ESTES
Model Rocket Supplies

KITS, ENGINES, INFORMATION
AND SUPPLIES FOR AMERICA'S
FUTURE SPACE SCIENTISTS.

Catalog
No. 641

PRICE - 25¢

Estes Industries, Inc.
BOX 227
PENROSE, COLO. 81240

Devoted to . . . Safety . . . Education . . . Enjoyment . . . in rocketry
WHAT IS MODEL ROCKETRY?

Imagine the thrill of pressing the firing switch and watching a rocket you have built soar skyward in a cloud of smoke, leaving a vapor trail behind as it shrinks into just a speck. Then at the apex of its flight, a streamer or parachute blossoms out, returning the rocket to the earth undamaged, ready for another flight.

But there is more to model rocketry than this. Not only is it thrilling, but it provides an unexcelled opportunity to study and learn space science, to begin studying for a career dedicated to pushing man's frontiers farther and farther towards the stars. Scores of young rocketeers today are finding the value of model rocketry in science fair projects, school projects, and in their own private research programs.

Today's youth are finding model rocketry an ideal means for aiding their studies of aerodynamics, math, physics, optics, biology, space medicine, astronautics, electronics, photography, and psychology. They also find it of great value as a stimulant to the study of the non-science fields such as language arts, history, and literature. These young people who today are pursuing, on their own, a study of the sciences with model rocketry are a vital part of the new generation of scientists. These are the people who will explore the planets and beyond.

How does model rocketry accomplish this? A model rocket itself is a highly specialized mechanism, light in weight, utilizing nonmetallic materials such as paper, plastic, and balsa. By using these materials, the model rocketeer gains the highest performance from a prepackaged commercial engine, and is able to launch accelerometers, biological specimens, electronic instruments, and many other objects inexpensively, reliably, and above all, without the dangers normally associated with amateur rocketry.

The model rocketeer does not fabricate his own engines or mix his own propellants, for he realizes that he does not have the facilities and background to do so efficiently or safely. Instead, he makes use of propellant devices which are pre-made, providing him with a reliable power package which is consistent from one unit to the next. This introduces an element of control into his experiments, and enables him to reduce and correlate his data more readily and accurately. He can now draw conclusions from his experiments which would otherwise have been only conjecture.

The type of youth science study provided by model rocketry has no equal for developing active minds which can explore new concepts and principles. Practical experience, gained from working with the same principles, theories and ideas which will be used in his profession, is necessary if today's young person is to be motivated to study for a vital career in the space sciences. When motivated he becomes a pioneer, a pioneer of the greatest frontier man has ever faced.
Model rocketry can be simple or it can be a complex activity. It can involve the use of calculus to determine the speed of a model rocket at any instant of its flight, it can involve the construction of a smoke tunnel to study exact airflow characteristics, the construction of analog computers, or it can lead into any one of the hundreds of other areas of science. No matter what the young scientist's special interest, he can find that model rocketry will fit in perfectly with it.

While a model rocketry program can often result in an even more advanced scientific research program, it is easy to start in model rocketry. There is one way to do this—by building and flying models. To make this important first step more convenient, Estes Industries has prepared two Beginners Specials.

The first of these specials, and the most complete, is the $6.00 Beginners Special, which contains all the materials necessary for a successful start in model rocketry. It consists of a kit for the construction of America's most flown model rocket, the Astron Scout, three engines for launching this rocket, a Launcher to ignite the engine and guide the rocket during the initial portion of its flight, batteries for the launcher, and the Design Booklet, the authoritative handbook on model rocketry.

The Astron Scout rocket kit introduces the young scientist to the methods of constructing model rockets and illustrates vividly the important principles of balance involved in the flight of model rockets. With the three rocket engines included in the kit, the rocketeer can fly his rocket to altitudes of up to 1,000 feet and learn the relation of engine impulse to rocket performance.

The Electro-Launch and batteries included in this special not only enable the rocketeer to launch his rockets with relative safety and convenience, but also form a permanent part of his rocketry equipment. The Electro-Launch is durable, and will last for hundreds of launchings. While building and using his Electro-Launch the rocketeer also learns about the best methods of igniting rocket engines.

The Design Booklet included with the rocket and the launcher includes plans for single and multi-stage rockets, information on the design and operation of model rockets, and information on rocket construction. Also included in this handbook are technical report TR-1 giving basic information on rocket stability, technical report TR-2 on multi-stage techniques and operation, and technical report TR-3 on determining rocket altitudes.
get the MOST from MODEL ROCKETRY

...by following a carefully planned course of study and experiments. By starting out with simple models and working up to the more complex ones, you'll have more successful flights, enjoy your studies more, and learn more. By studying technical reports and other available literature you'll gain a solid knowledge of model rocketry that will serve you well in other areas of science.

To help you plan your own studies in model rocketry, here's a suggested program. With this program you tackle more advanced subjects after mastering the more basic subjects.

1. Build and fly the Astron Scout. Study the rocket's design and read the included report, TR-1, to gain a thorough understanding of the principles of rocket stability which are so very important to proper rocket performance.

2. Build and fly the Astron Sky Hook to learn about parachute recovery.

3. Design, build and fly your own single stage bird, applying the things you learned in steps 1 and 2.

4. Build and fly the Astron Apogee. Study TR-2 (included with the kit) to master the principles of multi-staging.

5. Build and fly the Astron Farside to gain further experience in multi-staging and gain a broader knowledge in the field.

6. Design, build and fly your own multi-stage model, practicing the techniques you learned with the Apogee and the Farside.

7. Learn the principles of rear-engine boost-giders by building and flying the Astron Space Plane and studying the included report, TR-4.

8. Build the Astron Falcon to learn the principles of front engined boost-giders and gain further experience in the art of balancing gliders for maximum performance.

9. Design, build and fly your own boost-glider, applying the principles you have studied while working with the Space Plane and the Falcon.

10. Get started in clustering by building and flying the Astron Cobra and studying TR-6 (included with the kit).

11. Practice what you've learned by designing, building and flying your own cluster rocket.

12. Get started on your own special research program. Space medicine, electronics, meteorology, physics and aerodynamics are but a few of the fields open to the ambitious model rocketeer.

Once you've started, don't stop. The whole universe is yours to explore. As you train yourself to be a competent scientist, you'll find more and more new fields opening for you. Don't be afraid to be curious. Curiosity gave us the electric light, the radio, the automobile, and the airplane. Your curiosity may well give you things he has never dreamed of.

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Astron Drifter
GREAT FOR COMPETITION AND SPORT FLYING!

2 BIG 'CHUTES

Spectacular in upward flight and recovery, the Astron Drifter combines low weight with a large chute capacity. Perfect in any competition with it's 12" chute, the Astron Drifter is a great performer with it's 12" chute for test and sport flying fun. Parachutes are easily interchanged.

Cat. No. 641-K-14 $1.75 each
Shipping weight ............... 8 Oz.

Body Dia.: 1"
Length: 14.3"
Weight: 1 oz.

Recommended engines are: .15A-2, A-8-3, B-8-2 and B-8-4.

(Engines are not included in kit)
Easy to Build

WAC CORPORAL

Great for Flying and Display

Flying Scale Model!

Body Dia.  .756 in
Length    11.8 in
Weight    .65 oz

High-flying scale model of the famous sounding rocket! Easy enough for the novice to build, yet interesting enough for the experienced rocketeer, the WAC Corporal gives top performance for a scale model. Parachute recovery gives gentle landings flight after flight. Comes in easy to assemble kit form. (Engines not included.) Shipping wt. 5 oz.

Cat. No. 641-K-11 $1.50 each

Astron Scout

Get valuable experience building and flying the Astron Scout. Kit teaches rocket balance principles. A must for the rocketeer who wishes to learn to design his own models. Kit comes complete with all parts, instructions, and a copy of technical report TR-1 (but no engines). Shipping weight 2 oz.

Cat. No. 641-K-1  $.70 each

Patent No. 3,114,317

Tumble Recovery Easy to Build Educational

Only $.70 P.P.

Length    7 in
Body Dia. .765 in
Weight    .28 oz

The next step for the beginner.

An excellent bird for novice or experienced rocketeer. Easy to build, ideal for sport and demonstration flying, the Astron Mark gives top notch performance. Kit comes complete with all parts and instructions (but no engines). Shipping weight 5 oz.

Cat. No. 641-K-2 P.P. Price - $1.25

Streamer Recovery

Recommended Engines
1/4A.8-2
1/4A.8-2
A.8-3
B.8-4
(Use 1/4A.8-2 engines for first flights.)

Astron Mark

Ideal for Sport & Demonstration Flying

Length    9.12 in
Body Dia. .765 in
Weight    .65 oz

Recommended Engines
1/4A.8-2
1/4A.8-2
A.8-3
B.8-4
B 3-5
(Use 1/4A.8-2 for first flights.)
Astron
Space Plane

Always a WINNER!
America's No. 1 Contest Winner
and Record Holder!

Rocket powered glider—ascends vertically, then
slides to a gentle landing. The most successful
boost-glider ever developed, the Space Plane wins
duration contests with amazing regularity. The
Space Plane features easy and accurate adjustment
of glide characteristics, plus a payload compart-
ment large enough to handle small biological spec-
imens and other scientific objects. The Astron
Space Plane is easy to launch, and with proper care
will give you unlimited flying enjoyment. This kit
is recommended for the experienced modeler, and
must be assembled with precision and care. (Eng-
ines not included.) Shipping weight 5 oz.

Cat. No. 641-K-3

$1.80 Each

patent pending

Recommended Engines
\( \frac{1}{4}A.8-2 \) \( \frac{1}{2}A.A.8-2 \)
A.8-3 B.8-4

Body Dia. .765 in
Length 10 in
Wing Span 9 in
Weight .5 oz

Fascinating Rocket Glider

ASTRON
FALCON
ROCKET GLIDER

Only $1.00

Get sky-high performance with the new Astron
Falcon boost-glider. Beautiful climb—glide
durations up to and over 1-1/2 minutes on
\( \frac{1}{4}A \) engines, even more with larger engines.
A great bird for the experienced rocketeer.
Glide recovery brings it back gently, ready
for a fresh engine and another flight. Kit
comes complete with all parts and instruc-
tions (engines not included). Shipping wt.
5 ounces.

