needed for recovery and they are not owned by the same person then signed letters from them will be needed.

** The original letters must accompany the application**

You will need the following site specifications:

Longitude and latitude of launch and recovery area.

Size of recovery area

Distance of launcher from spectator area, buildings, and roads

Emergency contact phone numbers including:

Police

Fire

Ambulance

Hospital

Regional weather office that can provide cloud ceiling information.

Any other information your Transport Canada regional contact deems necessary.

...CAR Launch Application Procedure

2) Download and fill out launch application form. This form is available from the documents page on the CAR website.

An appropriately qualified RSO must be listed on the application and be on site for the size of motors.

L1 RSO for up to and including H motors.

L2 RSO for up to and including I motors.

L2 RSO + L3 flyer for J, K, L motors.

L3 RSO + L4 flyer for M and up motors.

On the page that asks for vehicle information, estimate the number of flyers you expect and the range of motors that will be used. More specific information will be included in your final report.

Plan your requested altitude to be 5000 feet above the highest planned flight. This will give a safety margin to ensure that nobody breaks the waiver. Transport Canada will determine the maximum altitude allowed based on site dimensions and distance from air traffic lanes. For high altitude flights altitude windows may be needed and will have to be negotiated with your Transport Canada contact. If altitude windows are used a call will need to be placed to the regional air traffic control center 30 minutes prior to the time of the window. Contact numbers for the office nearest you will be given on your launch approval form. Air traffic control has the right to disallow the window if the air traffic needs the area.

Make sure you have filled out all the information on the form. Any missing information will delay your launch approval. If you have any questions about what information is needed contact your regional contact and ask him or her.

3) Forward the completed application to your regional contact.

The Transport Canada regional contacts are:

...CAR Launch Application Procedure

Pacific Region: Mr. Jake Woelk – Transport Canada, General Aviation, 800 Burrard St. Suite 810, Vancouver B.C. V6Z 2J8 (604)666-5577 e-mail WOELKJ@tc.gc.ca

Prairie Region: Mr. Bill Atherton – Transport Canada, General Aviation, P.O. Box 8550, 355 Edmonton St. Winnipeg, Manitoba. R3C 0P6 (204)983-7413 e-mail ATHERTW@tc.gc.ca

Ontario Region: Mr. Jim Pengelly – Transport Canada, General Aviation,4900 Young St. Suite 300, North York, Ontario M2N 6A5 (416)952-0219 e-mail PENGELJ@tc.gc.ca

Quebec Region: Mr. Raymond Lambert – Transport Canada, General Aviation, 7oo Leigh Capreol, Dorval, Quebec. Suite 2033, H4Y 1G7 (514)633-3578 e-mail LAMBERR@tc.gc.ca

Atlantic Region: Mr. Dave Wall – Transport Canada, General Aviation, 95 Foundry St. Moncton, New Brunswick, E1C 8K6 (506)851-7439 e-mail WALLD@tc.gc.ca

Normally the applications are forwarded by mail, however the Transport Canada contact may be able to do so by fax at his or her discretion.

4) Keep clear records of all launches.

