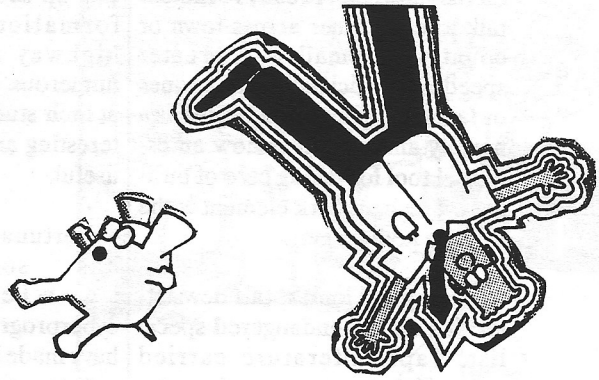
MAX-Q HARA

Newsletter of the Huntsville Area Rocketry Association Volume 10, Number 2, Jun 1996

MEETING PLACE LOST, - FOUND
FLYING FIELD LOST, - MISSING



Crisis hit HARA twice this year in the most important departments, a meeting place and a flying field. The club has recovered and adjusted, but the convenience of regular facilities will not be taken lightly again.

The HATS office made the comment to the departing members of the March meeting that "we won't be here next month, and due to rent problems, don't know where we will be." The following month meeting was set up for a dinner meeting at Quincy's. Then the HATS announced they were back in business in the same building and address, but suite 30 instead of 32, and our meetings could resume.

Rocketeers were shaken at the April launch to hear Greg Warren say that the landowner had planted corn in the Athens cow pasture and we were dismissed from further flying. SEP was fortunate to get the kids' payloads launched and save the schedule for the spring. May had no launch at all. With Vince confirming the old airport as a backup for the rest of the year, Greg got the field adjacent to the previous pasture for the June 29 launch. An optimum flying site for HARA's size rockets is still being investigated.

The plan now is to fly in the area just north of where we were. It's smaller and closer to the highway, but at the same general location and therefore the insurance and waiver still applies. Just turn in the closergate.

Following the launch on the 29th, everyone is invited to a cookout at Greg's house. Not only will this be a chance to commune with rocket folk, but a time to discuss the situation of launches and meetings.

Evening attendance of the second Thursday meetings as be bad lately, but with everyone seeming to have reasonable circumstances to distract them. The idea of lunch meetings has been suggested. Many people can take time during the day to get together at lunch and touch base with the club. Can you? Contact Vince or Brian with your preference for a time. We can talk it up at the cookout.

INSIDE MAX-Q

From the President's Pad

Dramatic changes have hit home in HARA. We're reconsidering our meeting style, and scrambling to find another range for high power. But the most sweeping shift, is the information age taking our consciousness into cyberspace on the internet. Already rocketeer talk to each other across town or country on email with greater speed and efficiency than phones or faxes can give. What begins as a novelty amusement is now an essential tool for taking care of business. The landmark element is the website homepage.

Take a good look at this newsletter; it's on the endangered specie list. Paper literature carried around by stamps cannot keep up with text, graphics and images that can be put in a computer server file as soon as it is formed and read instantly by the world. Other rocket clubs, and all kinds of organizations, are setting up shop on the information super highway and seeing numerous visitors look at their stuff. It's fun, interesting and incredibly useful.

Fortunately HARA has some very knowledgeable cyberprogrammers who have made leaps into the web to get us online and looking good. Dave Gannett and Brian Day have done a masterful job at assembling the next generation of this medium. They'll keep it updated with our schedule and events.

With the expansion of our website, it becomes necessary to rethink the paper MAX-Q. For the cost of publishing and postage saved, this newsletter will be adjusted in size and scaled to a quarterly issue printing. (It kind of already has.) We still need to send out the news to those not wired to the net, and we have to have something to hand out at launches to visitors, so hard copies will continue. Much of the MAX-Q content will continue on the homepage. Understand though, that more of the journalism and photography effort will go the home page. More people will see it there, quicker, and in color. It's the direction of the wave.

Http://fly.hiwaay.net/~bday/hara

MAX-Q

VOL 10. NO 2 . June 1996

Editor: *Vince Huegele*

Contributors: *Brian Day, Mark Tygielski, Dave Gannett*

Max-Q is the official newsletter of the Huntsville Area Rocketry Association (HARA), NAR Section 403. Subscriptions are included as part of membership dues, or available to non- members for $10.00 per year (four issues.) The editor welcomes any material submitted for publication. Send all items or payments to 11108 Argent Dr., Huntsville, Al, 35803.

