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November/December 2002

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Editor – Jeff Pleimling
Production – Julie, Beth & Brian Pleimling

This Issues Contributors

Todd Bavery, Jonathan Charbonneau,
Adam Elliott, Norman Heyen,
Tim Johnson, Bob Kaplow,
Kathleen Knapp, Rick Kramer,
Mark Kotolski

THE LEADING EDGE is published bimonthly by and for members of the Northern Illinois Rocketry Association (NIRA), NAR Section #117, and is dedicated to the idea that Sport Rocketry is FUN!

Articles, plans, photos, other newsletters, and news items of interest should be sent to:

Jeff Pleimling, Editor
The Leading Edge
245 Superior Circle
Bartlett, IL 60103-2029

or emailed to leadingedge@pleimling.org

Photos will be returned, other material returned upon requested.

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Ken Hutchinson
82 Talcott Avenue
Crystal Lake, IL 60014-4541

Web site: <http://www.NIRA-rocketry.org>

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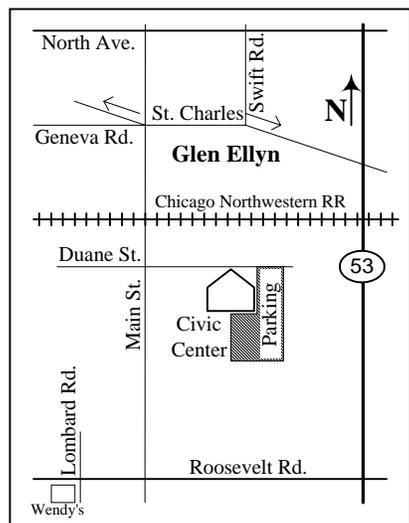
InfoLine: (630) 830-1587



CLUB MEETING DATES

All meetings start at 7:30 pm. Bring a model for 'Model of the Month.' We always need volunteers for pre-meeting lectures, contact Rick Gaff if you want to schedule a date. The location is usually the Glen Ellyn Civic Center, 535 Duane Street (check the board in the lobby for the room number).

December 6
January 3, 2003
February 7
March 7
April 4
May 2
June 6
July 11

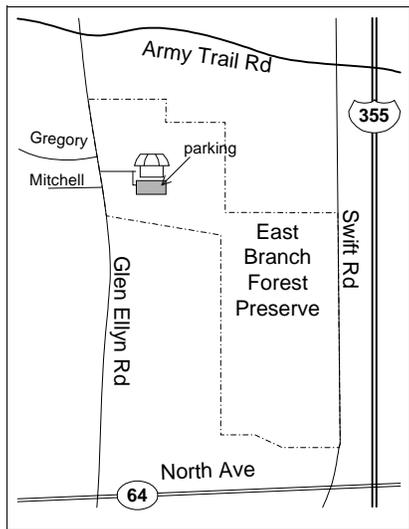


CLUB LAUNCH DATES

Launches are BYOL (bring your own launcher). Call the NIRA infoline for pre-launch information: 630-830-1587.

As the map shows, our new launch field is the East Branch Forest Preserve but the arrangement may not be permanent! **Please** call/check the infoline/website before coming!

March 16, 2003 - East Branch Forest Preserve
April 20, 2003 - East Branch Forest Preserve
May 18, 2003 - East Branch Forest Preserve
June 14-15, 2003 - Midwest Regional Fun Fly (site TBD)
July 20, 2003 - East Branch Forest Preserve
August 17, 2003 - East Branch Forest Preserve



Model of the Month Winners!

October – Mark Knapp was the Adult winner with a Loc Minnie-Magg that he named Escher 1. (Kathleen Knapp photo)
November – Adult winner Todd Bavery shows off his rebuilt Velociraptor from Binder Design. See his article on page 9 about building and rebuilding this rocket. (Jeff Pleimling photo)

Shop and Support the NAR Legal Fund!

by Adam Elliott

Below you will find a Shop and Share identification slip from Jewel-Osco which we encourage you (and your family, friends, co-workers) to use this month in our ongoing show of support for the NAR Legal Fund.

Simply shop at any Jewel-Osco location, sign, and present the slip to your checker when completing your purchase and a whopping 5% of your pre-tax purchase price will be donated by Jewel-Osco to the NAR Legal Fund.

The program runs three days, December 16, 17, and 18. These are Monday, Tuesday, and Wednesday of that week. These slips can be copied as many times as you feel necessary; you don't even need to cut this one out. It doesn't matter how much or how often you shop on those days, except you need a new slip for each purchase. The sky's the limit! Shop often! Spend lots! ☞☞☞

	Shop & Share Identification Slip											
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Group Number	Store Number	Dollars	Cents									
Group: National Association of Rocketry												
Your Shop and Share Days: 12/16/2002, 12/17/2002, 12/18/2002												
Signature _____												
PLEASE SIGN THIS SLIP AND TURN IT IN TO YOUR CHECKER WHEN YOU SHOP. PARTICIPANTS CAN MAKE PURCHASES AT ANY JEWEL -OSCO STORE ON THE DATE ABOVE. IDENTIFICATION SLIPS ARE NOT TO BE DISTRIBUTED IN FRONT OF ANY JEWEL-OSCO STORE.												
				Jewel-Osco								

Food Container Rocketry

by Rick Kramer

If you have attended a NIRA club launch in the last two or three years you have probably noticed my arsenal of pasta bowls, cool whip containers, picnic plates & bowls, cream cheese containers, and margarine containers flying through the air.

Not only is this form of model rocketry inexpensive, but also a lot of fun and very rewarding when you hear the cheers from the spectators when they realize that a food container has just been launched 300 feet into the air on a C engine - straight up, a perfectly stable boost and gently floats back to earth and lands only a few feet from the launch pad.

When I began the search for the ultimate food container rocket, I started with a myriad of parts. The 1996 Blue Plate Special had 2 plates, a bowl, motor tube, launch lug, engine hook, and 2 centering rings. The 2002 Cool Whip UFO has

only a motor tube, launch lug and a motor block (1/4 inch cut from a used C6-3) and the Cool Whip container.

If you center the motor tube in the body you will need the container lid lid to keep the rear of the motor tube in the vertical plane. However, if you center the bowl in the middle of the motor tube you can forget the lid and lose the excess weight. Getting back to the ultimate UFO, I have found the Cool Whip container and the Betty Crocker Bowl Appetite pasta bowls have ideal aerodynamic shapes for this type of rocketry.

Let's make a food container UFO.

I first glue a 1/4 inch motor block into one end of a standard 70 mm length of BT-20. Next I glue a 1/8 X 2 inch launch lug to the side of the motor tube making sure the lug is perfectly aligned.

I find the exact center of the container and using a set of dividers set to 9 mm scribe an 18 mm diameter circle. Use your favorite method to cut out the hole and enlarge it just enough so the motor tube fits snugly.

Next cut or file a notch at the edge of the circle so the launch lug will pass through. Make sure you have the end of the motor tube with the block in it on top, center the container body at the middle of the engine tube and tack it with a drop of CA.

