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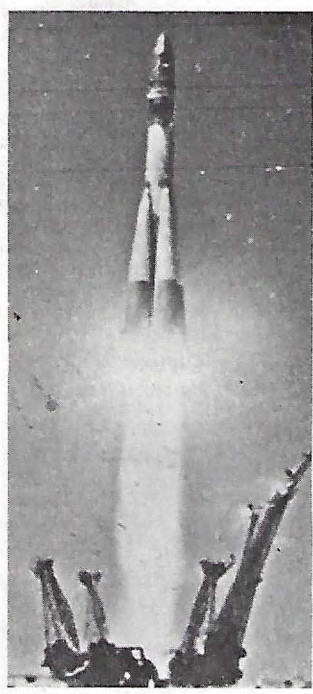
# The Soviet Space Launchers

by Mike Dorffler  
Estes R & D Staff

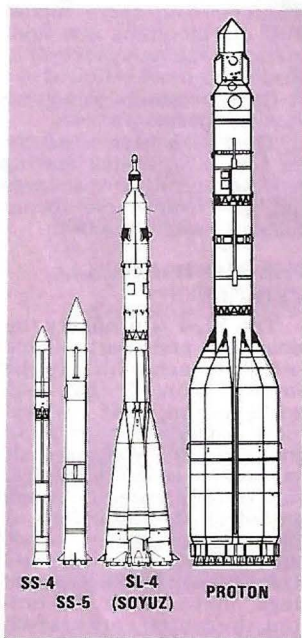
In October 1957, an odd looking rocket was loaded onto a special rail car and transported to a concrete launch pad near the Aral Sea deep in the Soviet Union. There it was hydraulically hoisted to a vertical position and held erect by four structural arms. It was fueled with liquid oxygen and kerosene and, after extensive checkout, a man named Sergei Korolev gave the launch command.

Pyrotechnic devices brought 32 rocket engines to

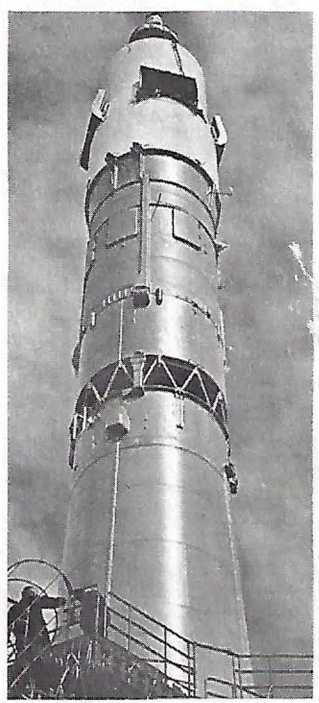
life in a huge fireball. As the engines built up thrust, the four support arms swung back like flower petals and the rocket rose swiftly from a thrust of over 450,000 Kg (1,000,000 pounds). Four minutes later, four conical strap-on booster half-stages were shut down and then separated from the central "core" which continued to burn. Eight and one half minutes after leaving the launch pad, the eight engines of the central core were shut down, and for an instant,



Yuri Gagarin Lifts Off In Vostok 1  
April 12, 1961.



the world's first artificial satellite was over 30 meters in length, 3 meters at its largest diameter, and weighed over 3,500 Kg. Moments later a set of springs separated a highly polished, instrumented sphere from the main rocket, and Sputnik 1



Soyuz SL-4 Launch Vehicle  
Soviet Union Magazine

began "beeping" coded information back to a startled world.

Although we now know that this is how Sputnik 1 was put into orbit, it wasn't until several years later that these facts were made available to others outside the Soviet scientific community. The overall reasoning behind this veil of secrecy by the Soviets is actually quite simple: All Soviet launch vehicles used for space research are further developments of military rockets and therefore any information regarding their operation is considered classified.

(Continued on Page 2)



For this reason it was not until 1967, at the Paris air show, that the Soviets publicly displayed a copy of the launch vehicle that placed Yuri Gagarin in orbit in 1961. To this day this is the only version of any Soviet satellite launch vehicle that is displayed openly. No other vehicle has ever been set up and shown in any country including the Soviet Union.

However, now we know that there are only five different launch vehicles that the Soviet Union has ever used in launching satellites, Lunar and planetary vehicles, and manned space missions. We know what they look like, their dimensions, the types of engines and fuels used, and how these basic vehicles are adapted for a variety of payload requirements.