RSO Training Manual

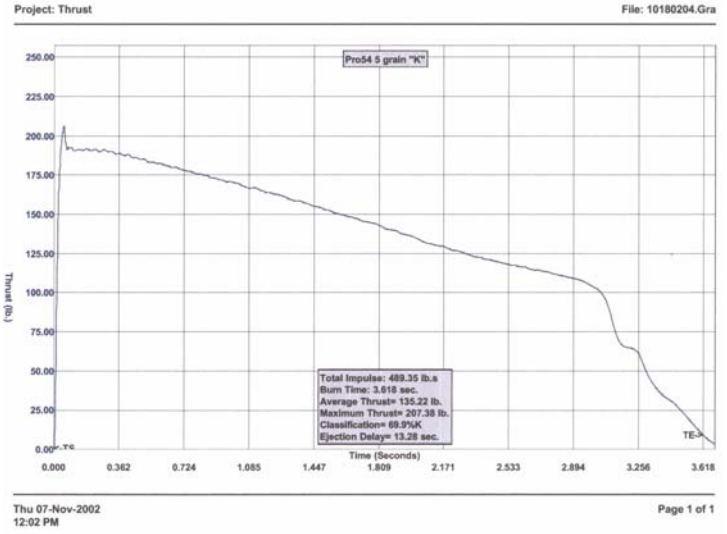
Max Baines

Motor Thrust Data

This is the first in a multi-part series of articles designed to focus in on certain key areas that a Range Safety Officer must take into consideration while inspecting a rocket prior to flight. The RSO is charged with the SAFE operation of the range, and while CAR's multi-level program based on field experience is very good, it is not always possible to guarantee that each candidate will be exposed to every variable. Please view these articles as augmenting the in the field training, and keep them handy as a reference for future situations.

One of the fundamental "rules" we use in assessing a rockets safety is the 4 to1 weight versus thrust ratio of the rocket. This golden rule, established over a number of years, simply stated, requires that the motor deliver thrust at a rate of 4 times the takeoff weight of the rocket. In other words, a 1 pound (454 gram) rocket requires a motor that delivers 4 pounds (17.8 N) of thrust. Several RSO's today apply a 5 to 1 ratio as an additional margin of safety, thus this same rocket would have to have 5 pounds (22.25N) of thrust. The safety ratio helps a RSO to ensure that the rocket will have enough speed as it comes off the launch rail to ensure a stable flight. This is why we have a scale at the RSO table to weigh the rocket, and why the Flight Data Card lists the motor to be used for that flight.

This 4 to 1 ratio has traditionally been based on the AVERAGE impulse that the motor produces, and does not take into account the INITIAL thrust of the motor, or more par-

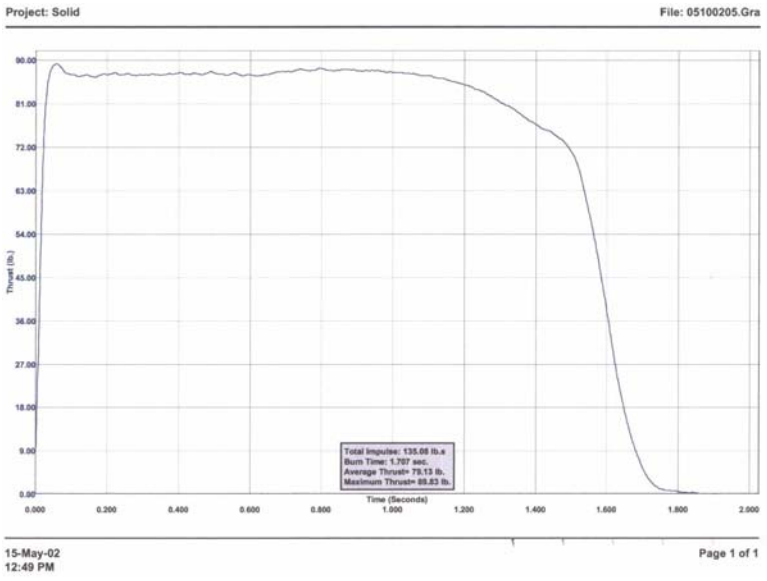


...RSO Training Manual

ticularly, whether the motor is regressive, progressive, or neutral in character. A regressive burn motor can lift a much heavier rocket than can a progressive burn motor, even though both may have the same average impulse. Let's take a closer look at some specific examples of these burn rates, and assess the impact these will have on the 4 to 1 ratio.

REGRESSIVE

Regressive burn motors start out at or near their highest thrust, and the thrust rate continues to fall throughout the burn. If we used the conventional 4 to1 ratio and applied it to the AVERAGE impulse of the motor pictured above which is a K600 (601 N or approx 135 lb average thrust), we would arrive at a motor which could lift a rocket weighing approximately 33 pounds. Using a 5 to 1 ratio it would lift about 27 pounds. However, when you carefully examine the thrust data you note that the maximum thrust of this motor is near to 207 pounds thrust, and during the critical first 1/4 second, which is the only part of the burn which determines liftoff speed, this motor develops about 190 pounds of thrust. Again, using the 4 to 1 ratio and applying it to the 190 pounds of thrust, then this motor could safely lift a rocket weighing 47 pounds, and at 5 to1 it would lift about 38 pounds. Using the AVERAGE thrust of a motor does not give a true indication of the lifting capacity of a REGRESSIVE BURN motor.