HARA officers

President: Vince Huegele
Vice President: Joe Robertson
Secretary: Brian Day
Treasurer: Sharal Huegele

NAR address: 1311 Edgewood Dr., Altoona, WI 54720.

COUNTDOWN '96

HARA meetings are second Thursdays (except December) at the (HATS) office, Suite 32, Building 4900, University Square, Launches are 9:30 am Saturday mornings at the Old Huntsville Airport, or at the Athens field. Call for subsequent schedule.

JUNE
29 Sat , Launch and cookout, Athens

JULY
11, Thurs; HARA Meeting 7:30 pm HATS
27 Sat; Launch

AUG
8, Thurs;HARA Meeting 7:30 pm HATS
24 Sat; Launch

SEP:
12 Thurs; HARA Meeting 7:30 pm HATS
21 Sat; Launch

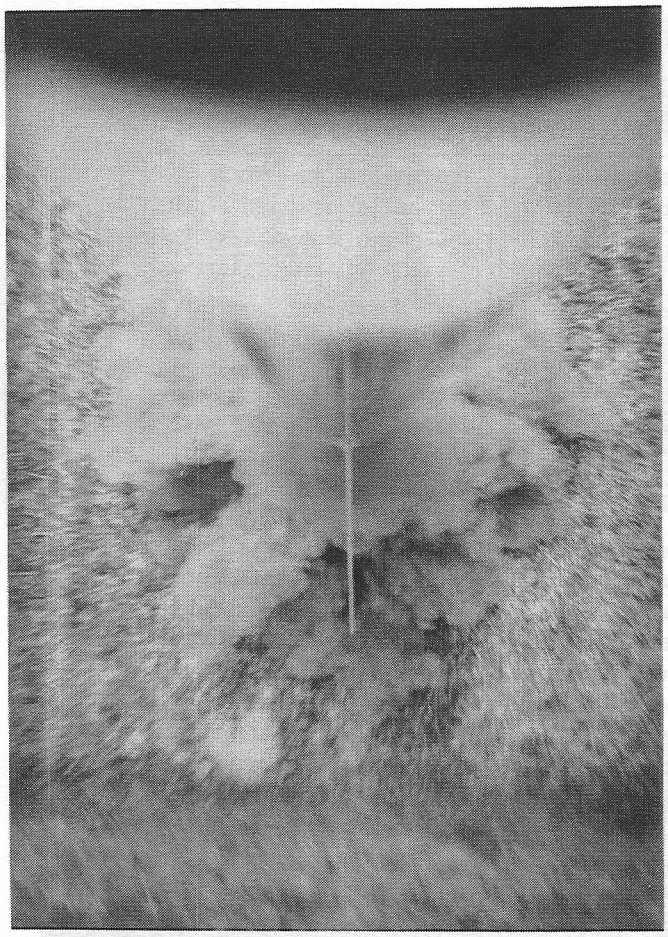
OCT:
3 Sat; Rocket City Classic XV Model Contest and Exhibition, Old Airport, 9am-12
10 Thurs; HARA Meeting 7:30 pm HATS
26 Sat; Launch

NOV:
14 Thurs; HARA Meeting 7:30 pm HATS
23 Sat; Launch

For more details call Vince Huegele at 881-2904 or Greg Warren, 232-0830, for Athens launch site information.