#### THE SMALL SS-4 INTERCOSMOS LAUNCH VEHICLE

The SS-4 is the smallest of all Soviet launch vehicles. It is a two stage rocket which stands about 30 meters in height and is about 1.7 meters in diameter. The first stage has an engine with four thrust chambers, burns nitric acid and kerosene, and produces a liftoff thrust of approximately 75,000 Kg. Thrust vectoring is accomplished by carbon vanes in the rocket exhaust. The second stage which is separated from the first by a steel truss section has a single thrust chamber which produces about 11,000 Kg of thrust by burning a combination of liquid oxygen and dimethyl hydrazine. Thrust vectoring is accomplished by directing the turbopump exhaust through four nozzles located around the main chamber.

This vehicle is primarily responsible for the launching of small scientific satellites and early reconnaissance satellites. It is still in use today after its introduction in mid 1962. Its primary launch site is Kapustin Yar.

#### THE LARGE SS-5 INTERCOSMOS LAUNCH VEHICLE

The SS-5 launch vehicle was developed from a Soviet

IRBM missile, as was the smaller SS-4. In launch configuration it stands nearly 34 meters high and is about 2.4 meters in diameter. As is the SS-4, the SS-5 is a two stage rocket. The first stage is about 21 meters in length and has four thrust chambers which develop approximately 135,000 Kg of thrust by burning what are thought to be nitric acid and kerosene. Carbon vanes in the exhaust of these engines provide thrust vectoring. The booster also has four triangular shaped fins at the base.

The second stage uses a twin-chambered engine which is designated RD-219 by the Soviets. It burns a combination of nitric acid and dimethyl hydrazine and produces a thrust of about 90,000 Kg. This engine is probably the most efficient of all Soviet rocket engines. Part of the exhaust gasses developed in the turbine pump are fed into the thrust chambers and there mixed with the incoming raw fuel. In rocket engine science, this produces a more efficient use of fuels, pressures, and combustion characteristics.

The SS-5 is used primarily for earth satellites having general scientific packages and for recoverable reconnaissance satellite work.

#### THE SL-4 LAUNCH VEHICLE

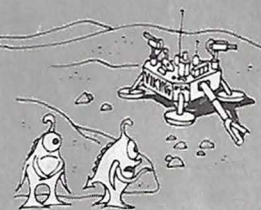
The SL-4 is probably the most used and most reliable satellite launch vehicle in the Soviet Union. In its basic configuration, a central "core" stage surrounded by four conical shaped half stages serve as the first stage. The central core, although ignited at the same time as the surrounding half stages, burns for a longer time and is considered as the second stage. Viewed from the bottom, the central core has four main thrust chambers surrounded by four vernier engines which swivel to apply vectoring thrust. The central core is 2 meters in diameter and approximately 27 meters in length. The four identical 1/2 stages or strap-ons are 2.7 meters in diameter at their base and taper for a length of approximately 20 meters.

Each has four main thrust chambers identical to the central core but has only two thrust vectoring engines instead of four as found on the core. This results in a total of 32 thrust chambers all burning at liftoff and producing a total thrust of over 450,000 Kg using liquid oxygen and kerosene for fuel. This basic vehicle was used to launch the first three Sputniks without the need of another rocket stage. In all three instances, the entire central core went into orbit along with the satellite after the engines were shut down. This fact was not known for several years after their launch as the Soviets did not want to reveal the total orbital payload capability of this vehicle.

Another rocket stage was later added in order to add sufficient escape velocity to its payload to enable the Soviets to launch probes to the moon. This rocket stage was later modified to increase the SL-4's orbital payload from 900 Kg to over 4,000 Kg for the manned Vostok missions. The upper stage was later replaced with one more powerful, producing nearly 130,000 Kg of thrust and increasing the SL-4's useful orbital payload to over 6,000 Kg. This improved stage was used in the manned Voskhod series of missions and is now being used in the Soyuz missions. This vehicle has been used for many of the lunar and planetary probes as well as launching several classified Soviet satellites.

*(Continued on Page 3)*

Ben L. Behler  
St. Paul, MN



*"UGH!! Those Earthmen are hideous!"*



## THE PROTON LAUNCH VEHICLE

The largest of all the operational Soviet space boosters is nearly 70 meters in length and approximately 12 meters in diameter at its base. Soviet designers used the same strap-on concept as the SL-4 booster to achieve a very high thrust level. Although the number of thrust chambers is not known, the Proton launch vehicle uses six strap-ons around a central core. However, unlike the SL-4 where all engines are ignited at liftoff, only the strap-ons are running as the Proton lifts off the pad. These six strap-ons produce thrust exceeding 1,300,000 Kg. Just before the strap-on units have expended their fuel, the central unit ignites and becomes the second stage. It is thought that the central core and upper stages are of about four meters in diameter as are the six strap-on units. The Proton booster has been responsible for launching the Soviet Salyut space stations used in the Soyuz program, the latest Mars and Venus probes, the Zond circum-lunar flights, the Lunakhod lunar rovers, and the moon landers which have returned lunar soil.

