MASA Planet

Volume 5, Issue 5 | The Tip of Your Nose Edition | November 2002

Safety First!

Tilt!

Will it lead to…Game Over?

Ted Cochran, NAR 69921

It's common to see fliers tilt their launch rods into the wind so that their rockets don't drift too far during recovery. We all do it! But how far should we tilt the rod, and in which direction? After watching a few too many scary flights, I decided to analyze some of the variables involved. You may be surprised by the results.

Ted Cochran

Lil Nuke on a 10˚ ascent path.

The NAR safety code allows launch rods to be tilted as much as 30˚ away from vertical, which is a *lot*— In the picture above, the angles shown are 0˚, 10˚, and 20˚! A rocket leaving the pad at a 30˚ angle will convert a lot of its thrust to horizontal motion, resulting in a lower flight, an earlier apogee, and a greater velocity at ejection.

This can make a good flight go bad. For example, Rocksim says an Estes Alpha on a C6-7 flying straight up in calm conditions will reach 1494 feet and eject within a second of apogee, at a velocity of 10 mph. Great flight! But, if launched at a 30˚angle it

Ballistic, continued on page 2

Also in This Issue

Keynote Article

Rocket Rhinoplasty

Beyond cones and ogives

Kerry Hodges

One of the things I enjoy at a MASA launch is to wander around and look at other people's rockets hoping to see something that fires my igniter. Some interesting rockets have unique color schemes, are large, or have bizarre fin designs. Others are interesting because of their expert construction and exquisite finishing detail. Others are interesting because of raw power using a single high-powered engine or sheer number of engines (clusters). Maybe it's just me, but I also tend to notice nose cones. I've given it some thought and have concluded that a nose cone is very important in defining the appearance of any rocket.

If you look at all the interesting people at a launch, you will notice that every one has a unique nose (yes, nose!). No two are alike. Different shapes and sizes. Although we do not rely solely on noses to identify people, they do help us distinguish one person from another. The same principle applies to rockets. Unfortunately, if you look at rockets, there are not too many unique nose cones. The parabolic and ogive curves of most Estes nose cones are ordinary. Likewise, Public Missiles and LOC have a boring run-of-the-mill selection of nose cones. Although we can not point and recall their part numbers or derive the mathematical equations defining their shapes, we do subconsciously recognize them. Our eyes have been accustomed to seeing their shapes, and we tend to gaze past them to focus on the rocket's other features, the features that distinguish the rocket from others in the crowd.

This provides a great opportunity for attention seeking rocketeers such as myself. I have found that

Schnozzes, continued on page 2

Ballistic, continued from page 1

will only reach an altitude of 1159 feet, and will eject 1.5 seconds after apogee at a velocity of 55 mph! Suppose the rocketeer uses a shorter delay? Surprisingly, that makes things worse! The ejection occurs a half-second before apogee, all right, but the rocket is moving five mph faster!

How can this be? When launched at a 30˚ angle, the Alpha achieves a horizontal velocity of 200 mph. After burnout, the only thing that reduces horizontal velocity is drag. Our little Alpha has the same vertical velocity a half-second before apogee as it does a half-second after, but its horizontal velocity is still decreasing. Early ejection is no longer just as bad as late ejection.

The lesson here is that rockets on ballistic trajectories— those with a significant horizontal component— don't behave the same way. The significant horizontal component of ballistic flights does not decay at the same rate as the vertical component. Recovery timing is more challenging; the velocity at ejection is always positive, and it is often significant. But wait! It gets worse!

But wait! It gets worse!

Suppose the wind is blowing at 20 mph? Now the Alpha weathercocks an additional 17˚ and flies to only 944 feet, and it's traveling at *71 mph* at apogee. Can a shock cord stand the load of a parachute deploying at that speed? If it does, can you say, "zipper?"

You may think this example is extreme. After all, who flies with 30˚ rod tilt in 20-mph winds? No one, on purpose! But initial flight angles of this magnitude are easily achieved by accident— you've probably seen a few! If the rocket is over-stable, especially if is under-powered, it will weathercock more. If the launch rod is flexible, rod whip may make things worse. Also, if the rocket's diameter is large with respect to the motor, the offset of the thrust vector from the rod can cause the rod to bend even more.

Plug some of these parameters into Rocksim, and you'll find that it isn't too difficult to lawn dart that Alpha with a C6-7, or to achieve flights with a velocity at apogee of 100 mph, even with modest rod tilt!