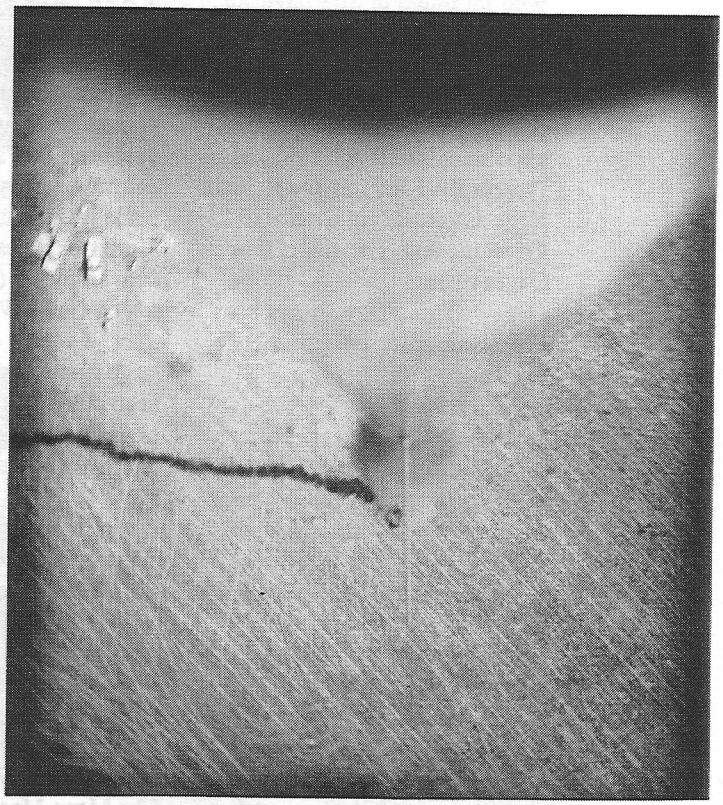
Launch Director Sought

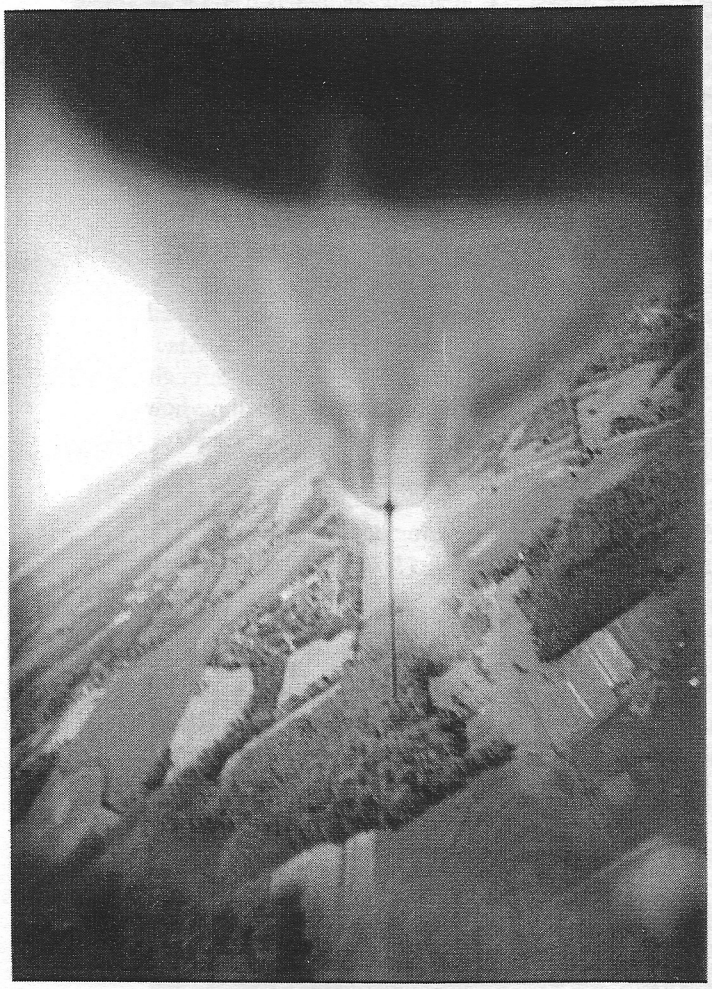
Another adjustment this year is the need for a director of the annual *Rocket City Classic*. The task was established by Wayne McCain, and a specific person is needed to completely take over this job. It's mostly just coordinating the people who support the contest, but it takes some time to plan and follow through. There's plenty of notes and lessons to get you started. Call me now. The *Classic* is ready for a fresh face. Is it yours?