## THE SOVIET "SUPER" BOOSTER

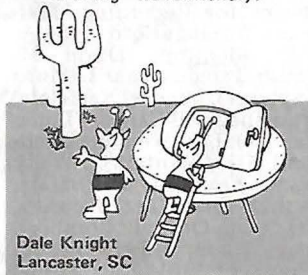
Very little is known about this vehicle except that three launch attempts have been made, all meeting with total failure. It is thought that this rocket was designed and built in order to give the Soviet Union the capability to launch men to the moon. It is estimated that at launch this vehicle produced a lift-off thrust exceeding 4,500,000 Kg and was approximately 15 meters in diameter at its base. It is

known that a prototype of the Class G booster, as it is called, while being fueled on the pad at Tyuratam in the summer of 1969, suddenly caught fire and exploded. In the summer of 1971 another type G was moved to the launch pad and launched. All systems on the huge rocket performed properly until it reached an altitude of 12,000 meters where it exploded in a huge fireball. Another was launched in 1972, and again the same fate befell the launch vehicle. Since then very little information has filtered through as to the progress of this "super" vehicle or its future in the Soviet space program.

## Oops We Made An Error!

Please note the following corrections to Technical Note, TN-6, Space Boosters by Dean Black in the Oct. 15, 1976 issue of Model Rocket News, Vol. 16, No. 1: Table #1 on page 30 in the Density Column should read gm/cc not 9m/cc. Table #2 on page 31 should state Space Shuttle thrust as 6,600,000 lbs. not 3,070,000 lbs. SORRY ABOUT THAT!

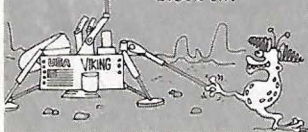
"Put your hands down,  
Earthling - we're friendly."



Dale Knight  
Lancaster, SC

Mark Davenport  
Grand Junction, CO

"New kid on the  
block eh?"



## Help Us Publish Model Rocket News

Got any good ideas for MODEL ROCKET NEWS articles, technical information, cartoons, anecdotes, club news of unusual interest, etc.? Then why not submit them to us for possible publication? Our constant aim is to make MRN a better, more interesting magazine, and you might be just the type of contributor we need.

If you send us photos, please make sure that you pack them between cardboard sheets so that they won't get creased in the mail. All contributions become the property of Estes Industries and cannot be returned. Address all material to: MRN Editor, Estes Industries, Penrose, Colorado 81240.

Should your article or photos be used in MRN, we'll reward your efforts and talent with an Estes merchandise certificate, the amount of which will be determined by the MRN editorial staff.

Hope to hear from you soon!

## DON'T MISS AN ISSUE OF MODEL ROCKET NEWS

Model Rocket News is published six times yearly and inserted with return mail orders. To receive your bi-monthly copy simply place an order or request the latest issue from: Estes Industries, Attn: MRN Editor, Penrose, Colo. 81240.

YOUR BEST BET IS TO OBTAIN MODEL ROCKET NEWS WITH YOUR NEXT ORDER!

| MRN PUBLICATION SCHEDULE |     |          |      |
|--------------------------|-----|----------|------|
| Vol.                     | No. | Month    | Year |
| 17                       | 2   | April    | 1977 |
| 17                       | 3   | June     | 1977 |
| 17                       | 4   | August   | 1977 |
| 17                       | 5   | October  | 1977 |
| 17                       | 6   | December | 1977 |



# DESIGN OF THE MONTH WINNERS

Congratulations to another fine group of Estes Rocketeers for their outstanding DOM entries. First place winners will receive \$75.00 merchandise certificates and honorable mentions will be awarded \$10.00 certificates. Keep those entries coming, maybe you'll be our next winner!

## MARCH 1976 — Winners:

Laurent Ferrere, Granite City, IL (Camroc 2). Dan Pankratz, Green Bay, WI (Goddard). Lance Crain, Huntington Beach, CA (Intrepid 3). Gordon D. King, Hudson, NH (X-15). Rich Goodsel, Costa Mesa, CA (Whirlybird). Honorable

