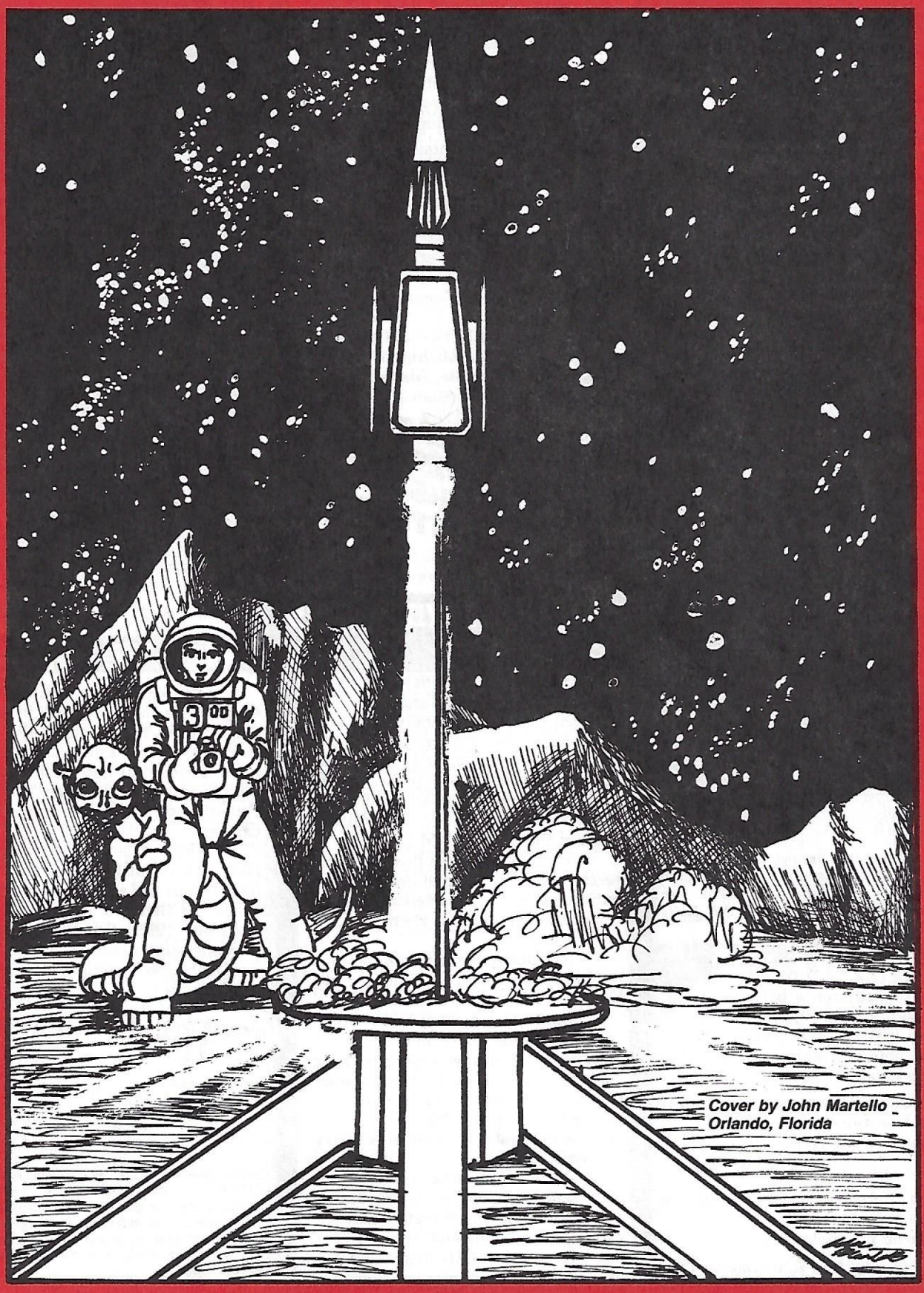
ESTES
WINTER
1986

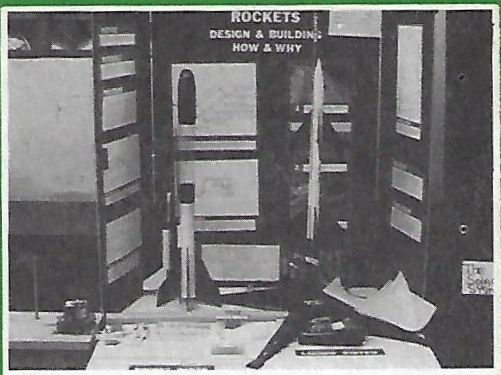
MODEL ROCKET NEWS MAGAZINE

DEDICATED TO AND PUBLISHED FOR ESTES ROCKETEERS, AMERICA'S FUTURE IN SPACE

$1.00



Cover by John Martello
Orlando, Florida



Scott Porter's Science Fair project on model rocketry won first place at the Level II and Middle School (Levelland, TX) Science Fair and First Place at the South Plains Regional Science Fair in Plainview, TX.

His project utilized three model rockets with explanation of the parts and functions. He also made flight tests comparing performance of the rockets. His teacher, Mrs. Debbie Moore, suggested that he not use the word "model" on his project, so he used the word "miniature" instead.

Congratulations on a great job, Scott!

John Hamill and friends launch his AstroCam rocket. He has given several demonstration launches. Photo by Pat Eager. Reprinted with permission from the Roanoke Rapids, NC Daily Herald of July 7, 1986.

RIDDLES

Q. What is the difference between an astronaut going to an upper deck and an astronaut looking up a ladder?

A. One is stepping up stairs, and the other is staring up steps.

Q. Why don't sophisticated people go to the Moon for vacations?

A. It doesn't have the right atmosphere.

Contributed by Dan Wright, Kalamazoo, MI

Q. What did the rocket engine say to the igniter as it took off?

A. You light up my life!

Contributed by Danny Noel II, Colchester, CT

MODEL ROCKET NEWS MAGAZINE COVER CONTEST

Your response to this contest was very gratifying! The judging was difficult. After hard deliberation, and some strongly expressed sentiments by the judges, the winners were decided.

1st PLACE

John Martello of Orlando, Florida won First Prize. His $200 Estes Merchandise Certificate has been mailed.

HONORABLE MENTION:

Honorable Mentions, along with $75 Estes Merchandise Certificates, went to Brett Blackman of Winter Park, Florida; Garry Mangum of Canon City, Colorado; Dan Diffenback of Harrisburg, Illinois; Mark Mantzke of Norwood, Colorado; Kyle Handy of Flint, Michigan; and Vince Huegele of Huntsville, Alabama.

CONGRATULATIONS TO THE WINNERS, AND THANKS TO ALL WHO ENTERED!

Vinson Huegele Age 30 Huntsville, Alabama

MRN CONTRIBUTIONS NEEDED

Send us YOUR news. Write a letter with suggestions and ideas. Tell us what you want in the way of new products, types of items you want to see in Model Rocket News Magazine, and comments on our products and service. We can't answer all of them, but we will read them. We will use some of them in MRNM.

We like your Idea Box tips. This section of the magazine has been expanded since it has proven so popular. Share that great idea! Help your fellow rocketeers.

Articles--technical, humorous or simply reports on your model rocketry activities--are welcome.

Cartoons are always welcome. If you can, please draw them in ink or soft pencil on plain white paper. Your cartoon stands a much better chance of use if we don't have to redraw it before we can print it.

Jokes and riddles about rocketry are welcome.

Put each separate contribution on a separate sheet of paper. Please put your name and complete address on each thing you send in.

Keep this YOUR magazine!

GODDARD DAY

Charles Roweth of Kim, CO read our suggestions about a launch in honor of Goddard Day in the Winter 1984 MRNM. He volunteered to do a program, and his teacher liked the idea. He and a friend gave a rocket launch in honor of Robert Goddard on the Friday before Goddard Day. Way to go, Charles!

Why not suggest to your teacher or club leader that he or she let you and your friends put on an assembly for Goddard? Write to: Goddard Day, Estes Industries, Dept. 307, 1295 H Street, Penrose, CO 81240 for some suggestions. Please enclose a SASE (self-addressed, stamped envelope).

ESTES MODEL ROCKET NEWS MAGAZINE

Robert Cannon ..... *Editor*
Mary Roberts ..... *Asst. Editor*
Charles Webb ..... *Photographer*
Kent Jodrie ..... *Graphic Design*
Claudia Smith ..... *Typesetter*

MESSAGES FROM LAUNCH CONTROL

ESTES AEROSPACE CLUB

Kenneth Wang is a Craftsman rocketeer in the Estes Aerospace Club. He writes "If you have not already joined the club, I highly recommend it. You receive the Viper kit, membership certificate, iron-on club emblem, decal sheet, range box stickers, membership card, stationery, Model Rocketry Technical Manual, Model Rocket News, and the thrust bar program..." See page 9 for an opportunity to join the Estes Aerospace Club at a big savings!

ADVERTISE YOUR CLUB

Want to get a lot of interested, active, happy, dues-paying members for your rocket club? Advertise! People can't join your club if they don't know about it. If they have heard of your club and want to join, they still need to be able to contact you easily.

The J.A.R.C. (Junior Aerospace Rocket Club) of Urbana, IL is quite active. One of the things they do to recruit new members is prepare and distribute fliers (small information sheets) about their club through local hobby shops (with the permission of the owners) reports Jim Zimmerman. The 5½ x 8½" fliers are mimeographed on one side of the paper on the school's mimeograph machine. The flier features a nice drawing of a model rocket, the club name in large letters, information about the club, when and where they meet, and the names and phone numbers of two people to contact for more information or to join the club.

Maybe your club could try this approach to gain new members.

SCIENCE FAIRS

Model rocketry projects make great Science Fair projects. Kurt Bertram of Kansas City, MO reports that he launched an insect in a payload section several times for his Science Fair project. He studied the insect's reactions before and after the flights. He won First Place in his school's Science Fair. His project went on to place second in the Greater Kansas City Science Fair. Good work, Kurt!

Two other reports of Science Fair projects involving model rocketry appear on pages 2 and 9 of this issue. Why not make your Science Fair project this year on model rocketry? Write us letting us know what you did and how well your project did in the competition. If you can include a good photo of yourself and your project with your report, great!

FREE MRNM COPIES

Don't forget that your club can receive free copies of Model Rocket News Magazine for each member. To receive your free copies, just have one of the officers or your sponsor write us as soon as each new issue is received and ask for the number of additional issues which you need for members who are not on the Estes rocketeer mailing list. Be sure to identify the name of the club, the number of members, your name and address (including street address and zip code), your phone number, and the number of copies which you need. Mail this request to MRNM Free Copies, Estes Industries, 1295 H Street, Penrose, CO 81240.

YOUR CLUB'S NEWSLETTER?

Lee Olyniec, Model Rocket Association of Scottsboro, Alabama (MASA), sent us a copy of his most recent issue of DOWNRANGE.

Does your club have a newsletter? If so, please send it to us. We like to keep up with what rocketeers are doing. Send each issue to: Editor, Model Rocket News Magazine, 1295 H Street, Penrose, CO 81240.

If there is an article or photo which we especially like, we will contact you to see if we can receive permission to reprint it to share it with our readers.

YOUNG ASTRONAUT PROGRAM

If your rocket club has not yet joined the Young Astronaut Program, now is a great time to join. It costs only $20 to affiliate your club as an official YAP chapter and receive all of the benefits. Maybe your school, the school PTO, a local civic group, or a similar organization will be willing to pay the chapter registration fee if you ask them. Your members will not regret the decision to join. They have a number of very good activities and membership benefits. Last year they ran local chapter and regional model rocketry competitions.

For more information, have your president or sponsor write and request information on becoming an official chapter to: Young Astronaut Program, 1211 Connecticut Ave., NW, Suite 800, Washington, DC 20036.