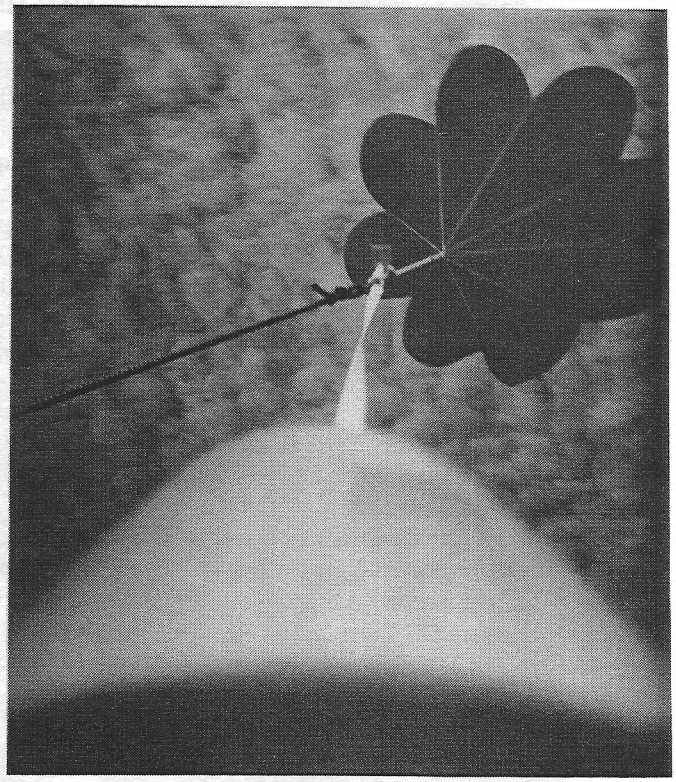


SKYCAM!

Brian Day's Skycam Falcon
lifts-off on a I154J.
Smoke trail leaves a ground shadow.
Horizon at Apogee.
A happy red parachute in a stratus sky.







HARA Spring Flight Conquered by Corn

It was a good day in north Alabama for "rocket flesh," with light winds and good visibility. HARA assembled on April 20, 1996 for a sport launch and the annual flight of the first round of SEP payloads. The SEP program brings out all kinds of students, teachers and their families who make a field day of preparing their science experiments and watching the rockets fly. Kids had fun flying a large assortment of Estes and Quest models. The adults flew larger rockets.

Brian Day always has his pickup truck full of rocket excitement. The fun began with a VB Extreme 38 on its maiden flight on a F40-10W. The delay was much too long, and the shock cord made a small zipper on body tube. Brian says she'll fly again. Next, he lit off a PML Io on a G64-10W, the first flight on a G motor for this small rocket. This is the motor for this rocket!

Brian's serious stuff came with the THOY Falcon on a I154-MJ and carrying the skycam payload (a sequenced 35mm camera). The first flight was beautiful and textbook perfect. Second flight on the same type motor had a *really* late ejection, resulting in a stripped 'chute and separation at high speed. The camera survived and the film was okay. Miraculously, after a new bulkhead coupler and touching up some scratched paint, it's good as new. The pictures show an impressive blackjack plume.

Emily Tygielski fired a LOC Legacy on an F25-4W and had to walk a long way for that one. Kate Riley lit off a Quest DC-X on a C6-3 for her first rocket launch. Anna Tygielski flew a LOC Onyx on F14-4J. Mark Tygielski got attention with an ACE Shark on F14-4J. The kids seemed to enjoy the look of this one. Then he popped the 'Birdie' badminton shuttlecock on a 1/2-A6-2, built from old plans reprinted in the MAX-Q. His Brighthawk worked well on a F25-4W and 2 D11 airstarts, but he had a problem with the "BAMA Booster," taking a H97-SJ and 6 airstarted D11's. The chute did not fully deploy but the airframe made it OK with no damage. More trouble came with Mark's Crayon rocket (Ver 3.0) loaded with a G40-4W, which failed to eject. Granted even with those large fins, it had a lot of horizontal trajectory. After three crayons and three crashes, "I will not give up," said Mark.

