



earthrise

Volume 5 Number 1—April 2005

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The Canadian Association of Rocketry Newsletter
Volume 5 Number 1
April 2005

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A Word From the Big Chair

Ian Stephens

Since this is my first "Word from the Big Chair" since becoming Chairman, I want to take this opportunity to thank David Ross, Max Baines and David Buhler for their efforts over the last few years. Dave Ross, as Chairman, and Max Baines, as Vice Chairman, have worked extremely hard during their two terms at the helm of the Association and have done a great job of holding things together through some interesting times in our hobby. David Buhler has done an incredible job of maintaining the databases and processing memberships and all the other administrative and paperwork required to keep things going.

So - Thank you Dave, Max and David!

The last few months have seen some historic events in space exploration and rocketry, especially in the amateur and non-governmental areas. First the continued exploration of Mars by NASA's "Spirit" and "Opportunity" Mars Rovers has exceeded all expectations. Congratulations go to Ky Michaelson and his team for his recognition as the first amateur team to reach space with their "GoFast" rocket, soon to be displayed in the Smithsonian. Ky and most of the volunteers on the "GoFast" team are TRA members. Also huge congratulations to Burt Rutan and the Scaled Composites team for their achievement - winners of the X-Prize competition for the first non-governmental group to reach space with a reusable manned spacecraft. There are also amateur rocketry connections here - the motor used on the SpaceShipOne is a hybrid, running on nitrous. It's unfortunate that the DaVinci Project team were not able to get their project "off the ground". Perhaps we'll see them and the Canadian Arrow team fly their projects sometime in the future.

Earthrise is published on an "availability of information" basis. When sufficient content has been received by the Earthrise Editor from the rocketry community, the next issue will be produced. Send your articles and photos to the editor by mail or the Internet:

Earthrise Editor
c/o Shane Weatherill
28 Douglas Glen Cr SE
Calgary, AB
T2Z 3M6

Earthrise@CanadianRocketry.org

ON THE COVERS

Front: A LOC/Precision Norad heads in the right direction at a Spokane Area Rocketry Club (SPARC) launch near Spokane, Washington. The motor is an Aerotech G40-7W.

Back: Vince Chichak's level 4 rocket waits on the pad at Roc Lake 7 before a successful certification flight.

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- they can be a lot of fun.

The two launches that I attended in Canada were relatively large so I can't really compare them to the Tripoli launches in the U.S. The CAR launches were a bit more formal and vendors were present, but then, these differences are more likely related to the size of the launches rather than the fact that they were on different sides of the border. I got a lot out of volunteering for a shift as rocket inspector at Roc Lake VII. This was a great opportunity to see some well-built, complex rockets up close and ask questions of their owners about building details. In this respect, the larger, more formal launches are an advantage. Roc Lake VII was a bit disappointing in that the two vendors present had little for sale besides motors. Vendors have supported the Roc Lake launches in previous years and I hope that they will support future launches, too.

I would like to put in a plug for the vendors who attend launches. It is really an advantage having vendors at the launch. I, for one, am a real sucker for rocket goodies at the launch (I can feel my wife nodding her head and rolling her eyes in the other room). Where else can you go to see high power goodies? I think vendors should get some sort of perk, perhaps launch fees could be waived for any vendors who attend a launch and also fly rockets.

Most launches, large or small, attract spouses, significant others and spectators who come out to watch or to support the fliers. These people really provide an added dimension to launches which we often appreciate but don't recognize. My wife is an excellent example. In addition to helping prep and retrieve rockets, she adds a lot of good spirit and good company to the launch. And people don't have to help directly to add to the spirit of a launch. For example, at Roc Lake VII, there was a group of Hutterites from one of the three nearby colonies who came to watch the launch. My wife was highly entertained by the reactions of the Hutterite children to each flight. As the LCO announced a flight, the kids would quiet down and pay attention. Then, as soon as the rocket left the pad, they would burst out chattering in German, pointing and gesturing. A good time was had by all, especially my wife, and we all benefited from the good spirit.

I found that all of the launches, large or small, in Canada or the U.S., had something different to offer. With some effort and advance planning, one can participate in high-power launches in the U.S. My wife and I made numerous new friends and enjoyed some spectacular scenery traveling to the launches.