CHALLENGER COMMEMORATIVE LAUNCH

Tommy Magyar of Warren, OH wrote suggesting that it would be appropriate to hold a model rocket launch in memory of the Challenger astronauts. That is a commendable idea. These individuals made the supreme sacrifice. You may want to hold a memorial launch for these astronauts on the anniversary of the tragedy.

REPORTS FOR ENGLISH CLASS

Robbie Richardson of Marian, IN wrote an interesting report on using model rocketry for several oral reports for his English class. We don't have room to reprint the report, but Robbie reported success (A's) on several oral reports when he spoke about his model rocketry activities. He made a C when he switched to another topic for an oral report. I don't know if that is significant or not, but thanks for spreading the good word about model rocketry, Robbie.

DELAYED PROBLEM

One of our rocketeers wrote in that on the third launch of his Phoenix, the rocket experienced an unusual problem--when the ejection charge functioned, the parachute didn't eject but the engine mount did! Always use plenty of glue when securing the engine mount. The thrust of the engine and the ejection charge both put a lot of pressure on the engine mount. If you don't use enough glue, you could experience the same problem. A word to the wise is sufficient.!

CHRISTMAS PRESENTS

Christmas is just around the corner. If your parents or relatives ask you for suggestions for things you would like, or even if they don't, you might suggest the rocket kit you would most like to have, a starter set, or a Blast-Off Flight Pak. Additional ideas appear on page 6 and 7 of this magazine.

COMPUTER PROGRAMS

If you have an Apple IIe or IIc computer, you can enjoy our two new computer software products, In Search of Space: Introduction to Model Rocketry and Flight: Aerodynamics of Model Rocketry. See page 16 for more information.

Bob Cannon

MY ROCKET CLASS

By Sam Chambers, Port Edwards WI

I had to do a class for our reading group. It was getting near my time, and I had no idea what to do. Then I thought about model rockets.

My class went great. I explained the different recovery systems, the different engines and their use, the different types of rockets, and the different fin shapes.

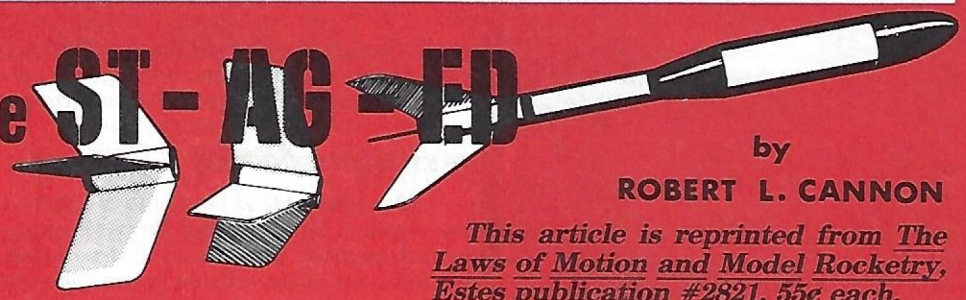
Then we all went outside to the football field/track to launch Big Bertha. I had shown the class how to get it ready for launch. I used a B4-4. They thought it was great and wanted to see it go higher with my biggest engine. I was hesitant because there was a little wind, and my engine was a C5-3. I decided to go ahead and try it. The rocket rose about 650 feet, then the wind caught it. We thought it would go into the 80 ft. tall trees along the track, but it drifted a good 100 ft. above them. I got worried because it was headed for a big tree. It made it by that one. Then there was a house! Luckily it landed on the ground. The kids all went wild. Some were talking about it most of the day.

I think I got some kids interested, so now there will be more rocketeers in the area.

The Second Law of Motion: If an unbalanced force acts on a body, the body will be accelerated; the magnitude of the acceleration is proportional to the magnitude of the unbalanced force, and the direction of the acceleration is in the direction of the unbalanced force.

ESTES
A DAMON COMPANY

WHY ROCKETS are ST-AG-ED



MOMENTUM CHANGE

by
ROBERT L. CANNON

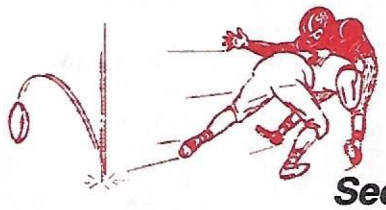
This article is reprinted from The Laws of Motion and Model Rocketry, Estes publication #2821, 55¢ each.

This is an "action" article to help you understand some principles of rocket flight. To get the most from your study follow these instructions:

*Whenever** appears, stop reading immediately and answer the question or perform the action which has just been suggested. Keep thinking and try to reason out why the action was performed. Try to answer each question before going on with your reading.....*

An *unbalanced force* is a force which is not matched by an opposing force.

If one football player charges into another player who is not expecting the charge and is not ready for it, the player who is hit receives an unbalanced force. He probably gets knocked several feet!



See page 6!

If you hold a ball at arm's length and then release the ball, what happens? The ball_____.

falls

The increase in performance of an upper stage as compared to a complete rocket can be demonstrated with a model rocket. To perform the experiment, prepare a Hercules or similar multi-stage model using A8-0 engines in the booster stage and an A8-5 engine in the upper stage. Launch the rocket and carefully observe the acceleration as each stage ignites. (It will help to have several people observing and then compare results.) Try to determine which had the "hottest" acceleration – the entire vehicle at lift-off or the upper stage by itself just after it ignited.

Any time the speed at which an object is moving is changed, the object is *accelerated*. If the object is made to move at a greater speed, we say that the object receives *positive acceleration*. (Thus a moving body that is slowed down would undergo *negative acceleration.)*

An unbalanced force acting on an object causes the object to_____.

accelerate

When you released the ball you were holding, the ball received _____acceleration because of the force of_____.

positive *gravity*

To properly describe a force we need to know the *magnitude* (amount) of the force and the *direction* in which the force is acting.

An unbalanced_____accelerates an object in the direction in which the_____is acting.

force *force*

The harder you throw a ball, other factors being equal, the farther it will go. When you throw the ball with only a little force, the ball receives only a small acceleration. If you throw the ball hard as you can, the ball receives a large acceleration.

A large force produces a _____acceleration than a smaller force on the same object.

larger

A large acceleration produces_____speed change than a small acceleration for the same length of time.

more

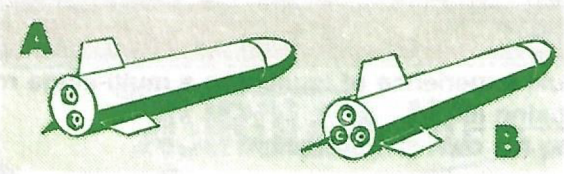
All moving objects possess *momentum*. The momentum of a moving object is determined by multiplying the *mass* of the object (its quantity of matter which can be determined from the weight of the object) times the *velocity* (speed in a certain direction) of the object.

MASS x VELOCITY = MOMENTUM

Which has more momentum, a ball moving at a given velocity or an identical ball moving at a higher velocity? The ball moving at the_____velocity has a greater momentum.

higher

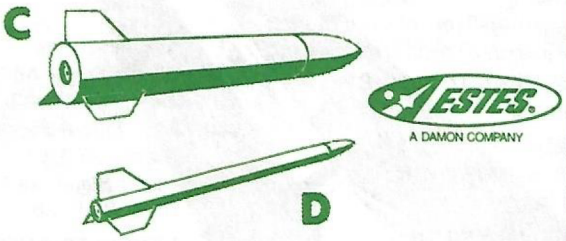
The greater the unbalanced force acting on an object, the greater is the acceleration the force produces.



Which rocket will accelerate more if the individual engines produce equal thrust and the rockets have equal total masses? Rocket _____ will accelerate more than the other rocket.

B

The more massive an object is, the greater is the force needed to achieve a given acceleration (rate of velocity change). In other words, a given force will accelerate an object of low mass more than it would accelerate an object of greater mass.



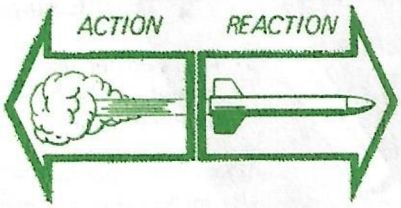
The engines of rockets C and D produce the same thrust. Rocket C has much more mass than Rocket D. Rocket _____ will have a greater acceleration than the other rocket.

D

A rocket engine can produce a certain amount of thrust under ideal conditions. To cause a satellite payload to reach the desired velocity the rocket must accelerate the satellite payload from zero velocity to the desired velocity.

The entire rocket (satellite payload, engine, propellant, body, etc.) is accelerated by the engine's thrust.

The total momentum achieved by a rocket is equal to the total momentum achieved by the rocket's exhaust gases.



If the same thrust is applied to a small mass as to a large mass, which will receive more acceleration — the small mass or large mass? _____

The small mass.

Reducing the mass which the engine's thrust must accelerate will enable a given level of thrust to give a rocket a higher velocity.

The less the total mass of the rocket, the _____ the velocity the payload can reach when the rocket's engine is operated for a specified time.

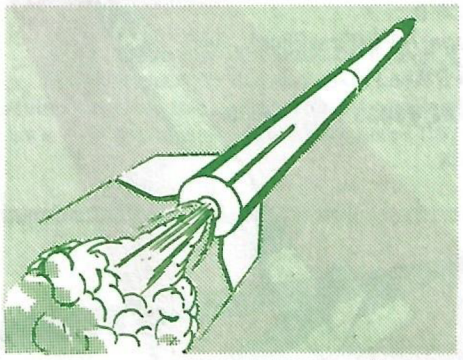
greater

The mass of a satellite does not change as it moves from its position resting atop the rocket on the launch pad to its insertion into orbit. Since the satellite had zero momentum (its mass times zero velocity equals zero momentum) on the launch pad but a large momentum as it follows its orbit, the satellite has undergone a tremendous change in its momentum. (The momentum possessed by all objects on Earth because of Earth's motions is ignored in this article.)

A small engine producing a small thrust but operating for a long period of time can make a given payload mass reach a high velocity. A larger engine producing greater thrust could make the same payload mass reach the same velocity by operating for a _____ period of time.

shorter

A small rocket engine producing a small thrust may not be able to lift a rocket with the payload and the necessary propellant, so a large engine or a cluster of small engines are often necessary to lift a rocket from the launch pad.



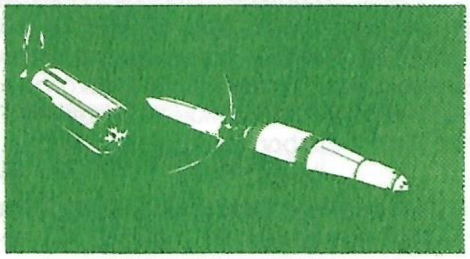
As the rocket's engine operates the propellant is converted to gases which leave the rocket, reducing the rocket's mass. As a result, a steady thrust level can produce an _____ in the rocket's acceleration.

increase

The greater the mass of a rocket, the _____ is the acceleration produced for a given total thrust.

less

As the propellant in each stage of a multi-stage rocket is used, that stage can be dropped. This reduces the mass of the rocket (by removing the engine and other parts of that stage). As a result, the thrust of the next stage's engine pushes a smaller mass. This allows that engine to give the rocket more acceleration than it could were the rocket more massive.



As a rocket's stages separate from the rest of the rocket, the rocket's total mass _____.

decreases

Thus staging allows a payload to reach a _____ velocity for a specific mass of propellant than would be achieved by using only a single-stage rocket.

greater

STAGED ROCKETS!

*Don't just talk theory for staged rockets, **FLY** them!*

If a picture is worth a thousand words, how much is the actual experience of launching a multi-stage rocket worth, in understanding the concept, in remembering it, and in using it?

Every rocketeer should have at least one experience launching his own staged rocket.

Scorpion

EASY!