Once you are sure that the motor tube is perfectly vertical within the body, use a hot melt glue gun to permanently attach the motor tube both inside and outside the container body.

That's all there is to it! They fly great on C-6-0 and C-6-3 motors. ☞☞☞



"UFO Alfredo" built from a left over 'Bowl Appetite' bowl. (Dan Cordes photo)

(Club News and Notes continued from page 1)

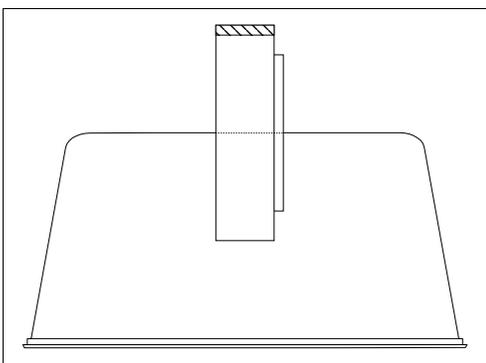
Bob Kaplow - Baby Boy/Fat Bertha combo
Jonathan Charbonneau - SS Eliminator
Terry House - Big Boy conversion

November Model of the Month contest -
Todd Bavery - Velociraptor from Binder Design
(Adult Winner)

Bob Kaplow - Great Pumpkin (scratch)
Mark Knapp - 1/5th scale 2260

January/February Leading Edge - The deadline for the next issue of the Leading Edge is January 3rd, 2003 - the same day as the club meeting.

As always, NIRA can use a wide-range of articles including launch reports, kit reviews, technical articles, plans and whatever you think might interest NIRA members. ☞☞☞



Drawing of a simple food container UFO that shows the position of the motor mount.

Ceraroni Technology's Pro38 by Norman Heyen

So what's a high power rocket enthusiast to do these days? The state government decides to enforce the explosives laws on the books. After being contacted by the ATF. The prime supplier of AP motors burns to the ground, and seemingly takes forever to come back online. The various weekends chosen for flying seem to be the ones with bad weather. It was bad year for this flier at least. I flew my last Aerotech motor in February and not another one until a few I357's became available in late summer.

But during this time, while I was mulling over in my mind the wisdom of continuing in this hobby, a new vendor seemingly appeared from nowhere. And out of Canada of all places. I'd heard about the Pro38 line of motors, that they were easy to use, available and reliable. But, I was wrestling with spending the money necessary for yet another set of hardware. Boy, what was I thinking? In October, I bit the bullet at a Quad Cities launch in Van Orin, the offer of a complete set of cases and adjustment tool for \$200 seemed like too good of a deal to pass up. The fact there were plentiful supplies of propellant tipped the scales and my credit card fell out...

What a difference in thought processes between AT and Cesaroni! With AT, you get to assemble a raft of various parts into something that you hope will work. Did you get grease where grease doesn't belong? Is the delay element is correct? Did AT package the right parts in the bag? And have you assembled all the O-rings correctly? The skinny one goes where? Instead of a bag of parts, the Pro38 motors are pre-assembled and simply screw into the casing. That's right, the hardest part of assembling a Pro38 motor is getting the caps off the plastic storage case.

If you need to use a different delay length, you don't need a stash of various delays. Is the short delay for a blue thunder the same as the one used for a medium white lightning? Instead, you simply pop the delay module out, dial in the amount of time to remove, and adjust the supplied element. It is all very simple, and a complete change in thought. Cesaroni certified the motors system with a delay adjustment tool. It is a little tool that holds a drill bit, with fixed stops to remove up to 9 seconds from the maximum delay. The motors basically are all extra long delays (12 to 16 seconds). So, if you need a 7-second delay, dial in the right time and adjust away. How can you do this without violating the safety code? Simple, Cesaroni certified them that way, and recommends this method. You are using the motor in the way specified by the manufacturer, and not violating any rules. Cool!

And clean up? Forget the baby wipes and scrubbing and Hoppe's and vinegar and all that. When the flight is done, unscrew the metal casing, slide the used propellant housing out, wipe the top off a bit and that is it. It takes about as long to clean as it does to read this. Seriously, the only cleaning is wiping off the little bit of ejection charge crud on the top of the motor casing.

The Pro38 line is made by Ceraroni Technology Incorporated (CTI) <http://www.pro38.com/> out of Gormley Ontario Canada. They ship as 1.4c classification, so the Illinois regulations aren't a problem. (Although you will still need a LEUP.) The Pro38 set consists of a Delay Adjustment Tool and 6 cases. The cases are for 1, 2, 3, 4, 5 and 6 grain motors. The motors are CAR, NAR and TRA certified. Available in 133G69-12A, 244H153-13A, 384I205-15A, 512I285-15A, 648J285-15A and 765J330-16A types. The designations are a little different from what we are used to seeing. The first number is the total impulse of the motor (in Newton-seconds), the next group is the 'normal' designation and the last-

number is the delay as shipped. So, the single grain motor (133G69-12A) is a 133 Ns motor, a G69 with a 12 second delay element. Granted, a 38mm G motor isn't the most useful thing, at least for me, but it is a cute little guy. Maybe a test flight in a VB38 Extreme?

OK, enough hype. How do these things perform? The propellant appears to be roughly the same as AT's white lightning formulation. There is about 120Ns per grain, and give roughly the same thrust spike as the AT equivalents. Over the past couple of launches I've flown the 2, 4 and 6-grain motors with great success. The 2-grain H153 is a lot like the H123, the 4-grain I285 is close enough to an I284 that you wouldn't notice and the 6-grain J330 is about like the venerable J350. My 10-pound IRIS reached about 2800' with the J330. Not spectacular, but an easy flight, and about the expected performance. No problem with lift-off, good tracking smoke and plenty of BP to eject all my many feet of tubular nylon and Rocketman chute. The I285 really launched Nancy's Minie Magg to about as high as it's been flown before, and right about to the limit of a level 1 flight. The H153 in an Ariel was fine as well. Oh yeah, the supplied igniters work very well. They look like an electric match dipped in pyrogen. In short? Great motors, great ideas behind them, and they are available!

What else does Cesaroni have planned? First, they are beginning to ship a Smokey Sam type of propellant in the Pro38 sizes. And they have certified some really huge motors, care for an 05100 with almost 30K of impulse? Well, maybe not at one of the local fields any time soon. There are Pro54's in the pipeline, as well as 75 and 98mm motors for those with larger budgets than mine.

Maybe the world of high power doesn't begin and end in Las Vegas? 

AeroTech Utah Facility Delayed by Insurance Company

As posted to www.rocketryonline.com

(ROL Newswire) -- AeroTech is pleased to provide the following update on the status of its new propellant and rocket motor manufacturing facility in Cedar City, Utah. The anticipated completion date of the Utah facility continues to be delayed due to the insurance company's failure to pay legitimate insurance claims in a timely manner. AeroTech is investigating legal remedies to help expedite this process.

As of Monday, October 30 most of the door handles were installed and much of the painting was complete. A removable section of mezzanine safety railing that was critical to the granting of occupancy had been installed. The exterior AP storage bunker was still awaiting roof and door installation, and other areas of the building such as the high power motor magazine bunker and the enclosed static test cell were still in various stages of completion.