Those outcomes are Not a Good Thing. So pay attention to how much you tilt that rod, especially if your launch rod is bendy, or your rocket is heavy, over-stable, or wide-bodied!

Schnozzes, continued from page 1

people who ask me about my 2x scale Estes Goblin almost always ask about the nose cone. It grabs the eye. The nose is longer with a less pronounced parabolic curve then the garden-variety 2.6" diameter nose cone. Balsa Machining Service custom made it to the length and shape I desired. This makes the Goblin different from every other rocket on the field. Another example, John Carlson's 1/4 scale WAC Corporal (hanging in the trees to the East) is a nice looking rocket. Although it is a simple design, the long conical shape of the nose cone made me take notice of it. John made the nose cone himself and there is none other like it.

Alan Estenson

This fascination with unique nose cones has been captured in a few factory production kits. The Launch Pad Company tends to take existing boring nose cones and glue paper cone tips on them to slightly alter their shape. The newly created curvature catches our attention, and although we may not consciously notice it, we do notice how cool the rocket looks. Mike Kutzke's Harpoon from The Launch Pad is a nice example of this. Other kits like the Estes Odyssey, scaled kits like the Mercury Redstone, Honest John, and Saturn V all have unique nose cones. I think this is part of their appeal.

For those of you looking to scale up existing rocket designs or to scratch build your own unique design, consider acquiring a distinctive nose cone. You can make it yourself, have it custom made to your own design, or cleverly modify an existing nose cone to create a new shape. Give your rocket a nose job, and you may find it turns a few more heads.

Nose Tip

A Tangent Ogive is made from two arcs, each from a center in line with the base of the nose cone, that thus blend smoothly with the body. The ratio of the length to the diameter (e.g., 3:1) is used to describe the shape.

MEETING SCHEDULE

MONDAY, NOVEMBER 4
[NOTE CHANGE DUE TO GAME AND ELECTION DAY]
Location: Science Museum of Minnesota, St. Paul
Time: 7pm to 8:30pm
Topic: 2003 MASA Officer Nominations

SATURDAY, DECEMBER 14
MASA Holiday Party!
Location: The Hoymes' house
5930 Annapolis Lane North
Plymouth, MN (See map below)
763-551-1748
Time: 7:00 - 9:00 PM

TUESDAY, JANUARY 7
Location: Science Museum of Minnesota, St. Paul
Time: 7pm to 8:30pm
Topic: 2003 MASA Officer Elections

LAUNCH SCHEDULE

SATURDAY, OCTOBER 26: CLUSTERS!
Location: Blaine
Time: 10 am -2 pm
Fun Events: SAM Drag Race; Junk Yard Rockets Fly(?) Off

SATURDAY, NOVEMBER 23
Location: Elk River / Otsego
Time: 10 am -2 pm

SATURDAY, JANUARY 25
Location: White Bear Lake
Time: 10 am -1 pm

President's Corner

Times are a changin'

Alan Estenson

At the September launch, MASA had its first experience with a "hybrid" misfire alley range. Eight "community" pads were set up from a central controller. Plus, many people set up their own pads and controllers. All launches were performed under LCO direction, and an inspection was required of every rocket before launch. I'm happy to report that it worked quite well, and we plan on doing it again at the October launch. It was absolutely, positively, not the "Misfire Alley of the Apocalypse."

A larger change will arrive with the New Year. Effective after the January 2003 meeting, there will be some new MASA club officers. After serving two years, S/T David Fergus and myself will both be retiring. Also, Ted Cochran would like to retire from the VP position so that he can focus his efforts on the Planet newsletter. This means nominations, elections, and new people in charge. I encourage everyone to consider running for a club office. For the club to survive and thrive, talented people need to step forward and volunteer to fill our shoes. (I'm supposed to use terms like "fresh blood" and "new generation of leadership.") Requirements? MASA officers must be senior members of the NAR (or join before they take office), and, of course, members in good standing of MASA.

Nominations for 2003 club officers will officially open at the club meeting on November 4. Nominations will be accepted from then until November 22. You can nominate someone else; you can nominate yourself; someone else can nominate you (with or without your consent!). After the meeting, I will accept more nominations via email until the cutoff date. Nominees will have until November 30 to accept or decline their nomination. Remaining nominees will officially become candidates on December 1, and the election will be held at the meeting on January 7. Absentee ballots will be accepted from those MASA members unable to attend that meeting. Election details will be published in the December newsletter.