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class motors and I really liked their long burn characteristics. It is an advantage to have both the Aerotech and Cesaroni motor casings. This increases your chances of finding motors to fly. Contact a Tripoli member who is willing to help place a motor order well in advance. It will take a couple of weeks to place an order and have it shipped by ground without stressing anybody out. More time may be required if there is a large club order in the works. I suggest that you contact the person a month (or more) in advance. Remember, the order must be placed by someone with a LEUP and approved storage magazine. This person must retain possession of the motors. I found the people I dealt with to be very helpful. To find out who to contact for a particular launch, get hold of the launch organizers or the Tripoli prefect in that area and ask who can help you out.

CAR members can fly at Tripoli launches and their certification level is recognized as the equivalent to the Tripoli certification level. Insurance presents a problem, though. Right now, unless you are a Tripoli member, you have no insurance coverage and must accept the risk for any damages that you cause. You will not be prevented from flying because the launch organizers, the sponsoring Tripoli prefecture and the landowner are all covered by Tripoli insurance (but you are not unless you are a Tripoli member).

The launches that I attended in the U.S. were typically small, ranging from three to perhaps fifteen fliers. There were no vendors at any of the launches. If you attend large launches where vendors are present, then you don't have to worry about placing your own motor order as I described above. Just be sure to confirm with the vendor ahead of time that your desired motors will be available. At the smaller launches, there were no crappers ...er, porta-potties... available. In these cases, large clumps of sagebrush and distance are your best friends. Bring your own toilet paper and bottle of hand sanitizer.

I really enjoyed the small launches. Everyone inspects (and admires) everyone else's rockets and, in fact, you are all almost prepping each others' rockets together. You serve as your own LCO. You are all good friends by the end of the launch. Another advantage is that the turn-around time for launching is quicker. There are no waiting lines and fewer distractions during prepping. My record was 5 high power flights in one day (between 9am and 4pm). Of course, the disadvantages are that there are no vendors, no sanitary facilities and fewer people to talk to (for those of you who are socialites). My advice: Don't look down on the small launches

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In spite of the ongoing issues that HPR has with the BATFE and other regulatory bodies in the US, amateur rocketry is alive and well - achieving more and more milestones every year. We can all be thankful here in Canada that our relationship with the two main governmental bodies that we interface with, Transport Canada and ERD, is so good. In fact once the new Canadian Aviation Regulations are in force, CAR and our safety and certification programs will be fully recognized by Transport Canada. In many ways, it would be easier to fly large milestone-type projects here in Canada than in the US.

As the Chairman and President of CAR, my vision for the association is to provide all rocketry enthusiasts in Canada with a structure and organization to help them achieve whatever dreams they might have in the amateur aerospace world, from kids to adults and from model rockets to advanced high power. To get there, a few things have to be done.

- First, the organization has to be more formal and national in scope. As I have mentioned before, the Executive is seeking Federal not-for-profit incorporation for CAR and new organization with a board of directors and formal local club affiliation.
- Next, all our programs and forms, such as HPR certification, will be updated and made consistent to clearly reflect the CAR "brand".
- To be truly national in scope, we need to have much of our communications available in French. Watch for French versions of the forms and programs to come, and hopefully soon, CARweb in French. While I can't promise that any of the Executive will be able to respond in French, French speaking members should be able to read up on the programs and use the forms that are in their language.
- By the time you read this, the CAR Model Rocketry Committee should be up and running, with a particular focus on promoting model rocketry.
- Insurance is critical to CAR growing at all, and to the survival of model rocketry. Dave Ross, Manager of Insurance and Risk Assessment, is getting closer to having insurance companies give us some attention and reasonable premiums.

Getting back to milestones for a moment, a significant event is happening this summer near Lethbridge, Alberta. If you haven't heard of this before, for the first time, the annual TRA launch, LDRS, is being held outside the US at the site of the annual Roc Lake launch near Lethbridge. There is sure to be more information on LDRS24 elsewhere in this issue. Max Baines,

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the launch organizer, and his team are doing a great job and I'm sure that LDRS24 will be one of the most memorable LDRS events, if not the most memorable launch ever!

On a final note, in spite of the explosive nature of our hobby, we enjoy an enviable safety record. The reason for that record is the emphasis that we, as an organization and as individuals, put on safety. We need to continue to emphasize safety in all aspects of our hobby, and not just at the range. Think safety at home at the shop, and when you are driving to and from a launch. It would be too easy for the fear-mongers to capitalize on any incident anywhere and use it to try to shut down or restrict our activity. So Safety First!