Contract manufacturing at Ellis Mountain Rocket Works is planned to continue until the Utah facility is fully operational. AeroTech appreciates its customers' patience as it looks forward to realizing its goal of resuming full production at the earliest opportunity, and filling all backorders in the shortest time possible thereafter.

November 5, 2002 

LOC Acquires Yank Enterprises

As posted to www.rocketryonline.com

(ROL Newswire) -- LOC/Precision is pleased to announce the acquisition of Yank Enterprises. As of Monday, October 21st, all Yank Enterprises' inventory, tools and equipment were relocated to LOC/Precision's manufacturing facility in Brecksville, Ohio. Yank Enterprises manufactures high quality mid and high power kits in sport and military scale. All of the 24 kits listed on www.yankenterprises.com are in stock and available for immediate shipment. These in-stock kits currently utilize flexible phenolic airframe tubing. Once the current inventory is depleted, LOC/Precision plans to reengineer the kits using their standard proprietary high quality Kraft paper airframe.

With this acquisition LOC/Precision offers over 60 different kits which are in stock and ready for immediate shipment. The company's website www.locprecision.com will be updated to include the Yank Enterprises product line in the near future. 

A Simple Digital Camera Payload by Bob Kaplow (NAR 18L)

I'd been looking for a nice rocket camera project ever since an extra short I161 delay trashed my 35 mm camera payload. Ideally the camera would be much smaller and lighter than a standard 35 mm camera, so it could be flown on smaller motors and smaller fields than the full size Ricoh I had. And while film still gives better resolution, digital seemed both convenient, and cheaper to fly long term.

The solution was the Aiptec Pencam 2. This is a simple fixed focus, fixed exposure, no flash camera that shoots 26 VGA pictures stored in built in 8 MB volatile RAM, and can double as a USB webcam and camcorder. It has no view screen, like the more expensive cameras, just an LCD screen that shows the mode and number of pictures left.



Photo 1: Finished camera on its mounting board (Rick Gaff photo)

There is an older Pencam Trio, and now a new Pencam 1.3 with 16 MB RAM and Pencam SD. I've not seen the newer Pencams yet, but you may want to check them out at www.aiptec.com. I've also seen knock-offs that are **not** compatible with the controller.

I got mine on sale for about \$50. The camera itself is 5.5" x 1.4" x 1", and would fit in a BT-60 tube. But I couldn't just stop there. I carefully pried open the case with a tiny screwdriver, and removed the 3 small screws that held the circuit board into the case. The gutted camera is only 2.9 x 1.2 x .4", except for the lens which is .7".

Next I had to figure out how to trigger the camera in flight. Older models, in the lower resolution mode would shoot 15-20 seconds of sequence video. But I wanted to keep the higher VGA resolution, and that only gave about 7 seconds of flight. Not even enough to run away from the pad after starting the camera Cineroc style.

My problem was solved by Rob Nee and his AYUCR camera controller. Just as I was starting the project, he was upgrading his basic 35 mm controller to handle the Pencam. I got one of the first Pencam kits he shipped. The complete kit is \$40. You'll also need the cable to connect to the Pencam which is another few dollars.

Building the kit was simple, even for someone 25 years removed from his last Heathkit. No surface mount components, the PIC microprocessor is in a socket, most components solder to

the top of the board, except for the resistors on the bottom. Less than hour from bag of parts to completed unit.

If you have a different Pencam than either Rob or mine, here's how to tell if the AYUCR will work with it. Power the camera on, and time how long before it powers itself off automatically. Most seem to take about 30 seconds of inactivity. Now power it on again, this time holding the mode switch down and wait at least twice the time it took to power down. If the camera stays powered up, the camera will work.

Also note that the camera memory is volatile, so it's constantly draining the battery to hold the memory. New AAA batteries are good for about 2 weeks. Clear the camera memory, and there is no battery drain. Unfortunately, this means any in flight power glitch resets the camera and wipes out the pictures.

I only had one problem with assembly, actually in testing the unit out. As soon as I installed the battery, it didn't work, but the battery got **hot**. Turns out CMASS's Bill Spadafora encountered the same problem at the same time. The little 12v car alarm batteries (same ones used in Adept and other electronics) have nothing but the paint on the battery to insulate them. If the battery clips scratch through the paint and touch the bare metal, you have a short and the battery is dead real fast. I now put tape over the side of my batteries.



Photo 3: The battery end of the camera (Rick Gaff photo)

You can see that in Photo 3 that the battery is wrapped with red (+) and green(-) cellophane tape to prevent shorts (back center). In front of that is the power jumper, tied to the PCB to prevent loss. In the front is the mode switch; Standby to the left, armed to the right. Right next to the switch is a status LED. In front of the battery is the PIC microprocessor. The small silver item in the right front is the G switch. This detects liftoff, and it is directional. UP must be to the left as shown in the photo. On the left side are



Photo 2: The complete camera in its payload bay (Rick Gaff photo)

the 2 I/O ports. The 4 pin jack goes to the camera switches. The 3 pin jack is a serial port used to program the AYUCR options according to the instructions. You need a 2400 baud serial port, or an optional PDA interface and software.

Information about the AYUCR, ordering, assembly instructions, and operation can be found at www.ayucr.com.

Next, you have to make two simple modifications to the Pencam, even if you leave the case intact. Open it up, and find the 2 button switches. One is on the top, and is the "push to shoot" switch. The other is in the middle and is the power/mode switch. My Pencam II was slightly different layout than the one Rob shows in his instructions, but I had no trouble figuring out the proper wiring.

For the mode switch, check with an ohmmeter to determine which poles of the switch close and open when the button is pushed and released. Solder the red and black wires to these terminals, in the center of Photo 4. Then solder the yellow and green wires to the "shoot" switch at the right of the photo. The LCD display is visible behind the two switches. If you wish, route the wires out of the case and reassemble the Pencam.

I choose to integrate both the Pencam, AYUCR, and battery pack on a carrier board made of clear Lexan (see Photo 1). Even with small standoffs for the 3 screws that held the Pencam into the case, I had to use a moto tool to cut out a hole for the LCD display. There are also standoffs for the AYUCR board, due to the resistors on the back. Currently I use a commercial 2 x AAA battery holder for Pencam power, but I've had a lot of in flight glitches. The blue capacitor I added hasn't eliminated the problem, Neither has screws in the battery compartment to prevent spring compression in flight or at ejection. This

(Simple Digital Camera continued on page 10)



Photo 4: The LCD end of the camera (Rick Gaff photo)

Aerobee Hi

Semi-Scale model of USAF AF6
Plan 111298, Designed by Mark Kotolski (NAR 35707, TRA 3609)

Parts List:

- A. PNC 1.9 (Aerotech 11191) Nose Cone
- B. BT-1.9 x 20" (Aerotech 11926) Body Tube
- C. MMT .95 x 6" (LOC) Motor Mount Tube
- D. CR .95 x 1.9, 1/16" Ply Centering Rings (2 needed)
- E. 1/8" Plywood Finstock
- F. 1/4" x 1/4" x 17 3/4" Spruce
- G. Launch Lugs, 1/4" x 1" (2 needed)
- H. Elastic Shock Cord, 1/4" or 3/8"
- I. Parachute, 16" nylon (Aerotech 13016)
- J. Cable Shock Cord Mount