- ★ Easy to build--only Skill Level 2
- ★ Fast construction with all plastic fin units
- ★ Booster uses tumble recovery. Top stage returns under 12 inch parachute
- ★ High altitude capabilities, or "tame" launches with lower-power engines

Engines:
Single Stage: A8-3 (First Flight), A8-5, B4-4, B4-6, B6-4, B6-6, B8-5, C6-5, or C6-7.
Multi-Stage--Booster: A8-0 (First Flight), B6-0, or C6-0.
Upper Stage: A8-5 (First Flight), B4-6, B6-6, or C6-7.

SCORPION #1333 . . . . $8.49

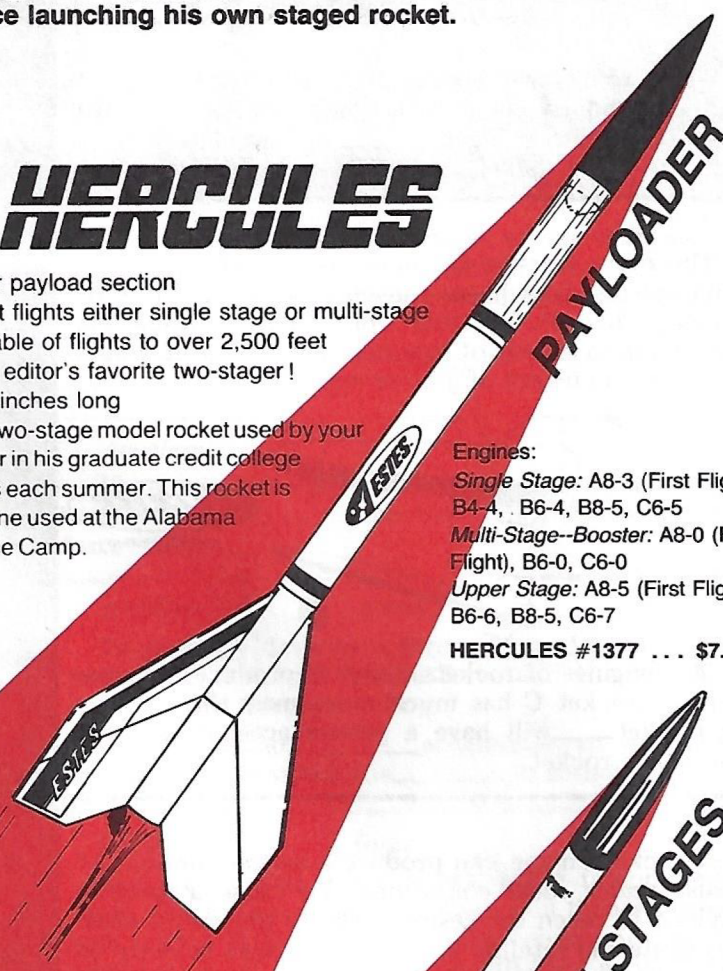
HERCULES

PAYLOADER

- ★ Clear payload section
- ★ Great flights either single stage or multi-stage
- ★ Capable of flights to over 2,500 feet
- ★ Your editor's favorite two-stager!
- ★ 21.6 inches long
- ★ The two-stage model rocket used by your editor in his graduate credit college class each summer. This rocket is the one used at the Alabama Space Camp.

Engines:
Single Stage: A8-3 (First Flight), B4-4, B6-4, B8-5, C6-5
Multi-Stage--Booster: A8-0 (First Flight), B6-0, C6-0
Upper Stage: A8-5 (First Flight), B6-6, B8-5, C6-7

HERCULES #1377 . . . $7.95



COMANCHE-3

THREE STAGES

- ★ Awesome flights to over 2,600 feet (not recommended for the average school athletic field or playground!), but capable of less fantastic flights with lower powered engines.

- ★ **THREE stages!**
- ★ First booster uses D POWER, but rocket can be flown as one, two, or three stager.
- ★ Over three feet tall! Actual length is 41 inches.

Engines
Single Stage: A8-3 (First Flight), B4-4, B6-4, B8-5, C6-5
Multi-stage--First Booster: D12-0
Second Booster: A8-0 (First Flight), B6-0, C6-0
Upper Stage: A8-5 (First Flight), B4-6, B6-6, C6-7

COMANCHE-3 #1382 . . . . . $7.95

Buy and build your multi-stager now, even if you don't launch it till Spring.

HAVE A QUESTION ON MULTI-STAGING?

We have the answers.

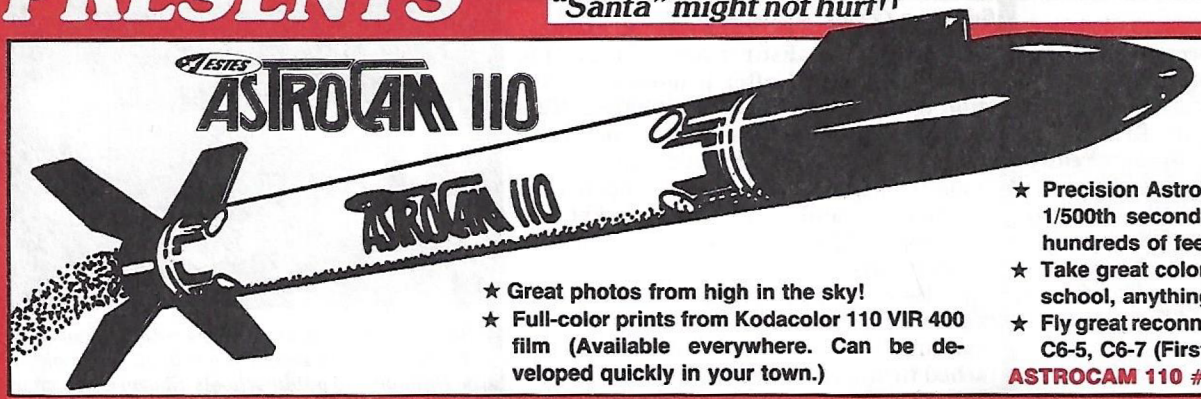
The classic Technical Report TR-2 "Multi-Staging" is available as part of **THE CLASSIC COLLECTION #2845.** This entire volume costs only $3 and contains much information on staging and many other areas of model rocketry. An essential book for the bookshelf of any serious rocketeer.

THE LAWS OF MOTION AND MODEL ROCKETRY #2821 is available for only 55¢. This booklet is about all three of the Laws of Motion. It has more theory, but less "how to" information than The Classic Collection.

THE ROCKET BOOK #2859 includes information on staging, both theory and applications. This publication is available for $12.95.

GREAT PRESENTS

These make "dream" presents, to give or to receive. Make one of your favorite rocketeers very happy this Christmas with one of these great rockets. (A few not-too-subtle hints to your own favorite "Santa" might not hurt!)



★ Great photos from high in the sky!
★ Full-color prints from Kodacolor 110 VIR 400 film (Available everywhere. Can be developed quickly in your town.)
★ Precision AstroCam 110 camera operates at 1/500th second to "freeze" the action from hundreds of feet in the sky
★ Take great color photos of your house, your school, anything you want!
★ Fly great reconnaissance missions with B8-5, C6-5, C6-7 (First Flight) engines

ASTROCAM 110 #1327 ..... $28.95

MERCURY REDSTONE

★ 1/35 scale model of the rocket and capsule which carried Alan Shepard on America's first sub-orbital flight
★ Massive 28.75" length
★ Large diameter body tube (over 2")
★ Beautifully detailed, Skill Level 4 kit
★ Make this deluxe rocket the pride of your fleet
★ Impressive flights with Estes C5-3 engines

A BARGAIN

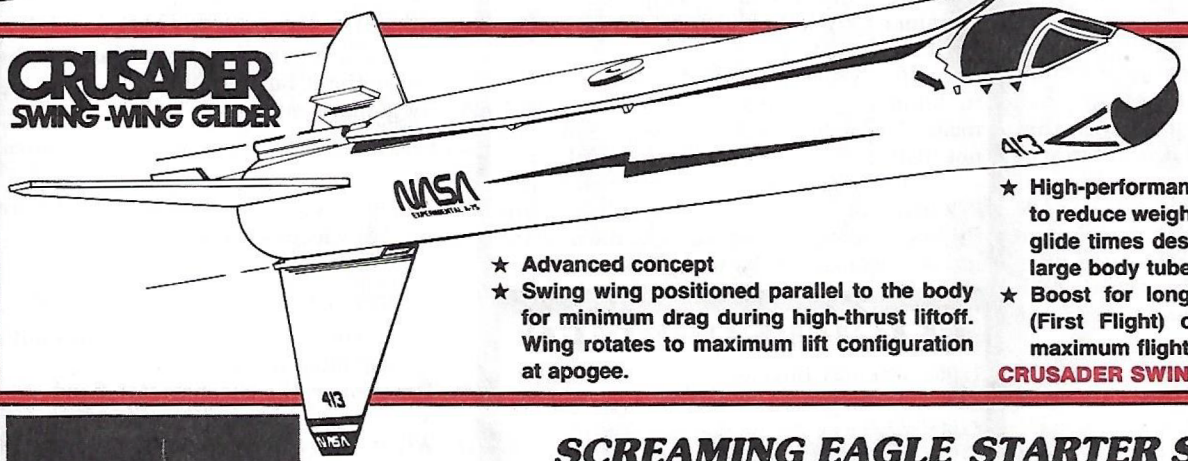
MERCURY REDSTONE #1921 ..... $12.95

Mean Machine

★ **AWESOME!**
★ Estes' biggest rocket--over 6 feet 6 inches long!
★ Despite its impressive length (Odds are very good that it is taller than you are!), it is a good performer. Flying it is a real thrill.
★ Only Skill Level 2
★ Spectacular flights with D12-5 engines

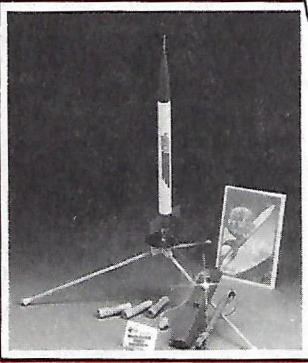
MEAN MACHINE #1295 ..... $13.95

CRUSADER SWING-WING GLIDER



★ Advanced concept
★ Swing wing positioned parallel to the body for minimum drag during high-thrust liftoff. Wing rotates to maximum lift configuration at apogee.
★ High-performance design ejects power pod to reduce weight during descent. Impressive glide times despite massive, 18" length and large body tube.
★ Boost for long duration flights with B4-2 (First Flight) or B6-2 engines or go for maximum flight times with C6-3 engines

CRUSADER SWING-WING #1961 .... $7.95



SCREAMING EAGLE STARTER SET

★ Bargain price for a starter set!
★ Skill Level 1
★ Screaming Eagle rocket is a big 15 inches long and has a plastic fin unit for fast construction. Nose cone is red, tail assembly is blue, and rocket body is white, so it needs no painting! Dynamic decal completes the patriotic decor.
★ Electron Beam Launch Controller is included in kit form.
★ New Lunar Launch Pad is included. This clever tripod launcher assembles in seconds.
★ Lunar Launch pad is not recommended for rockets more than 16 inches long, for rockets with body tube diameters over 1 inch, or for rockets weighing more than 1.5 ounces without engines. White glue, plastic cement, and 4 AA alkaline batteries are needed but are not included.
★ Three high performance Estes model rocket engines and igniters are included.

A BARGAIN!

SCREAMING EAGLE STARTER SET #1417 ..... $18.95

HOW MY FAMILY BECAME ROCKETEERS

By Bert Stewart, Sparta, MI

A few months ago I became involved in RC airplanes. While building my kit, my children, aged 9, 8, and 7, were after me to get them kits. When I made my first flight, they wanted to fly it, also. They were really putting the pressure on.