I hope to see many of you at LDRS or Sullivan Lake and I hope to make it out to an eastern launch this year as well. Thanks - Clear Skies!

How to Build a Level 4 Project in 24 Hours

Vince Chichak

It all began 4 years prior on a road trip to and from a BALLS launch at Black Rock Desert Nevada. Dave Wakerchuck, Dale March, and I were to meet at a fellow rocketeer's house in Seattle for a night of rocket talk before heading out on the highway to attend a BALLS launch. I had arrived early and no one was home yet so we decided to head into Seattle and check out our favourite rocket materials hideaways. While there we spotted several lengths of fiberglass pipe. In the stack of pipe I found a 30 ft. length of 4.5 inch pipe that looked like it was in good shape. I checked with the office and discovered they would sell it by the pound. I would have bought the full length except that Dave's Volvo could only accommodate a 10 foot length. I found a chop saw and cut off 10 feet. Total cost \$3.00 U.S. Excellent! The pipe was used for a lot of things, one of which is to carry water on oil well sites. It was filament wound fiberglass with an epoxy resin. The bore was baby smooth but the outer diameter is very rough and needed to be smoothed out. Obviously, no one makes a nose cone for a

Contributing to this Issue...

Earthrise would like to thank the following contributors: Vince Chichak, Greg Dietlein, Nelson Eisel, Tim Rempel, Marc Roberts, Ian Stephens, Shane Weatherill

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sympathize with the Canadian vendors who have to go through this process every time they obtain motors from U.S. suppliers. The suppliers periodically receive shipments from Aerotech and update their websites with a list of available motors as they receive them. The popular motors sell out literally within hours. For example, Magnum Hobbies will automatically email updates of available motors as they receive new orders to those who are signed up on their list. If you want to order any motors, you respond by email and Magnum will call you back to complete the order. Magnum fills orders on a first come, first served basis, based on the date and time of the email replies that they receive. The vendors charge shipping and HAZMAT fees. Giant Leap Rocketry will pay the HAZMAT fee if the order is over \$250. Of course, I am talking about ordering within the U.S. here. The vendors will not ship outside of the U.S. unless you have the necessary import permits. Motors from other manufacturers such as Ellis Mountain and Cesaroni seemed to be more readily available.

My advice is to be flexible in the motor types that you are willing to use. The motors that you really want may not be available from a particular vendor or may just have sold out. Be willing to try motors from different manufacturers. While in the U.S., take advantage of the wider choice of motors available. I tried some Ellis Mountain single-use H and I impulse



A mid-power rocket takes to the sky at the Big Sky Rocketry Association launch site near Twin Bridges in southwestern Montana. The Tobacco Root Mountains form the backdrop.

The past year was a good year of rocketry for me. Usually, I attend two high-power launches per year. This year, thanks to my location within a day's drive of four launch sites, I was able to attend eight high-power launches. Was I happy!

I was located in western Montana for the year and participated in launches on both sides of the border, including Tripoli-Montana launches at two different sites, Tripoli-Washington launches near Spokane, Washington, and two CAR-sponsored launches (Sullivan Lake XI and Roc Lake VII) at the Roc Lake site near Lethbridge, Alberta. My purpose in this article is to describe some of my experiences in flying on both sides of the border and offer some suggestions to other CAR members who may wish to participate in Tripoli launches in the U.S.

The first and biggest challenge was obtaining motors in the U.S. I joined two different rocketry clubs associated with Tripoli prefectures, the Spokane Area Rocketry Association (SPARC) and Big Sky Rocketry Association (BSRA), as soon as I arrived in Montana. I flew only mid-power motors for the first two launches until I was able to get access to high-power motors through other SPARC and BSRA members. Obtaining mid-power motors was not a problem at first. Until early spring 2004, I was able to purchase Aerotech G40 and G80 motors at two different hobby shops in Spokane, WA; then they ran out of inventory and were not able to obtain additional motors from Aerotech. For some reason, the hobby shops had a large stock of Aerotech F21 (24mm) Econojets, so I had this to fall back on as my workhorse mid-power motor during the year.