Specifications:

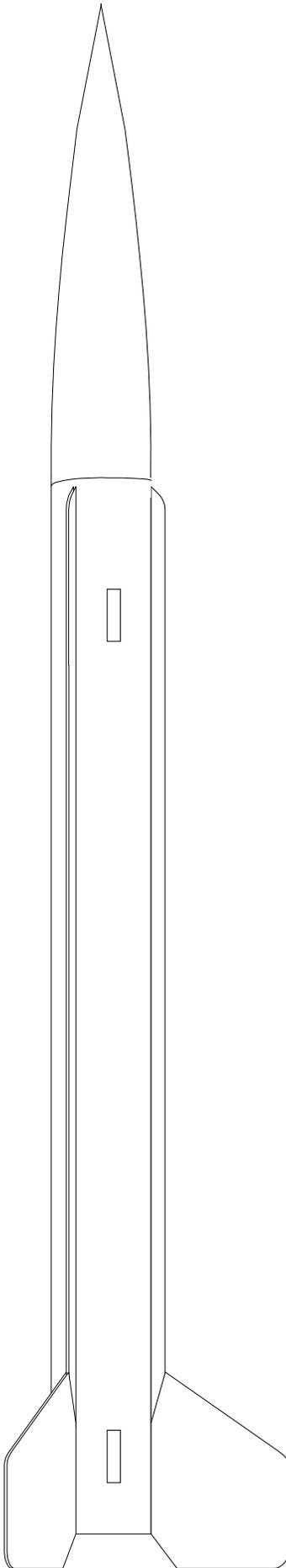
Length 29.875"
Diameter 1.9"
Weight 7.84 oz.
CP 23.88" from tip of nose

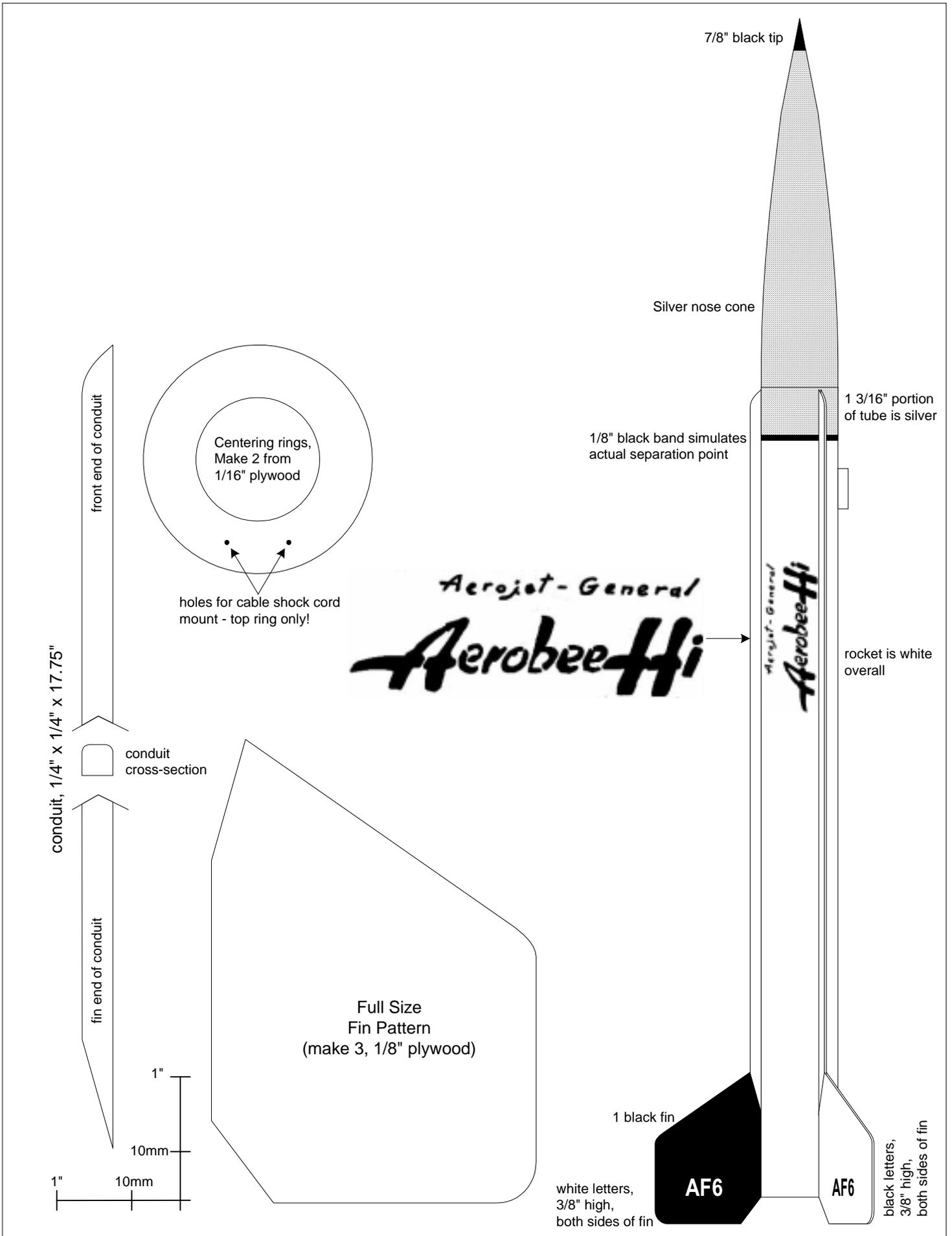
Recommended Motors:

D94w	D12-5	D15-4t	E11-5j	E15-7w
E18-7w	E28-7t	E30-7t	F24-7w	F39-9t

Construction:

- Start assembly of the motor mount by cutting two centering rings from the 16" plywood. Epoxy a ring 1/4" from each end of the 6" long tube. Form a small epoxy fillet at the ring/tube joint.
- Drill two small holes about 1/2" apart from the cable shock cord mount in one of the rings. Attach a cable shock cord mount to this ring. Be sure the cable is short enough to remain inside the body tube when the mount is installed (about 12" long).
- Cut the body tube to a length of 20". Mark the tube, full length, with three fin lines.
- Apply a ring of epoxy about 5" into one end of the body tube. Slide the motor mount, into place until the motor tube end is even with the body tube. When this has cured, apply an epoxy fillet to the rear ring and tube joint.
- Using the fin pattern, cut out three fins from 1/8" plywood. Round or taper all edges except the root edge and sand the fins smooth.
- From 1/4" spruce, cut 3 conduit pieces, 17 3/4" long. Shape the front and rear portions of the conduit pieces as shown. Finally, round the top edges and sand the piece smooth.
- Epoxy the conduit pieces to the body tube on the fin lines. The front of the conduits are placed 1/8" from the top of the tube.
- Epoxy the fins in place on the fin lines. Be sure the front of the fin is centered on the conduit and lines up on the fin line.
- Apply epoxy fillets to the tube/fin joints. Also apply small fillets to the conduit/tube joint.
- Attach the shock cord to the cable shock cord mount.
- Cut two launch lugs, 1" long. Epoxy one launch lug, centered between two fins and positioned 1" from the rear of the body tube. Epoxy the second launch lug 2" from the top of the tube in a straight line with the bottom lug.
- Tie the shock cord to the nose cone.
- Attach the parachute to the nose cone.
- Use your favorite method to seal all the wood surfaces. Sand and seal until satisfied with the finish.
- Refer to the diagram provided for painting details. Note that the top portion of the body tube is painted silver. This does not include the tops of the conduits, which will remain white.
- Fly safe and have fun.