Cat. No. 641-K-13 $1.00 P.P.

Length 12 in
Wing Span 10 in
Weight .30 oz

Recommended Engines
\( \frac{1}{4}A.8-2 \) \( \frac{1}{2}A.A.8-2 \)
A.8-3 B.8-4

For normal flying only \( \frac{1}{4}A \) and \( \frac{1}{2}A \) engines are recommended—the
Astron Falcon can easily glide out of sight with larger engines
if it is built and balanced carefully.
ASTRON FARSIDE

Three Stages
Choice of two Distinctive Payload Units
Advanced Stage Coupling

A sophisticated ultra-high altitude probe or a workhorse vehicle for high altitude studies with large payloads—take your choice with the new Astron Farside. Advanced stage coupling gives dependable ignition and stage separation. Perfect for your advanced research programs. Top stage flies to well over 2500', returns gently by parachute. Available with standard 1" payload section (#641-K-12) or with extra large 1-1/2" dia. capsule for large payloads (#641-K-12X). Be sure to specify model type when ordering. Kit comes complete with all parts and assembly instructions (but no engines). Shipping wt. 8 ounces.

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Astron APOGEE II

IN ORBIT... the highest or farthest point from Earth is called "APOGEE."

The ability of this rocket to reach extreme altitudes consistently, makes "APOGEE" a natural name choice.

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Recommended Engines

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The ultimate in two stage performance and dependability. The new, improved Astron Apogee II incorporates revolutionary discoveries in multi-stage methods, features a transparent, see-through payload capsule—lets you observe specimens without removing them from the rocket. Parachute recovered for soft landings. Complete with all parts and instructions (but no engines). Shipping weight 6 ounces.

Cat. No. 641-K-5 $2.00 each
Spectacular Single Engine Performance!

Soars to over 2,000 ft.!

Body Dia. .72 in
Length 5.6 in
Weight .125 oz

Low weight and wind-cheating design give the Astron Streak fantastic performance. Uses mylar body tube for high strength and low weight—only 1/8 ounce without engine. Ideal for contests and records. Recommended engine for normal flying is the ¾ A, 8-4. Kit comes complete with all parts and instructions (but no engines). Shipping weight 4 oz.

Recommended Engines
¾ A, 8-4 ¾ A, 8-4
A, 8-4 B, 8-4

Cat. No. 641-K-4 $0.50

Astron PHANTOM

DEMONSTRATES BASIC BUILDING RULES.

Great for classroom or fair!

Weight .72 oz
Body Dia. 7.56 in
Length 8.7 in

Recommended Engines
¾ A, 8-2 ¾ A, 8-2
A, 8-3 B, 8-4

(Use ¾ A, 8-2 engines for first flights.)

Cat. No. 641-K-7A $1.75

Astron SKY HOOK

• EASY TO BUILD
• PARACHUTE RECOVERY
• TERRIFIC PERFORMER

You'll really enjoy building and flying your Astron Sky Hook. Easy to build and durable, parachute recovery brings it back gently for flight after flight. Kit comes complete with all parts and instructions (but no engines). Shipping weight 5 oz.

Cat. No. 641-K-8 $1.35 P.P.

Body Dia. .765 in
Length 12 in
Weight .65 oz

Recommended Engines
¾ A, 8-2
¾ A, 8-2
A, 8-3
B, 8-4
B, 3-5

(For first flights use ¾ A, 8-2 engines.)

Astron SPACEMAN

A real odd ball of a rocket, you'll get a big "kick" out of building and flying the Astron Space Man. Featherweight recovery brings him back close to the pad, ready for a new engine and another flight. Kit comes complete with all parts and instructions (but no engines). Shipping weight 7 oz.

Cat. No. 641-K-9 $.75 P.P.
Astron RANGER
BIG
2 'CHUTES

3 ENGINE WALLOP!

EXTRA LARGE PAYLOAD SECTION

Body Dia. 1.6 in
Length 24 in
Weight 3.35 oz

Specially designed for big payloads—you can demonstrate your skill by launching and recovering an egg with this rocket! Carries payloads up to 3-1/2 ounces to high altitudes. The perfect vehicle for your special instruments and specimens. The Astron Ranger kit comes complete with all necessary parts, assembly and flight instructions, plus a copy of TR-6 on cluster techniques. (Engines not included.) Shipping wt. 13 oz.

Cat. No. 641-K-6 $3.75 Each

Recommended Engines
A.8-3 B.8-4

Astron COBRA
STABILITY is "Built in"

Dependable

Body Dia. 1.6 in
Length 22.25 in
Weight 2.5 oz

The ideal bird for getting started in clustering, yet challenging to the experienced rocketeer, the Astron Cobra gives you top performance. Medium size payloads (up to 4 ounces) get a real ride in the Cobra's 1" diameter capsule. Kit comes complete with all parts, instructions, and a copy of technical report TR-6 on cluster techniques. (Engines not included.) Shipping weight 13 ounces.

Cat. No. 641-K-10 $3.50 Each

Recommended Engines
A.8-3 B.8-4
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* Replacement part for the Astron Scout, with holes punched. Be sure to give correct catalog number and length when ordering!

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**CONSTRUCTION TIPS**

This Fin Spacing Guide will space equally three or four fins on all the body tubes sold by Estes Industries. To space the fins, center the end of the tube in the circle, then mark at the "X" lines for four fins or on the "O" line for three fins. Draw lines from these marks as shown in the bottom drawing.

Apply PFM-1 smoothly eliminate bubbles

After fins are dry flow in a good fillet of white glue or plastic putty.

Mylar! PFM on the inside of nose BT-10 Mylar

Glue these joints Strips of PFM-1 Where balsa must be glued to plastic surface.

BT-10 is an ultra-light mylar tube for use with the featherweight recovery system. It will withstand the heat of an ejection charge only when the engine is ejected from the rocket body by the charge. Paper reinforcing material must be used to glue parts to the tube, as ordinary glue will not stick to the mylar tube.

**Fin Placement Guides**

Straight or spin-fin placement can be marked with these easy-to-make guides. Select a 2 or 3 inch piece of the same size body tube you are using for the rocket body. Illustrations #1 and #2 show how each guide is first cut. A quicker way of marking straight fins using the "Vec"-top of a drawer grill is also shown and is especially good for those extra long marking chores.

Using drawer grill or guide Use end of marker for tube cutting lines... to draw fin attachment lines.
## NOSE CONES

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<th>Material</th>
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<tr>
<td>641-BNC-10A</td>
<td>1 1/16&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
</tr>
<tr>
<td>641-BNC-10B</td>
<td>1 1/16&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
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<td>$15.00</td>
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<tr>
<td>641-BNC-20A</td>
<td>7/8&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
</tr>
<tr>
<td>641-BNC-20B</td>
<td>1 1/16&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
</tr>
<tr>
<td>641-BNC-20C</td>
<td>1 1/16&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
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**VARIETY FOR A BT-30**

**BALSA BEAUTIES FOR A BT-30**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Material</th>
<th>Tilt</th>
<th>Average Weight</th>
<th>Price Each</th>
<th>Price 3 for</th>
<th>Price 50 for</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/8&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
</tr>
<tr>
<td>1 1/16&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
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</table>

**PLASTIC AND BALSA FOR A BT-40**

<table>
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<tr>
<th>Dimensions</th>
<th>Material</th>
<th>Tilt</th>
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<th>Price 50 for</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/8&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
</tr>
<tr>
<td>1 1/16&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
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**DESIGNED FOR THE BT-50**

<table>
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<th>Tilt</th>
<th>Average Weight</th>
<th>Price Each</th>
<th>Price 3 for</th>
<th>Price 50 for</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/8&quot; x 5/16&quot;</td>
<td>Plastic</td>
<td>5 oz</td>
<td>.08 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
</tr>
<tr>
<td>1 1/16&quot; x 5/16&quot;</td>
<td>Plastic</td>
<td>5 oz</td>
<td>.08 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
</tr>
</tbody>
</table>

**EXCLUSIVELY FOR OUR ENGINE MAILING TUBE**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Material</th>
<th>Tilt</th>
<th>Average Weight</th>
<th>Price Each</th>
<th>Price 3 for</th>
<th>Price 50 for</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/8&quot; x 5/16&quot;</td>
<td>Balsa</td>
<td>5 oz</td>
<td>.05 oz</td>
<td>$1.25</td>
<td>$8.00</td>
<td>$15.00</td>
</tr>
</tbody>
</table>

**Nose Cone Dimensions**

- **1" x 1/16"** Balsa: Shipping Weight 1 oz $15 each
- **3" x 1/16"** Balsa: Shipping Weight 3 oz $20 each

**Notes:** Dimensions may vary slightly. Nose cones may vary due to manufacturing tolerances. Nose cone lengths are approximate. Each nose cone is designed to fit specific cases and may not be interchangeable. Always measure your rocket cases before ordering to ensure the best fit.