If you go to the "Officers" page on the club web site, you can read descriptions of the officer's duties. If you have any questions about the duties, feel free to ask the current officers.

Hot jets!

Alan Estenson, MASA President

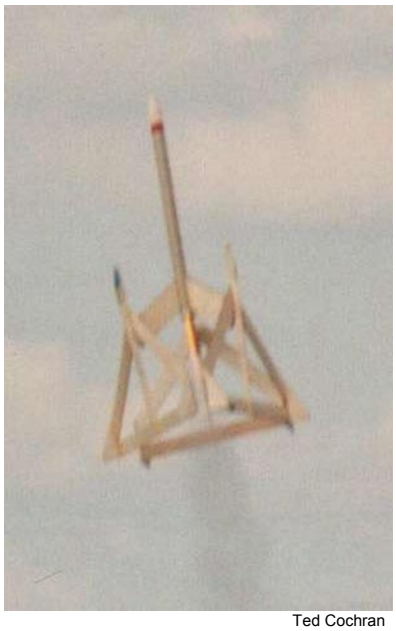
Kit Review

Deltie Air Show

Think one Deltie is fun? Try flying three of them!

Seth Cochran

I really like the Edmonds Deltie kit. It was easy to build, and it flies very well. When I found out about the Deltie Air Show, which is a rocket that launches three Delties at once, I really wanted one, and Dad gave me the kit for my birthday!



Ted Cochran

Seth Cochran's Deltie Air Show ascends on another crowd-pleasing flight.

The kit is very easy to build. The Delties are built the same way as the original Deltie kit. The only tricky part is to get the fuselage to stand up straight. I used a couple of square paint bottles to hold it that way while the glue dried.

The carrier rocket is easy to build too—like a regular rocket with three fins, except the fins have hooks at the end to hold the Delties. The Delties in the Air Show are hooked on to the tail by their wings, not by their noses.

It is a little bit tricky to set up on the pad. The first time we tried to launch it, it was a bit breezy, and the wind kept blowing the Delties off. Then when the motor lit the igniter clip hooked on to one of the Delties, and the rocket didn't leave the pad. Now we use a clothespin to hold the rocket up, and more clothespins to hold the igniter cord to the launch rod near the motor and at the bottom of the launch rod.

The Deltie Air Show uses a B4-4 motor. When it fires the ejection charge, all of the Delties zoom up and out like the Air Force Thunderbirds, and then glide down at the same time. It's a great kit! Next: The Deltie Thunderbird Air Show!

Edmonds Aerospace Deltie Air Show, about $20.

Road Trips

Midwest Regional Contest

Oct. 5-6, 2002

Mike Erpelding, NAR 79922

The WOOSH section of the NAR hosted the Midwest Regional Contest (MWRC). The contest was held at the Bong State Recreation Area; near Kanasasville, WI.

I drove down to the hotel that I was staying at in Kenosha on Friday. There was a lot of road construction on I-94. It was weird to come to a dead stop on the interstate in the middle of nowhere. My best friend's aunt from Tomah passed away that week; so we followed each other that far. It was nice to someone to eat lunch with. We left St. Cloud around 11:00 A.M. and I arrived in Kenosha around 9:30 P.M.

The contest was supposed to start at 10:00 A.M. on Saturday morning. Due to a scheduling error by the park administration, we were double booked with a horse trail ride for cancer. There was concern by the horse people that our rockets would spook the horses. I was a little surprised that they were more concerned about us rather than the couple of dozen hunters in Bong. A compromise was reached and we were allowed to fly our rockets at 1 PM, after the trail ride was mainly over.

Besides me, NAR members from Wisconsin, Iowa, Indiana, Illinois and as far away as Tennessee participated. One busload of students from Upper Michigan came down to try to fly their Team America rocket. Unfortunately their rocket suffered a separation.

The first event that I entered was the open spot parachute landing. A steel post was driven into the ground 50 meters from the launch pads. The goal was to have your parachute-equipped rocket land as close to the post as possible. This was a one-flight-only event, and one of the rules was that your entry also had to be your first flight of the contest, so that no one could have any "test flights". I put an eight-inch nylon parachute from Recovery Technologies in my Mini Mars Lander rocket. The wind was swirling, so it was hard to decide how to angle the launch rod. My rocket

MWRC, continued on page 5

MWRC, continued from page 4

landed 46.8 meters from the post, good enough for fourth place.