Space Launch Report for September - October 2002

by Tim Johnson

Twelve space launch attempts occurred during September- October 2002. Two of these ended in failure.

Russia accounted for one of the failures and for four successes. A Soyuz-U carrying the Foton M-1 scientific satellite exploded shortly after liftoff from Plestesk Northern Cosmodrome on October 15, killing a soldier on the ground. Two similar Soyuz-FG boosters successfully launched humans and cargo from Baikonur to the International Space Station (ISS). Successful Proton and Kosmos 3M launches rounded out the Russian numbers.

China accounted for the second failure and one success. A Kaitaiosha (KT-1) launcher failed. A Long March 4B (CZ- 4B) flew successfully.

Space shuttle Atlantis and an Atlas 2AS lifted off from the United States. An Ariane 44L, an H-2A, and a PSLV flew from Kourou, Japan, and India, respectively.

ISS

The three-person Expedition 5 crew handled three spacecraft visits during September-October. A Soyuz-FG rocket launched the Progress M1-9 cargo ship from Baikonur LC 1 on August 25. Progress docked to ISS four days later.



Atlantis on its way to the ISS. (NASA Photo)

Space Shuttle Atlantis lifted off from Kennedy Space Center (KSC) LC 39B on October 7 with six crewmembers and the S1 solar array truss segment on the STS-112/ISS-9A mission. Atlantis docked with ISS two days later. The STS-112 crew attached the 12-ton radiator-equipped S1 to the growing station. Atlantis undocked on October 16 and landed at KSC on October 18.

Soyuz TMA-1 launched toward ISS on October 30 with two Russians and one Belgian on the ISS-5S/VC-4 Soyuz taxi mission. The fourth Soyuz-FG booster, an upgraded version of the Soyuz-U rocket, launched the mission from Baikonur LC 1. It was the first use of Soyuz-FG for a crewed launch. The visiting crew was to return in Soyuz TM-34 after a one-week stay. Upgraded Soyuz TMA has larger couches and improved landing rockets.

Soyuz-U Failure

A 2.5 stage Soyuz-U launch vehicle failed shortly after liftoff from Russia's Plestesk

Northern Cosmodrome LC 43 on October 15. One of the RKK Energia-built rocket's four RD-107 strap-on booster engines failed just after the vehicle rose from its launch pad when its turbopump ingested a metallic object through its hydrogen peroxide line. A few seconds later, the four remaining engines shut down and the rocket fell back to earth near the launch pad. The ensuing explosion killed one Russian soldier and injured several others. This, the first Soyuz launch vehicle failure since June 20, 1996, ended a string of 61 consecutive Soyuz, and 75 consecutive Soyuz/Molniya, successes.

Lost with the rocket was its 6.5-ton Foton M-1 payload. The three-part, Vostok-based spacecraft had a reentry module to return experiment samples back to earth after 15 days in low earth orbit.



China's Long March 4B (CZ-4B) waiting to launch the the ZY-2 satellite.

China

A three or four stage solid fuel Kaitaiosha (KT-1) launcher suffered a second stage failure during its September 15 inaugural flight from Taiyuan. It was the first known space launch failure of 2002. The rocket was trying to boost a 50 kg satellite into a low earth polar orbit. KT-1 is derived from that country's DF-31 ballistic missile.

A three-stage Long March 4B (CZ-4B) orbited the ZY-2 remote sensing satellite from Taiyuan on October 27.

Other Launches

India's PSLV No. C4, the seventh four-stage PSLV rocket, successfully boosted 1,060 kg Metsat 1 into geosynchronous transfer orbit (GTO) on September 12. PSLV-C4 flew from India's Sriharikota Range. It was the first time that a PSLV launcher had flown a GTO mission. PSLV uses solid propellant first and third stages, storable liquid propellant second and fourth stages, and six strap-on solid rocket boosters.

The core and four of the strap-on boosters ignite at liftoff.

Japan's third H-2A orbited two satellites from Tanegashima on September 10. The 2.5 stage rocket boosted the 1,500 kg USERS reentry experiment spacecraft into low earth orbit (LEO) just before its second stage reignited to send the 2,800 kg DRTS data relay satellite into GTO. Although the launch was successful, DRTS appeared to have subsequently failed to boost itself into geosynchronous orbit.

Ariane 44L L4114 flew the V154 mission for Arianespace from Kourou ELA 2 on September 6. The 3.5-stage rocket boosted 4,723 kg Intelsat 906 into GTO. V154 was the 10th Ariane mission of 2002 and the 72nd consecutive Ariane 4 success.

A Krunichev Proton-K/DM-2 boosted the 4,100 kg Integral gamma ray observatory into a 688 x 153,000 km Earth orbit from Baikonur on October 17. A single Block DM-2 fourth stage burn boosted the European Space Agency satellite from LEO into the highly elliptical orbit. Integral subsequently fired its own engine to raise perigee to about 10,000 km.

AC-159, a Lockheed Martin Atlas 2AS, launched 3,250 kg Hispasat 1D into a supersynchronous transfer orbit from Cape Canaveral SLC 36A on September 18. It was the seventh International Launch Services flight of 2002.

On September 26, a Kosmos 3M boosted an 825 kg Nadezhda M navigation satellite into low earth orbit from Plestesk.

(Space Launch Report continued on page 10)



Flight Readiness Firing of the core engines of Boeing's first Delta IV. (Boeing photo)

Binder Design Velociraptor by Todd Bavery (NAR 80794)

Let me start by telling you that my Level 2 certification flight was not successful. But that has not deterred me from recommending this kit. The re-build was very successful and the rocket re-built won Model of the month for the November meeting of NIRA. With a few adjustments, I know this model will make it during my second attempt. Completed, this model is quite impressive.

The Velociraptor was not only a challenging rocket to build it was a lot of fun. To start, the buying experience of selecting and ordering through Binder Design was incredible. I ordered the Velociraptor on-line on a Sunday and received it in the mail on the following Thursday. You could tell I just bought a top shelf kit. The packaging was done with care. Everything was wrapped individually and all of the parts were in place and in excellent condition. The 11 page instruction manual with illustrations was very well thought out and easy to follow. The website is very well thought out and the very easy to order a number of different kits and supplies. This website is the best kept secret in Rocketry, the buying experience alone scores a ★★★★★. Mike Fisher, the owner of Binder Design answered all of my questions on e-mail or on the phone. He was very accessible.