...RSO Training Manual

If, as an RSO, you apply only the 4 to 1 safety margin, in most cases with regressive burn motors you will end up with a 6 to1 or even 7 to 1 safety margin. The difficulty will come when a rocketeer shows up at your table with his M rocket that he is using a regressive burn K motor to do a test flight with, and you will have to be aware of the actual thrust characteristics of this motor in order to make a true assessment of whether the rocket will have enough speed at the end of the rail to be stable. If there is any doubt in the mind of the RSO, he (she) should ask the rocketeer to provide a thrust curve for the motor. This is easier than it sounds, since almost all high power motor manufacturers provide a thrust curve as part of the instructions.

With the increasing popularity of Hybrid motors, this will become an ever increasing dilemma as almost all hybrids are regressive in nature.

NEUTRAL BURN MOTORS

Neutral burn motors are the easiest for an RSO to deal with. The initial thrust is very near to the average thrust of these motors, thus applying the 4 to 1 ratio will almost always result in the rocket having sufficient speed to be stable. For example, the MAXIMUM thrust of the CTI I350SS shown above is approximately 89 pounds, thus if we apply the 4 to 1 ratio on maximum thrust only this motor could lift a rocket weighing about 22 pounds. The AVERAGE thrust is nearly 80 pounds, thus applying the 4 to 1 ratio results in this motor having the ability to lift a rocket weighing 20 pounds. The difference is small, and the 4 to 1 ratio can be easily, and safely, applied.

PROGRESSIVE BURN MOTORS

Happily there are very few of these types of motors in the hobby rocketry arena. With these motors, the LOWEST thrust occurs during the critical first 1/4 second of burn, and the stated average thrust will be significantly higher than its initial thrust. Progressive burn motors can not have the usual 4 to 1 safety ratio applied to the AVERAGE thrust of the motor, and the RSO will have to know what the initial thrust is in order to determine the maximum safe lifting capacity of these motors.

WHAT ABOUT SIMULATION PROGRAMS

It has become common place for HPR flyers to use computer simulation programs to determine the speed of a rocket at the end of the launch rail. These programs are a good aid to a RSO, but there are still some concerns which arise. Firstly, there is NO requirement for a rocketeer to provide a simulation. This is, and likely always will be, optional extra infor-

Falcon AIM—4D A Level 4 Project—Part 2

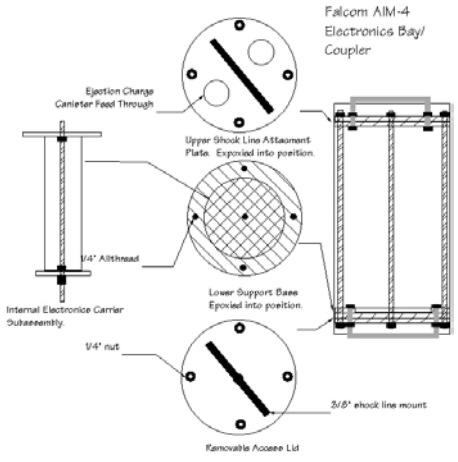
David Buhler

Falcon AIM-4D Part 2 Ebay and Launch by David Buhler

Electronics Bay designs are as numerous as there are rocketeers and rockets. Not many of my rockets have the same design, it may be from experimenting or just adapting to the size of tube and space available or both. My latest design I felt pretty good about, not only was it for my L4 project but it gave some flexibility in electronics, room to wire, ease to assemble and so on. Working with a 6 inch tube afforded the room to wire things but I also had to keep the length down to make room for the recovery space. In scale designs and keeping things scaled there is only so much room one can use for all the rocket components (an M1315 is 32 inches long in a 85 inch rocket).