Mike Erpelding

Saturday's range head. Note the tall weeds!
Pole on left has thermometer and streamer for thermal sniffing.

My second event was the ½ A Boost Glider Duration. I built my first scratch- built glider following the specs listed in the book*: Model Rocket Design and Construction*. I hand-tossed it once before I launched it and it glided beautifully. I flew this rocket on an Estes ½ A 3-2T. I had a nice boost but I ran into trouble. The "lift" produced by the wings of my glider caused it to arch steadily back. The pod ejected barely before impact. Can you say, "DQ- unsafe?"

I got several tips on how to correct this. One was to move the wing slightly out of square with the glider body. Rather than wasting my last flight attempt on an unproven glider; I dug out my vintage Flat Cat. Normally I fly this glider on Bs and Cs because it's build solidly. For my second contest flight, I used an Estes ½ A 6-2. She was a little under-powered on boost, climbing to an altitude of about thirty feet before she started to fall, still vertical. The ejection charge went off at somewhere around 15 feet. The glider managed to transition to a glide, less than two feet off the ground. It was declared qualified, just barely! Total time: 3 seconds. This flight took fifth place.

My next event was ½ A helicopter duration. I built an Apogee Components Heli-roc. This was the first time that I ever flew a helicopter recovery rocket. I also flew this rocket on an Estes ½ A 3-2T. I made the mistake of using too many wraps of thread around the blades. When the ejection charge burned through thread that passed through the body tube, the rest of the thread prevented the blades from opening, DQ- no deployment (NDP). I finished gluing the last pieces on this rocket Friday night so there was no way I had time to paint it. The bare balsa really blended in well with the tall dry grass where it landed. I looked around for a while for it. I was thinking to myself that, unlike Texas at least, I didn't have to watch for rattlesnakes. Just then I heard a crunch under my left foot. I'd found my rocket! I cracked two of the rubber band hooks off the blades. The rest of the rocket was fine, but the damage prevented me from flying it again.

<Crunch> …I'd found my rocket!

I'd started prepping one of my E streamer rockets when there was an call was made for a couple sport flights to warm up the trackers. I grabbed my Estes Mach 12, added some orange chalk, put in an Estes C6-5, and headed for the range head. WOOSH has two really cool theodolites! They electronically measure the azimuth and the elevation [I forgot to ask

MWRC, continued on page 6

Sunday's range was set up on the old runway

Mike Erpelding

MWRC, continued from page 5

how high the Mach 12 flew].

Next I decided to fly my 200 meter set altitude rocket. This event was also a one flight, no required return event. My theory was that I could control my rocket's altitude by varying the mass of the tracking powder. Rocksim said that if I used an Estes C6-5 with 2.7 oz. Of tracking powder ; my rocket should reach an altitude of 201 meters. I made one big miscalculation, however: I didn't realize how much volume 2.7 oz. of chalk can fill up! I set my rocket on a scale and at 2.1 oz. I ran out of body tube. After some shaking, I got the chalk to settle enough to get everything to fit.

I had a nice flight, but the ejection was pretty loud. The RSO wanted to impound my rocket to see if it ejected its motor. Much to my surprise when I recovered my rocket, the side of the rocket was blown out. The engine was still intact and not all of the chalk came out. The pressure had to go somewhere. I brought my rocket over for inspection. Since to engine was still there, it was okayed (with a lot of laughs!). My rocket flew to 232m. Since you lose ½ point per meter your altitude is off of the set altitude, I got 16 points.

Next I flew my Apogee Aspire on an Estes E9-6 for my first E streamer duration flight. I got a time of 47 seconds. On my second attempt I used a rocket I designed with a BT-80 tube. My idea was to use the biggest streamer I could find. I found a crepe paper streamer at Hub Hobby that was 6" by 60". I got a 39-second flight with this rocket. These two flights placed me fourth again. There were a few flights until dusk, including an upscale of an Estes Manta.