Kit specifications:

Designed for the advanced builder and sport flyer, the Velociraptor is a 4" diameter High Power Rocket with an aggressive look. It comes with unique anti-zipper baffle design, aluminum motor retainer, and rail buttons! Fly it on an H or I for your level one certification, then stick a J motor in it for your level two flight and watch it scream.

Kit included cut and sanded 3/16" aircraft quality plywood fins, high strength airframe tube and couplers, centering rings, bulkhead plate, high quality hardware package, 54 mm motor tube, plastic nose and tail cone, computer designed and cut vinyl decals. A 45" premium nylon parachute was included.

Construction:

With the instruction manual being very thorough, all you need to be able to do is read left to right. The longest part of this project was the building of the aft section. With a boat tail assembly and 9 fins to sand and align, the slower I went produced terrific results. As the instructions tell you, the care that you take during these steps will insure a well built and solid rocket. A hand sander and dremel came in very handy, especially with the talon fins.

I used a Slim Line motor retainer that was included with the kit. I am sold on these, and plan on using them in all future rockets. Sleek, easy, strong and better than masking tape. This rocket also incorporated a Binder Baffle System, the first time that I had built and used a baffle. This also worked well.



I purchased an avionics bay for this rocket, but chose not to use it. The rocket can be built two ways, with or without the bay. I did not feel that I was ready for the electronics, but I now realize that if I am going to play in the higher power stuff, I am going to have to get involved with electronics.

I took my time and made sure that the rocket was going to be solid. I wanted to have it able to use a K550W. So I built it strong. The rocket weighed in at 5.5 lbs. loaded and ready to go.

Finishing:

I had built this stock, so my intentions were to finish it exactly as it showed in the instructions. After sanding and prep, I applied two coats of primer followed by three coats of finishing paint. I used white high gloss paint for the aft section and Green Krylon for the forward section. The Nose cone was finished in silver. Binder provided excellent decals to finish the rocket and give its great look. Using my garage as my paint studio never sits well with my wife, but she has gotten use to it.

Binder Design Velociraptor:

Length: 86"

Diameter: 4"

Recovery: 45" X-form parachute

Fins: 3 sets of 4 plywood

Motor Configuration: 1 - 54mm

Recommended Motors:

38mm: H242T, I161W, I211W, I300T, I195J, I284W, I435T, J350W, J570[†]

54mm: J180T, J275W, J460T, J415W, K550W[†]

List Price: \$199.99

[†] This model can fly on these high thrust motors, only if expert modeling techniques are utilized and 30 minute epoxy is used throughout construction.

Flight:

My level 2 certification flight was set for WTGG in September. I arrived at the field a late morning, to find that a lot of people were looking for me; I had the only rail for the launch. It became very popular that day. I checked in with everyone that was going to help me with the flight. After watching 4-6 flights to gage the wind, I started to build the J350W motor that I was going to use.

As I said in the first paragraph, this was not a successful flight. When you start to investigate why something went wrong, here was my first mistake of the day. The motor came with a long delay. I was advised based on what Space Cad had recommended to change to a medium delay. Going with the medium delay led to a premature separation. After talking to Binder, the long delay should have been the choice. Space Cad does not do a very good job when using boat tails. The Rocket probably reached an altitude of 3300-3500 feet. Where Space Cad had it toping

out at 2800 feet, this extra 500-700 feet was the difference in coming in perfect or with w 9 inch zipper.

Back to the launch. As a mentioned the rocket is quite impressive when finished, and I believe this was to be the only Level 2 launch of the day. So it got a little of attention. The rocket was loaded on the Impulse Aerospace Quad Pod, and we were reading to go. The wind was at about 5 miles an hour out of the south west. I adjusted the angle of the pad to take advantage of the wind and to try to keep the rocket out of the corn field.

5,4,3,2,1 Lift off, the rocket lifted off the pad. It looked great. With everyone watching we saw the separation and chute deploy. The chase was on.

Recovery:

With the chute fully deployed with the rocket appearing in good shape. The extra height that we saw allowed to drift into the corn field about two hundred yards in. After two hours and a second attempt I was able to recover the rocket with the help of a flag pole and walking talking.

I was very disappointed in finding the zipper damage. I also lost two talon fins. When the post opt was completed, we realized the following things that could have lead to a successful flight:

1. A Long delay.
2. A wider lead line coming out of the body tube, the 1/2" shock cord allowed the cord to zipper through the body tube more easily.
3. Electronics would have allowed for dual deployment and brought the rocket closer to the launch pad.
4. Fiber glassing the body tube.

Summary:

The next day I had e-mailed Mike Fisher at Binder and had the parts that I needed to rebuild the rocket. It is now ready to go at the next opportunity for a HPR launch. I have learned a lot in the last 15 months, and have found that this is a great hobby to be a part of. I will continue to learn and gain experience, and will always seek the advice from others that have gone before me.

This is a great rocket, and I recommend it to anyone. The failed attempt was not that of the rocket, but a lack of experience – I know I won't make the same mistakes again.

[Editor's Note: See page 2 for a photo of Todd and his Velociraptor in the Model of the Month section.] 

Confused Stages – Stage 28

by Jonathan Charbonneau

In the pervious stage, I pointed out how high thrust engines out perform long thrust engines on windy days, even in rockets specially designed for long burn engines. Ever wonder how engines of the same impulse can have such diverse performance while looking similar on the outside? This stage will tell you the inside story.

As simple as a rocket engine may look, it is really a highly engineered precision device. Factors affecting performance include: propellant weight, propellant type, grain configuration, nozzle shape and size.

Propellant weight is obvious so I will go straight on to propellant type. Some engines use black powder (Estes and Quest), which consists of sulfur, potassium nitrate and charcoal. This propellant is easy to ignite. Engines can be directly staged so the booster ignites the sustainer directly at burnout. However, this propellant is not very efficient (low specific impulse) and is sensitive to moisture and temperature. The latter is why cacos are common with black powder engines.

Some engines use composite propellant. Composite propellant is made of ammonium perchlorate, aluminum powder and a rubber-like binder. This propellant is more difficult to ignite but is more efficient (high specific impulse). This is why a composite engine is usually in a smaller casing then a black

powder engine of the same impulse. Composite engines can be staged only through the use of a staging timer (or similar device).

One of the newer innovations is the hybrid engine. This uses cellulose (Aerotech) or plastic (Hypertek) for fuel and nitrous oxide for the oxidizer. For more information about hybrid engines, see *Stage 6* of my series.

Different engines have different grain configurations. Some are end burners. Some are core burners. Still others are ‘C’ slot burners and then there are moon burners.

End burners have a grain that burns from one end to the other. These have a relatively low thrust and a long burn. The Apogee B2 type engines were an example of an end burner.