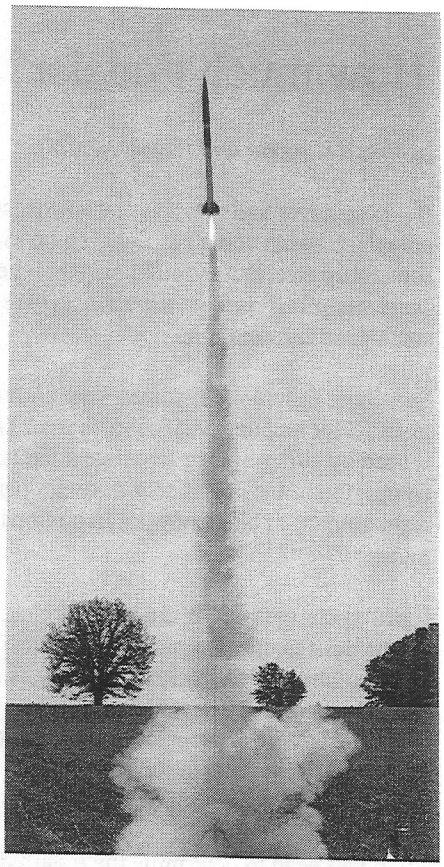
Vince Huegele had an exceptional day with no losses and minor damage to his birds. His PML Explorer worked fine on an F25-4. He launched an Aerotech Arcas on F25-6 and G80-7 motors, the first launches of that model recovered both times without a mark. Vince also flew an Estes V-2 on a D12-3. The Mean Machine with parasite shuttle glider did real well on a D12-3, with a nice trim on the Styrofoam orbiter. Lastly, the Terrordactyl delta wing pop-pod glider went up on two C6-3 flights for Vince. Gliders with no moving parts are easy to prep and quick to fly.

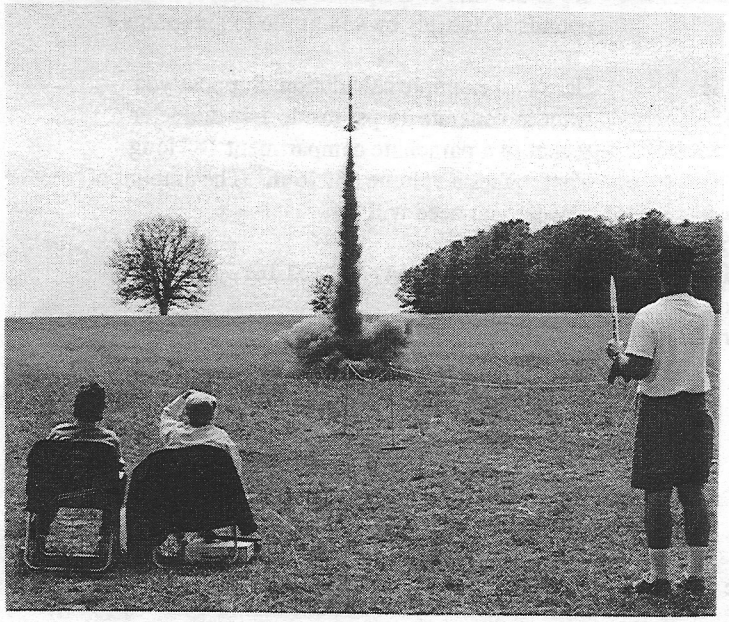
Neal Redmond stays with the "manly" size rockets. He warmed up his Fiber Dawg with an I211-MW going to 2000 feet in a nominal flight. The Dawg is an 8 foot tall, 4 inch diameter rocket which Neal has flown several times on K550 and K1100 motors at Mojave Desert, and Black Rock & LDRS to 10,000 feet. He had some fun with a fiberglass Patriot on a I357-M. The semi-scale "in development" rocket, (unpainted) had an in-flight motor failure: a blow-by ignited the ejection charge prematurely. Besides a small zipper on the body tube in a dramatic flight, the bird was otherwise undamaged. It had a good parachute recovery despite deployment at around 500 miles/hour.

When Greg Warren discovered the engine casing sent to him by Aerotech was a for a hybrid motor and did not fit the RMS he needed, he was suddenly a man without a motor. Fortunately, Neal's Dawg was available with power and served to fulfill the SEP objectives for the day. Two I357-S motors were used for SEP Flight #1 and #2 respectively. Both flights were nominal and all experiments were recovered. The students excitedly received their payloads from the capsule and immediately began evaluating the results.