Mention: Ramon Haderlie, Provo, UT (Alpha Centauri). Mark Cochran, Normal, IL (Ramedia 301). Todd Kay, Colorado Springs, CO (Merc Mark III). Gordon Skinner, Canon City, CO (Interstellar Space Probe). Scott A. Caldwell, Bainbridge, OH (Asper I). Jason Hollister, Hanover Park, IL (Light-speed). Alan Gustafson, INTL Falls, MN (Odyssey). Len Philpot, Bonita, LA (Sigma). Philip Fok, Hockessin, DE (Zenex 1). Tyler Morgan, Mercer Island, WA (Saturn Ring). Marc McManama, Niagara Falls, ON Canada (Venus Cruiser). Bruce Harper, Massilon, OH. Mr. Thomas A. Mullen, Waukegan, IL (Astro-Star Shooter). Keith Prukop, Renton, WA (Sorcerer). Joseph Wambach, Sharonville, OH (X-50 Star Cruiser). Jeff Rossy, Chester, WV (Plutonian). Doug Roberts, Gray, ME (Heavy Hauler). Clark Fraser, Wall Lake, IA (Aerobee 150). Bill Esunis, Bartlett, IL (USS Neptune C-7 and Redbird Satellite). Rodney Ziebol, St. Cloud, MN (Nigel 5). Greg Brown, Wilmette, IL. Mike Pankratz, Mountain Lake, MN (Vulcan II). Bill Sheldon, Padroni, CO (Water Rocket). Scott Poretsky, Franklin Square LI, NY (Two Squared). Fred Kuhus, Little Rock, AR (Mini-Booster). Scott Linder, Pacifica, CA (Voyager III).

## APRIL 1976 — Winners:

Bruce Simmons, W. Des Moines, IA (Allamerican).

Chuck Shreve, Odessa, TX (Cobra-SST). Honorable

Mention: Gary Ellis, Cloverdale, CA (Nuclear Inceptor). Patrick F. McAvinue, Cleveland, OH (X-29). Harry Schouten, Spencerport, NY (Colosus II). Tim Hazlewood, Johnson City, TN (Dagger). Curtis Huffman, Hickory, NC. Alan Reindl and Thad Philpott, Mansfield, OH (Centron II). Bill Engar, Salt Lake City, UT (Rigel VII Rescue Ship). Tim Bartlett, Sayama Shi, Saitama Ken, Japan (Star Spangled Spirit of '76). Michael Walton, Montgomery, NY (Tricenturian 2076 A.D.). Geoff Boyer, Modesto, CA (Skunk Land Ricket 21). Wesley S. McBee, Odessa, TX (USS Intrepid). Andrew Cirioli, New Haven, CT (Mighty Mouse). Eddie Blalack, Fayetteville, TN (U.S.S. Eclipse). John Foreman, Tacoma, WA.

## MAY 1976 — Winners:

Jeff Fox, Houghton, MI (Flying Funnel). Charles Bobbins, Tarrytown, NY (A Device for Recording Maximum Acceleration). Honorable Mention: David M. Smith, Tallahassee, FL (Pluto Explorer). Michael Kastelein, Winnipeg, MB Canada (Lunar Lander). Bert Weimer, Litchfield, OH (Mantaray). Wally Wang, Franklin, MI (Safat). Arthur Smith Jr., Security, CO (Sub-Orbital Bomber). Larry Stein, Milwaukee, WI (Spirit of '76). Rick Drew, Burbank, IL (Tristar). Keith Belt, Kansas City, MO (Flying Saucer). Robert Bettin, Rochester, NY (Scorpion, Lexington, and the Jark). Brent Miller, Manhattan Beach, CA (Pegasus). Dan Maxhimer, New Bern, NC (Robin). James Signore, Batavia, NY (Mercury 1). Lee Hasiuk, Philadelphia, PA (Five Model Rocket Launcher). Kevin Werling, New Haven, IN (V-2 Booster).

Paul Alvarez, Valparaiso, IN (Tiros III). Paul Simpson, Savannah, GA (Intrepid). Eric Unruh, Newton, KS (Flying Saltbox). Russel Lang, Carlisle, MA (Sky Bird).

## JUNE 1976 — Winners:

Nick Kroeze, Coyoacan 21 D F, Mexico (King Fisher). Paul Calkins, Hanover, IN (Rosy Red Rage). Greg Nicholson, Kelso, WA (Y 76 Fighter). Honorable Mention: Gordon Wyngaert, Jackson, MI. Mike Harris, Huntington, WV (Scout). Scott Melson, Hacienda Heights, CA (Mega-Lifter). Jeff O'Brien, Davison, MI (U.F.O. Invader). Shanon Molmen, Faribault, MN (Andromeda Shuttle). Blake Hardegree, Colorado City, TX (Mystic). David Chura, Harvey, IL (Hydrochloric Acid). James Hicks, Carbonale, PA (204 Evader). Gary Glover, Plain City, OH (Stalactite). Eric Unruh, Newton, KS (Starship Procyon). David Dickson, Salt Lake City, UT (After Burner). Dominic DiFino, Parma, OH (Cape Kennedy type Launcher). Randall Martin, Waynesboro, VA (Tetra-Spire). Steve LeBato, Lake Charles, LA (Starship Andromeda). Philip Moy, Bronx, NY (Bandito II). Albert Dommann, Sehonbuhrling 9, 6005 Luzern, Switzerland. Dwight Horner, Tulsa, OK (Turbojet). Gene Weber, Dallas, TX (Under Ground Launch System). Terry Wheelock, Fort Worth, TX (Evel Knievel).