That evening was the giant sport scale judging. Since I didn't have an entry, I got to be a judge for the team division. I'll have to make sure that I build a sport scale rocket for my next contest, because they're worth

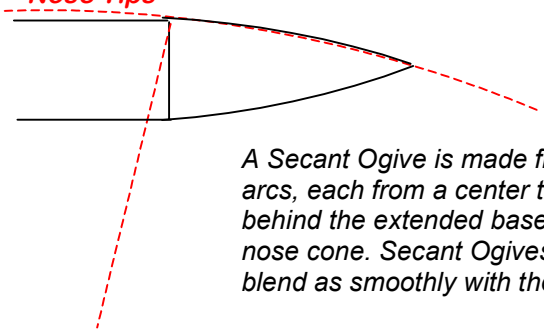
Giant Sport Scale models Mike Erpelding

major points! First place was worth 600 NAR points, second place: 360, and third place 240 points.

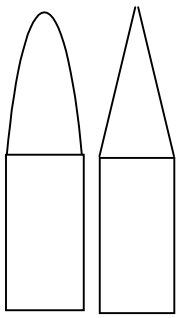
Sunday was a windy day to fly rockets with winds of 18mph. Some of the giant sport scale rockets were flown for flight points. A few sport flights and a couple contest flights were flown before I left to come home. Before I left, several WOOSH members asked if we might ever hold a regional contest, especially since we are so close too them. I said maybe in a couple years, if our members would feel interested in one. I didn't want to over-step my bounds, but I think we could handle a regional contest easily. It is operated basically the same as our recent parachute contest: If you want to compete, you help out, for example by timing other flights, tracking, scale judging, etc.

I'm looking forward to the next contest, probably this spring.

Nose Tips



A Secant Ogive is made from two arcs, each from a center that is behind the extended base of the nose cone. Secant Ogives do not blend as smoothly with the body.



Most other nose cone shapes are named after the geometric figures on which they are based (ellipsoid, parabolic, conic, or combinations such as triconic).

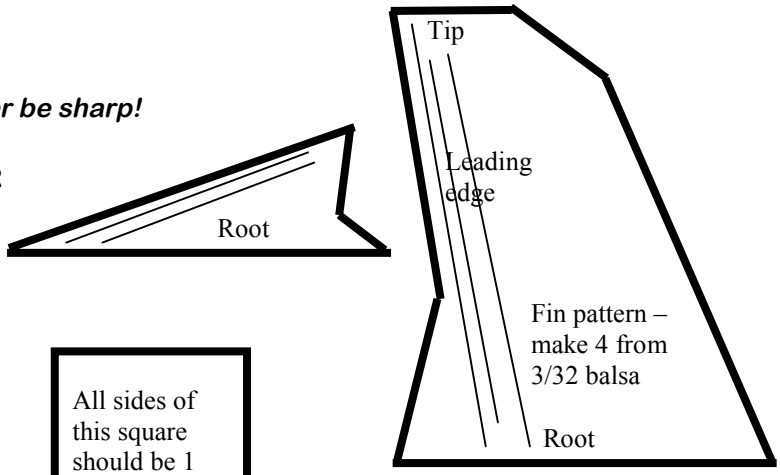
Further reading: http://www.geocities.com/rocketguy_101/ogive/OgiveNoseCones.htm


MASA
2002

Xactron Projectile

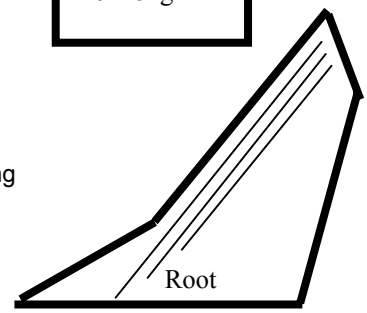
'Cause with all these fins, your X-acto had better be sharp!

Design MH-04 by Alan Estenson, NAR 69539 SR



Specifications

Length:	457 mm (18 in.)
Diameter:	25 mm (0.98 in.)
Weight:	40 grams (1.4 oz.)
Recommended engines:	A8-3 (230 ft);
	B4-4 (480 ft);
	B6-4 (490 ft);
	C6-5 (880 ft)



Parts list

A. One (1) bt-50 body tube, 356 mm (14 in.) long
B. One (1) plastic nose cone (from Estes NC-50 pack)
C. One (1) bt-20 motor mount tube, 70 mm (2.75 in.) long
D. One (1) eb-20 engine block
E. Two (2) 20/50 centering rings
F. One (1) standard motor hook
G. One (1) 1/8 in. launch lug, 51 mm (2 in.) long
H. One (1) shock cord – 610 mm (24 in.) of 1/8 in. elastic or Kevlar
I. 3/32 inch balsa sheet for fins
J. One (1) parachute – 12 inch diameter
K. One (1) snap swivel for parachute (optional)