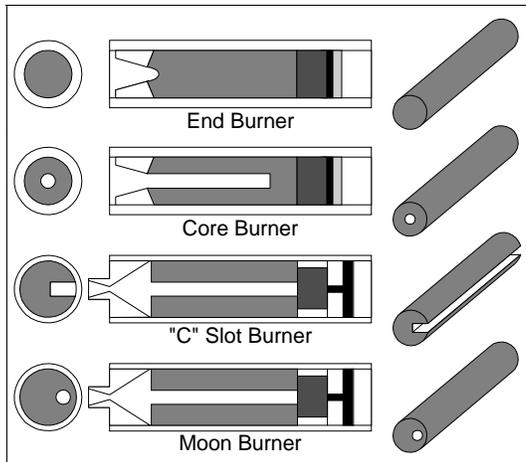


Figure 1: Grain Configurations

Core burners have a hole (or *core*) running lengthwise through the center of the grain. These burn from the inside out, resulting in a relatively high thrust and a short burn time. The Aerotech F60 is an example of a core burner.

‘C’ slot burners are like end burners but have a slot running lengthwise with the grain. ‘C’ slot burners have more thrust then end burners but less thrust then core burners. The Aerotech D13 is a ‘C’ slot burner.

Moon burners are just like core burners except that the core is offset to one side instead of being in the middle. These have thrust profiles that are somewhat core-like initially but more end-like later in the burn.

All rocket engines used in hobby rocketry have DeLaval nozzles. This shape is very efficient. The exact dimensions vary depending on the performance wanted. This is why different engines have different size nozzles.

Superman’s Words of the Wise:

- Do not attempt to alter or dismantle any engines. It is far safer to look at the illustrations that appear with this article.
- Propellant grains and nozzles of reloads can be examined directly but handle them carefully.
- Keep all engines and reloads away from sources of ignition and/or heat at all times.
- Do **not** install igniters into engines until actually ready to launch.
- Always follow the NAR Safety Code.

Keep them Flying. 

(*Space Launch Report continued from page 8*)

Space News

Ground software problems delayed launch of Boeing’s first Delta IV into mid-November. A spectacular 3-second Flight Readiness Firing (FRF) of the rocket’s RS-68 LOX/LH2 core stage engine occurred October 14 at Cape Canaveral SLC 37B.

Arianespace announced plans to discontinue Ariane 5G in favor of the new Ariane 5-ECA, which will boost 10,000 kg to GTO. Arianespace expects to show a monetary loss for the third consecutive year in 2002.

NASA may be planning to redirected Space Launch Initiative (SLI) funding toward development of a small “orbital space plane” that would be launched by Delta IV or Atlas V. The space plane could serve both as a crew transfer vehicle and as a rescue vehicle for ISS.

S-IVB-507, the Saturn V third stage that sent Apollo 12 to the Moon in 1969, has been spotted by astronomers in an unstable Earth/Moon orbit. The Douglas-built stage apparently was recaptured from solar orbit in early 2002. It will slip back into solar orbit in early 2003. 

(*Simple Digital Camera continued from page 5*)

winter I’m going to replace the battery pack with a small 3.6v NiCad that is hard soldered.

The payload fits in an 8” section of clear fluorescent light tube just a tad larger than BT-60 (see Photo 2). The nose cone is from a Bertha, with tape to fit the tube. The bulkhead coupler is installed with hot melt glue!

I cut one porthole for the lens to stick out slightly, and one for access to the AYUCR power jumper and arm switch. I chose to leave my camera shooting straight out the side, rather than adding a mirror so it’s looking sown towards the pad. Add enough padding so the camera can’t move. I filled the coupler with hard Styrofoam so the camera can’t shift under G loads. I also use 2 Velcro straps (not shown) to keep the batteries from popping out in flight (the first flight suffered an Estes Dent, jarring the batteries loose, and wiping out all the pictures). After that first flight, I now separate the camera from the booster, recovering each on its own chute, just as I do for Egglofters. As a result, I’ll occasionally get a photo of the booster.

To fly, prep the booster rocket. Install the PenCam/AYUCR in the payload section, making sure the G switch is in the right orientation. I now attach a “remove before flight” tag to the hole by the switches, as once I launched it without turning on the camera, for less than spectacular results :- (Install the power jumper and watch

for the red light to blink. Flip the switch from standby to arm, to get the different blink pattern. Then launch and recover.

Pictures are downloaded from the camera to your computer via a USB cable. Software that comes with the camera downloads .BMP files of each image shot, then can put them together into an .AVI movie for viewing.

Overall, I’ve been impressed with the images from the simple camera. With a longer run time, it would be the digital equivalent of the old Estes Cineroc.

You can see some of the pictures I’ve shot at www.nira-rocketry.org in the photo gallery. Still others are on the Fermi rocket club page at www.fnal.gov/orgs/far (including a couple neat shots of the main ring!)

Finally, at least for a while, I’ve got some still images at www.encompasserve.org/~kaplow_r/ These are from Watch The Grass Grow and some East Branch launches. One neat shot is NIRA-OCT-27.JPG which shows a good portion of the range head. That’s me near the center, in the red jacket. NIRA-OCT-29.JPG catches the booster just before landing. This low altitude flight was with a C11-3, all other flights have been D12-5 except the one on the Fermi web site which was an E9-6. 

Welcome to the Club!

Steven McReady, David J. Perry and Marcus H. Smith II have all joined NIRA in the past few months. Welcome to the club!

(If I somehow missed your name, please let me know!) 

NARAM-45 Announcement

As posted to www.rocketryonline.com

The National Association of Rocketry is pleased to announce that the bid for NARAM-45 has been awarded to Launch Crue section of Indiana, with Lila Schmaker as Contest Director.

NARAM-45 will be held in Evansville, Indiana, August 2-8, 2003. The events will be:

- 1/4A Boost Glide
- A Altitude
- A Helicopter Duration
- B Parachute Duration Multi Round
- C Super Roc Altitude
- E Streamer Duration
- F Dual Eggloft Duration (pending NAR S&T decision on contest certification of current F motors; could become D DELD)
- Open Spot Landing
- Peanut Sport Scale
- Plastic Model Conversion
- R&D (for enhanced prizes but no contest points).

A website with more details will be established shortly. Lila may be reached by email at lilas@vincennes.net.

Trip Barber
National Events Committee Chairman
11/3/2002 

Aero Pack Revises Retainer

As posted to www.rocketryonline.com

(ROL Newswire) -- Aero Pack International has revised the RA54 Quick-Change Motor Retainers to work with Animal Motor Works 54mm motor hardware. By increasing the inside diameter of the retainer body the AMW motors snap ring will now fit inside. By increasing the length of the retainer cap the end of the motor casing is captivated. Also, the internal threading on the cap runs the entire length thus allowing the retainers to still be used with all other standard hardware. Now the RA54 retainer assemblies are compatible with AeroTech(TM), AMW(TM), APS(TM), Cesaroni Pro54(TM), Dr Rocket (TM), Hypertek(TM), Kosdon(TM). In addition both pieces of the new 54mm retainer assembly are interchangeable with both pieces of the original 54mm retainer assembly.