On one of my trips to the hobby shop I stopped by the rocket section and picked up three rockets, launch pad, engines, wadding, etc. We spent that day constructing the kits. The next day we went flying. While I was flying my plane, they set up the launch site.

After I had crashed, my normal landing, I helped them get ready for their first launch. All three rockets had perfect flights. The kids really got a "blast" out of it.

A neighbor and I are now considering starting a rocket club, and we were wondering if you could help out. We can get a meeting place and a flying site with no problems. We will supervise the meetings and the launch area. (Ed. We sent him several publications to help him get the club started. The following is from a separate letter he wrote to us later.)

A CLEVER WORKTABLE

I don't have a workshop or table in my house. I used the coffee table for my first airplane. The wife objected! The kids used the dining room table to build their rockets. Same problem!

To save what was left of our hides, I went to the local lumber yard and bought two 2 x 4 foot sheets of plain, smooth ceiling tiles--total cost $4.99. I use one for my plane construction. I gave the boys the other one.

The 2 x 4' work area is large enough for both boys to use it at the same time. When they are done building, the tile is stored under a bed.

With rocket building going full bore, we were soon faced with another problem--space. I built them a work table along a wall of their bedroom. I also built a bench that slides under the table when it is not in use. The bench has storage areas under the seat for parts, glue, etc. The table top is made from plywood with the ceiling tile tacked on top of it. Six tacks around the edge were enough. I also suggest covering the tile with wax paper. Use masking tape to hold the wax paper in place.

One trick I learned about masking tape is worth passing on. Always tape the igniter firmly in place with masking tape. However, do not let the tape stick out past the sides of the rocket. This creates extra drag and an unbalanced force on the rocket in flight.

Q. What two candy bars are out of this world?
A. Mars Bar and Milky Way.

Contributed by Brian Gersna, Sherrodsville, OH

HOW NOT TO LOSE YOUR MODEL ROCKETS

By Devon Copley, Amherst, NY

There is a distinct art to recovering your model rocket after a launch. All too often it winds up in the rocket-eating trees at the edge of the field. Occasionally, a rocket goes up and "doesn't come down". Sometimes the parachute doesn't open fully, and fins are broken when the rocket hits the ground. Most of these occurrences can be prevented.

Before you even hike out to your local launch site, check all the rockets you are planning to launch. Are all shroud lines attached firmly? Is your recovery wadding installed? Do you have single stage engines where they are supposed to be and booster engines where they should be?

If it is a cold day, it is a good idea to lightly dust your parachute with talcum powder. This makes them open easier.

Once you get out to the launch site, lick your finger and hold it up. Whichever side feels coldest is the direction from which the wind is coming. Set up your launch pad as far over in that direction as you think necessary. ALWAYS LEAVE AS MUCH OPEN SPACE DOWNWIND AS POSSIBLE. You could be surprised how far, even in a light wind, a parachute can carry a rocket.

If there are several people with you, have a couple go out 50 feet or so in different directions from the launch pad. They can help track the rocket if you lose it in the sun.

You should first launch a relatively heavy model with a small engine in it, just to make sure your pad is in the right place. If this rocket lands only a few feet downwind, you're in business.

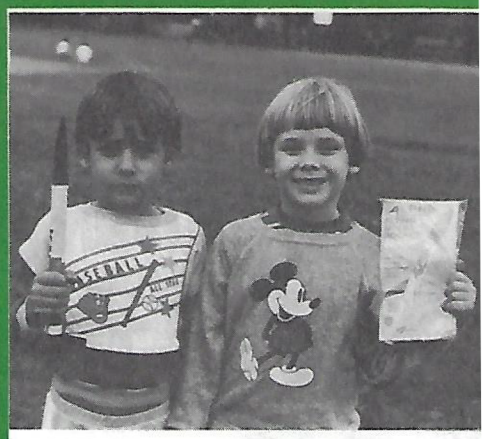
Before each launch, again check the wadding, and repack the parachute or streamer. Check the wind occasionally, also, for it may shift.

If it is a very windy day and you have to launch something, launch a streamer model. These come down the fastest and will not drift as far as a parachute model.

If these guidelines are followed, you are much more likely to have safe and fun flights, and your rockets are much more likely to survive to be launched again.

FLIGHT SUPPLIES

1503	1/2A3-2T Engines	$3.00
1598	A8-3 Engines	3.00
1599	A8-5 Engines	3.00
1600	A8-0 Engines	3.00
1601	B4-2 Engines	3.00
1602	B4-4 Engines	3.00
1617	C5-3 Engines	3.25
1614	C6-5 Engines	3.25
1666	D12-3 Engines	5.49
1667	D12-5 Engines	5.49
1665	D12-0 Engines	5.49
2274	Recovery Wadding	1.49
2301	Solar Igniters	1.49
2232	AltiTrak	8.95
2231	Fin Alignment Guide	10.95



The Latchkey Program meets after school fron 3-6 PM for youngsters from 6 to 12 years old i the Dumont, NJ public schools. Sheryl Cohn, coor dinator of the program, reports that they recentl ran a very successful Rocketry Program. Shown here are Larry Medina, age 8, and Geoff Rickly age 6½.

COMPUTER SOFTWARE

See page 16 for news about two great computer software programs about model rocketry. Both feature great graphics and interactive text to help you understand. Excellent way to improve your model rocketry skills. Point out to Mom and Dad that this program is educational so maybe they will buy it for you. (You need not mention how much fun it will be! After all, Christmas will soon be here.)

RIDDLES

Q. What did the rocket say to the sky?
A. I look up to you.

Contributed by Huy Nguyen, Santa Ana, CA

Q. How will the first astronaut land on the sun without burning up?
A. By going at night.

Contributed by John Cruickshank, Jr., Houston, TX

Q. Which planet was the biggest before Jupiter was discovered?
A. Jupiter.

Contributed by Dan Wright, Kalamazoo, MI

Q. What time is it when an astronaut's chronometer shows 27:00?
A. Time to get the chronometer fixed.

Q. Which Estes rocket is from the northeast US?
A. Yankee.

Contributed by John King, Christiana, PA

Q. What kind of catalog flies?
A. A flying model rocket catalog.

Contributed by Troy Buckley, Nevada, OH

Q. Where do astronauts leave their space ships?
A. At parking meteors.

Contributed by Cliff Li, Bethesda, MD

FREE ROCKET

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Send in your order for merchandise totaling $10.00 or more and receive a FREE Wizard Kit.

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Send in your order for merchandise totaling $30.00 or more and receive a FREE Hercules Kit.

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ESTES AEROSPACE CLUB #7624
Send in your order for merchandise totaling $20.00 or more and receive a FREE EAC membership kit.

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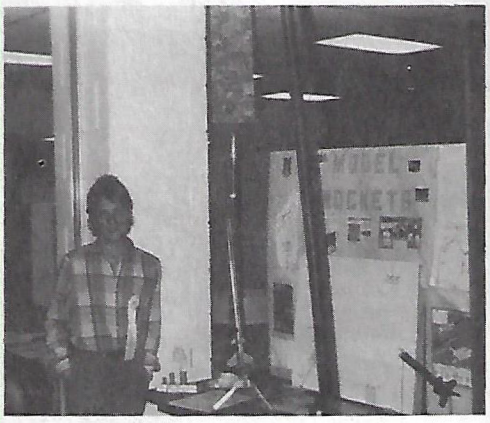
These special free offers are available only for orders received by June 30, 1987. Orders must be accompanied by full payment (check, money order, Master Charge, or Visa charge). Order qualification for a free kit is based on amount of merchandise ordered. If you qualify for one of these free rocket kits, just list the name and special kit number from this page as the last item on your order. List "Free" in the column for total price. These special offers may not be used with other special offers, bonus coupons, or discount.

"You weigh 160 pounds and you're going to be in big trouble if you don't get off my foot, Earthman."

Contributed by Terry Baldwin, Marion, WI



SCIENCE FAIR PROJECT

Gerald Hilzendeger of Napoleon, ND won first place in his Distict Science Fair and went on to compete in the Regional Science Fair with his project on Model Rockets. Congratulations, Gerald!

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ESTES AEROSPACE CLUB #7625 . . . . . $4.49 ~~$6.49~~

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THE FUNDAMENTALS OF ROCKET POWERED GLIDERS

By Bruce L. Carey, R & D Department, Estes Industries

Rocket powered gliders have been with us since the early 1960's, but even today they pose a challenge to model rocketeers from the beginner to the expert. There have been hundreds, maybe thousands, of different designs used, but they all have basically the same problems to overcome, namely drag and gravity. You might think that these are the same problems faced by rockets, and you are partly right, but gliders have additional handicaps that rockets don't. These additional handicaps set gliders apart from other types of rocket powered models and make them more challenging to fly successfully.

TYPICAL BOOST GLIDER

Let's see what a rocket powered glider looks like, examine a powered glider in flight, and talk about those handicaps mentioned before. Figure 1 is what we call a conventional "boost glider". It has a "pop pod" which attaches to the front of the glider and contains its own recovery system. This type of system returns to earth in two separate pieces. The pod returns by streamer, and the glider returns in a nice flat glide, hopefully! There have been many design variations used as boost gliders. They all try to accomplish the same end, to glide for the longest time.

See Figure 1

TYPICAL B/G FLIGHT PATH

Imagine that our conventional boost glider (Let's call it a B/G for short.) has been prepped for flight. The pop pod has recovery wadding in it, the streamer is rolled up and inserted into the pop pod tube, and the engine with an igniter installed has been put in place, The glider itself is hooked on the pod, and the complete B/G is placed on the launch rod. Micro-clips are attached to the igniter leads, and our bird is ready for flight. Range safety is "GO!", and we countdown--5, 4, 3, 2, 1, Launch! Our B/G streaks skyward in a perfectly straight boost. As it slows down after engine thrust has ended, the ejection charge backs the pop pod off of the glider's nose. The pod descends to earth slowed by the streamer. At the same time the glider levels off into a smooth glide and slowly circles the launch site for 1 minute before landing 100 feet away from the launcher. Another perfect B/G flight!

See Figure 2

Now that we have walked through a textbook flight, let's examine each of the three phases of it separately to see what is really going on. Phase 1 is the Boost phase. During boost our B/G accelerates from 0 to 200 or 300 feet per second. After slightly less than one second of thrust, and one or two seconds of coast time, during which the delay charge in the engine operates, our glider is several hundred feet above the ground, and ready for phase 2 of the flight.

Phase 2 is the Transition phase. At transition the engine ejection charge fires creating a rearward force which pushes the pop pod back out of the slot in the glider nose and the streamer out of the front of the pop pod to provide a safe pod recovery. Meanwhile, the glider, having lost the weight of the pop pod, drops from the vertical flight of boost phase into the horizontal, gliding flight.

Phase 3 is the glide portion of the flight. As we just stated, our glider assumes a horizontal path at "transition". At this point the glider stops acting like a rocket and starts acting like a glider. The wing and tail surfaces create lift and make our glider fly much like an airplane. We will make our glider turn in the air so it will stay near the launch site and we won't have to chase it too far.

Boost gliders have certain rules which must be followed if they are to work as just described. Even if you do not plan to design your own B/G's, understanding how and why they work will make it easier for you to fly the ones you use whether from kits or the designs of others.