The basic design parameters were; space (10"x 6 dia"); ability to load two main ejection charges from empty bay; connections for two drogue ejection charges; sealed bay from ejection charges; vented to outside for barometric altimeter; room for power and safety switches; removable mounting structure for electronics, easy wiring and simple to prep.

I accomplished most of my goals with this design, if you look at the layout, (top is toward nosecone and main bay). I was able to mount two plastic 3/4 " irrigation couplers into the main/ebay bulkhead. Electrical nuts were used along with epoxy to seal the outside threads.



On the ebay side, irrigation pipe end caps were used to hold the ejection charge (EC) inside the coupler. There is a small hole in the end cap to allow the EC wires into the ebay, which was sealed after running the wire through. Wiring from the EC goes to a screw terminal block on the electronics subassembly. All wiring from the switches and EC are separated from the electronics via a 4 inch tube which is inserted after the ECs are installed. Five 1/4" all thread rods are used to couple the main/ebay bulkhead to the removable drogue/ebay bulkhead/lid. Four rods were place on the outside radius of the six-inch tube and one was attached to the center of the drogue/ebay bulkhead. This center rod held the base for the electronics and wire block. Although it would have been nice to have a detachable base, I opted to have the wiring hard wired with no extra connections (except the drogue EC). This meant that the base could not detach from the ebay/coupler easily.

Some pics of the actual bay. Figure 1 shows the internal layout with the ejection charge feed through holes. Figure 2 is the same view with the separator tube installed to keep the wires outside and the inside free and clear. At the bottom, you see the white cap for the ejection charge holder and seal. So what fills the inside? Figure 3 gives a side view of the mounting base for the electronics. The current view is the adept side, just below that is the wire connection points to the rest of the rocket. The all-thread to the right, screws into a coupler nut at the top of the bay (see figures 1&2).

On to figure 4, the electronics base is installed and lined up ready for the bottom shock anchor plate (top plate on pics). Figure 5 has the plate installed. Finally, in Figure 6 the outside switches. If I had to do this again I would reduce the switch count by a few. Part of the safety criteria is to have the EC shorted and disconnected from the electronics and this added a bit more to the wiring.

The Flight was great. It did a little wiggle a few hundred feet up (not sure why) but just kept on

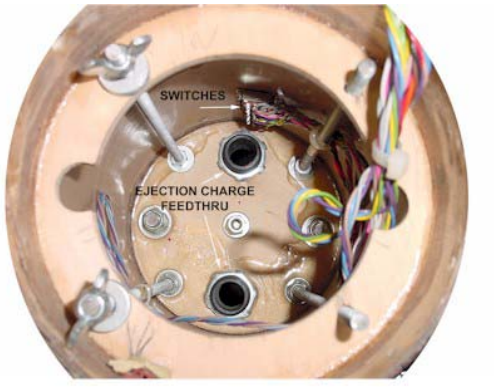


Figure 1

going. Flight spun a little, from what I hear, I barely remember the whole flight. Way too much anxiety and excitement. I did not see the drogue come out but saw it shortly after, drifting in the wind, further and further away. Now the lump in the throat was back and I'm trying to guess when the main will come out. As it creeps closer and closer to the ground I run back in my mind, did I wire the charges properly, enough BP, did I turn the switch on, OK luck, WORK! A few seconds later, a mile or so in the distance I see the nose cone pop off followed by the deployment bag, then the chute unfurling and filling. What a sight, and the crowd went wild… well at least that was what it felt like to see it all work first time round!

Matthew, my son, helped with the recovery, we found everything strewn out nicely on the ground (about 80 feet of stuff.) The quad came out to help and so Matthew rode back with the upper section back and I ended up lugging the booster section back on foot…. my penance

Figure 2

for something I guess.