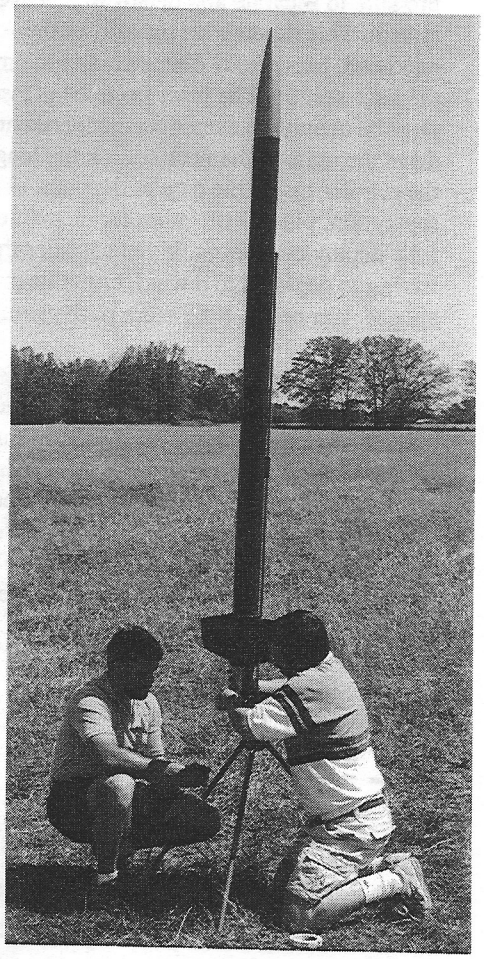
Kevin Cornelius had an interesting rear ejection model that did the trick. It was a modified medium size LOC something-or-other that flew on G64's. Scott Saint showed the Estes Sidewinder around. He had a Black Brant and a DC-X. Mac Weathers put a Mustang through its paces. It's hard to believe how high these things go on E motors.

At the end of a satisfying day the kids and teachers had all gone leaving just the rocket faithful. HARA members took a last look at the cow pasture which was to be planted with corn this year and no longer accessable. The search for another place to fly is on again, because the models that this club launches can't be flown in the schoolyard.






Crayola



How much Powder?

by Vince Huegele and Wayne McCain

If you've never had a rocket crash because the parachute didn't come out right, go on to read something else. But if you know what the term "core sampling" is from experience, here is some good information.

Parachute failure often comes from an incorrect insufficient amount of ejection charge. This is caused by either having too large a parachute compartment inside the rocket, or not using the right amount of black powder in a reloadable motor.

Ejection charge weight can be calculated based on the desired ejection pressure and the internal "free-volume" of the rocket airframe. Normally the volume of the parachute and rigging inside is neglected. This approach is used in industry for closed bomb calculations and pulsar (pressure cartridge) applications.

First, you need to determine the required pressure to separate and deploy the recovery system. This depends on the area of the bulkhead, hence body diameter, and the mass of the nose section. The force from the pressure must be enough to overcome the inertia and drive the mass of the nose section the length of the coupler inside the tube to the point of separation, plus a little more for momentum to fully deploy everything. If you consider the nose having to deploy into a wind, or not near apogee, you need a little more push again.

Assume that the gas expands and the pressure occurs instantly and uniformly throughout the volume. The pressure exerts an instant force on the forward bulkhead intended for extention. Neglect any change in pressure and temperature from the change in volume as the nose moves forward, (unless you just like calculus.) This is the simplest case for a single set of variables and adequate for most ejection systems.

The ejection charge equation is:

$$W_p = \frac{dPV}{RT}$$

where
dP is the ejection charge pressure in psi.
R is the combustion gas constant, 22.16 (ft-lbf/lbm R°) for FFFF black powder. (Multiply by 12 in/ft to get in terms of inches.)
T is the combustion gas temperature, 3307 degrees R for black powder.
V is the free volume in cubic inches. Volume of a cylinder is cross section area times length L, or from diameter D, $V = L \pi D^2/4$
W_p is the charge weight (mass, actually) in pounds. (Multiply by 454 gm/lb to get grams.)

Here's an example calculation. Suppose you want to generate 15 psi inside a 4" diameter rocket in a parachute compartment 18" long. That makes a volume of 226 in^3. The amount of powder you need will be