For high-power motors, I made arrangements with a SPARC member to share his inventory. This requires advance planning and the cooperation of a Tripoli member with a low explosives user's permit (LEUP) and a storage magazine approved by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF). I provided him with a list of the motors that I wanted and he ordered the ones that were available from the vendor. He brought his motors to the launch site and I would sign out the motors as I used them at that launch. With this arrangement, he retained possession of the motors at all times and there was no chance that any motors could leave the launch site or be handled by unauthorized persons. Because I also wanted to fly at Tripoli-Montana launches and could not transport the motors from the Spokane launch site, I had to repeat the process with a BSRA member who had a LEUP and magazine for the Montana launches.

Ordering motors (particularly Aerotech motors) is a bit of a crap shoot and I

4.5 inch fiberglass tube. I figured I would just have to make one later.

With my new air frame strapped to the roof of the Volvo, we made our way back to our host's house for a night of rest before our drive to Black Rock Nevada. We stashed the tube at his house until our return trip.

Late the next day we arrived at Black Rock and spent the next few days flying EX motors and talking with the people there. One of the guys we met there was from Oregon where he owned a shop used to build surf boards and other related parts. Being a rocket guy, he also built carbon fiber fins, tubes and nose cones. "Hmm," I thought, "maybe I will just buy some of his carbon parts and build a rocket with that." When I found out how much it cost for hand made carbon parts I decided I had better stick with my 10 foot long fiberglass tube for \$3.00.

That night we went into Brunos for dinner and refreshments to wash down the play and to re-hydrate ourselves (Mmmm, Miller High Life- the Champion of Beers!). I ate dinner, had a few brews, and played one of the 4 slot machines in the "Casino" and won \$40.00. Later, we started to talk about how to make a nose cone for the 4.5 inch tube I had found.

Mr. Surf board/carbon fiber guy said to me "Hey I'll make you a nose cone. What do you want it made out of? Fiberglass, Kevlar, Carbon?"

Naturally I responded, "Carbon of course! How much?"

Carbon guy says to me, "Give me the \$40.00 you just won and I send you a carbon nose cone. What L/D ratio do you want?"

"5:1," I respond.

30 days later a big brown box shows up at my door with a gorgeous 4.5 inch carbon fiber nose cone with a 5:1 ratio. Way Cool!

Because of long working hours, being sick for 5 months, being fired from my job, and life in general, the tube and nose cone sat in my garage for 4 years.

During these years I went to almost every launch held in Alberta and several outside Alberta. Almost every time I saw Max Baines there, he harassed me to get a rocket together to fly my level 4. In fact, every time I spoke to him he did the same. One day Max said he had demo motors from

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CTI, but not enough rockets to fly them in. If I could get the rocket together, I could end up flying my Level 4 on a free M motor. This was too much for me to take and I decided I could kill two birds with one stone. Fly my level 4 certification (on a free motor) and get Max off my case. Done!