I flew the Falcon at the Lethbridge Air show on a L850, with much thanks to Max Baines. Again, a beautiful flight, nice and slow liftoff and apogee at 3500 feet. Unfortunately the drogue was tangled in the fin section and made a rapid sideways descent. At about 200 feet the main went off but came in too fast for the chute to deploy. One rear fin broke and one long one was twisted, the rest survived quite well, no tube damage. (Read, it was way over-

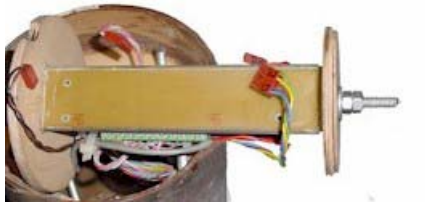


Figure 3

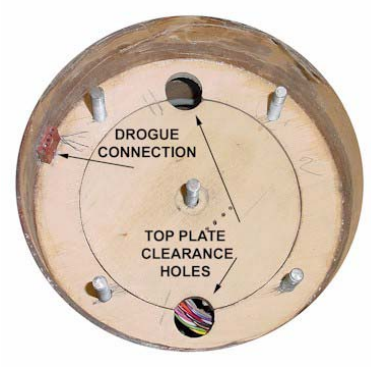


Figure 4

Figure 5

built, me thinks). Think I could sell the military a few??

Barometric Vent Holes

One question that seems to pop up every once in a while is, vent holes how many, how big? There are formulas out there such as:

$$Dia = \frac{p \times r^2 \times l}{c \times n}$$

r is the radius of the electronics bay

l is the length of the electronics bay

Figure 6

n is the number of static ports

c is a constant; 400 for a single port, or 200 for multiple ports

Basically it is: internal ebay volume / (number of holes x a constant)

Paraphrased from the missile works manual http://www.missileworks.com/ and FC877 manual http://members.shaw.ca/fc877/

This gives, in my opinion, pretty big holes. I am not sure of other formulas out there but this one seems to be used a lot. So, what do you do if something does not look right, TEST (BTW this goes for ejection charge sizes also.) You'll notice the c constant in the above formula, you need to ask what that constant entails, what assumptions were made to simplify the formula, do they fit your model and planned flight characteristics. Not having the foggiest, as is mostly the case, I tested.

Equipped with a vacuum pump and gauge I pumped out the 280 cubic inches of air from the ebay to 24" Hg vac. I let go 1 1/4" hole and timed the response, it was definitely less that two seconds to equalize from about 36,000 feet (asl). Two holes were around 0.9 sec. Now this was a crude test and I took it further, using a microcontroller and pressure sensor and timed the rise in pressure to within 3 kPa of ambient from various vacuums with one 1/4 inch hole release. Of note, the 60-kPa release to 83-kPa took less than 0.6 seconds (~12000 ft asl to ~3500 ft asl).

Looking at my flight profile it would be 5 seconds from launch to burn out and 20 seconds