Aero Pack International
6755 Mira Mesa Blvd. #123-191
Miramar, CA 92126

Website: <http://aeropack.net>
Email: aeropack@san.rr.com
Phone: 858.566.2900 

NAR Standards & Testing News

R85 Motor Desertification 4 November 2002
The following motors will lose their approval for use in NAR contests effective January 1, 2003 due to an extended production hiatus. They remain certified for general sport flying. Should production of one of these motors be (re)started, contest certification will be restored after a 60 day delay.

Aerotech:

- D9-4,7
- D13-4,7,10
- D15-4,6
- D21-4,7
- D24-4,7
- E15-4,7,PW
- E16-4,7
- E18-4,8
- E23-5,8
- E28-2,5
- E30-4,7
- F12-2,5
- F22-4,7
- F23FJ-4,7
- F24-4,7
- F25W-4,6,9
- F37-6,10,14
- F39-6,9
- F40-4,7,10
- F52-6,8,11
- G38FJ-4,7
- G40W-4,7,10
- G54-6,10,14
- G64-4,8,10

Public Missiles Ltd.:

- G40W-4,7

NAR Standards and Testing understands that Aerotech anticipates the activation of their new manufacturing facility will be soon. In support, NAR S&T will be contacting Aerotech every two weeks for a production update.

While the above represents the majority of Aero-tech's model rocket motor line, a few NAR contest-certified motors remain in limited produc-

tion: F20, F50, G35, G80. The F21 also remains in limited production, but is not certified for use in NAR contests. In a telephone conversation today, Gary Rosenfield, President of Aerotech, confirmed that Aerotech is producing a couple thousand motors per month through an arrangement with Ellis Mountain Rocket Works. Contestants desiring these motors are advised to order these motors through major distribution channels (not Aerotech), such as Hobby Lobby or Magnum (to name a random couple outlets). Ordering motors well in advance of a contest would also be a prudent competition strategy.

Jim Cook, Secretary for
NAR Standards & Testing

Jack Kane, Chairman

R86 New Motor Certifications 5 Nov 2002

The following motors have been certified by NAR Standards & Testing for general use as high power rocket motors effective November 4, 2002. They will not be certified for NAR contest use as they are not model rocket motors.

The following are reloadable motors, certified only with the indicated size casings and manufacturer supplied nozzles, end closures, delays (or smoke devices), and propellant slugs.

Animal Motor Works:

75mm x 785mm (74-6000 casing):

M1350WW-P-SM (5725 N-seconds total impulse, 2927.3 grams propellant mass)

75mm x 1039mm (74-7600 casing):

M2500GG-P-SM (7800 N-seconds total impulse, 4248.0 grams propellant mass)

Propellant Key:

GG = Green Gorilla

WW = White Wolf

SM = Produces 10 to 15 seconds of smoke after burnout

Jim Cook, Secretary for
NAR Standards & Testing

Jack Kane, Chairman 

blacksky Holiday Sale

As posted to www.rocketryonline.com

Carlsbad, CA. (ROL Newswire) -- From now through December 31, blacksky is pleased to announce discounts on all blacksky products.

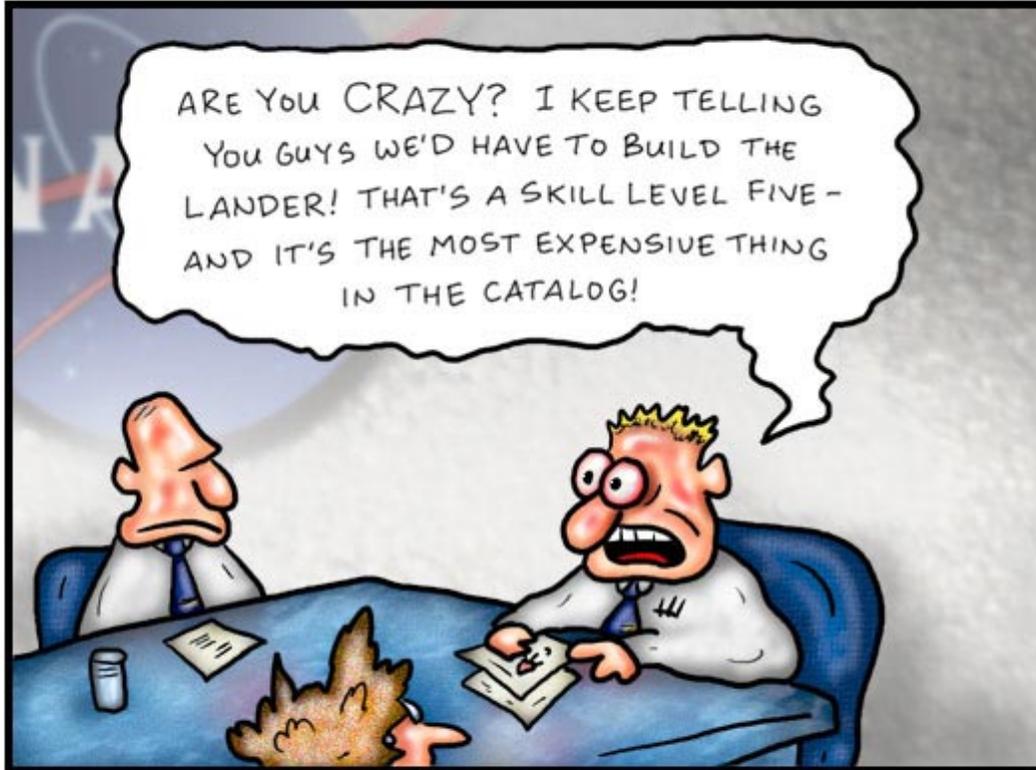
Electronics: The NEW AltAcc2C-Altimeter/Accelerometer system, AltAcc Accessories, Timer2, TimerOne and the NEW Timer4-advanced programmable 4 channel timer system.

Pyro-devices: HiRMI igniters, Advanced Retention and Release Device (ARRD), ARRD Heavy Duty ^ twice the load of the regular ARRD, Ejector reusable ejection charge holder.

Pro38: Motor Cases and Reloads. Standard propellant available now, Smokey Sam propellant available after January 15. 

All orders will receive a free gift from the blacksky Corporation as a thank you. The orders must be received by mail (blacksky, 3179 Roosevelt St. Carlsbad, CA 91008) phone (760)730 3701 or on-line (www.blacksky.com) by midnight December 31. Every effort will be made to assure that orders placed before December 19 will arrive in time for Christmas. Orders placed after that time will be shipped as soon as possible.

For all orders, get a free blacksky gift. For orders totaling over \$100, take 5% off. For orders totaling over \$250, take 10% off, and pay no standard shipping and handling (hazmat and overnight delivery fees still apply). For orders totaling over \$500, take 15% off, get an extra blacksky gift, and pay no shipping and handling (hazmat and overnight delivery fees still apply). 



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(Doctor Fun used in the Leading Edge by permission of David Farley)

The collective childhood trauma that has stalled a manned mission to Mars for years.



Jeff Pleimling, Editor
245 Superior Circle
Bartlett, IL 60103-2029

This may be your last newsletter! Check your label for the expiration date.
If it says Membership Expired or Membership Expiring this will be your last newsletter!