W_p = 15 *226 (454) / 12 (22.16) 3307

= 1.75 grams

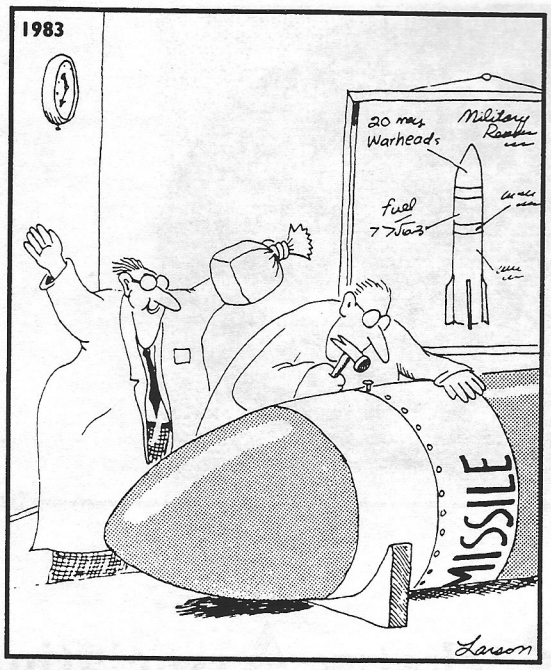
The equation can be turned around to find what pressure is produced by a given charge mass. So that you won't have to think, it's just

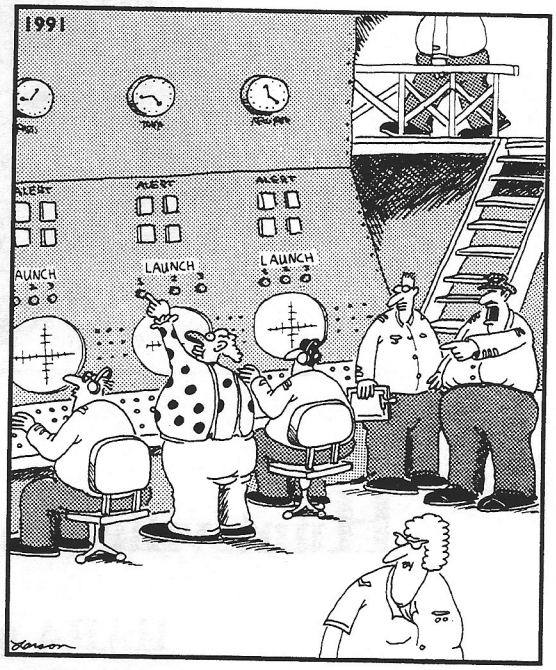
$$dP = \frac{W_p RT}{V}$$

Now, so you will have to think, given the ejection charge mass in a D12 motor is .85 grams, what pressure is generated inside an Estes Phoenix model, with a 2.4" diameter and 8" long chute compartment?

From this relationship of parameters, you can better design the amount of recovery space in your rocket, or customize the amount of powder to successfully deploy the system.

Of course, since you're being this careful to determine the correct charge amount, you'll want to verify it by a ground test. That way you can get a better handle on other less precise variables like nose coupler friction inside the tube and necessary shock cord length. But how to do that is another article!

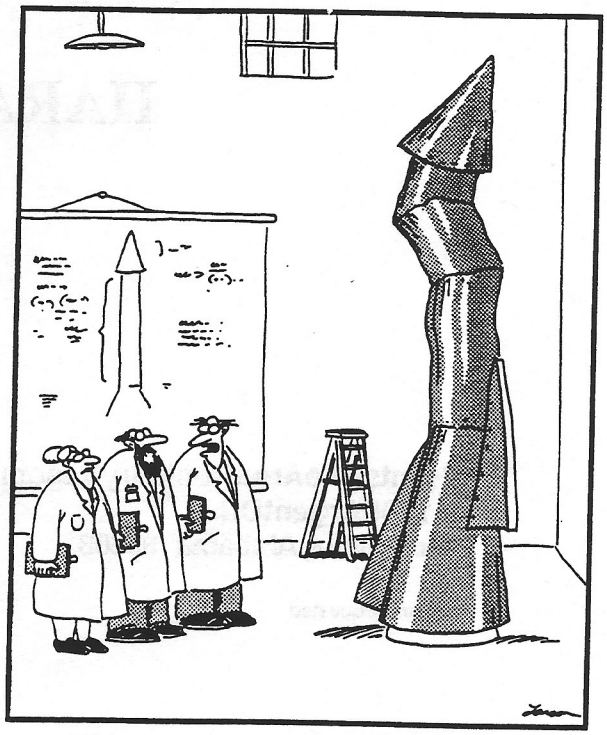




"Hey! What's that clown think he's doing?"

Celebrate Rocketry on a National Level

LDRS July 4-7, Orangeberg, SC



"It's time we face reality, my friends. ... We're not exactly rocket scientists."

Huntsville Area Rocketry Association

HARA past, present and future

HARA's Data Nexus

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