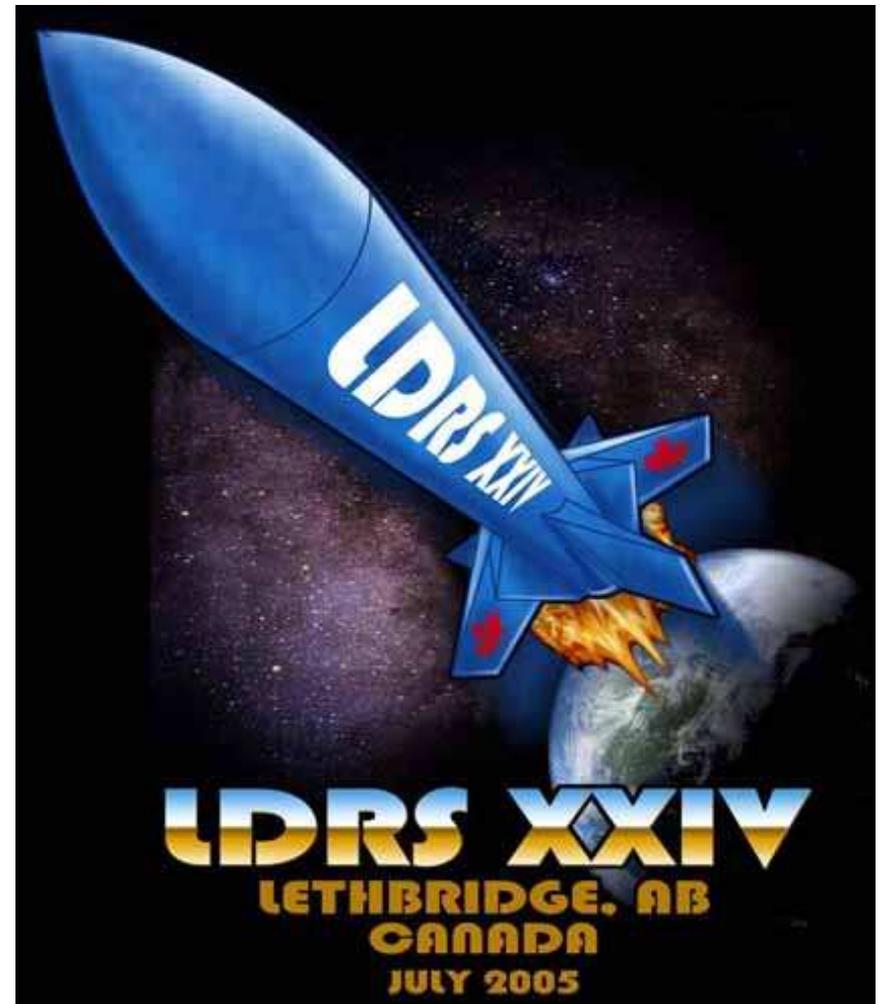
My only problem was that I had started a new job and I was working 12 hour night shifts 5 days a week and some weekends which left very little time for up keep of my house and my life, never mind hobbies. So for a couple of months the nose cone and tube sat on my work bench in my garage, untouched until finally I got a long weekend off work. I decided that if I was ever going to get this rocket built, I would have to have to do a lot of work this weekend.

The first thing I needed to do was to smooth out the rough exterior of the body tube. Being an industrial strength filament wound fiberglass tube, it had a really tough finish that I found extremely hard to sand. After trying several types of sand paper that did very little to smooth out the epoxy, I finally found that Aluminum Oxide paper held up really well to the tube, but it was hard work using a sanding block. "Hey wait a tic, I have a garage full of power tools." Under the work bench, I found a DA sander. I blew the dust off it and stuck on a disk of the sand paper, fired up the air compressor and set wheel to tube. That worked really well and cut the bumps down really fast. With quick sweeping movements across the tube I had it baby butt smooth in 40 minutes. If any of you have ever seen my rockets, you might have noticed I am a little anal about the finished paint job and I'll tell you now a nice paint job starts with a smooth tube. A couple coats of high built automotive primer had the tube absolutely smooth.

The next problem was bulkheads and fins. The bulkheads were easy. A trip to Windsor Plywood netted me a 2 X 2 foot square of $\frac{3}{4}$ inch 20 ply marine plywood off cut for \$15.00. 20 minutes with a circle cutter from my tool box and I had 4 bulkheads.

The fins were a different story. Because I did not know what motor I would end up with, I wanted to make sure the fins would not flutter if I had a fast burn/high thrust motor. Also because the motor would be a 98 mm and the tube was just over 4 inches (98 mm) inside, the fins would have to be surface mounted. My only choice seemed to be aluminum fins, but they needed to be stiff enough to handle high speed flight. I came up with the idea of using a composite fin of two aluminum skins over a G10 core. To bind it all together, I used a urethane formulated specifically for aluminum from the auto body trade which was designed to bond body panes together instead of welding them. I drew up a quick blue print on some scrap paper

...LDRS XXIV Update



As we go through the preparations and deal with Canada customs on border issues and intense scrutiny from Transport Canada, we can see that this event is going to provide a great legacy that will benefit Amateur Rocketry in Canada for a long time. Whether it is the new and/or enhanced relationships with Government agencies or the extra launch pads and other equipment that will be in use by clubs for years to come.

LDRS XXIV Update

Tim Rempel

As most of you know, LDRS 24 is being held in Canada this year on June 14-19. As a member of the planning committee, I have been asked to give an update on how planning is progressing and hopefully to give some insight on what to expect.