**Designer:** Bruce H. Kolb

**Cautions:** Always wear safety glasses when working with nose cones. Do not over-tighten nose cones as they may break. Do not neglect to order extra nose cones for replacement or backup. Always measure your rocket cases before ordering to ensure the best fit.
**Nose Blocks**

Use these top quality, featherweight balsa nose blocks in payload sections and anywhere else a solid bulkhead is required. Precision turned for exact fit in body tubes.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Dimensions</th>
<th>Fits</th>
<th>Weight oz.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O. D. Length</td>
<td></td>
<td>Net</td>
<td>Ship</td>
</tr>
<tr>
<td>641-NB-20</td>
<td>.710&quot; 3/4&quot;</td>
<td>BT-20</td>
<td>.014</td>
<td>1</td>
</tr>
<tr>
<td>641-NB-30</td>
<td>.725&quot; 3/4&quot;</td>
<td>BT-30</td>
<td>.014</td>
<td>1</td>
</tr>
<tr>
<td>641-NB-40</td>
<td>.765&quot; 3/4&quot;</td>
<td>BT-40</td>
<td>.015</td>
<td>1</td>
</tr>
<tr>
<td>641-NB-50</td>
<td>.950&quot; 1&quot;</td>
<td>BT-50</td>
<td>.040</td>
<td>4</td>
</tr>
<tr>
<td>641-NB-60</td>
<td>1.595&quot; 1-1/2&quot;</td>
<td>BT-60</td>
<td>.190</td>
<td>4</td>
</tr>
<tr>
<td>641-NB-LMT</td>
<td>.957&quot; 1&quot;</td>
<td>Mailing Tube</td>
<td>.040</td>
<td>4</td>
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</tbody>
</table>

**Engine Blocks**

Get light weight, precision fitting engine blocks for the best internal construction on your models. These hollow bulkheads position the engine, allow gases to pass forward unobstructed for normal ejection or upper stage ignition.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Dimensions</th>
<th>Fits</th>
<th>Weight oz.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O. D. I. D. Length</td>
<td></td>
<td>Net</td>
<td>Ship</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>641-EB-20</td>
<td>.710&quot; .46&quot; 3/4&quot;</td>
<td>BT-20</td>
<td>.007</td>
<td>1</td>
</tr>
<tr>
<td>641-EB-30</td>
<td>.725&quot; .46&quot; 3/4&quot;</td>
<td>BT-30</td>
<td>.007</td>
<td>1</td>
</tr>
<tr>
<td>641-EB-40</td>
<td>.765&quot; .46&quot; 3/4&quot;</td>
<td>BT-40</td>
<td>.008</td>
<td>1</td>
</tr>
</tbody>
</table>

**BALSAM ADAPTERS**

There's no limit to design ideas when you use these precision-made balsa adapters. Switch from one size body tube to another for payload capsules, parachute compartments, propulsion sections, etc. Adapters fitting BT-20 can be built up with masking tape to fit BT-30 or BT-40, and any adapter may be hollowed with a knife or drill to make a passage for ejection gases or upper stage ignition charge. All adapters have a 1/2" mating surface on each end.

<table>
<thead>
<tr>
<th>Catalog No.</th>
<th>Mates</th>
<th>Length</th>
<th>Taper Length</th>
<th>Weight oz.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Net</td>
<td>Ship</td>
</tr>
<tr>
<td>641-TA-2050</td>
<td>BT-20 to BT-50</td>
<td>3&quot;</td>
<td>2&quot;</td>
<td>.15</td>
<td>4</td>
</tr>
<tr>
<td>641-TA-2050A</td>
<td>BT-20 to BT-50</td>
<td>2&quot;</td>
<td>1&quot;</td>
<td>.11</td>
<td>4</td>
</tr>
<tr>
<td>641-TA-2060</td>
<td>BT-20 to BT-60</td>
<td>3&quot;</td>
<td>2&quot;</td>
<td>.20</td>
<td>4</td>
</tr>
<tr>
<td>641-TA-5060</td>
<td>BT-50 to BT-60</td>
<td>3&quot;</td>
<td>2&quot;</td>
<td>.23</td>
<td>4</td>
</tr>
</tbody>
</table>

**ENGINE BLOCKS**

Mating a big payload unit to a small body tube. Ejection Gas will actuate chute in the upper section through use of hollowed adapter. Use adapter to mount a big parachute on small body, for duration events.

**PAPER ADAPTERS**

Add still another dimension in rocket design. This adapter set is a "must" for the imaginative rocketeer. Get 16 rings for positioning BT-20, BT-30, and BT-40 in BT-50; and BT-20, BT-30, BT-40, and BT-50 in BT-60, plus instructions and 3 universal tapered shrouds. Combine light weight and versatility! (Does not include body tubes or nose cones.)

Shipping weight 2 oz.

**Cat. No. 641-TA-1**

$.35 each
ENGINE MOUNTS

Get a precision engine fit in large body tubes without adding unnecessary weight. Engine mount sets come complete with instructions—just assemble and glue in place in your model.

EH-2040 Fits BT-40, includes BT-20J and EB-20A. Mount slips easily into rocket body. Net wt. .05 oz. Shipping wt. 5 oz.
Cat. No. 641-EH-2040 $ .15 each

Cat. No. 641-EH-2050 $ .35 each

EH-2060 Fits BT-60, includes BT-20J, EB-20A, 2 rings for centering holder tube, and JT-60C for positioning rings. Net weight 0.17 oz. Shipping weight 5 oz.
Cat. No. 641-EH-2060 $ .35 each

STAGE COUPLERS

Little tubes with many uses, stage couplers exactly fit the inside of the tube designated. Great for multi-staging, joining body tubes, positioning adapter rings, etc. Make perfect guides for cutting body tubes and sanding cut edges of body tubes, too. Extra durable, light weight. Shipping weights: JT-20C, 30C, and 40C, 1 oz., JT-50C and 60C, 5 oz.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Dimensions</th>
<th>Fits</th>
<th>Average Weight</th>
<th>Price Each/3 for</th>
</tr>
</thead>
<tbody>
<tr>
<td>641-JT-20C</td>
<td>.708'' x .650''</td>
<td>3/4''</td>
<td>BT-20</td>
<td>.027 oz</td>
</tr>
<tr>
<td>641-JT-30C</td>
<td>.724'' x .650''</td>
<td>3/4''</td>
<td>BT-30</td>
<td>.030 oz</td>
</tr>
<tr>
<td>641-JT-40C</td>
<td>.763'' x .650''</td>
<td>3/4''</td>
<td>BT-40</td>
<td>.033 oz</td>
</tr>
<tr>
<td>641-JT-50C</td>
<td>.949'' x .920''</td>
<td>1''</td>
<td>BT-50</td>
<td>.051 oz</td>
</tr>
<tr>
<td>641-JT-60C</td>
<td>1.55'' x 1.55''</td>
<td>1-1/2''</td>
<td>BT-60</td>
<td>.124 oz</td>
</tr>
</tbody>
</table>

RANGE KIT SPECIAL

$9.00
Value Look What You Get! Only $6.00

A Complete Range Kit!
Carry it with you when you fly rockets. Get a sturdy, all-metal range box loaded with all these most needed items.

1 15' Roll Nichrome #NW-12A 1 Parachute #PK-18A
1 Bottle White Glue #WG-1 2 Parachutes #PK-12A
1 Knife Handle #KN-1 1 Streamer Material #SM-1
1 Knife Blade #KNB-1A 3 Snap Swivels #SV-12
1 Knife Blade #KNB-1B 3 Shock Cords #SC-1
1 Knife Blade #KNB-1C 1 Shock Cord #SC-2
1 Tweezers #T-1 3 Screw Eyes #SE-1
1 Whetstone #W-1 5 Nose Cone Weights #NCW-1
1 Engine Holder #EH-1 1 Roll Masking Tape #MT-1
1 Reinforcing Mat #PRM-1 1 Balsa Fin Stock #BFS-20
1 Roll Shroud Lines #SLT-1 1 Balsa Fin Stock #BFS-50
1 Sheet Tape Strips #TD-2 3 Launching Lugs #LL-1C
1 Pack Flameproof Recovery Wadding #RP-1 18 Sheets Sandpaper #SPA-2
1 Parachute #PK-24A 1 Emery Board #BE-1
1 Parachute #PK-24A 2 Micro-Clips #MC-1

Sorry, no substitutions. Not available on quantity discount purchases. Shipping weight 3 pounds. Cat. No. 641-RBK-1A $6.00

Range Box
Good-looking, roomy, tough all metal box—the same as included with the special above. A big 11¾'' x 5¾'' x 4'', complete with a three compartment tray for small parts. Has full-drawn seamless body, snap catch with eye for padlock. Shipping wt. 2 pounds.
Cat. No. 641-RB-1 $2.50 Each
Fin Stock

Top quality balsa sheeting for making fins for model rockets. For maximum strength, grain of wood should follow the leading edge of fin. For more information, read FINS in Vol. 5, No. 3 of the Model Rocket News.

<table>
<thead>
<tr>
<th>Catalog No.</th>
<th>Dimensions (in Inches)</th>
<th>Weight oz.</th>
<th>Major Use</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>641-BFS-10</td>
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<td>.065</td>
<td>4</td>
<td>3 for $ .35</td>
</tr>
<tr>
<td>641-BFS-20</td>
<td>1/16&quot; x 3&quot; x 9&quot;</td>
<td>.130</td>
<td>4</td>
<td>3 for $ .40</td>
</tr>
<tr>
<td>641-BFS-20B</td>
<td>1/16&quot; x 1/2&quot; x 6&quot;</td>
<td>.015</td>
<td>2</td>
<td>2 for $ .10</td>
</tr>
<tr>
<td>641-BFS-30</td>
<td>3/32&quot; x 3&quot; x 9&quot;</td>
<td>.150</td>
<td>4</td>
<td>4 for $ .45</td>
</tr>
<tr>
<td>641-BFS-40</td>
<td>1/8&quot; x 5&quot; x 9&quot;</td>
<td>.200</td>
<td>4</td>
<td>3 for $ .50</td>
</tr>
<tr>
<td>641-BFS-60S</td>
<td>3/16&quot; x 1/2&quot; x 3&quot;.5&quot;</td>
<td>.020</td>
<td>2</td>
<td>3 for $ .15</td>
</tr>
<tr>
<td>641-BPS-80</td>
<td>1/4&quot; x 2&quot; x 17&quot;</td>
<td>1.00</td>
<td>12</td>
<td>3 for $ 6.00</td>
</tr>
</tbody>
</table>

Plastic Fin
Tough white plastic fin unit. Build models the quick, easy, durable way. Fits body tube BT-40. The unit used on the Sky Bird and the Dirty Bird, fins are large enough to stabilize most models. Great for beginners. Net weight .44 oz. Shipping weight 4 oz.

Cat. No. 641-PF-40A $ .50 each 3 for $ 1.20

Spin Fin
Use this unit with the fins set at an angle to make the rocket spin. Made of molded polyethylene, fits body tube BT-40. Ideal for beginners and experimenters. For the best fit, slot the body on opposite sides as shown above. Net weight .35 oz. Shipping weight 4 oz.