See Figure 3

The location of the rocket engine in relation to the surfaces of the glider is the first important factor to consider. Refer to

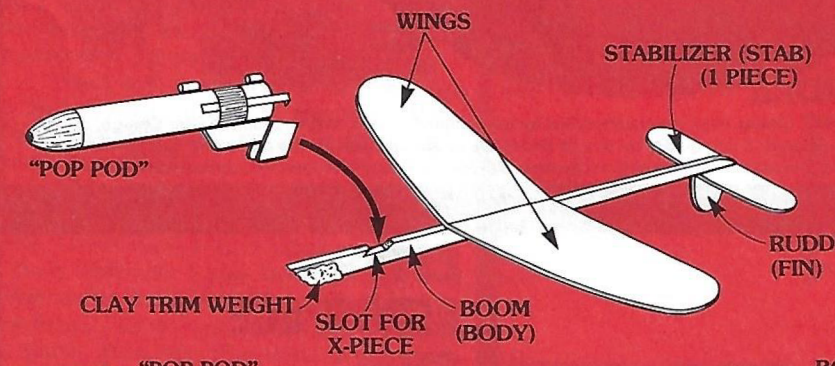
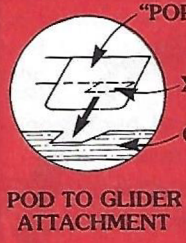


FIGURE 1
CONVENTIONAL BOOST GLIDER



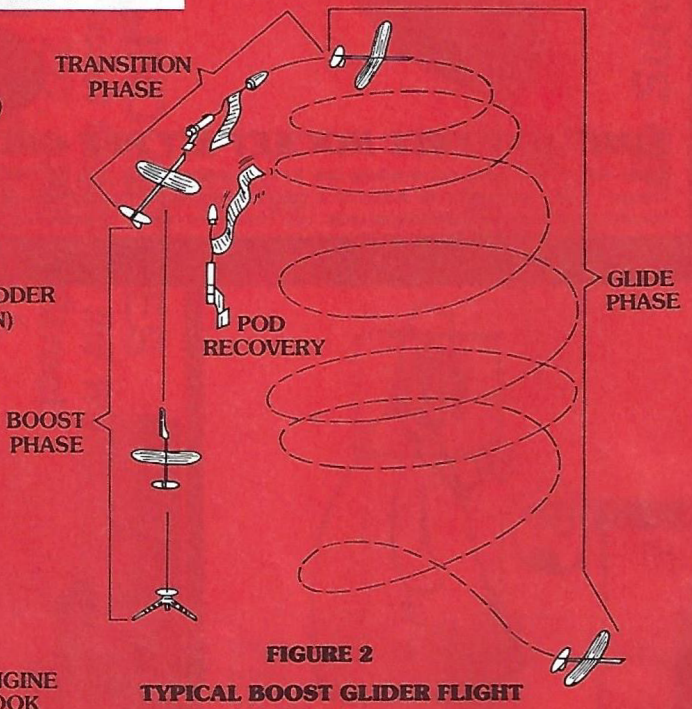


FIGURE 2
TYPICAL BOOST GLIDER FLIGHT

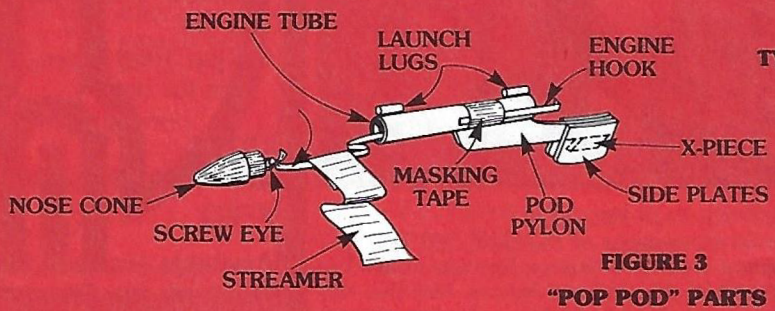


FIGURE 3
"POP POD" PARTS

Figure 3 for the names of the different parts of the "pop pod". You will see that our pod has a recovery system like that of a rocket, but it also has some parts which are not typical for a rocket. The "x-piece" holds the pod and glider together until transition. The side plates keep the x-piece from coming out of the slot in the "body" (boom) of the glider until we want it to. The pylon attaches the glider to the engine tube, keeps the engine in proper alignment with the glider for a straight flight, and positions the engine far enough above the glider to keep hot engine gases from damaging the glider.

Studies have been done which show that the nozzle of the rocket engine should be at least 1/2 inch in front of the leading edge (front edge) of the glider wing in order to provide a straight and stable boost.[1] This location provides a balance between the pod and the glider which offsets the tendency of the engine thrust and the lifting surfaces of the glider to take an arcing flight path. The pod pylon also counteracts this arcing tendency by maintaining a fixed and parallel thrust line (the imaginary line which points in the direction in which the engine's thrust is pushing). A 1/2 inch high pylon seems to work best as it is not too close or too far away from the axis of the glider body to cause unfavorable powered flight characteristics. Also, as we mentioned, the pylon keeps the engine exhaust from damaging our glider during flight.

At this point let's assume we have a B/G built from our own design or a kit, and we want to fly it. Before we can do this we have to "trim" our glider so that it will do what we want it to when it is up in the air on its own. Trimming a glider is actually balancing the wing and the forces it produces against the forces produced by the stabilizer. Trimming also involves adjusting another aspect of the glider's flight which doesn't affect a proper glide, but does provide for better flight times by helping to keep the glider in sight longer. This is accomplished by putting a turn into the glider's flight by adding a small amount of clay to one wing tip. This causes the glider to turn toward the direction of the heavier wing tip in a large circle. The glider stays over the launch site and allows the timer to see it longer.

In order to achieve those 2 minute plus flights we mentioned earlier, the glider we use must be trimmed or balanced to fly properly. We test fly our glider by hand-launching it on a grassy field. Each time we gently toss it into the wind we watch its flight to see what happens. When hand-launching, always toss your glider into the wind. If the glider climbs sharply and then dives toward the ground, we say it is tail-heavy. This means that we must add weight (as clay) to the nose. If the glider dives into the ground when we throw it, it is nose-heavy, and we need to add weight to the tail to balance it. When hand-launching, gently toss your glider from shoulder height in a slightly downward direction away from you.

Remember that gliders fly at very low speeds and throwing them hard will not tell you if they are trimmed properly. Throwing them hard will usually break them. After you have tossed your glider several times and added clay as needed, and it is gliding very flat and straight, add a small piece of clay to the right wing tip. This will make your glider turn to the right. You will have to add a little more clay to the nose cone of the glider to compensate for this additional weight, so retrim your glider as you did before. Watch each flight carefully to see how the glider is performing. If it is not gliding in a flat glide and circling overhead the way you would like, retrim it after the flight and fly it again until it performs the way you want it to perform.

I hope that this brief look at how B/G's work, why they work, and some of the considerations that must be taken into account when designing them will spark your interest in flying some for yourself. It is best to have some model rocketry experience under your belt before attempting a B/G. It is also wise to use proven designs before trying some of your own designs. Safety should always be your first concern! Give B/G's a try, and I'm sure you will like them.

[1]*Gregorek, Dr. G. M., "Design Rules for Boost and Rocket/Gliders", Model Rocketeer, June 1974, pages 14-16.*

EAC corner

Congratulations to the following EAC members who have reached a higher achievement level since the last report.

Skill Level Five

Peter W. Kodis III, North Dartmouth, MA; **Mark Kotolski,** Stevens Point, WI.

Skill Level Four

Archie Chapman, Rockwall, TX; **Marvin C. Craig,** York, PA; **David Gerbig,** Wheat Ridge, CO; **Joe Ishoy,** Newcastle, CA; **Don Jorney,** Valrico, FL; **Peter W. Kodis III,** North Dartmouth, MA; **Scott Meiring,** Sidney, OH; **Jason Morovits,** Houston, TX; **Steve Olend,** Indianapolis, IN; **Robert Robbins,** Monson, MA; **Jason Sullivan,** Norwell, MA; **Joe Tarica,** San Rafael, CA.

Skill Level Three

Charles Amos Jr., Temple, TX; **James Barber,** Mechanicsville, MD; **Greg Barnes,** Leisure City, FL; **Kurt Benjamin,** Spanaway, WA; **Matthew Bergeron,** Manheim, PA; **Tyson Bruneis,** Palmer, AK; **Donald J. Brda,** Redwood City, CA; **Terry Burgoon,** Osawatomie, KS; **Lorenzo Canlas,** Maplewood, NJ; **Archie Chapman,** Rockwall, Tx; **Joseph Conley,** Montgomery, NY; **Florence Craig,** York, PA; **Robert Deis,** Colorado Springs, CO; **Kirk Duchow,** St. Joseph, IL **Tom Edmonds,** Marreline, MO; **Joe Fiocca,** Elizabeth, CO; **Bob Foster,** Baltimore, MD; **Donald A. Frosty, Jr.,** Lexington, KY; **Thomas J. Goudreau,** Yuma, AZ; **James Grasso,** Cranston, RI; **Alan Hart,** Munford, TN; **Jason Haynes,** Scottsboro, AL; **Bob Horvath,** Houston, TX; **Brad Hughes,** Galloway, OH; **Daryl Hughes,** Osawatomie, KS; **Andrew Kinkella,** San Leandro, CA; **Aaron Knox,** Kansas City, MO; **Peter W. Kodis,** North Dartmouth, MA; **John Kuykendall,** Due West, SC; **Bill Landefeld,** Lewisberry, PA; **Jason Lines,** Lakebluff, IL; **George Lobb,** Rockport, TX; **Tommy J. Magyar,** Warren, OH; **Shinonagen Masonite,** Clear Lake, WI; **Scott Meiring,** Sidney, OH; **Jennifer Molnar,** Phoenix, AZ; **Ken Nagel,** Park City, IL; **Craig Peron,** Verona, NY; **Steve Policastro,** Allegany, NY; **Jason Purtiman,** Moundsville, WV; **Thomas Risse,** Huntington Beach, CA; **Bill Shoenborn,** Molalla, OR; **David Spiker,** Manhattan, KS; **Jason Sullivan,** Norwell, MA; **Joe Tarica,** San Rafael, CA; **Sheri Walter,** Beavercreek, OH; **Steven Waxmonsky,** Lilburn, GA; **Gary Westbrock,** San Diego, CA; **Richard Wilson,** Dolores, CO; **Philip L. Wing,** San Francisco, CA; **Chris Zimmermann,** Rigby, ID. *(continued page 13)*

MULTIPLE CANOPY RECOVERY SYSTEMS

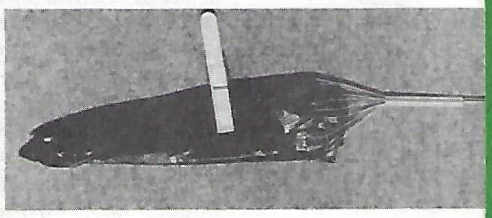
By Stuart Lodge, British Space Modeling Association, Bath, United Kingdom. This article is based on the winning entry in the July 1986 Design of the Month Contest.

One of the most satisfying aspects of Space Modelling is the operation of larger than normal rockets with their slower and more realistic lift-off and climb. Frequently, however, the recovery phase is anything but majestic with a single and often inadequate parachute planting the model unceremoniously into the turf. By far the best way of recovering models the size of the Estes Phoenix, Honest John, Pershing, et al is to use two or even three 18" diameter polyethylene (plastic) canopies in a cluster. On the face of it there is a major risk of all rigging lines of the system tangling and causing the demise of a prize model, but using the techniques described below (the "Slider System") we take a leaf from the book of full size parachuting in that line restraint is employed to assist an orderly canopy opening sequence on the aerobatic square parachutes.

Materials and Methods

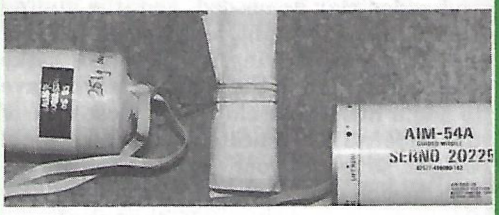
(1) Two/three 18" parachutes with identical rigging
(2) Plastic drinking straw, 1/4 inch diameter, 1" long
(3) Clothes peg (pin) (for holding canopies while packing)
(4) Thin string and recovery wadding

Select the parachutes required for the operation and connect all rigging together at the base using the thin string leaving an 18" leader for attachment to the rocket. Cut the 1" length of drinking straw (the "Slider") and thread this onto the string leader to the base of the riggings. Attach the leader to the rocket's shock cord or nose cone.