Wednesday July 13	Thursday July 14	Friday July 15	Saturday July 16	Sunday July 17	Monday July 18	Tuesday July 19
Registration	Commercial Launch				Experimental Launch	
	8:00 am	8:00 am	8:00 am	8:00 am	8:00 am	8:00 am
	9:00 pm	9:00 pm	7:00 pm	6:00 pm	9:00 pm	4:00 pm

First some updates. Registrations are now being accepted. Simply download the form from the website (<http://www.ldrs24.org/>), mark off the appropriate information and send it in with payment. To help simplify the payment process, Paypal is now active through the site so you don't have to send cheques through the mail. In addition to registering for the event you can also book banquet tickets and order t-shirts. The t-shirts, in my biased opinion, are awesome. The graphics definitely grab your attention. Planning is progressing nicely and it is nice to see the almost 2 years of work getting close to completion.

	Commercial		Experimental		Combined	
	Before	On Site	Before	On Site	Before	On Site
Junior Model	Free	Free	NA	NA	Free	Free
Junior High Power	\$50	\$50	NA	NA	\$50	\$50
Senior	\$60	\$90	\$20	\$40	\$80	\$100

What can you expect at LDRS? Well, you can expect to see people from all across Canada and the US. Thus far, we have received registrations from many different locations like Texas, California, Illinois, Alberta and Ontario. You can also expect to see some of the most intense rocket launches possible. Check out the "Feature Flights" page on the web site to see a full listing. These flights will include Team Extreme from Texas. They will be flying the Aurora project on a P9807!!! There are at least two N to N two stage rockets as well. The 50,000 ft ceiling is definitely going to be tested.

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and gave it to my father who had a friend of his who owns a sheet metal shop make up the aluminum skins. Each skin has a ½ inch wide flange on it to mount the finished fins to the air frame. Out of the eight skins, 4 had left hand flanges and 4 had right hand flanges. I used 2 scrap pieces of 2 X 6 and my bench vise to laminate all the parts into fin units.

Having never flown a level 4 rocket and never building one so heavy, I needed to order a parachute and free bag. I contacted Ed from Giant Leap Components and had him ship them out. In a week and a half the parts showed up, but a quick check of the parts in my airframe showed that I had overestimated what I could fit in the near minimum diameter airframe. I quickly contacted Ed and explained the situation. He said no problem but that he did not have the smaller chute in stock and it would be in a shipped to me the following week. The Roc Lake launch was getting close. Would it get here in time? I kept my fingers crossed!

Now it was time to assemble all the parts into a Level 4 rocket. Due to other commitments, work, and life in general, I did not get started assembling until the weekend before the launch. Once again I was cutting it close.

With only 2 days to assemble the rocket, would I have enough spare time after my 12 hour shift to get it painted? Would the chute and free bag show up in time? My live was beginning to look like an episode of American Chopper without the bi**hing.

So with paper and ruler in hand, I began to figure out how to mount all the components. I bolted the fins to the airframe, using some high strength button head screws I found at RONA and some rivet nuts from Home Depot. Since there was no way to bond any components to the airframe, I decided to do the same with the bulkheads.

Some time earlier I had bought some military surplus nylon strap from one of my favourite places to scout out cheap rockets parts, Princess Auto (or as I call it Princess Aerospace). This was cut into two 20 foot lengths for the shock cord and mounted to the bulkheads using 3/8 inch thick stainless steel U - bolts and ¼ inch quick links from Home Depot.

I made a quick trip down to Metal Supermarket (another favourite) to pick up some 4 inch diameter aluminium pipe to machine up into centering rings for the phenolic motor tube and Giant Leap threaded motor retainer. The motor retainer needed to be slightly modified to fit the airframe and I

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made 2 rings to center the tube, one of which also acted as a thrust ring.

I drilled all the vent holes, shear pin holes and mounting holes for the dual Altacc's. I added the necessary wiring for the dual redundant ejection charges.

Everything was machined, modified and bolted in during the course of the 2 day weekend. It took about 15 hours to get from a pile of parts to something that was starting to look like a rocket.

Next up was paint. It took nearly 5 hours of driving around Edmonton to find my favourite shade of florescent orange paint in quality automotive urethane paint. Sometimes I hate Edmonton! Next time I will let my fingers do the walking!

I went over the high build primer with a Scotch Brite pad then sprayed it with 2 coats of white paint and when this got tacky, 2 more coats of "Real Freekin bright Florescent Orange" paint. It turned out glass smooth and no dust bunnies. Perfect! I was running out of time and the paint was too nice to scuff up and spray with clear so I left it like this.