Cat. No. 641-PF-40B $ .50 each 3 for $ 1.20

Fin Pattern Sheet
Fourteen different popular fin designs, all tried and proven, printed full size on heavy index stock. Simply cut out and trace around pattern to transfer design to balsa. A must for the model rocket designer. Shipping Wt. 1 oz.

Cat. No. 641-PP-2 $ .25 each 3 for $ .50

PAYLOAD SECTIONS

Ideal for payload launching! Carry instruments, biological specimens, etc., in these lightweight, high capacity payload sections. These capsules come complete with all needed parts, including nose cone, body tube, nose block, and screw eye. PS-50B includes stand off and launching lug for rocket's main body. Dimension "A" is inside diameter. "B" is inside length, and "C" is overall length.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Type</th>
<th>Weight oz.</th>
<th>Fits</th>
<th>Dimensions</th>
<th>Price Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>641-PS-20A</td>
<td>Clear Plastic</td>
<td>.16</td>
<td>1</td>
<td>BT-20</td>
<td>.710  2  4.00 $ .80</td>
</tr>
<tr>
<td>641-PS-30B</td>
<td>Regular Tube</td>
<td>.24</td>
<td>1</td>
<td>BT-30</td>
<td>.725  2  3.75 $ .85</td>
</tr>
<tr>
<td>641-PS-40A</td>
<td>Clear Plastic</td>
<td>.32</td>
<td>1</td>
<td>BT-40</td>
<td>.765  2  3.75 $ .85</td>
</tr>
<tr>
<td>641-PS-50B</td>
<td>Regular Tube</td>
<td>.36</td>
<td>4</td>
<td>BT-50</td>
<td>.950  3  6.50 $ .85</td>
</tr>
<tr>
<td>641-PS-50D</td>
<td>Regular Tube</td>
<td>.95</td>
<td>11</td>
<td>BT-50</td>
<td>1.59  4  10.5 $ 1.25</td>
</tr>
<tr>
<td>641-PS-60B</td>
<td>Regular Tube</td>
<td>.90</td>
<td>11</td>
<td>BT-60</td>
<td>1.59  6  10.5 $ 1.25</td>
</tr>
</tbody>
</table>

MERGENCY CAPSULE

Add a special touch to your rockets! Get this model Mercury Capsule! A big 1.8 inches in diameter and 3.2 inches high, this capsule is equipped with a removable base for easy payload access. Comes in easy to assemble kit form, with a full set of adapters to fit the capsule to all Estes body tubes. Start your own Project Mercury! Shipping weight 3 ounces.

Cat. No. 641-PSM-1 Only $ 1.00

Perfect for Payloads!
ENGINE CLASSIFICATION

All engines sold by Estes Industries are stamped with a code designation which, when understood, will give the rocketeer important and useful data on the engine’s performance capabilities.

Here's how to read this coding:

1. This portion gives you the "total impulse" or total power produced by the engine as in the chart below.

2. This portion is the engine's average thrust in pounds. Series I and Series III engines are rated at .8 lb. average, Series II engines at 3 pounds. Series I and Series III engines are for normal flying, Series II engines are for lifting larger payloads and for high acceleration studies.

3. This number gives you the delay in seconds between burnout and ejection charge activation. Engines with "0" have no delay charge, no ejection charge, and are for use in booster stages only.

Series III engines are identical in performance to the corresponding Series I engines. Series III engines have a final "S" in their code.

TOTAL IMPULSE CLASSIFICATION

<table>
<thead>
<tr>
<th>Code</th>
<th>Total Impulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4A</td>
<td>0.175-0.175 lb-sec</td>
</tr>
<tr>
<td>1/2A</td>
<td>0.351-0.350 lb-sec</td>
</tr>
<tr>
<td>A</td>
<td>0.701-1.20 lb-sec</td>
</tr>
<tr>
<td>B</td>
<td>1.21-2.00 lb-sec</td>
</tr>
<tr>
<td>C</td>
<td>2.75</td>
</tr>
</tbody>
</table>

QUALITY CONTROL: One out of every hundred engines made by Estes Industries is static tested on a recording type of test stand which graphically records the maximum thrust, thrust variations, minimum thrust, overall thrust duration, length of time delay, and the strength of the ejection charge. Any batch of engines which does not meet rigid standards is discarded. In addition, the engine production machine automatically rejects all engines which do not contain the correct amount of propellant. Tolerances are kept as small as possible so that these engines make excellent propulsion units for contests and exhibitions.

Tips for Flying Model Rockets

SUGGESTIONS FOR BEGINNERS: Most beginners start their rocket studies and experiments with single stage rockets because they are easier to build and are generally more dependable. We suggest that you use single stage designs for your first half dozen rockets. There are five primary rocket engines for single stage flying, the 1/4A.8-2 for general testing, the 1/2A.8-2 for low altitude flights, the A.8-2 for medium altitude flights, the B.8-4 for high altitude flights, and the B 3-5 for high acceleration, high altitude flights. These are the most popular engines for general use. When you have mastered their use you may select other engines which are designed for specific purposes.

FIRST TESTS: It is best to use the smallest engine(s) possible for the first tests on a new rocket design. If the design is bad and the rocket is not stable it presents no hazard. If you have a high performance rocket and use the largest engines first, you are likely to see it soar off into the wild blue yonder, never to be seen again—quite a disappointment if you spent hours building it. For most designs 1/4A and 1/2A engines are best for the first test flights. A well designed high performance rocket can approach an altitude of 1,000 feet when powered by a 1/2A engine.

RECOVERY FIELD: The altitude to which you fly a rocket should not be greater than is practical for the size of the flying area. In a town or city, flying in a limited area, 1/4A and 1/2A engines are best. In large open park areas A engines are all right, and in open rural areas B engines and two or three stage rockets are okay. A general rule to follow is that the field should be at least as large as the altitude to which you intend to fly the model. When flying a rocket to 500', you should launch it from the center of a 500' field.

SERIES II ENGINES: The wallop packed by B 3-0 and B 3-5 engines makes them even more difficult to handle than Series I engines. Extra care should be exercised to be sure the rocket is stable. Extra caution must be taken to be sure fins are extra durable and well secured to the rocket body. A Series II engine must be mounted against a secure bulkhead so a sudden force of 9 pounds will not force it forward in the rocket body. With a Series II engine, a light weight model will be traveling about 400 miles per hour in just 70 feet from the launcher. Use extra caution.