"Funny, Bow Wow isn't in here!"



Dale Knight  
Lancaster, SC



# 204 EVADER

HONORABLE MENTION JUNE 1976  
DESIGN OF THE MONTH CONTEST  
By JAMES R. HICKS  
Carbondale, PA

**SKILL  
LEVEL 2**

Build the 204 EVADER with Estes High Performance Parts and Accessories

## PARTS LIST

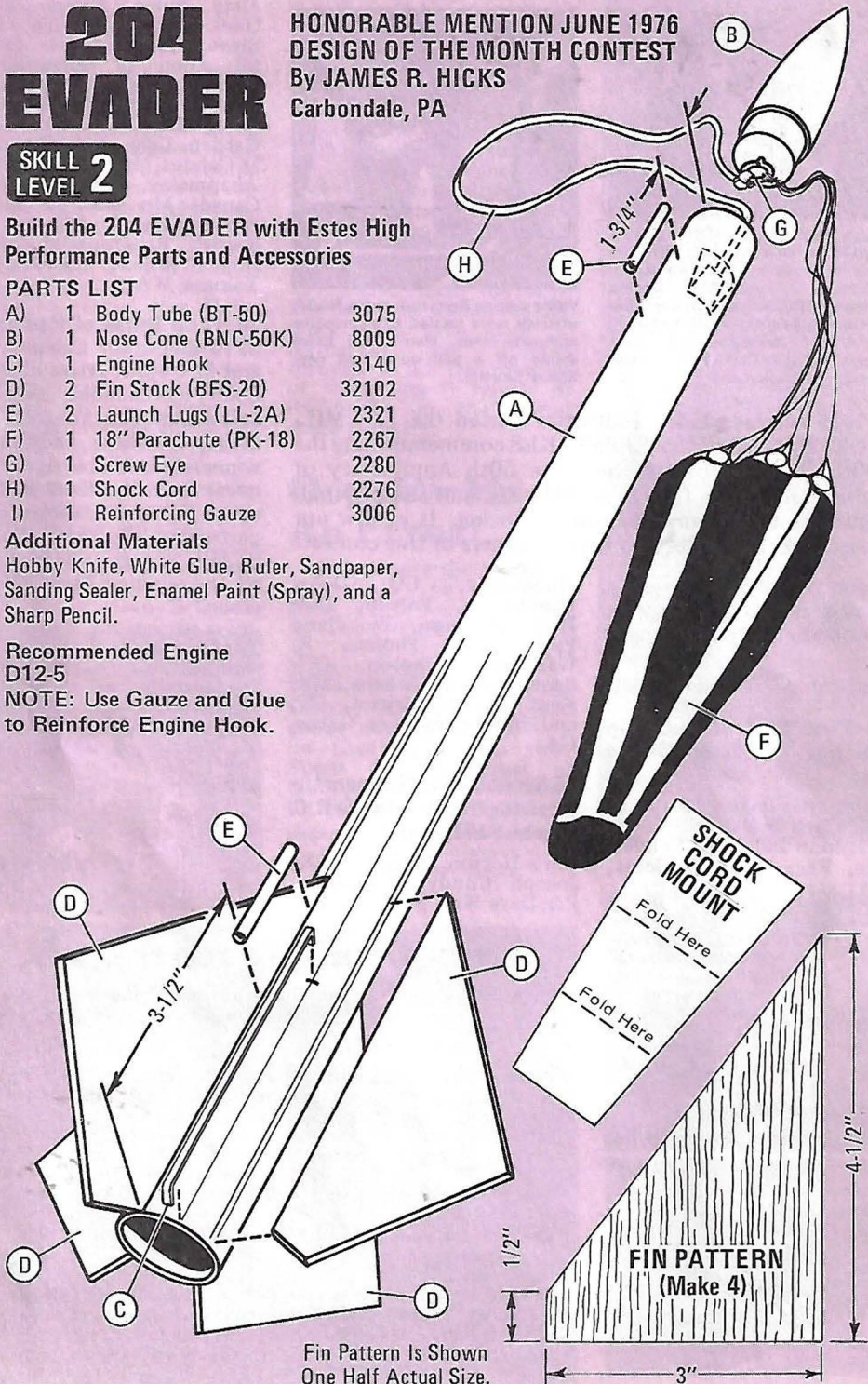
|    |   |                       |       |
|----|---|-----------------------|-------|
| A) | 1 | Body Tube (BT-50)     | 3075  |
| B) | 1 | Nose Cone (BNC-50K)   | 8009  |
| C) | 1 | Engine Hook           | 3140  |
| D) | 2 | Fin Stock (BFS-20)    | 32102 |
| E) | 2 | Launch Lugs (LL-2A)   | 2321  |
| F) | 1 | 18" Parachute (PK-18) | 2267  |
| G) | 1 | Screw Eye             | 2280  |
| H) | 1 | Shock Cord            | 2276  |
| I) | 1 | Reinforcing Gauze     | 3006  |