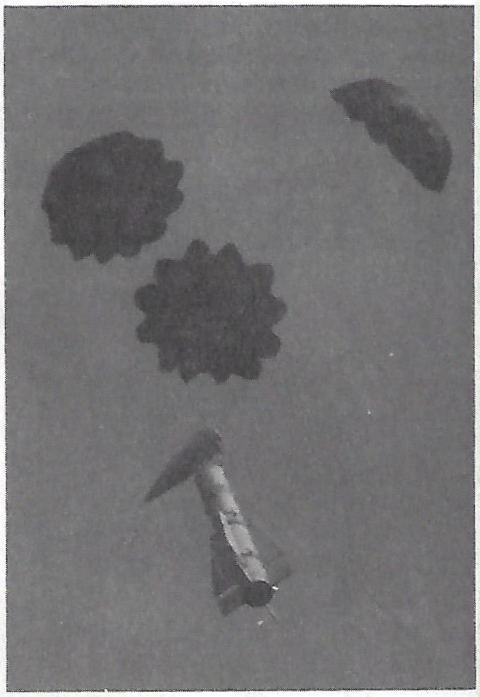
Canopies held with peg, slider in position

The folding/packing sequence of the canopies may now begin, just prior to flying. The canopies in turn should be "spiked" and the rigging pulled taut and held in place with the clothes peg (pin). This is repeated with the other parachutes until all are clipped together with tight, untangled rigging. The slider should then be moved to a point 1" from the parachutes peripheries (edge) (Say that on a packet of wine gums!) and a wrapping of recovery wadding given to the collected canopies after folding in half. Carefully encircle the canopy pack with the rigging up to the interface with the string leader, and at this point roll on another layer of wadding encircling with the string loosely. This unit may be inserted into the model body atop the usual amount of recovery tissue.



Tissue wrapped parachutes

Following the launch and (we hope) majestic climb, the rocket's spent motor will fire the expulsion (ejection) charge, blowing off the nose cone and ejecting the recovery pack. The rocket will turn 180° in the air moving tail first towards the ground, the string leader will unwind, followed by the rigging....This is the "lines first" deployment much favored in full-size parachuting....leaving the restrained canopies to deploy last of all. At this point the slider will move down the lines, and the parachutes will open. In my experience, it works every time!



Deployed Parachutes

DESIGN OF THE MONTH WINNERS

NOVEMBER, 1985 WINNERS:
Mark A. Nugent, Natchitohes, LA "StarStreak"; **Erik Zimmitti,** Bridgwater, NJ "Time Traveller"; **Timothy Dotson,** Flagstaff, AZ "Nighthawk"; **Guy Hanley,** Minot, ND "V-Wing"; **Peter W. Kodis III,** N. Dartmouth, MA "The Stealth E5-A AWACS"

HONORABLE MENTION:
Louis J. Jiardina, Marion, IL "T.O.W. Antitank Missile"; **Robert H. Smith,** Derry, PA "Professional Launch Platform"; **Eric Wock,** Cocoa, FL "Skyscraper"; **J. Timothy Dotson,** Flagstaff, AZ "The Peregrine"

DECEMBER, 1985 WINNERS: Vincent Giovannone, Latham, NY "Black Lightning"; **Robert F. Quigley II,** Las Cruces, NM "Halley's II"; **Chuck and Matthew Svanda,** Anaheim, CA "Top Secret"

HONORABLE MENTION:
Resfran A. Figueroa, Hollywood, CA "Bomarc"; **Chris Rathman,** Comfrey, MN "Apollo"; **Neil Zysk,** Niagara Falls, NY "Rocket Transporter"; **Cory Ramsett,** La-Cross, WI "Satellite Speeder"; **Louis J. Jiardina,** Marion, IL "Entac"; **Peter Alway,** Ypsilanti, MI "Hyperion"; **Dan Hoar,** Poynette, WI "The Hustler"; **Dan Hoar,** Poynette, WI "The Searcher"; **Dan Hoar,** Poynette, WI "The Aviator"

JANUARY, 1986 WINNERS:
David J. Petry, Cincinnati, OH "SR-72 Harrier"; **Jeff Hartkopf,** Schofield, WI "Luna II"; **Stuart Lodge 28,** Foxhill BATA, County of Avon, UK "Sea-Squirt & Mini-Squirt"; **Doug M. Boles,** Everett, WA "Little Joe Rocket"; **Peter W. Kodis III,** N. Dartmouth, MA "XB-70 Valkyrie Bomber"; **Kevin Dickey,** San Luis Obisop, CA "Computer Program"; **Jason R. Sullivan,** Norwell, MA "HMS Dragonfire"

HONORABLE MENTION:
Robbie Richardson, N. Marion, IN "The D Powered Poseidon"; **Chad Brannon,** Corona, CA "Sky Sniper"; **Louis J. Jiardina,** Marion, IL "SA-5 GRmmon"; **Ryan Wagner,** Lancaster, OH "No Name"; **Ethan Simmons,** Little Compton, RI "No Name"; **Terry Johnson,** Lompoc, CA "Widow-Maker"; **Troy McClellan,** Farmdale, OH "The Aerolus"; **John,** Bishop, CA "No Name"

FEBRUARY, 1986 WINNERS:
Ronald E. Thomas, Carroll, OH "Led Flasher Circuit"; **Louis J. Jiardina,** Marion, IL "Air to Surface Missile"; **Dave Setchko,** Strongsville, OH "No Name"

HONORABLE MENTION:
Peter Alway, Kalamazoo, MI "Nike-Impersonator"; **Aaron Butcher,** Seattle, WA "M.K.B. Missile"; **Scott Balkum,** Katy, TX "Mini V-2"; **P. Keding,** Salt Lake City, UT "No Name"; **John Johns,** Charlotte, NC "M-1"; **Jeff Scheetz,** Delta, CO "Explorer"; **Mark A. Kotolski,** Stevens Point, WI "Boomer"; **Tad Wilkey,** Bourbonnais, IL "Scorpion"; **Jim Bradford,** Lake Station, IN "Moonshot I"; **Mark Lane,** Golden, CO "Flame"; **Brian Sullivan,** Chisholm, MN "Chosen Eagles"; **David Bartch,** Stockton, IL "Big Zipper"; **Rusty Gersch,** Lakewood, CO "Double Trouble"; **Joseph G. Vecchitto,** Wallingford, CT "Day Maker"

MARCH, 1986 WINNERS:
Gary Smith, Colorado Springs, CO "Hypersonic Plane"; **David Gerbig,** Wheat Ridge, CO "Rotary Rocket"; **Tagg Gorman,** Henderson, NV "Altitude Determination"; **Jim Nieberding,** Rockville, MD "Griffon I"; **Moose Lavigne,** Redondo Beach, CA "The R/C Digiroc"; **Peter Alway,** Kalamazoo, MI "Semi-Scale Saturn I"; **Peter W. Kodis III,** N. Dartmouth, MA "MIG-21"; **Neil Zysk,** Niagara Falls, NY "Tornado-1"

HONORABLE MENTION:
Jeff Kliewer, Shaver Lake, CA "Interceptor"; **Robbie Richardson,** N. Marion, IN "Gemini"; **John Johns,** Charlotte, NC "Thrush"; **Rocky Petrone,** Moorestown, NJ "Experimental Glider Recovery"; **Neil Zysk,** Niagara Falls, NY "Tornado-2"; **Bret Wilder,** La Junta, CO "German Buzz Bomb"; **Brian Bontrager,** Cambridge, OH "Launch System"; **Bill Engar,** Salt Lake City, UT "Exeter 2"; Michael Edward Prince, Whiteville, NC "Silver Bullet; **Drew Gray,** Brookville, PA "Omicronian Destroyer"; **Dean Pilato,** Warren, MI "FLT"; **Bill Smith,** West Fayette, OH "VTO"; **John Lindal,** La Canada, CA "Launch Pad"; **Robbie Richardson,** N. Marion, IN "Jovian Star Crusier"; **Mark Viegelahn,** Mesa, AZ "Galatic Gladiator"
Marty Albers, Portland, OR "Blue Shark"

APRIL, 1986 WINNERS:
David Edington, Ann Arbor, MI "Eliminator"; **Richard Malvarose,** Santa Maria, CA "Tigershark"; **Dean Pilato,** Warren, MI "Horizon VIII"; **Peter W. Kodis III,** N. Dartmouth, MA "Josie and the Pussycats Rocket Ship"; **Louis J. Jiardina,** Marion, IL "Space Pirate"; **Kevin Boyd,** Fullerton, CA "Launch System"

HONORABLE MENTION:
Dasatha Jayasekara, Los Angeles, CA "Double Eagle"; **John Martello,** Orlando, FL "Giotto & Ice"; **David Neins,** Blytheville AFB, AR "Seawolf"; **Eric Peters,** Coraopolis, PA "Futuroc"; **Bobby Donaldson,** Charlotte, NC "Explorer II"; **R.A. Stachowiak,** Reseda, CA "Berserker"; **Ken Foreman,** Pacific, WA "Pershing II I.C.B.M."; **Scott Branche,** Scarsdale, NY "The Squid"; **M.J. Albers,** Portland OR "Nova Scout Ship"