SAFETY: Rocket engines are not toys, but scientific devices. With common sense and close adherence to safety rules, model rocketry is as safe as any other sport, hobby, or scientific study. Carelessness can make it dangerous, as with model airplanes, baseball, or swimming. If you are hit by a model rocket traveling 500 or more miles per hour, you will be hurt. Don't spoil model rocketry's excellent record of safety.
<table>
<thead>
<tr>
<th>Cat. No. and Engine Type</th>
<th>Total Impulse</th>
<th>Thrust Duration</th>
<th>Maximum Thrust</th>
<th>Time Delay</th>
<th>Engine Length</th>
<th>Initial Weight</th>
<th>Label Color</th>
<th>Maximum Rocket Weight***</th>
<th>Single Stage</th>
<th>Multi-Stage</th>
<th>PRICES</th>
<th>Each 5 for 12 or more</th>
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<td>SINGLE STAGE ENGINES</td>
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</tr>
<tr>
<td>1/4A.8-2</td>
<td>0.17 lb-sec</td>
<td>0.15 sec</td>
<td>23 oz.</td>
<td>2-2½ sec</td>
<td>2.75 in.</td>
<td>0.50 oz.</td>
<td>Green</td>
<td>2.0 oz.</td>
<td>2.0 oz.</td>
<td>2.50 oz.</td>
<td>$ .25</td>
<td>$.65 $.21 each</td>
</tr>
<tr>
<td>1/4A.8-2S</td>
<td>0.17 lb-sec</td>
<td>0.15 sec</td>
<td>23 oz.</td>
<td>2-2½ sec</td>
<td>1.75 in.</td>
<td>0.38 oz.</td>
<td>Green</td>
<td>2.0 oz.</td>
<td>2.0 oz.</td>
<td>2.50 oz.</td>
<td>$ .25</td>
<td>$.65 $.21 each</td>
</tr>
<tr>
<td>1/2A.8-2</td>
<td>0.35 lb-sec</td>
<td>0.40 sec</td>
<td>23 oz.</td>
<td>2-2½ sec</td>
<td>2.75 in.</td>
<td>0.54 oz.</td>
<td>Blue</td>
<td>2.5 oz.</td>
<td>2.5 oz.</td>
<td>2.50 oz.</td>
<td>$ .30</td>
<td>$.70 $.23 each</td>
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<tr>
<td>1/2A.8-2S</td>
<td>0.35 lb-sec</td>
<td>0.40 sec</td>
<td>23 oz.</td>
<td>2-2½ sec</td>
<td>1.75 in.</td>
<td>0.42 oz.</td>
<td>Blue</td>
<td>2.5 oz.</td>
<td>2.5 oz.</td>
<td>2.50 oz.</td>
<td>$ .30</td>
<td>$.70 $.23 each</td>
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<tr>
<td>A.8-3</td>
<td>0.70 lb-sec</td>
<td>0.90 sec</td>
<td>23 oz.</td>
<td>3-3½ sec</td>
<td>2.75 in.</td>
<td>0.60 oz.</td>
<td>Purple</td>
<td>3.0 oz.</td>
<td>3.0 oz.</td>
<td>3.00 oz.</td>
<td>$ .35</td>
<td>$.80 $.26 each</td>
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<tr>
<td>B.8-4</td>
<td>1.15 lb-sec</td>
<td>1.40 sec</td>
<td>23 oz.</td>
<td>4-4½ sec</td>
<td>2.75 in.</td>
<td>0.71 oz.</td>
<td>Red</td>
<td>3.5 oz.</td>
<td>3.5 oz.</td>
<td>3.50 oz.</td>
<td>$ .40</td>
<td>$.90 $.30 each</td>
</tr>
<tr>
<td>B 3-5</td>
<td>1.15 lb-sec</td>
<td>0.55 sec</td>
<td>9.0 lb.</td>
<td>5-5½ sec</td>
<td>2.75 in.</td>
<td>0.69 oz.</td>
<td>Red</td>
<td>5.0 oz.</td>
<td>5.0 oz.</td>
<td>5.00 oz.</td>
<td>$ .50</td>
<td>$1.00 $.35 each</td>
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<td>UPPER STAGE ENGINES (OR SINGLE STAGE ENGINES IF USED IN VERY LIGHT ROCKETS)</td>
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</tr>
<tr>
<td>1/4A.8-4</td>
<td>0.17 lb-sec</td>
<td>0.15 sec</td>
<td>23 oz.</td>
<td>4-4½ sec</td>
<td>2.75 in.</td>
<td>0.51 oz.</td>
<td>Green</td>
<td>1.0 oz.</td>
<td>1.0 oz.</td>
<td>1.00 oz.</td>
<td>$ .25</td>
<td>$.65 $.21 each</td>
</tr>
<tr>
<td>1/4A.8-4S</td>
<td>0.17 lb-sec</td>
<td>0.15 sec</td>
<td>23 oz.</td>
<td>4-4½ sec</td>
<td>1.75 in.</td>
<td>0.39 oz.</td>
<td>Green</td>
<td>1.0 oz.</td>
<td>1.0 oz.</td>
<td>1.00 oz.</td>
<td>$ .25</td>
<td>$.65 $.21 each</td>
</tr>
<tr>
<td>1/2A.8-4</td>
<td>0.35 lb-sec</td>
<td>0.40 sec</td>
<td>23 oz.</td>
<td>4-4½ sec</td>
<td>2.75 in.</td>
<td>0.55 oz.</td>
<td>Blue</td>
<td>1.5 oz.</td>
<td>1.5 oz.</td>
<td>1.50 oz.</td>
<td>$ .30</td>
<td>$.70 $.23 each</td>
</tr>
<tr>
<td>1/2A.8-4S</td>
<td>0.35 lb-sec</td>
<td>0.40 sec</td>
<td>23 oz.</td>
<td>4-4½ sec</td>
<td>1.75 in.</td>
<td>0.43 oz.</td>
<td>Blue</td>
<td>1.5 oz.</td>
<td>1.5 oz.</td>
<td>1.50 oz.</td>
<td>$ .30</td>
<td>$.70 $.23 each</td>
</tr>
<tr>
<td>A.8-4</td>
<td>0.70 lb-sec</td>
<td>0.90 sec</td>
<td>23 oz.</td>
<td>4-4½ sec</td>
<td>2.75 in.</td>
<td>0.63 oz.</td>
<td>Purple</td>
<td>1.5 oz.</td>
<td>1.5 oz.</td>
<td>1.50 oz.</td>
<td>$ .35</td>
<td>$.80 $.26 each</td>
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<tr>
<td>B.8-6</td>
<td>1.15 lb-sec</td>
<td>1.40 sec</td>
<td>23 oz.</td>
<td>6-6½ sec</td>
<td>2.75 in.</td>
<td>0.73 oz.</td>
<td>Red</td>
<td>1.5 oz.</td>
<td>1.5 oz.</td>
<td>1.50 oz.</td>
<td>$ .40</td>
<td>$.90 $.30 each</td>
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<tr>
<td>BOOSTER ENGINES</td>
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<tr>
<td>1/4A.8-0</td>
<td>0.17 lb-sec</td>
<td>0.15 sec</td>
<td>23 oz.</td>
<td>none</td>
<td>2.75 in.</td>
<td>0.46 oz.</td>
<td>Green</td>
<td>Don't Use</td>
<td>4.0 oz.</td>
<td>4.00 oz.</td>
<td>$ .25</td>
<td>$.65 $.21 each</td>
</tr>
<tr>
<td>1/4A.8-OS**</td>
<td>0.17 lb-sec</td>
<td>0.15 sec</td>
<td>23 oz.</td>
<td>none</td>
<td>1.75 in.</td>
<td>0.34 oz.</td>
<td>Green</td>
<td>Don't Use</td>
<td>4.0 oz.</td>
<td>4.00 oz.</td>
<td>$ .25</td>
<td>$.65 $.21 each</td>
</tr>
<tr>
<td>1/2A.8-0</td>
<td>0.35 lb-sec</td>
<td>0.40 sec</td>
<td>23 oz.</td>
<td>none</td>
<td>2.75 in.</td>
<td>0.49 oz.</td>
<td>Blue</td>
<td>Don't Use</td>
<td>5.5 oz.</td>
<td>5.50 oz.</td>
<td>$ .30</td>
<td>$.70 $.23 each</td>
</tr>
<tr>
<td>1/2A.8-OS**</td>
<td>0.35 lb-sec</td>
<td>0.40 sec</td>
<td>23 oz.</td>
<td>none</td>
<td>1.75 in.</td>
<td>0.37 oz.</td>
<td>Blue</td>
<td>Don't Use</td>
<td>5.5 oz.</td>
<td>5.50 oz.</td>
<td>$ .30</td>
<td>$.70 $.23 each</td>
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<tr>
<td>A.8-0</td>
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<td>0.90 sec</td>
<td>23 oz.</td>
<td>none</td>
<td>2.75 in.</td>
<td>0.56 oz.</td>
<td>Purple</td>
<td>Don't Use</td>
<td>6.0 oz.</td>
<td>6.00 oz.</td>
<td>$ .40</td>
<td>$.90 $.30 each</td>
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<tr>
<td>B.8-0</td>
<td>1.15 lb-sec</td>
<td>1.40 sec</td>
<td>23 oz.</td>
<td>none</td>
<td>2.75 in.</td>
<td>0.65 oz.</td>
<td>Red</td>
<td>Don't Use</td>
<td>6.0 oz.</td>
<td>6.00 oz.</td>
<td>$ .50</td>
<td>$1.00 $.33 each</td>
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<tr>
<td>B 3-0</td>
<td>1.15 lb-sec</td>
<td>0.55 sec</td>
<td>9.0 lb.</td>
<td>none</td>
<td>2.75 in.</td>
<td>0.61 oz.</td>
<td>Red</td>
<td>Don't Use</td>
<td>3.0 oz.</td>
<td>3.00 oz.</td>
<td>$ .45</td>
<td>$.95 $.31 each</td>
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<tr>
<td>C.8-0</td>
<td>1.50 lb-sec</td>
<td>2.00 sec</td>
<td>23 oz.</td>
<td>none</td>
<td>2.75 in.</td>
<td>0.71 oz.</td>
<td>Black</td>
<td>Don't Use</td>
<td>3.0 oz.</td>
<td>3.00 oz.</td>
<td>$ .45</td>
<td>$.95 $.31 each</td>
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<td>SPECIAL PURPOSE ENGINES</td>
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<td></td>
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<tr>
<td>B.8-2</td>
<td>1.15 lb-sec</td>
<td>1.40 sec</td>
<td>23 oz.</td>
<td>2-3 sec</td>
<td>2.75 in.</td>
<td>0.68 oz.</td>
<td>Red</td>
<td>Gliders &amp; Special Designs</td>
<td>$ .40</td>
<td>$.90 $.30 each</td>
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<tr>
<td>B.8-0(P)</td>
<td>1.15 lb-sec</td>
<td>1.40 sec</td>
<td>23 oz.</td>
<td>none</td>
<td>2.75 in.</td>
<td>0.66 oz.</td>
<td>Red</td>
<td>Static Test Engine</td>
<td>$ .45</td>
<td>$.95 $.31 each</td>
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</tbody>
</table>

NOTES: * Series II engine.  ** Series III engine.  *** With engine(s).  (P) Denotes plug to prevent blow-through. Burnout weight on all Series I and Series II engines is .42 oz., on all Series III engines .30 oz. Sufficient ignition material, instructions, and a streamer protector is included with each rocket engine (any quantity) ordered from Estes Industries. Shipping weight of each engine is 1 ounce.
This rocket engine design and performance information is given for educational purposes only. We believe that if you understand how your rocket engine works, you are in a better position to gain scientific knowledge from your activities and to design your rockets for specific purposes such as payload experimentation, altitude studies, drag racing, etc. We DO NOT grant permission for you to attempt to copy our design nor do we recommend that you attempt to build your own rocket engines.

The Series I engine is a solid propellant type with a dual thrust level design. There is a slight center bore at the very tip of the nozzle end of the grain which serves two purposes. First, it provides for easy ignition. Second, as you will note from the Series I graph, this special design produces a high initial thrust of 25 oz., thus stabilizing your rocket more quickly. This is because the slight center bore provides a relatively large burning area, resulting in faster consumption of the fuel. After this initial high thrust, a transition to the recovery system. For further information, see the Series I performance graph and cutaway drawing.

The Series II engine is a solid propellant type with a center burning grain. This provides a greater propellant burning area, resulting in a higher thrust level than the Series I engines, but with a shorter thrust duration. The total thrust duration of a Series II engine is slightly under .35 sec. This makes the thrust characteristics of the engine somewhat like a sledge hammer blow—thrust rises to over 9 pounds in a fraction of a second, then drops off again, as shown in the Series II performance graph. The average thrust of the Series II engine is 5.4 pounds. The result is that the Series II engine is ideal for acceleration studies, as a booster on heavy multi-stage rockets, and for drag racing. Delay charge and ejection charge operation are the same in the Series I and Series II engines.