The Parachute Burrito

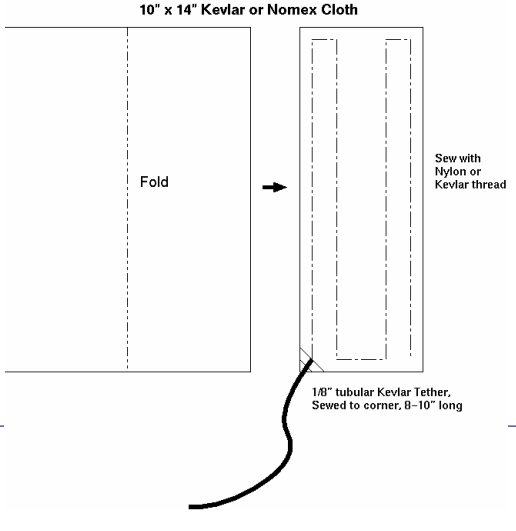
Marcus Leech

A new 2-stage recovery system

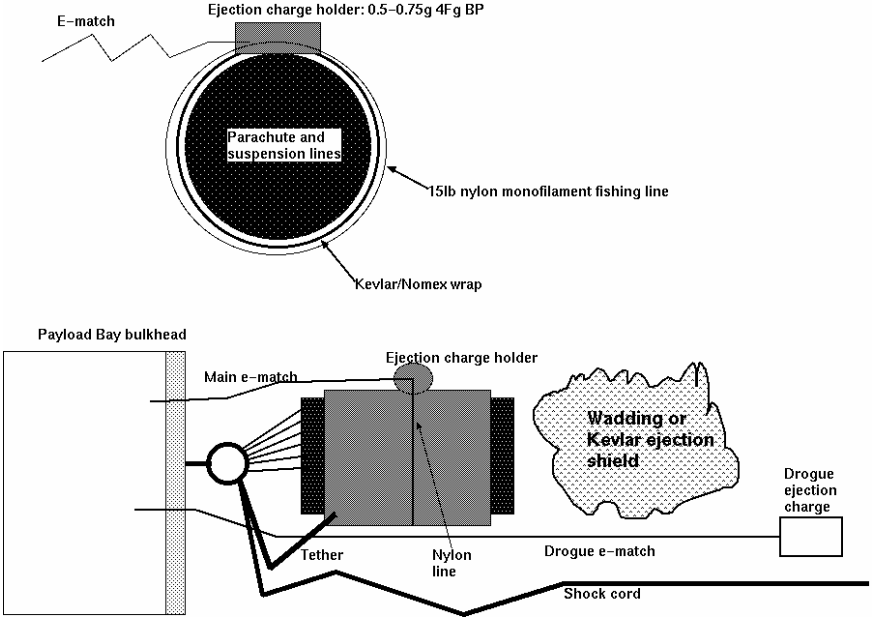
Those of you who know me understand that I like to fly hybrids, and more specifically, hybrids of my own design and manufacture. Hybrid fliers face a challenging problem when it comes to two-stage deployment for their recovery systems. Hybrid rockets are already volume-constrained due to the much-longer length of hybrid motors for any given motor diameter and impulse than corresponding composites (this is natural, since the N2O oxidizer is about ***half*** *the density of the ammonium perchlorate used in solid composite motors). This means that you can either make your rocket ungainly long, to accommodate a separate bay for the main parachute, or use a PRM to deploy the main out of the same compartment as the drogue.*

This flying season, I've been using a novel PRM-like system for two-stage deployment where the main deploys out of the same compartment as the drogue. The scheme also works for drogue-less two-stage, which is what I actually use most of the time. I call this scheme the "parachute burrito", for reasons which will become obvious very shortly.

I happened to have some samples of Nomex™ and Kevlar™ cloth lying around, and I got to thinking about their use in a scheme for deploying the main parachute. The idea was incredibly simple—wrap the main parachute "bundle" (the canopy and suspension lines) in a wrap of Kevlar™ or Nomex™ cloth, tie it together with a piece of nylon monofilament, and attach a



pyro charge to the nylon line. With this arrangement, the nylon line is broken by the pyro charge at the appropriate time, and the whole thing unwraps. Dave Ross and I tried a primitive version of this on the ground at Roc Lake V, and it appeared to work well—I decided to actually try it in my CAR L2 certification flight on a Propulsion Polymers I160 motor, in the 4" Black Adder II airframe. It worked like a charm, deploying a pair of 42" chutes when the Altacc



Perspectives of a Rockteer's Wife

Peggy Kemp

Or

"An "M" Motor costs **HOW** much?"

One day my husband brought home the great movie "October Sky". The whole family enjoyed the rocket shots, and the movie seemed to re-light a passion for rocketry that Leon had not enjoyed for 15 or 20 years. Together we decided that rocketry would be a great hobby for our family. That was before I realized a lot of things about the hobby.

First of all, rocketry cannot be limited to $12.00 kits anymore. Leon attended his first mid-power launch, and heard the guys talking about flying "J's". "Js?" he exclaimed. "When I was a kid, "D"s were considered big." That was the advent of a family trek into the mysteries of high power rocketry. We started off small, with one of Blackhawk R&D's great Black Brant X mid-power kits. That was launched to an altitude of a mere 1,500 feet, and the hunger for "MORE POWER" only increased.