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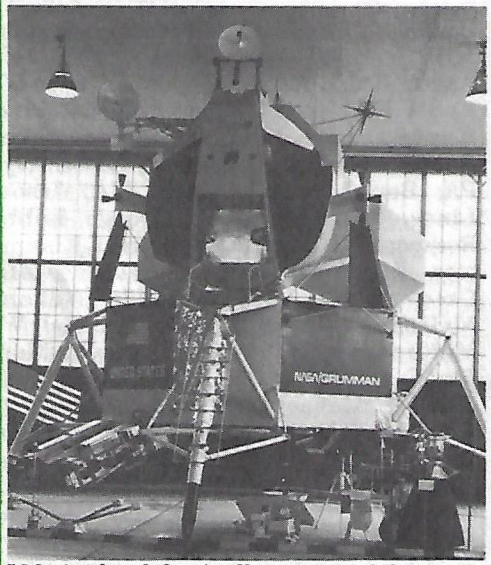
Marc Alexander, Warsaw, IN; **Chris Arvin,** Irvine, KY; **Paul Ashman,** Iowa City, IA; **James Barber,** Mechanicsville, MD; **Greg Barnes,** Leisure City, FL; **Ben Bargabus,** Burnsville, MN; **Lon Allen Beale,** California City, CA; **Shane Belcher,** Telford, TN; **Matthew Bergeron,** Manheim, PA; **Kurt Benjamin,** Spanaway, WA; **Kurt Bertram,** Kansas City, MO; **Mark Bistricky,** Phoenix, AZ; **Aran Bold,** Shaw Island, WA; **Donald J. Brda,** Redwood City, CA; **Terry Burgoon,** Osawatomie, KS; **Chris Campbell,** Peabody, KS; **Lorenzo Canlas,** Maplewood, NJ; **Marlin T. Carlson,** Lansdale, PA; **John Clark,** Boulder City, NV; **Brad Cole,** Bloomington, IL; **Joseph Conley,** Montgomery, NY; **Florence J. Craig,** York, PA; **Eric Cudnohoske,** Oshkosh, WI; **Jim Cunningham,** Colorado Springs, CO; **Ryan Cunningham,** Longmont, CO; **Joel Davis,** Utica, MI; **Robert Deis,** Colorado Springs, CO; **Johnny Diggs,** Wilmington, NC; **Paul Dion,** Bensalem, PA; **Rob Doster,** Pine Bluff, AR; **Scott Devel,** Carrier Mills, IL; **Tom Edmonds,** Marceline, MO; **Kenneth Scott Everhart,** Salem, OH; **Josh Findley,** Tualatin, OR; **Michael Finkel,** Scottsdale, AZ; **Jim Flood,** Greenville, SC; **Micah Gearhart,** Salina, KS; **Mike S. Gehman,** Denver, PA; **Joshua Glazeroff,** Newburgh, NY; **Thomas J. Goudrean,** Yuma, AZ; **Brian Govern,** Sterling Heights, MI; **Alan Hart,** Munford, TN; **Dave Hatfield,** St. Louis, MO; **Jason Haynes,** Scottsboro, AL; **Richard Hines,** Castleton, NY; **Bob Horvath,** Houston, TX; **Robert Hudgens,** Westminster, SC; **Daryl Hughes,** Osowatomie, KS; **Robbie Hisey,** Star, NC; **Steve Johnston,** Fayetteville, NC; **Andrew Kinkella,** San Leandro, CA; **David Kinser,** Columbia, PA; **Brady Kjos,** Minneapolis, MN **"Dr. Bob" Kreatz,** Point Pleasant, NJ; **Aaron Knox,** Kansas City, MO; **Peter W. Kodis III,** North Dartmouth, MA; **Frik Kositzki,** Lake Bluff, IL; **Steven Lake,** Omaha, NE; **Bill Landefeld,** Lewisberry, PA; **Ben Leonas,** Auburn, MA; **Jason Lines,** Lake Bluff, IL; **George Lobb,** Rockport, TX; **Claude Longstreet,** Kissimmee, FL; **Scott Looge,** Huntsville, AL; **Greg May,** Bridgeton, NJ; **William McDonald,** Vacaville, CA; **Michael W. McKachney,** Webster, NY; **Kevin Mefford,** Nacogdaches, TX; **Scott Meiring,** Sidney, OH; **Michael D. Mirmak,** Vienna, VA; **Ken Nagel,** Park City, IL; **David Ohance,** Denton, MD; **Geoffrey Oliver,** Clayton, NC; **Mark Olson,** Mound, MN; **David Ottman,** Littleton, CO; **Melanie Papcun,** Detroit, MI; **Matt Pawlowic,** Suttons Bay, MI; **Craig Peron,** Verona, Ny; **Rollie Peirson,** Juliet, IL; **Scott Porter,** Levelland, TX; **John Price,** Lincoln, NE; **Thomas Risse,** CA; **S. Alex Rudolph,** Mt. Horeb, WI; **Christopher Schmitt,** Evansville, IN; **John Self,** Midland, TX; **Robin Shields,** Mooresville, IN; **Billy Ray Shocky,** Graysson, KY; **Marcia Lynn Smith,** live Hill, KY; **Rick Sovine,** Decatur, IN; **Noah Stanik,** Monroe, WA; **Kurtis Staples,** Lake Mills, WI; **Shris Stoner,** Sand Springs, OK; **Kendall Strong,** Louisville, KY; **Joe Tarica,** San Rafael, CA; **Frank Thompson IV,** Lanton, MI; **Scott Todd,** Tampa, FL; **Robert Trezo, Blytheville AFB, AR; Aaron Tucker,** Moore, OK; **John Vanbturo,** West Orange, NJ; **Sheri Walter,** Beavercreek, OH; **Andrew Wulhelm,** Zionsville, PA; **Zeb Williamson,** Cullman, AL; **Craig J. Willie,** St. George, UT; **Joey Wojdowdki,** San Diego, CA; **Eric Wright,** New Brighton, MN; **Jason Zausmer, Ithaca, NY; Chris Zimmerman,** Rigley, ID, **Jason Zoick,** Macedon, NY.

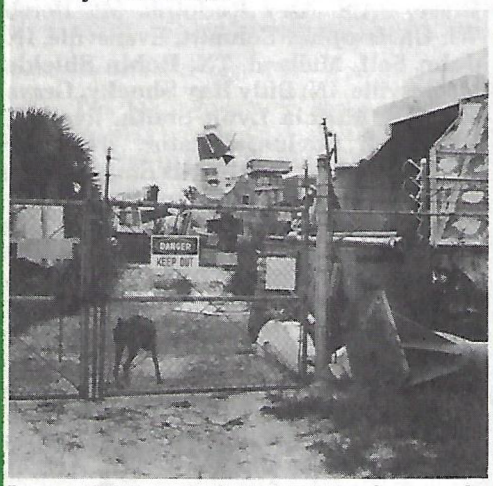
WHERE HAVE ALL THE SPACECRAFT GONE?

WHERE ARE THEY NOW?

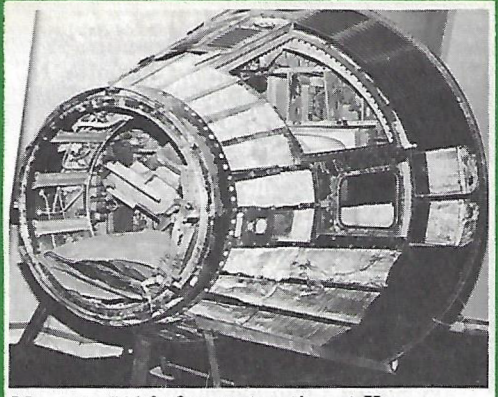
Any space buff can tell you how many Mercury, Gemini, or Apollo flights there were, but few know how many capsules were actually *built* for those programs. For example, McDonnell-Douglas built 22 Mercury capsules. Six were launched on manned flights; the rest were used for pad-abort tests, sub-orbital, and orbital tests, spacecraft pressurization tests, power tests, tracking and training tests for flight controllers, and a host of other trials--and errors. There were also several capsules that were never used at all. While a pad abort test was nowhere near as exciting as Alan Shepard's liftoff from Cape Canaveral every spacecraft built played an important part in the space program. Each served as a small stepping stone on the way to the Moon. So where are they now? Here is a list of known locations of spacecraft:



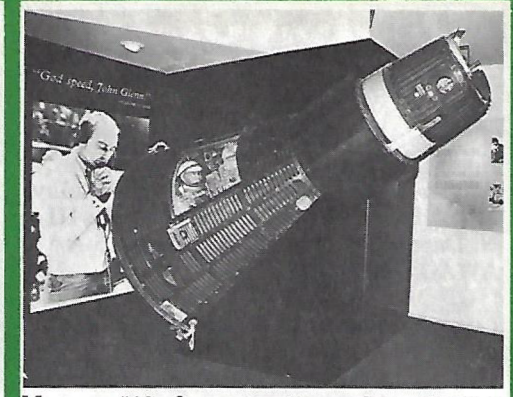
LM-13 (slated for Apollo 18) on exhibit at the Cradle of Aviation Museum, Garden City, NY Photo by Devera Pine



Lunar Module in junkyard at Cape Canaveral Photo by J. Stoff



Mercury #10 before restoration at Kansas Cosmosphere.



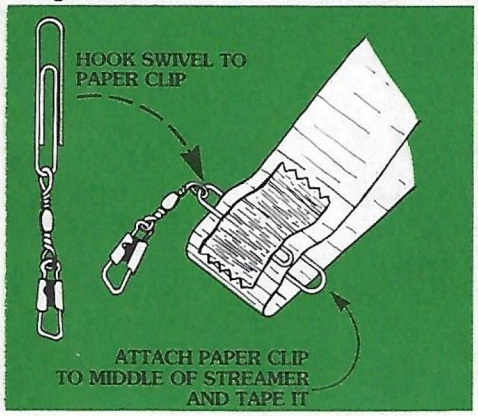
Mercury #10 after restoration and on exhibit at the Kansas Cosmosphere.
Both photos courtesy Kansas Cosmosphere

Mercury #1	*Goddard Museum, Roswell, NM*
Mercury MA-1	*Recovered in 1981. In storage in Kissimee, FL. Owner undetermined*
Mercury *Adios "M.F."*	*Oklahoma Aviation & Space Hall of Fame, Oklahoma City, OK*
Mercury MR-2	*NASA, Kennedy Space Center, FL*
Mercury MA-2	*World Trade Center, Houston, TX*
Mercury MR-1A	*McDonnell-Douglas, St. Louis, MO*
Mercury (Unknown #)	*Junkyard near Kennedy Space Center, FL*
Mercury MR-3	*National Air and Space Museum, (NASM), Smithsonian Institution, Washington, DC*
Mercury #9	*North Carolina Museum of Life and Science, Durham, NC*
Mercury MA-6	*NASM, Smithsonian Institution, Washington, DC*
Mercury MA-7	*Hong Kong Space Museum, Hong Kong*
Mercury MA-8	*NASA, Alabama Space & Rocket Center, Huntsville, AL*
Mercury MA-9	*NASA, Johnson Space Center, Houston, TX*
Mercury #10	*Kansas Cosmosphere and Discovery Center, Hutchinson, KS*
Mercury #17 (?)	*Hall of Science, Queens, NY*
Mercury #12B	*National Luchtvaart Museum, Schipol, Netherlands*
Mercury #14	*NASA, Langley Research Center, Hampton, VA*
Mercury #15B	*NASA, Ames Research Center, Mountain View, CA*
Mercury #19	*Swiss Museum of Transport, Lucerne, Switzerland*
Gemini 1A (?)	*Hall of Science, Queens, NY*
Gemini 2	*U.S.A.F. Space Museum, Cape Canaveral, FL*
Gemini MSHO #1890	*NASA, Alabama Space & Rocket Center, Huntsville, AL*
Gemini 2A	*Kansas Cosmosphere & Discovery Center, Hutchinson, KS*
Gemini (unknown #)	*U.S.A.F. Museum, Wright-Patterson AFB, Dayton, OH*
Gemini 3	*Grissom Memorial Museum, Mitchell, IN*
Gemini (unknown #)	*Florence Air & Missile Museum, Florence, SC*
Gemini 4	*NASM, Smithsonian Institution, Washington, DC*
Gemini 5	*NASA, Johnson Space Center, Houston, TX*
Gemini 6A	*McDonnell Planetarium, St. Louis, MO*
Gemini 7	*NASM, Smithsonian Institution, Washington, DC*
Gemini 8	*Neil Armstrong Museum, Wapakoneta, OH*
Gemini 9A	*NASA, Kennedy Space Center, FL*
Gemini 10	*Swiss Museum of Transport, Lucerne, Switzerland*
Gemini 11	*NASA, Ames Center, Mountain View, CA*
Gemini 12	*NASA, Goddard Space Flight Center, Greenbelt, MD*
Gemini Paraglider	*Manchester Air & Space Museum, Manchester, England*
Apollo 1	*NASA, Langley, Hampton, VA (in storage)*
Apollo 2	*Kansas Cosmosphere and Discovery Center, Hutchinson, KS*
Apollo 4	*North Carolina Museum of Life and Science, Durham, NC*
Apollo 6	*Fernbank Science Center Atlanta, GA*
Apollo 7	*National Museum of Science & Technology, Ottawa, Canada*
Apollo 8	*Chicago Museum of Science & Technology, Chicago, IL*
Apollo 9	*Michigan Space Center, Jackson, MI*
Apollo 10	*Science Museum, London, England*
Apollo 11	*NASM, Smithsonian Institution, Washington, DC*
Apollo 12	*NASA Langley Center, Hampton, VA*
Apollo 13	*Musée de l'Air, Paris, France*
Apollo 14	*Rockwell International, Downey, CA (to Los Angeles County Museum in 1985)*
Apollo 15	*U.S.A.F. Museum, Dayton, OH*
Apollo 16	*NASA, Alabama Space & Rocket Center, Huntsville, AL*
Apollo 17	*NASA, Johnson Space Center, Houston, TX*
LTA-1	*Cradle of Aviation Museum, Garden City, NY*
TM-3	*Junkyard near Kennedy Space Center, FL*
LM-2	*NASM, Smithsonian Institution, Washington, DC*
LTA-3	*NASA, Alabama Space & Rocket Center, Huntsville, AL*
LTA-8	*NASA, Johnson Space Center, Houston, TX*
LM-9	*NASA, Kennedy Space Center, Fl*
LM-13 (for Apollo 18)	*Cradle of Aviation Museum, Garden City, NY*
LM-14 (for Apollo 19)	*Franklin Institute, Philadelphia, PA*
Skylab 1B	*NASM, Smithsonian Institution, Washington, DC*
Skylab (unknown #)	*Junkyard near Kennedy Space Center, FL*
Skylab 1	*Naval Aviation Museum, Pensacola, FL*
Skylab 2	*NASA, Ames Center, Mountain View, CA*
Skylab 3	*NASM, Smithsonian Institution, Washington, DC*
Apollo-Soyuz, Apollo-Soyuz 1B	*NASA, Kenndy Space Center, FL* *NASM, Smithsonian Institution, Washington, DC*
Space Shuttle *Enterprise*	*Edward AFB (to Smithsonian Institution, Washington in 1986).*