Making Rocket Engines

At our plant rocket engines are made automatically, under controlled conditions, with limited amounts of propellant being measured by explosion proof metering devices. If you wish to attempt to build your own engines "safely," we would recommend that you have in reserve a few thousand dollars in cash for special equipment, a college degree, a safe place to work (not in a garage or basement), protective clothing and some specialized training. If you build rocket engines with less than the above you may find as some chemistry teachers, students, and many others have, that through the rest of your life you will be without a finger, hand, arm, eye, ear, face, or you may well be badly burned or even killed. Our country needs live rocket scientists and engineers who have all their fingers and hands. We are looking forward to fellows like you to fulfill this need.
MODELING TOOLS

PRECISION KNIFE SET: Includes one 4-1/4" long #1 aluminum handle and one each #1A cutting blade, #1B punch blade, and #1C gouge blade. Recommended for precision work. Shipping weight 2 oz.
Cat. No. 641-KNS-1 $0.75 each

RETRACTABLE BLADE KNIFE: Heavy duty #2 aluminum handle, 4-3/4" long, with one double ended #2D blade. Blade retracts into handle for safe carrying. For general cutting. Shipping weight 4 ounces.
Cat. No. 641-KNS-2 $1.00 each

UTILITY KNIFE: Includes 5-3/8" long #3 steel handle and one #3E general purpose blade. Shipping weight 3 ounces.
Cat. No. 641-KNS-3 $1.30 each

HEAVY DUTY KNIFE: Set of one 4-3/4" long #4 plastic handle with metal chuck and one general purpose knife blade similar to #4G. Shipping weight 6 ounces.
Cat. No. 641-KNS-4 $2.20 each

REPLACEMENT BLADES

Fits #1 handle only: For cutting balsa and paper.
Cat. No. 641-KNB-1A $0.10 each 3 for $0.35
Cat. No. 641-KNB-1B $.25 each

Fits #1 handle only: Punch and scriber.
Cat. No. 641-KNB-1C $.25 each

Fits #2 handle only: Double ended, for general cutting.
Cat. No. 641-KNB-2D $.35 each

Fits #2 and #3 handles: Double ended, for general cutting.
Cat. No. 641-KNB-3E $.15 each

Fits #4 handles only: 1" wide x 3/4" long razor saw blade for balsa and body tube cutting.
Cat. No. 641-KNB-4F $.45 each

Shipping weight on saw blade is 6 oz., all other blades, 1 oz.

MODEL Rocket Recovery

Step 1: Start cutting the slits

Step 2: Inserting the shock-cord into body tube

Step 3: Restore slot to original tube contours, clamping shock cord in place. Cover area with glue

Shroud Lines...and how to attach them.

1st. Gather a corner of 'chute to form a point.
2nd. Make a loop in end of shroud line.
3rd. Slip loop over the point.

4th. Bend the point around and back through the loop.
5th. Hold 'chute and point with one hand and work loop tight with the other.

Or... Do it easily...with our tape-strips!

1. Locate points to attach lines.
2. Lay lines in place...one at a time.
3. Place a tape strip over each line as shown.

Assembly and Use of Recovery System

Tie shock cord (1) securely to screw eye (2). Tie shroud lines (3) to screw eye and screw it into nose cone or payload section (4). Always repack your rocket with lots of wadding as soon as you can after a flight.

To be sure ejection gases do their job and activate the recovery system, secure the engine in parachute and streamer models by wrapping tape around its nozzle end until it makes a very tight press fit in the tube.
Recovery Equipment

Parachute Kits: Designed to give you the best in parachute recovery! Two color printed plastic parachutes give maximum visibility -- special pattern makes them extra easy to spot. Lightweight, durable, and easily folded, these 'chutes are only .00075" thick, allowing the most material to be packed into the least body space. Each kit is complete with chute material, tape strips, and shroud lines. Specify color combination and size when ordering. Shipping wt. 2 oz.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Parachute Diameter</th>
<th>Color Combinations Available</th>
<th>Price Each</th>
<th>Price 3 for</th>
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</thead>
<tbody>
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<td>641-PK-12</td>
<td>12 inches</td>
<td>Orange and White</td>
<td>$.20</td>
<td>$.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red and White</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red and Yellow</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Orange and Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>641-PK-18</td>
<td>18 inches</td>
<td>Red and White</td>
<td>$.30</td>
<td>$.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red and Yellow</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Orange and Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>641-PK-24</td>
<td>24 inches</td>
<td>Red and White</td>
<td>$.45</td>
<td>$1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Orange and Black</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parachute Material: High visibility red plastic in 10" x 10" sheets to make easy to spot parachutes for your models. Comes with 4 tape discs for attaching shroud lines of your choice. Net weight .07 oz. Shipping weight 1 oz.

Cat. No. 641-PM-1 $ .20 each 3 for $.35

Parachute Material: You get a big square yard of high strength, high visibility black plastic 'chute material. Each sheet can be cut to make one or more round or square parachutes up to 36" across. Shipping weight 5 oz.

Cat. No. 641-PM-2 $.45 each

Streamer Material: Bring light weight models back to earth with bright orange, flame resistant crepe paper streamers in 7-1/2 foot lengths, enough for two to eight streamers. Available in 1" and 2" widths. Specify size when ordering. Shipping weight 1 oz.

1" Wide: Cat. No. 641-SM-1 $.15 each 3 for $.30
2" Wide: Cat. No. 641-SM-2 $.20 each 3 for $.30

Shroud Lines: Build reliable, durable custom parachutes with this strong, hard surface shroud line cord. Comes in 72 yard spools. Available in red or white. Specify color when ordering. Shipping weight 5 oz.

Cat. No. 641-SLT-1 3 for $.10 12 for $.35

Screw Eyes: Attach recovery systems to nose cones or nose blocks with these lightweight metal screw eyes. Available in two sizes, 1 inch long (net wt. .04 oz.) and 3/4" long (net wt. .05 oz.). Shipping weight for 5 eyes 1 oz.

Large Eye: Cat. No. 641-SE-1 4 for $.10 12 for $.35

Small Eye: Cat. No. 641-SE-2 3 for $.10 12 for $.35

Tape Discs: Fasten shroud lines to plastic 'chutes with these 3/4" pressure sensitive tape discs. Shipping wt. for 12 discs, 1 oz.

Cat. No. 641-TD-1 4 for $.10 12 for $.15 Roll of 1000 $4.00

Tape Strips: For top strength, low bulk and low weight, fasten shroud lines with these 1/4" x 3/4" tape strips. Comes in sheets of 35 strips. Shipping weight 1 oz.

Cat. No. 641-TD-2 $.30 Persheet

Shock Cord: Convenient 18" lengths of model airplane contest rubber to absorb shock of recovery system deployment. Available in 1/8" widths for normal models and 1/4" widths for heavy rockets. Specify width when ordering. All shock cords are .05" thick. Shipping wt. 1 oz.

1/8" Wide: Cat. No. 641-SC-1 $.10 each 3 for $.20
1/4" Wide: Cat. No. 641-SC-2 $.15 each 3 for $.20

Snap Swivels: For quick changes and reduced tangling in your recovery systems, use these tiny 1" long snap swivels. Net weight .01 oz. Shipping weight 1 oz.

Cat. No. 641-SV-12 $.10 each 3 for $.20

Recovery Wadding: Protect parachutes and streamers from hot ejection gases, get greater recovery reliability with this lightweight flame-proof wadding. Each package contains approximately 3 oz., enough wadding for 15 to 60 flights, depending on size of the rocket. Shipping weight 5 oz.

Cat. No. 641-RP-1 $.25 each
EVERYTHING You need...

FINISHING WAX: For the high-gloss finish so important for appearance and low drag. Apply with soft cloth, let dry, and polish with a soft, dry cloth. In 2 ounce jar. Shipping weight 5 oz.
Cat. No. 641-FW-2 $..80 each

WHITE GLUE: Preferred for rocket building! Sets fast, gives super strong joints with wood, paper, cloth, and other porous materials. In 2 ounce plastic squeeze bottle. Shipping weight 6 oz.
Cat. No. 641-WG-1 $..40 each

BODY PUTTY: Make super-sleek models with body putty. Fill cracks, holes, grain marks in balsa parts, make smooth fin-body joints. In 21 cc. tube. Shipping weight 5 ounces.
Cat. No. 641-FM-1 $..30 each

MASKING TAPE: Secure engines in models, mask for painting, etc. Extra strong 1/2" wide tape comes in 30' rolls. Flexible, seals tightly and strips off clean. Shipping weight 5 oz.
Cat. No. 641-MT-1 $..30 each

PAINT BRUSHES: The set designed for model rocketry. You get one #1 brush for extra fine work, one #4 brush for normal work, and one #6 brush for covering large areas rapidly. Brushes are 6" long with quality camel hair bristles set in nickled ferrules. Available in sets of three only. Shipping wt. 2 oz.
Cat. No. 641-PB-3 $..30 Per set

SANDING MATERIAL: Fold, roll, or crumple it for hard to reach places! Special mylar plastic backed abrasive sheet can be used over and over again. Helps you get a mirror finish. Extra fine 320 grit in easy to handle 2-1/2" x 2-1/4" sheets. Shipping wt. 1 oz.
Cat. No. 641-SP-320 3 sheets $..10

SANDBPAPER: Shape and smooth model rocket parts with these handy 3" x 5" sheets of top quality sandpaper. Available in three grades, Specify grade when ordering. Shipping weight 1 ounce for 6 sheets.
6 SHEETS MEDIUM: Cat. No. 641-SPM-2 $..10
6 SHEETS FINE: Cat. No. 641-SPF-2 $..10
6 SHEETS EXTRA FINE: Cat. No. 641-SPF-2 $..10
18 SHEETS ASSORTED (6 each) Cat. No. 641-SPA-2 $..25

For the Finishing Touch

HEAT RESISTANT PAINT: Protect exposed rocket parts from heat damage with easy to apply, brush-on, high heat aluminum paint. Protects to 1000°, gives a bright metallic finish. Recommended for swept fins and other parts exposed to hot exhaust gases. In 1-1/2 ounce bottles. Shipping weight 6 oz.
Cat. No. 641-AP-1 $..35 each

FLUORESCENT SPRAY PAINT: Paint your rockets with the brightest colors available--make them easy to spot in the air and on the ground. This glowing, high visibility paint comes in handy 6 oz. spray cans, dries in minutes. For maximum brilliance, use glossy white enamel for an undercoat. Available in Cerise Red, Yellow Orange, Sunset Gold, Lemon Yellow, Red Orange, and Green. Specify colors when ordering. Shipping weight 16 oz. each.
Cat. No. 641-FP-1 $..40 each

ENAMEL SPRAY PAINT: Get that "professional" appearance for your best models. Top quality enamel in handy 6 oz. spray cans dries in minutes. Use indoors and outdoors. Not fluorescent. Available in the popular colors of Regal Blue, Hunter Green, Chrome Yellow, Glossy Black, Glossy White, and Cherry Red. Specify colors when ordering. Shipping weight 16 oz. each.
Cat. No. 641-EP-1 $..20 each