Secondly, I did not realize just how much the paraphernalia of rocketry can take over your life. This comes from the woman whose bedroom has been decorated in early American rocketry for the past year. Honestly, for a while a 9-foot section of a future model of a V-2 stood in my bedroom. Hmmmmmm. This doesn't even begin to take into account various wonderful tools, cans of pretty paint, and smaller rockets that creep into fill all available space. Before one launch I swear that I almost could not walk into the bedroom for fear of disrupting a herd of rockets in various states of repair and disrepair. Oh, Wait! The disrepair part comes after the launch, when all the little rockets are being put to bed.

Thirdly, I did not realize that rocketry is contagious. Our 13 year old, Bethany, asked for and received her first mid-power rocketry kit last year for Christmas. Her rocket, named "Gwahair" after the eagle king in "Lord of the Rings", made its maiden flight at this year's Roc Lake meet. She also looked with gleaming eyes at her Dad's "J" project, and started talking with rockets in her eyes about being 14 next year. I think I know what she wants for Christmas this year, although she hasn't realized just how difficult passing the test might be. Even the two little ones want "bigger rockets, MORE POWER."

Lastly, I was a bit amazed at just how much the sport can cost if you get really into it. When I speak of cost, I do not only mean money, although high-power motors could cause a slight heart attack ....as I said in the title, an "M" motor costs HOW much??? There are also costs in time. Ask anyone with a shiny rocket just how much time they put in sanding the thing. I also discovered that sanding is (hack cough) a better thing done outside the house, even if it is the middle of winter. And painting is something best done far away from the house (ah, the

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CATO Corner

Mark Roberts

At a launch of the Moncton Area Rocket Society (MARS) on August 18, 2002, I experienced a relatively rare event - the CATO (**CATO**strophic failure) of a motor. It was all the more unusual by virtue of the fact that I captured the CATO on film (see photo). On this particular flight, I was using a two-stage, D-powered Custom Lightnin', with a D 12-0 in the booster and a D 12-7 in the upper stage. Just after lift-off, the booster motor CATO'd at an altitude of roughly 10-15 meters. At this point, the upper stage motor ignited and the flight of the upper stage was normal, although at a fairly low angle, the trajectory having been affected by the blast of the booster motor. The booster stage was recovered undamaged a short distance from the pad. The motor casing was intact but the nozzle was missing, indicating that it had been blown out the rear of the motor. Upon recovering the upper stage, I found that the D 12-7 motor had been displaced approximately 2 inches forward into the motor tube and the bottom portion of the motor tube had been burned out. Otherwise, there was no damage.

The photo shows a fireball to the right of the upper stage and several smaller sparks shooting up above the upper stage. I assume these are bits of burning propellant. The booster stage appears to be still on the launch pad but is probably on the way toward the ground behind the pad. There are two puffs of smoke apparent in the picture, a larger one on the pad which probably is from the ignition of the booster motor and a smaller one above, probably resulting from the ignition of the upper stage motor. From the photo, it appears that the booster motor failed almost immediately after ignition, rather than when the rocket was 10-15 meters above the pad, as I had believed. Even though the nozzle was blown out, most of the blast must have been directed upward, as evidenced by the large fireball, causing the upper stage to ignite.

...Perspectives of a Rockteer's Wife continued

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aroma of freshly sprayed paint).

High-power kits, or even "scratch-built" rockets will add up in cost before the work is finally completed, especially as you enter the high-power rocketry stage and need to think about various electronic devices to ensure getting your rocket back in one piece, or to find out just how far up you went. The end result can be pretty spectacular, though.... and hopefully the "rocket gods" allow it to come back in one piece, or you start the whole process again. And you do want the rocket back, especially when all that time has been wasted....I mean spent working on the thing.

On the plus size, rocketry has made buying Christmas and birthday presents for Leon a whole lot easier. I think most of his presents for the past two years have had something to do with rocketry, be it combination birthday/Christmas gift of a new altimeter (cough cough hack hack...how much does that thing cost????), a set of binoculars, or a cute little table so he doesn't have to prepare the rockets on the ground.

...Cato Corner

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