## Additional Materials

Hobby Knife, White Glue, Ruler, Sandpaper, Sanding Sealer, Enamel Paint (Spray), and a Sharp Pencil.

Recommended Engine  
D12-5

NOTE: Use Gauze and Glue to Reinforce Engine Hook.



Fin Pattern Is Shown  
One Half Actual Size.



## 100 MILLIONTH LAUNCH SWEEPSTAKES WINNERS



NASA OFFICIALS ASSIST WITH AWARD DRAWING Left to Right: John R. Bannister, NASA Aerospace Education Specialist; George Johnson, NASA Space Science Education Specialist; Fred Kubesch, Jr., NASA Aerospace Education Specialist, and Carl Turse, Estes Director of Marketing.



While visiting Estes Industries, NASA officials were treated to a complete company tour. Here Vern Estes shows off a built-up of our new Space Shuttle.

Last summer Estes Industries hosted the 100 MILLIONTH LAUNCH SWEEPSTAKES commemorating the 200th Birthday of America, the 50th Anniversary of Robert Goddard's first rocket launch, and the 100 millionth launch of an Estes model rocket. It is now our pleasure to announce the lucky winners of this contest!

Grand Prize Winner of a Pioneer Stereo System with Automatic Garrard changer is:

Bruce June, Wyoming, MI.

10 First Prize Runners-Up receiving TV-Pong Games are:

Phillip Savignano, Auburn, ME; Chris Smith, St. John, MO; John Zullo, Ft. Lauderdale, FL; Albert E. Scott,

Wheatridge, CO; John Davenport, Toledo, OH; Hans Sorensen, Woodland Park, CO; Thomas E. Wellbaum, Dayton, OH; Scott Anton, Athens, ME; Kent Ridley, Bristol, CT; and Bill Impey, Los Gatos, CA.

15 Second Prize Runners-Up receiving the Speedwave R.C. Porche 917K are:

Chris Horton, Pasadena, TX; Joseph Chudy, Allentown, PA; Dave Way, Franklin, PA;

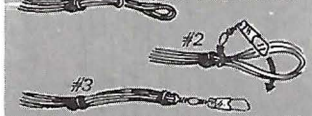
Marilyn Bush, Gering, NE; Mike Nuzio, Fresno, CA; Gedi Plenys, Chicago, IL; Steve Sprague, Lake City, MI; Glen L. Sunderland, Gaithersburg, MD; Herman Lupien, Bjorkdale, Saskatchewan, Canada; John Fay, Garden City, NY; Richard D. Galates, Melrose, MA; Siva Ananmalay, Ajax, Ontario, Canada; Mrs. H.C. De Groh, Oak Forest, IL; Thomas P. Secrist, Bellefontaine, OH; and Vernon Cartwright, Yakima, WA.

25 Third Prizes of Hanimex 2170 Electronic Calculators and 49 Fourth Prizes of \$25 Estes Merchandise Certificate's were also awarded. A listing of these additional winners is available upon request from the Estes Rocketeer Communications Department, Penrose, Colo. 81240. Congratulations to all the winning Estes Rocketeers!



### THE IDEA BOX

QUICK ATTACHMENT FOR SNAP SWIVELS Here's an easy way to tie the parachute to your snap swivel!



Robert Boardman Northridge, CA

Insert a 1/8" dowel (#32056) into a launch lug. Cutting and rolling the lug with a sharp knife will give you an even cut.



Niels Pedersen St. Paul, MN

## Stump Your Teacher Quiz

**Question for your teacher:** What happens if the weight of a rocket is greater than the thrust developed by the rocket's engine?

**Answer:** Lots of sound and fury, going nowhere. The thrust developed by the rocket's engine must be greater than the restraining forces of gravity, atmospheric drag, and inertia or the rocket will not leave the launch pad. The energy released by the rocket engine's operation may produce a lot of sound, much bright light, some vibration, and massive damage to the launch pad, but it is wasted for launching the rocket.