Cat. No. 641-BRD-1 $..20 each

SANDING SEALER: Use sanding sealer on all balsa parts for the smoothest possible paint or dope job--saves paint, too. Just sand the balsa, brush on sealer, let dry, and sand again. Repeat as needed to seal all the pores in the wood for a glass-like surface for painting. Get the best in aerodynamics and appearance. In 1 ounce bottles. Shipping weight 4 ounces.
Cat. No. 641-SS-1 $..20 each

THINNER: For diluting butyrate dope and brush cleaning. Completely colorless--won't interfere with the drying action of the dope. Comes in 1 ounce bottles. Shipping weight 4 oz.
Cat. No. 641-BT-1 $..20 each
Decorate Your Rockets with Our DECALS

A) -- STARS AND BARS: Sheet of 12 red, white, and blue Air Force emblems, each 1-1/4" wide. Fit on fins and body tubes, look great on gliders. Shipping weight 1 ounce.
   Cat. No. 641-D-1
   $ .15 each

B) -- LARGE STARS AND BARS: Add a special touch to your large models. Sheet contains two large 2" insignia, two medium 1-5/8" insignia, and appropriate designations. Shipping weight 1 oz.
   Cat. No. 641-D-2
   $ .15 each

C) -- 3/8" LETTERS AND NUMBERS: Identify and decorate your birds the neat and easy way with these 3/8" high letter and number decals. Sheet contains 62 characters. Available in black or white. Specify color when ordering. Shipping weight 1 oz.
   Cat. No. 641-D-3
   $ .15 each

D) -- 1/4" LETTERS AND NUMBERS: Ideal for code markings and identification on smaller rockets. Sheet contains 65 1/4" high characters. Available in black or white. Specify color when ordering. Shipping weight 1 ounce.
   Cat. No. 641-D-4
   $ .15 each

E) -- GOLD MINE SPECIAL: Get this real gold mine of decorative decals for your model rockets. Lettering, vents, hatches, rivets, and more, all on one big 3-1/2" x 8-1/2" sheet. You'll have a ball decorating your birds with this sheet. Printed in brilliant red, white and black to add extra color, too. Shipping weight 1 ounce.
   Cat. No. 641-D-5
   $ .25 each

F) -- KIT NAMES DECAL: Dress up your models with these special kit name decals. Identify and decorate—easy to apply. Comes in black or white. Specify color when ordering. Shipping wt. 1 ounce.
   Cat. No. 641-D-6
   $ .25 each

Tips on Decorating Your ROCKET

G) -- 1/3" CHECKERBOARDS: Glossy, colorful 1/5" square checks on clear background. Add color contrast to models for easy tracking. Extra large sheets, 9-1/2" x 4", available in red, black, gold, or white. Specify color and check size when ordering. Shipping weight 1 ounce.
   Cat. No. 641-D-7
   $ .25 each

H) -- 3/8" CHECKERBOARDS: Big 3/8" square checks for your large models. Cut out special patterns for even more striking effects. Large 9-1/2" x 4" sheets, available in red, black, white, gold, or silver. Specify color and check size when ordering. Shipping weight 1 ounce.
   Cat. No. 641-D-8
   $ .25 each

I) -- COLOR STRIPES: Put vertical stripes or horizontal rings on your models the easy way. Each sheet has ten stripes, 1/32" through 1/2" wide and 9-1/2" long. Available in red, black, or yellow. Specify color when ordering. Shipping weight 1 oz.
   Cat. No. 641-D-9
   $ .25 each
LITTLE ITEMS THAT GIVE . . . .

PHANTOM ENGINE: For display and demonstrations, here's 1/2 an engine, cut the long way to show placement of nozzle, propellant, etc. Helps explain model rocket operation. Safe, uses only non-combustible materials. Shipping wt. 1 oz.
Cat. No. 641-CE-1 $ .50 each

ENGINE HOLDER: For quick and easy replacement of engines in models use engine holders. Attach as shown in drawing or run forward from the engine as a substitute for the engine block. Use with BT-20 and BT-30 only. Net wt. .05 oz. Shipping wt. 1 oz.
Cat. No. 641-EH-1 $ .15 each 3 for $.30

FOAM PADDING: Protect payload specimens. Pad your payload capsules with this plastic foam. Each piece is 6" x 6" x 1/4". Cut to size, secure in place with white glue. Net weight .08 oz. Shipping weight 1 oz.
Cat. No. 641-PS-1 $ .20 each 3 for $.50

PAYLOAD: How high can your rocket lift an ounce of lead? This 1 oz. payload weight, 3/4" in diameter, is used in some altitude competition events. The current official record: 980 feet with a B engine. Think you can beat it? Shipping weight 2 oz.
Cat. No. 641-PL-1 $ .50 each 3 for $1.00

NOSE CONE WEIGHT: Balance your rockets for perfect stability with these 11/16" diameter lead weights. Now with center hole for easy attachment and alignment. Stack them for more weight, cut them with scissors for less. Each weighs .12 oz. Shipping weight 1 oz.
Cat. No. 641-NCW-1 3 for $ .23

NOSE CONE WEIGHT: For delicate balancing, use these 7/16" diameter brass washers. Each has a 1/8" hole in the center, weighs .02 oz. Attach up to four weights to a nose cone by threading them on the screw eye. Shipping weight 1 oz.
Cat. No. 641-NCW-2 10 for $.15

LAUNCHING LUGS: Cut lengths of soda straws. If you don't want to get a life-time supply at the grocery store for 25¢, you can buy these. Inside diameter 5/32", fit 1/8" rod. Shipping wt. 1 oz.
1-1/4" long: Cat. No. 641-LL-1A 5 for $.10
2-3/8" long: Cat. No. 641-LL-1B 4 for $.10
3" long: Cat. No. 641-LL-1C 3 for $.10

BIG RESULTS IN ROCKETRY

GAUZE REINFORCING: For super strong fin joints, reinforce with this unmarked gauze. Comes in 5" x 12" sheets. Apply by spreading a thin layer of glue over the area to be reinforced, smooth gauze down over the glue, and spread one or more layers of gauze over the gauze. Shipping weight 1 oz.
Cat. No. 641-GR-2 $ .15 each 3 for $.30

PAPER REINFORCING: Double fin strength with this easy to use self-adhesive treated paper. Cut reinforcing to shape, strip off protective backing, and press on balsa. Doubles fin strength when applied to both sides of the balsa sheet, provides a smooth white surface for painting. Comes in 3" x 9" sheets. Shipping weight 1 oz.
Cat. No. 641-PRM-1 $ .10 each 3 for $.20

TAPE HINGES: Easy to use elevon hinges for your boost-gliders. Treated paper, 4-1/2" x 3/4", adhesive coated on one side. Simply strip off protective backing, apply to wing. Shipping weight 1 oz.
Cat. No. 641-TH-1 2 for $.10

ELASTIC THREAD: Strong, elastic thread. Use as a spring to actuate elevons on boost-gliders. Each thread is eight inches long, 1/32" diameter. Shipping weight 1 oz.
Cat. No. 641-ET-1 3 for $.10

NYLON SCREWS: Extra light, high strength screws for glide adjustment on boost-gliders. 1/2" long, 1/16" thread diameter. Read TR-4 for information on gliders and their design. Shipping weight 1 oz.
Cat. No. 641-AS-1 $ .10 each

STYROFOAM BALLS: Build a Sputnik-Too or odd ball bird of your own design with feather-weight 3" diameter styrofoam balls. Use white glue for best results in attaching legs, antennas, stabilizers, etc. Net weight 2 ounces. Shipping weight 5 oz.
Cat. No. 641-SB-3 $ .25 each

BOWELS: Extra strong, light weight 1/8" x 18" seasoned maple dowels. Build a Sputnik-Too or design your own odd ball. Shipping weight 5 oz.
Cat. No. 641-WD-1 4 for $.20
ASSORTMENTS

"Launch Pad" Special

For Simple & Durable Rockets. Perfect starter assortment for the novice to explore the building techniques of model rocketry. Make sturdy, serviceable models for many hours of fun. Study aerodynamics, stability, and recovery techniques the enjoyable way with this special assortment. Not available with quantity discount orders.

$7.50 Value!

$5.00

BODY TUBES
1 Body Tubes
5 Body Tubes #BT-20
2 Body Tubes #BT-50

RECOVERY EQUIPMENT
2 Parachutes #PK-12A
1 Parachute Material #PM-2
1 Streamer Material #SM-1
1 Sheet Tape Strips #TD-2
1 Roll Shroud Lines #SLT-1
5 Shock Cords #SC-1
3 Screw Eyes #SE-1

MISCELLANEOUS
5 Engine Blocks #EB-40A
3 Launching Lugs #LL-1C
3 Snap Swivels #SV-12
3 Screw Eyes #SE-1
3 Shock Cords #SC-1
1 Shock Cord #SC-2

Shipping Weight 1 lb. 8 oz.

Cat. No. 641-ES-50 $5.00 each

"Countdown" Special

FOR HIGH PERFORMANCE BIRDS. Countdown on real rocket-building enjoyment with this high performance assortment. Build a basic fleet of high flying rockets—single and multi-stage. Great for your science project experiments, payload studies, etc. Not available with quantity discount orders.

$10.68 value!

$7.50

BODY TUBES
2 Body Tubes #BT-20
2 Body Tubes #BT-50

RECOVERY EQUIPMENT
2 Parachutes #PK-12A
1 Parachute #PK-18A
1 Parachute Material #PM-2
1 Streamer Material #SM-1
1 Sheet Tape Strips #TD-2
1 Roll Shroud Lines #SLT-1
3 Shock Cords #SC-1
6 Screw Eyes #SE-1
5 Snap Swivels #SV-12

ENGINE BLOCKS, MOUNTS, ETC.
1 Balsa Nose Block #NB-20
1 Balsa Nose Block #NB-50
3 Engine Blocks #EB-20A
2 Engine Mounts #EM-2050
1 Stage Coupler #JC-50C

Shipping weight 1 lb. 8 oz.