Time was getting real short now. It was Wednesday, the launch was on Friday, and still no chute. I was panicking. Would I have to beg, borrow or steal a chute at the launch? Thursday morning I went to work my 12 hour shift wondering what I had forgotten and where was my parachute. I got home at 12:30 A.M after my shift to find a delivery card in the mail box. Yes! It arrived just in time. I loaded all my rocket stuff up in the car along with the rocket and went to be to get 4 hours of sleep before having to get up in the morning to drive to Lethbridge for the Launch. A quick stop at the post office in the morning and I had my Skyangle Cert 3 chute in hand and I was off to the launch.

I did it! With only 24 hours invested in building time I had my level 4 rocket.

I arrived at the launch to find a 98 mm CTI M520 propellant grain and reload casing for me. With an inspection from Max Baines and Dave Ross, my L4CC members I was given the green light to fly. With help from my brother Andrei, his son Andrew, Mike Dennit and Alex Parker I had the rocket prepped and ready to load on the pad in about an hour and half. My brother and I double and triple checked everything and decided it was time to fly it. A stop at the RSO/LCO table showed that it now weighed in at 35 lbs. Man it was heavy, but hey....it's flying on a M. No big deal!

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violated by any of the partners. Even the data on some of the monitors would be enough to violate the regulations and agreements.

Our tour took us up several flights of very steep stairs that lead to the bridge. This was the first interior room we were allowed to photograph and everyone that had a camera quickly took advantage of the opportunity. One of the most interesting things we saw on the bridge was the pilots' location. There were two identical workstations side by side. One operated the ship, and the other operated the launch platform when it was unmanned during the actual launch. In fact, during the launch, there are two captains on duty on the bridge, one for each vessel. We also were shown a workstation where the launch platform's engineer worked during the launch. We were told that he could do almost anything short of turn a nut with a wrench from his station on the Sea Launch Commander.

From our vantage point on the bridge we could look out and see the telescoping walkway on the starboard side. It is used at sea when embarking and disembarking the crew of the launch platform before and after the actual launch of a rocket.

We left the bridge, traveled back down the stairs, back through the maze of corridors and exited the superstructure on the starboard side. We found ourselves under the telescoping platform we had just seen from the bridge. A few pictures and we left the ship traveling down the stair of another scaffold on the port side. The last view of interest was the bow thrusters. They were much larger than I had imagined.

We finally made our way back to the portable office where the tour was concluded by offering us one last piece of information: the staff had stopped counting the number of applications for tours at 150. Many more had been received, but this was the only tour that they would host while in Vancouver. We expressed our extreme gratitude and said our goodbyes. It was a truly memorable day.

In writing this, both Nelson and I wish we could say more about the technical aspects of the rocketry program. Unfortunately we were asked to keep the article superficial. This saddens us but we have tried to share as much as we can.

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comment on who won the last air hockey tournament. Bar hours are limited and it is always closed during launch preparations. It has proved to be an excellent place for the employees and representatives of the corporate partners to relax and mingle. We were to hear more about these relationships later.

Our next stop was the launch control room. There are two distinct halves. The left side is for the American workers and representatives who deal with the payload itself, and the right side is for the Russians and the Ukrainians who handle the launch vehicle. There is an imaginary line through the room and during the launch, it divides the Americans from the Russians and Ukrainians. After the count down reaches a certain point, no one passes over the line from one side to the other, and an officer is present to enforce this. Any discussions are controlled through a strict set of protocols and are conducted through headsets and translators. This is required to ensure that technology export laws and technology protection agreements are not



Courtesy of www.sea-launch.com, the Sea Launch Commander sends the Telstar 18 satellite aboard a Zenit-3SL launch vehicle.

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Vince pauses for a photo opportunity before the launch.

We set the rocket out on the M pad, paused for a photo opportunity, turned on the electronics, and when I was satisfied they were working properly, installed the igniter and checked the continuity.

It was a very long walk back the spectator line and all the while I went over it all in my head. Were the shock cords connected? Was the parachute in there? Did I use enough black powder in the ejection charges? Too late to worry now, the waver closes in 5 minutes. Time to light the candle. 5... 4... 3... 2... 1... Nothing. Crap... Wait... They had selected the wrong pad. Again 5... 4... 3... 2... 1... A short delay then a small puff of smoke came out of the nozzle. Then a flame. Then it was on it's way. The motor burned for 14.5 seconds and by the time it burned out I could not see it anymore. Then the long wait as it coasted to apogee to fire the drogue. There was too much noise around me from all the people cheering and clapping to hear any charge go off. Besides it was very high and I'm not certain if I could have heard it anyway.