**Question for your teacher:** What are the three axes of motion for a spacecraft?

**Answer:** Roll, pitch, and yaw. Roll is the spacecraft's rotation around its longitudinal or roll axis. Pitch is motion up and down about the spacecraft's lateral or pitch axis. Yaw is movement from side to side about the spacecraft's vertical or yaw axis.



# THREE STAGE RING ROCKET

**SKILL LEVEL 4**

WINNER SEPTEMBER 1976  
 DESIGN OF THE MONTH CONTEST  
 By **BOB DINSMORE** Wilberforce, OH  
 Build the Three Stage Ring Rocket with Estes High Performance Parts and Accessories

## PARTS LIST

|    |   |                         |       |
|----|---|-------------------------|-------|
| A) | 1 | Nose Cone (BNC-50Y)     | 8011  |
| B) | 1 | Body Tube (BT-50)       | 3073  |
| C) | 2 | Body Tube (BT-50J)      | 30362 |
| D) | 3 | Engine Mounts (EH-2050) | 3150  |
| E) | 1 | Body Tube (BT-101T)     | 30442 |
| F) | 2 | Stage Couplers (JT-50C) | 3052  |
| G) | 3 | Fin Stock (BFS-30)      | 3168  |
| H) | 1 | Launch Lug              | 2322  |
| I) | 1 | 18" Parachute (PK-18)   | 2267  |
| J) | 1 | Screw Eye               | 2280  |
| K) | 1 | Shock Cord              | 2276  |
| L) | 2 | Weights                 | 2305  |

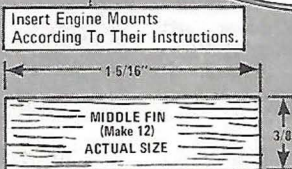
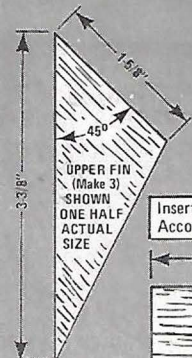
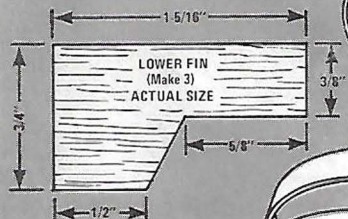
See Page 5  
 For Shock  
 Cord Pattern.

## Additional Materials

Hobby Knife, White Glue, Ruler, Sandpaper, Sanding Sealer, Enamel Paint (Spray), and a Sharp Pencil.

## Recommended Engines

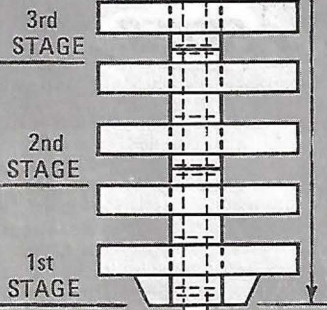
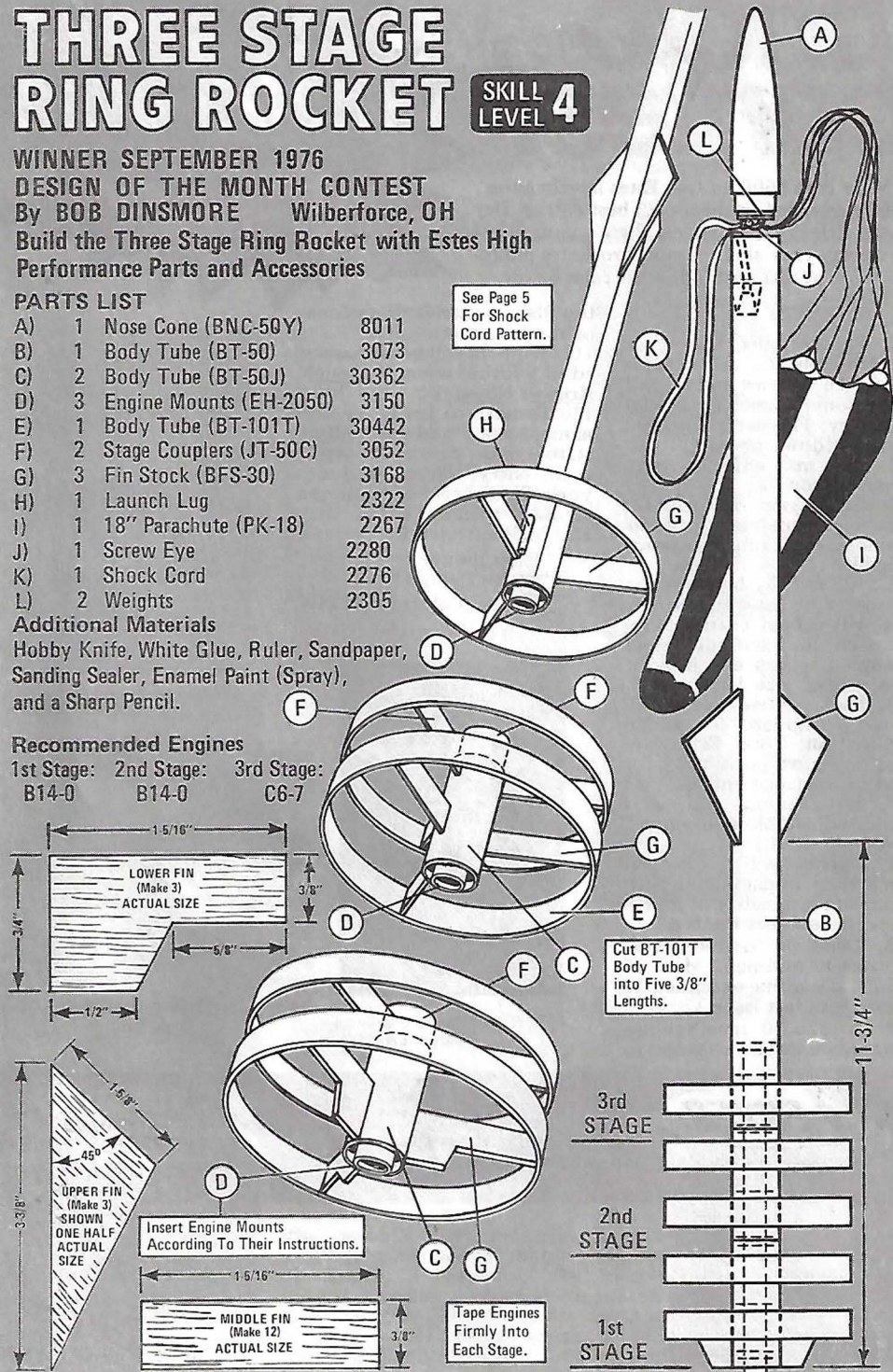
|            |            |            |
|------------|------------|------------|
| 1st Stage: | 2nd Stage: | 3rd Stage: |
| B14-0      | B14-0      | C6-7       |