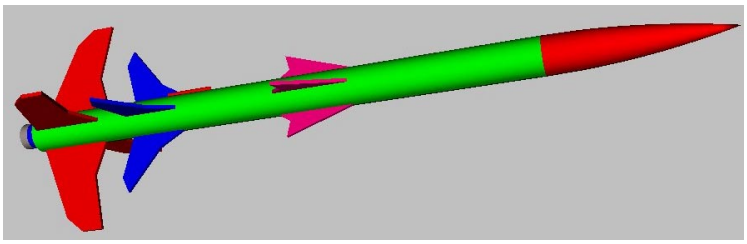
Notes

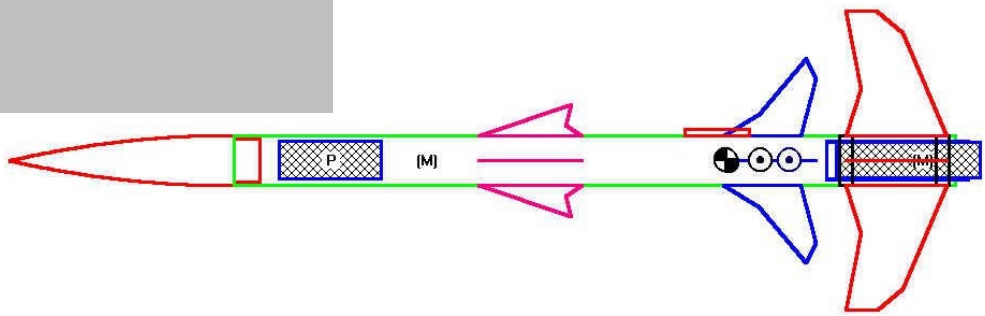
Place bottom of launch lug 4 inches up from bottom end of body tube.

Cut all fins from 3/32 inch balsa sheet. Make sure wood grain is parallel to longest section of leading edge. Measured forward from the rear of the body tube, place rear of each fin group at 0.125 inch, 3 inch, and 7.25 inch locations.

Center of Pressure is approximately 3.5 inches forward from the bottom end of the body tube.

(The multiple fins cause a nice whistle during flight. – Alan)

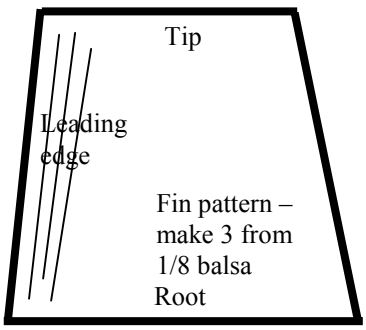


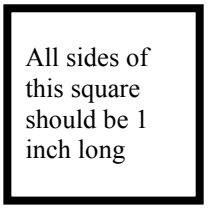


EZC6-5

A 1/3 scale version of the LOC/Precision EZI-65.

Design MH-03 by Alan Estenson, NAR 69539 SR





Specifications

Length:	516 mm (20.3 in.)
Diameter:	34 mm (1.33 in.)
Weight:	57 grams (2 oz.)
Recommended engines:	A8-3 (170 ft)
	B4-4 (440 ft)
	B6-4 (460 ft)
	C6-5 (960 ft)

Parts list:

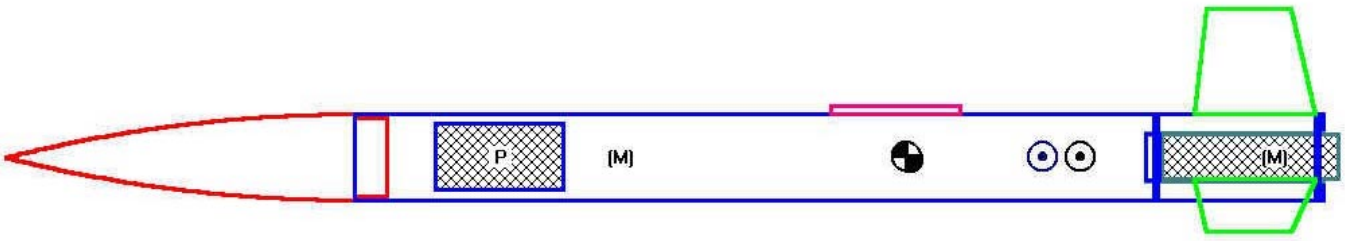
A. One (1) bt-55 body tube, 381 mm (15 in.) long
B. One (1) nose cone (prototype used Custom Rockets 55-size plastic cone)
C. One (1) bt-20 motor mount tube, 70 mm (2.75 in.) long
D. One (1) eb-20 engine block
E. Two (2) 20/55 centering rings
F. One (1) standard motor hook
G. One (1) 1/8 in. launch lug, 38 mm (2.325 in.) long
H. One (1) shock cord – 762 mm (30 in.) of 1/4 in. elastic or Kevlar
I. 1/8 inch balsa sheet for fins
J. One (1) parachute – 12 inch diameter
K. One (1) snap swivel for parachute (optional)

Notes:

Place bottom of launch lug 5.5 inches up from bottom end of body tube.

Fins are placed 1/8 inch up from bottom of body tube.

Cut three fins from 1/8 inch balsa sheet. Make sure wood grain is parallel to leading edge. Check the dimensions of your fin pattern to make sure it printed correctly: root 1.875 in., tip 1.33 in., height 1.625 in.



Center of Pressure is approximately 4 inches forward from the bottom end of the body tube.

[The color scheme shown in the photos is a duplicate of the EZI-65 that I used for my Level 1 certification flight. - Alan]

For The Good of the Planet

Reader's Poll Results

Ted Cochran

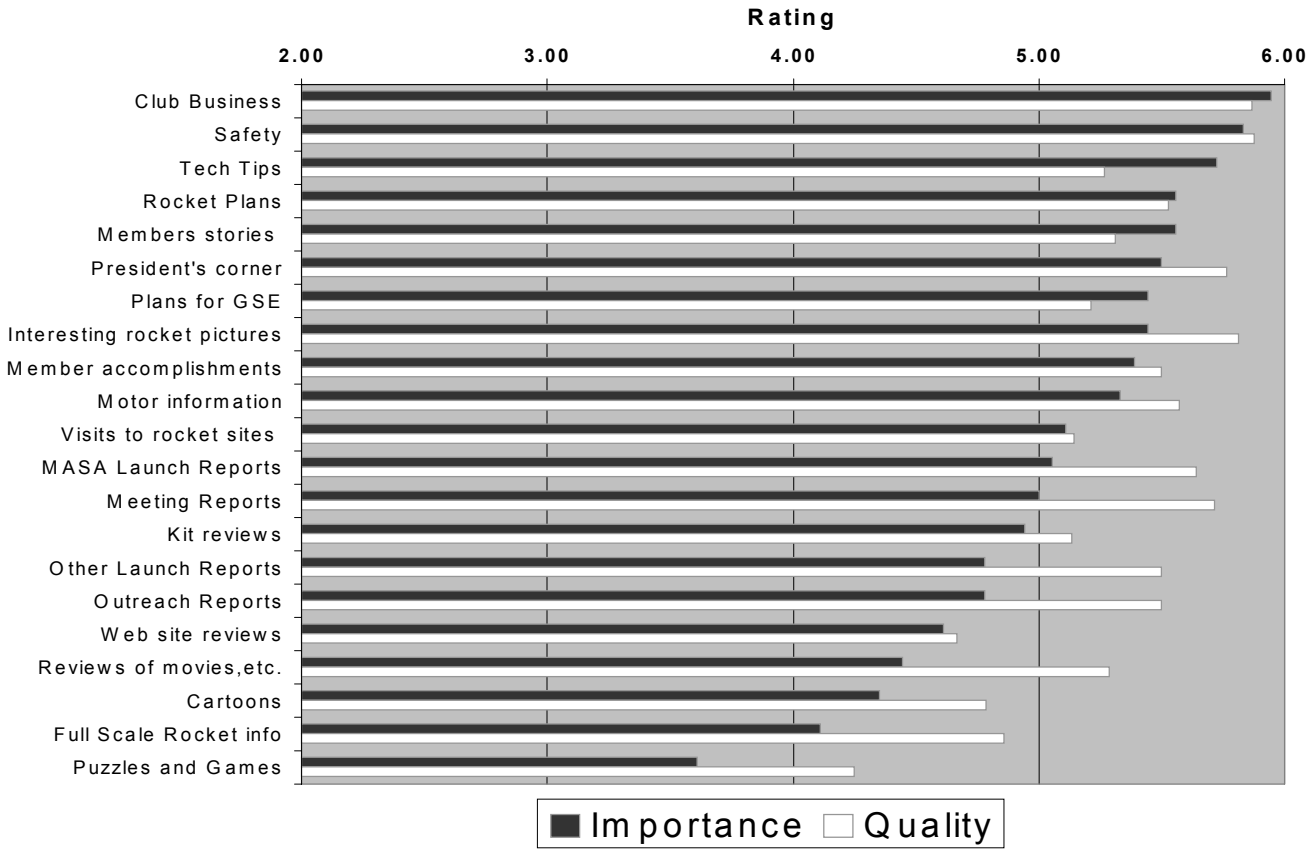
This is the last issue of Volume 5 of the *MASA Planet*. I have really enjoyed editing it! I want to take the opportunity to thank all of this year's contributors: Seth Cochran, Russ Durkee, Mike Erpelding, Alan Estenson, Dave Fergus, Kerry Hodges, Steve Hum, Glen Overby, and Rick Vatsaas. Because of your help, the *Planet* has had its best year ever! We've finished the transition to a bi-monthly publication: Volume 6 will be our first six-issue volume, with Number 1 due out by January 1, 2003.