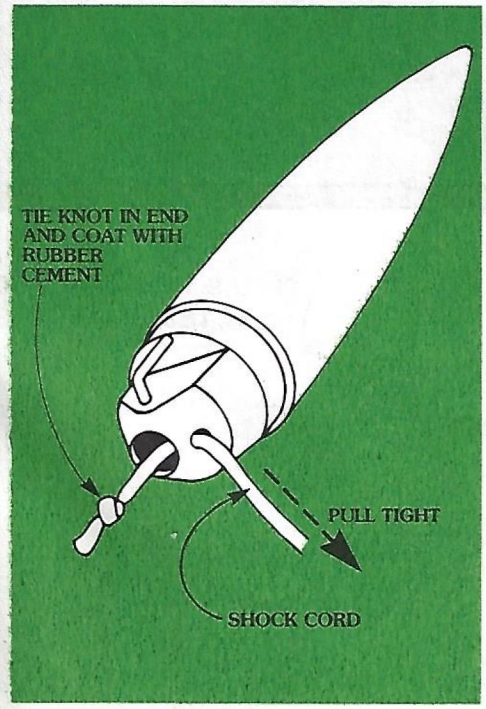
Are any of these spacecraft near you? Visiting one would be a great experience. Why not try to visit one, take your family to view one, talk your parents into taking you to see one, or setting up a field trip to see one for your club?

IDEA BOX

When preparing a streamer, I glue or tape the middle of the streamer around a paper clip. The paper clip has already been attached to the small ring on the end of a swivel. This makes a streamer that can easily be transferred between rockets. Also, the streamer can be hung from a nail in my storage area.



Attaching the shock cord to a plastic nose cone--Drill a small hole in the base (not the shoulder) of the plastic nose cone. Pass the shock cord through the small hole. Carefully pull the end of the shock cord back out through the large hole in the center of the nose cone. Then tie a double-knot or two on the end of the shock cord. Coat the knot with rubber cement. Do not use white glue as it will be too brittle when it dries. Pull on the shock cord so the knot is inside the hollow nose cone. You now have (a) a securely attached nose cone and (b) the plastic "loop" on the nose cone is available for attaching the 'chute or streamer.



Contributed by Fred Quinlan Sr., Clark, NJ

Lubricate the launch rod with silicone spray to help the rocket slide easier on it.

Contributed by John King, Christiana, PA

Apply a small amount of super glue (cyanoacrylate glue) to the body tube, then press the fin onto the spot. (Be careful to follow the directions on the glue container. Some super glues will work with cardboard and balsa, and some won't.)

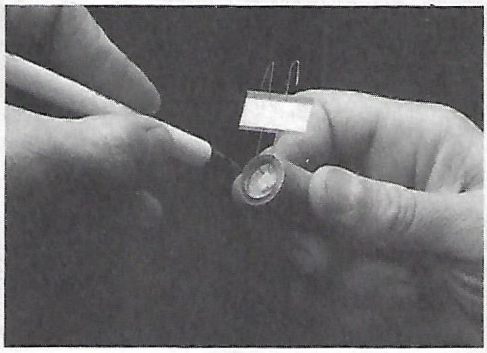
After the super glue has set, apply white glue to reinforce the fin. Use this same procedure on all fins and on the launch lug.
Contributed by Neil Zysk, Niagara Falls, NY

A good way to store those extra model rocket engines is in a zip-lock freezer bag or in a special plastic bag sealed with one of the electric bag sealers advertised for vegetables or frozen food. Seal the plastic bag with some air in it to cusion against damage. The plastic seals out moisture and lets you view the engines to see which type they are. Long term storage can be accomplished by storing them in a refrigerator away from the light bulb.

Before you build that rocket you've been wanting for so long, take the time to trace around those die-cut fins on a sheet of paper. When you've finished building the kit, file the fin patterns you traced with the rocket plans just in case you need to replace one or more of the fins due to unexpected damage. The fin pattern tracings are also nice to have around as a source of ideas when designing your own rockets from scratch.
Contributed by William Salzwedel, Madison, WI

Put the Estes symbol that often comes on the decal sheet for your rocket on your range box or some place special as on your notebook or in your work area.
Contributed by Matt Emery, Hollidaysburg, PA

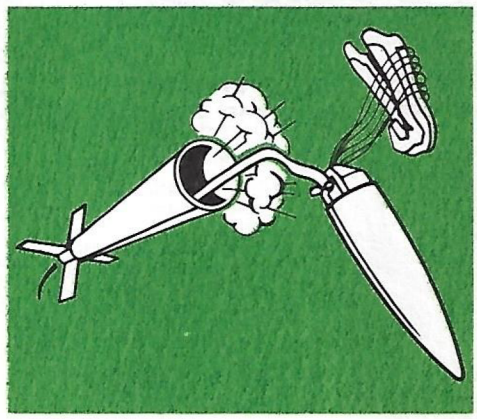
To reduce the chance of a misfire, roll a small piece of recovery wadding into a ball. Place the igniter properly in place in your model rocket engine. Then firmly push the small ball of recovery wadding down into the nozzle (the tip of a ball point pen works great) to act like a cork to hold the igniter in place. Apply a piece of tape in the usual manner to secure the igniter in place. This extra step of using the small pellet of recovery wadding helps hold the igniter firmly in place prior to ignition.



Contributed by Kenneth Wang, Rancho Palos Verdes, CA

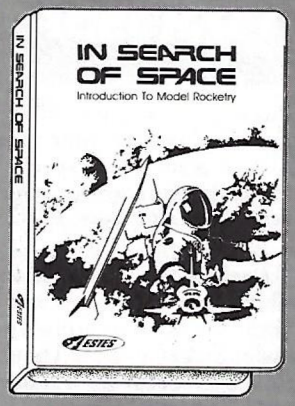
Keep the designs of the rockets you make so that you can reconstruct them with parts from the Designer's Special if you should lose them.
Contributed by Michael McKechney, Webster, NY

Put dust from colored chalk in your parachute just before you pack it into the rocket. When the parachute ejects, the colored chalk dust will eject making a small cloud in the sky. This makes it much easier to spot your rocket at apogee (the highest point in the flight).



Contributed by Loren Barstow, Centereach, NY

COMPUTER SOFTWARE



The FUN way to learn the basics of model rocketry. Explore these areas of model rocketry to become more expert!

MODEL ROCKET FLIGHT PROFILE
PARTS OF A MODEL ROCKET
MODEL ROCKET ENGINES
MODEL ROCKET ENGINE CLASSIFICATION
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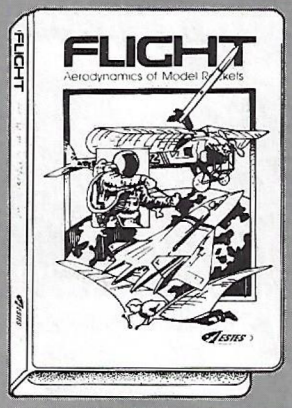
IN SEARCH OF SPACE: INTRODUCTION TO MODEL ROCKETRY#9025 ..... $24.95



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Here are the hot new Estes products.

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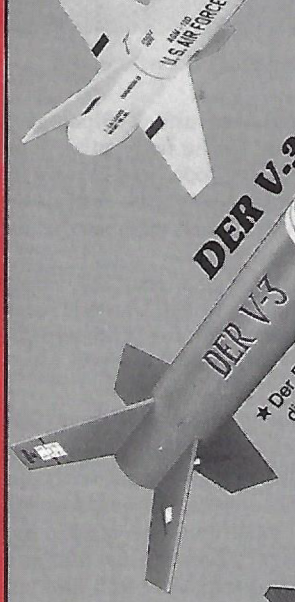
★ Skill Level 2
★ Semi-scale model of USAF Air-To-Air Missile
★ 15.6 inches long
★ Zoom off the launch pad with A8-3 (First Flight), B4-4, B6-4, B8-5, or C6-5 Estes engines

BULL PUP 12D #1972 ..... $5.95

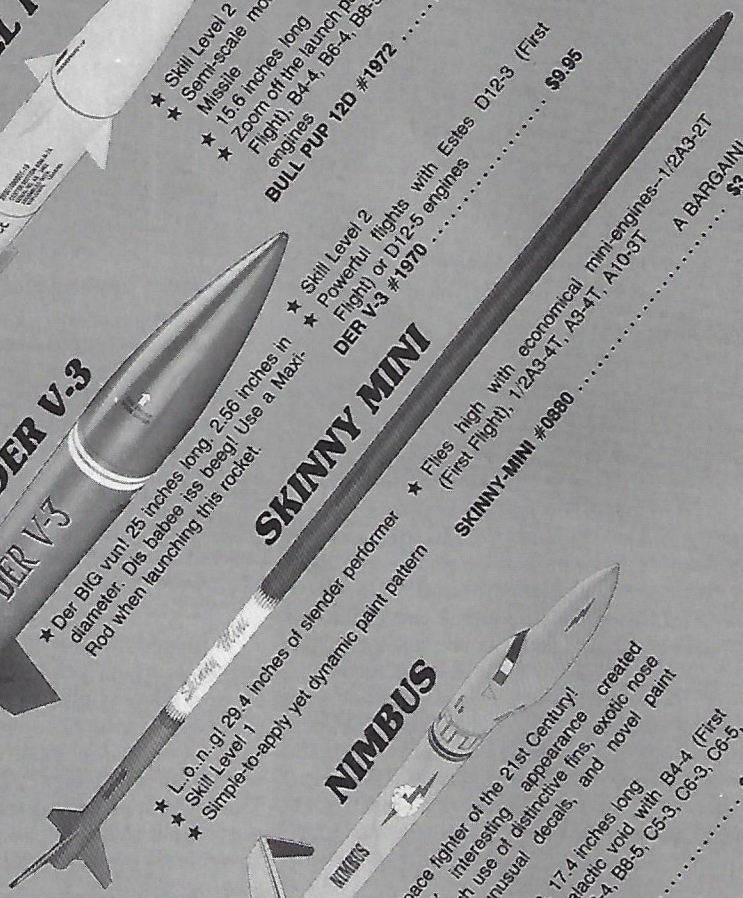


DER V-3

★ Skill Level 2
★ Powerful flights with Estes D12-3 (First Flight) or D12-5 engines

DER V-3 #1970 ..... $9.95

★ Der BIG vun! 25 inches long, 2.56 inches in diameter. Dis babee iss beeg! Use a Maxi-Rod when launching this rocket.



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★ Skill Level 1
★ Simple-to-apply yet dynamic paint pattern

NIMBUS

★ Space fighter of the 21st Century!
★ Very interesting appearance created through use of distinctive fins, exotic nose cone, unusual decals, and novel paint scheme
★ Skill Level 3. 17.4 inches long
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