Insert Engine Mounts According To Their Instructions.

Tape Engines Firmly Into Each Stage.

Cut BT-101T Body Tube into Five 3/8" Lengths.





# photo contest

More than \$600 in free Estes merchandise will be awarded to the top 25 best entries. Hey.... Heyy....Heyyy! Rocketeers, here's your chance to display your skills in model rocketry photography. To enter, just follow the rules below.

## CONTEST RULES

1. Photographs, slides, or Camroc photos are acceptable. All entries must deal with some aspect of model rocketry. Please do not send movie films or negatives.

2. You may enter as many times as you like

3. Employees of Estes Industries or members of their immediate families are not eligible.

4. All entries become the property of Estes Industries. We will return entries if requested and a self-addressed, stamped return envelope of the proper size is included.

5. Pack entries carefully - use cardboard for added protection. Note: Estes cannot accept responsibility for lost or damaged entries.

6. List camera setting if using adjustable equipment. (Not required.)

7. Entries will be judged for visual impact, composition, and originality of model rocketry subject matter.

8. Deadline for receipt of entries is midnight Mar. 15 1977. (Deadline extended 15 days since last issue.)

9. A \$25.00 merchandise certificate will be awarded to

the 25 best entries. Decisions of the judges are final.

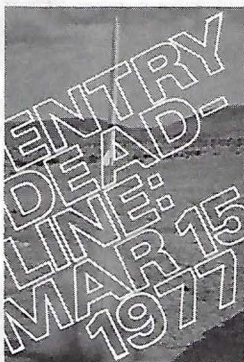
10. Winners will be announced in a future issue of Model Rocket News.

11. Be sure to include your name, age, address, city, state, and zip code with each entry. Please include your Skill Level if you are an EAC member.

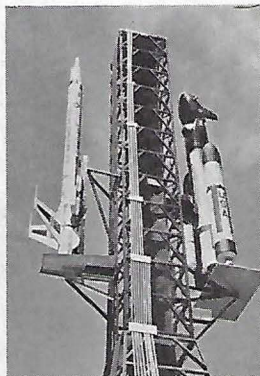
12. Mail entries to:

Estes Industries  
"Photo Contest"  
Penrose, Colorado 81240

**GOOD LUCK!**



1974 Winner Harold Boardman  
Tustin, CA



1974 Winner Ronald Carnicom  
Hicksville, NY



1974 Winners Glen Peterson & Steve Nagy  
Solon, OH 900,811



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PENROSE, COLO. 81240**

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