I'd like to share with you the results of the Reader's Poll I took in September. Those of you who filled out the survey said that you are happy with the *Planet* so far: Overall, you gave it a 6 on a 7-point scale. You also agreed with the existing philosophy of not repeating content available on the Most Excellent Web Site that Alan maintains for us [Other than the schedules of events, there is very little duplication between the *Planet* and the web. Except, of course, that the *Planet* itself is available on the web site!].

You think the publication frequency is fine, and you don't need (nor want to pay for) it to be printed in color. You'd also like to see more people contribute (so, set an example :-). Most of you get rocketry information from a wide variety of sources (web sites, magazines, books, email lists) which means originality in the Planet is a plus. You'd like to see more articles of all types, especially scale modeling and competition.

The chart below summarizes your opinions on various types of articles that appear in the *Planet*. The top bars represent how *important* you think these types of articles are to include, and the bottom bar indicates what you think of the *quality* of recent articles in each category. Although you don't think that everything that has been included is equally important, it was gratifying to see that your ratings on the quality of articles never fell below neutral. I'll reduce the frequency of some of the types of articles you're less interested in, and in the future you can expect to see still more of the kinds of articles you want!

Thanks again for the opportunity to be the *Planet* Editor, and keep those articles coming!



Readers' opinions of how important it is for various article types to appear in the Planet, as well as of the quality of recent examples of each article type. Original scale was 1 to 7. Overall mean=5.21, s.d.=1.22, n=18.

Five-Year *Planet* Index

Alan Estenson

The *MASA Planet* is the official newsletter of the Minnesota Amateur Spacemodeler Association, Section 576 of the National Association of Rocketry. It is published bimonthly as a service to its members.

The *Planet* is available in color on MASA's web site:

http://www.mn-rocketry.net/masa/

MASA's 2002 Officers:

President & Webmaster	**Alan Estenson**
Vice President & MASA Planet Editor	**Ted Cochran**
Secretary/Treasurer	**Dave Fergus**
President Emeritus	**Russ Durkee**

Submissions may be made to the editor at: masa.planet@mn-rocketry.net. (Volunteer quickly, lest you be asked to discuss the wisdom of a L1 Certification attempt with a 12-foot boost glider!)

If your email address, U.S. Mail address, or phone number changes: Please send notice of your change to masa@mn-rocketry.net. Include your name, old email address, and new address. We depend on email for communicating important information. When an email address starts "bouncing", we lose contact with you.

Kudos!

New NARTREK Awards

David Whitaker	Bronze (pending)
Stuart Lenz	Bronze (pending)

David and Stuart are the fifth and sixth MASA members to finish NARTREK Bronze. At least 15 other members have at least one of the four Bronze flights completed! Please let us know as you finish your flights!

Parting Shot

www.vandenberg.af.mil

Speaking of interesting truncated multi-conic nose cones….USAF Peacekeeper sheds packing spacers as it emerges from its silo during a test launch at Vandenberg Air Force Base.

MASA Planet

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