Still nothing to see. My eyes keep scanning the sky for my hot pink tracking chalk. Nothing... Then finally after what seemed like several minutes the main charge fired and the main deployed at 1200 ft along with another large cloud of pink chalk.

Alex, Andrew and I drove out with a Walston receiver in hand to find the rocket. After about 10 minutes we found it lying in a soft dirt field completely undamaged. We gathered it up and headed back to the launch site to retrieve the data from the dual AltAccs. Both of them showed the rocket had flown to an altitude of exactly 17,000 ft and the drogue had fired at 31 seconds into the flight and the main fired at 236 seconds. The rocket reached 1014 ft/sec at 8.75 seconds.

I have to thank all the people who helped me with this project and Max for pushing me and not letting me give up.

A Tour of the Sea Launch Commander *Greg Dietlein & Nelson Eisel*

I was enjoying a lazy Friday evening, checking emails when the phone rang. It was James Antifaev of the University of British Columbia rocket club.

James was a little excited. He had just received a phone call informing him that his request for a tour of the Sea Launch Commander had been accepted and a tour was arranged for 9 a.m. the following morning. There would be room for only ten people on the tour. James explained that he contacted the members of his group but only seven were able to go. As Coast Rocketry has been a sponsor of the group, would I like to come and bring two other rocketeers along? Needless to say, I said sure.

I hit the phones and called everyone I could. Some people were out of town, some had personal commitments, and some simply didn't answer their phone. In the end, only Nelson was able to attend although many expressed their disappointment at not being able to attend.

Nelson and I rode together and arrived a bit early at the Vancouver Dry Dock where the ship was being serviced.



The University of British Columbia Rocket Club pauses for a photo in front of the Sea Launch Commander in dry dock.

The security guard at the gate made a call and a gentleman met Nelson and I at the gate. We were directed to a portable office and there we met Ted, the head of security and a former Colonel in the US army. Ted had been a US military liaison in St. Petersburg, Russia when he was offered his current job. We also met Scott who was an engineer involved with the launch system, and the Captain of the ship. We all passed the next few minutes with some enjoyable

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conversation and then the members of the U.B.C. Rocket Club arrived.

Once everyone was fitted with goggles and a hard hat, we ventured out to get a closer look at the ship. Our tour guides explained that an agreement existed between the partners that each would protect the other's technology. Because of this agreement, we would not be permitted to take pictures of the inside of the ship.

We walked down a huge ramp to the floor of the dry dock approaching the stern of the ship. The rudder dwarfed the people working on the hull. We continued around to the starboard side and began to climb the stairs of a scaffold that lead us to the ship's deck. We passed through a few short corridors and our group emerged into the huge room where the rockets go through final assembly.

The room ran what must have been a good portion of the length of the ship and appeared to be more than a couple of decks high. There were two sets of rails; normally, a horizontal cradle would roll on each holding a Zenit rocket. The rails were spaced wider than we see here as they were based on the Russian standard gauge. One of the cradles stood in front of us and offered some sense of scale for the rockets.

Our guides explained that two rockets are placed onboard. One is for the current launch and the other is for the next launch. The first is assembled and transferred to the launch platform before the ship leaves homeport. The second rocket is kept on board the Sea Launch Commander awaiting final assembly and though the need has never arisen, it could be used to provide replacement parts for the rocket being launched.

The two ships then make ready for sea. The launch platform leaves three days before the command ship due to the launch platforms slower speed. The two vessels rendezvous on the equator southwest of San Francisco, near the Marshall Islands. The location is ideal for because of the excellent weather conditions, the lack of sea and air traffic, and because launching on the equator is clearly more economical for placing payloads in geosynchronous or equatorial orbits.

We then climbed a set of stairs, walked through a short corridor and then took a quick elevator ride higher up into the ship. A few more passageways and we found ourselves in a sort of recreation area. This is where the crew can dine, relax in a gym, play some air hockey or relax over a drink in the bar. Despite its clear interest to Canadian readers, Scott refused to