Cat. No. 641-ES-75 $7.50 each

Liftoff and accelerate to more rocket building enjoyment with this value-packed special. Great for gifts—or get one for yourself and build advanced models. Not available with quantity discount orders. Shipping wt. 1 lb. 12 oz.

$10.00 each

Special Price $10.00

"Lift-Off" Special

For building an all-purpose rocket fleet

RECOVERY EQUIPMENT
2 Parachutes #PK-12A
1 Parachute #PK-18A
1 Parachute Material #PM-2
1 Streamer Material #SM-1
2 Sheets Tape Strips #TD-2
1 Roll Shroud Lines #SLT-1
3 Snap Swivels #SV-12
9 Screw Eyes #SE-1
3 Shock Cords #SC-1
1 Shock Cord #SC-2

Cat. No. 641-ES-100

NOSE CONES
1 #BCN-60A
1 #BCN-30A
1 #BCN-20A
1 #BCN-10A
1 #BCN-10B

Cat. No. 641-ES-100

$13.40

VALUE

MISCELLANEOUS
1 Balsa Adapter #TA-2060
1 Adapter Set #TA-1
1 Nose Cone Stock #NC-1
1 Nose Cone Stock #NC-2
1 Nose Cone Dowels #CD-1
1 Nose Cone Weights #NW-1
1 Reinforcing Mat #RM-1
1 Launching Lugs #LL-1C
1 Decal Sheet #DS-5
1 Design Booklet #D-1
1 Pin Pattern Sheet #PP-2

Cat. No. 641-ES-100

$10.00 each
"ORBIT" Special Only $15.00

For Clubs or Ambitious Individual Rocketeers - Experiments Unlimited.

BODY TUBES
1 #BT-60
1 #BT-50
3 #BT-30
2 #BT-20
2 #BT-10B

NOSE CONES
1 #BNC-60L
1 #BNC-50K
1 #BNC-30D
1 #BNC-30E
1 #BNC-30M
1 #BNC-20A
1 #BNC-20B
1 #BNC-20N
1 #BNC-10A
1 #BNC-10B

ADAPTERS
1 Balsa #TA-2050A
1 Balsa #TA-2060
1 Balsa #TA-5060
1 Paper #TA-1

FIN MATERIAL
3 Balsa Sheets #BFS-10
3 Balsa Sheets #BFS-20
3 Balsa Sheets #BFS-30
7 Balsa Sheets #BFS-40

NOSE BLOCKS, ENGINE BLOCKS, HOLDERS, ETC.
1 Nose Block #NB-60
1 Nose Block #NB-50
3 Nose Blocks #NB-30
2 Nose Blocks #NB-20
3 Engine Blocks #EB-30A
3 Engine Blocks #EB-20A
1 Engine Mount #EM-2050
1 Engine Mount #EM-2060
1 Stage Coupler #JT-50C
1 Stage Coupler #JT-60C

MISCELLANEOUS
1 Payload Section #PS-20A
1 Nose Cone Stock #NCS-1
1 Nose Cone Stock #NCS-2
3 Nose Cone Dowels #NCD-1
6 Nose Cone Weights #NCW-1
1 Reinforcing Mat.#1 #RG-1
1 Reinforcing Mat.#1 #RG-2
3 Launching Lugs #LL-1C
1 Decal Sheet #D-5
1 Decal Sheet #D-6
1 Design Booklet #PB-1
1 Fin Pattern Sheet #PP-2

RECOVERY EQUIPMENT
1 Parachute Material #PM-2
3 Parachutes #PK-12A
2 Parachutes #PK-18A
1 Parachute #PK-24A
3 Streamer Material #SM-1
2 Sheets Tape Strips #TD-2
1 Roll Shroud Lines #SLT-1
6 Shock Cords #SC-1
3 Shock Cords #SC-2
12 Screw Eyes #SE-1
3 Snap Swivels #SV-12

Cat. No. 641-ES-150 $15.90 each

Determine Rocket Altitudes
Learn Math and Trig.

How high did it go? Find out with the Altiscope! Only one instrument is required for determining approximate altitudes (usually within ten percent). Use two together for even greater accuracy. Your Altiscope can also be used to find heights of trees, buildings, mountains, poles, etc. Easy to assemble, easy to use, the Altiscope comes in kit form complete with instructions, trig tables, and technical report TH-3 on altitude tracking. Shipping wt. 20 oz.

Cat. No. 641-A-1 $2.50 Each

Easy to Use!
**Electro-Launch**

- Dependable
- Convenient
- Portable
- Compact

**Only $3.00 P.P.**
Cat. No. 641-FS-1
(without batteries)

Fly your rockets the "professional" way with this completely self-contained launching system. Engineered for simplicity, safety, dependability, and convenience, the Electro-Launch is a basic piece of equipment for model rocketeers. Collapsible 36" long two-piece launching rod guides light weight models into the air for accurate flights. Use it for rockets weighing up to 6 oz., or anchor the base to the ground for heavier models. Spring return safety switch permits safe loading of rockets on launcher. Uses 4 size D photoflash batteries (#FPB-1). For heavy duty use the addition of a battery pack (#BP-1) is recommended to give longer battery life and sure starts in cold weather. Complete with all parts and instructions, but no batteries. Shipping weight 30 ounces.

**Complete Electro-Launch kit also available with 4 batteries. Special price $4.00.**

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**Astro-Launch Panel**

This compact panel attaches easily to your Electro-Launch in place of the standard switch. You get the same continuity check, key control, etc., as in the Astro-Launch, but without wires and clips. Available for use with either 6 or 12 volts. Specify voltage when ordering. Panel comes pre-assembled, ready to connect and use. Shipping weight 8 ounces.

**Replaces spring switch on any ELECTRO LAUNCH**

**$6.00 each**
Cat. No. 641-FS-3

**$4.50 each**
Cat. No. 641-FS-2
NOW!
LAUNCH from ANY terrain...AND adjust launch angle
Perfect with our FS-3 Astro Launch and Battery Pack!

Unbeatable for flexibility! Tilt-A-Pad adjusts to fit any terrain, adjusts to compensate for wind direction and speed, giving you the very best in launch control and convenience. Use it with almost any electrical firing system. Comes in easy to assemble kit form with complete instructions. Shipping weight 2 pounds.
Cat. No. 641-RL-3 $2.00 each

Econo-Launch
Designed for easy use with your own electric firing system. Consists of pre-drilled base, 36" two piece launching rod, and asbestos deflector material. Shipping weight 2 pounds.
Cat. No. 641-RL-2 $1.25

Use Your Own Electrical Ignition System or the ASTRO LAUNCH

Tilt-A-PAD launcher
Fully adjustable legs!
Two-Piece Rod

PILOT LIGHT HOLDER: Add visual control to your launch panel by wiring in an arm or continuity check pilot light. Holder is steel with 1/2" red plastic jewel, mounts in 7/16" hole. Takes either 6 or 12 volt bulbs, bulb not included. Shipping weight 4 oz.
Cat. No. 641-LH-1 $.45 each
Cat. No. 641-AL-6 .20 each
Cat. No. 641-AL-12 .20 each

6 VOLT BULB: Fits holder #LH-1. Shipping wt. 1 oz.
Cat. No. 641-KSW-1 $2.05 each
Cat. No. 641-KSW-1K $.25 each

EXTRA KEY: Heavy duty construction momentary type, SPST, normally open. Excellent for use as a firing switch. Mounts in 1/2" hole. Shipping weight 4 oz.
Cat. No. 641-SWM-1 $.90 each

ROTARY SWITCH: Twelve position single pole rotary switch—just right for use as a selector switch with firing systems using more than one launcher. With twelve positions, this switch should handle almost any need. Non-shorting, mounts in 3/8" hole. Shipping weight 5 oz.
Cat. No. 641-SWR-1 $1.35 each

DIAL PLATE: Numbered 12 position plate for use with rotary switch #SWR-1. Mounts on panel with same nut used to hold switch. Etched aluminum on black background. Shipping weight 1 oz.
Cat. No. 641-DP-1 $.25 each

SPRING SWITCH: Same switch as used on the standard Electro-Launch. Consists of masonite base piece, two terminal lugs, two self-tapping screws, and a contact strip. Can be used as a firing switch, phone switch, or for other utility applications. Shipping weight 1 oz.
Cat. No. 641-FSS-1 $.35 each
**LAUNCHING Equipment**

**MICRO-CLIPS:** Equip your launcher with the best. Use these spring-loaded, solid copper clips to attach lead wires to igniters. Easy to clean, highly conductive, with flat contact surfaces for the best connection. Only 1.1 inches long, attach to leads with or without solder. Shipping weight 1 oz.
Cat. No. 641-MC-1 2 for $.25

**BATTERY CLIPS:** Heavy duty clips connect to battery terminals up to 1" in dia. Replacement part for the Astro-Launch; clips are 3" long, available with red or black insulators. Specify color when ordering. Shipping weight 5 oz.
Cat. No. 641-BC-1 $ .40 each 2 for $.75

**TERMINAL LUGS:** Tiny 1/2" long solderless lugs make electrical connections a snap. Simply insert the bare wire into the end of the lug and crimp in place with pliers. Has 1/8" hole for mounting on terminal. Shipping weight 1 oz.
Cat. No. 641-TL-1 $.05 each 3 for $.10

**LEAD WIRE:** Flexible, durable size 18 two conductor insulated wire for use with firing systems. Ideal as a lead from firing panel to launcher, or zip the conductors apart for wiring inside the panel. In handy 12 foot lengths. Shipping weight 5 oz.
Cat. No. 641-LW-1 $.70 each
Same quality lead wire as above, in 250 foot spools. Shipping weight 6 lb.
Cat. No. 641-LW-1B $ 7.50 each

**NICROHME WIRE:** Electrical heating wire for professional model rocket ignition. #30 recommended for use with car batteries, #32 for use with other power supplies. Shipping wt. 1 oz.

#30, 7 INCH LENGTHS: Cat. No. 641-NW-30 3 for $.13
#30, 15 FOOT ROLL: Cat. No. 641-NW-30-A $ .50 each
#32, 7 INCH LENGTHS: Cat. No. 641-NW-32 3 for $.18
#32, 15 FOOT ROLL: Cat. No. 641-NW-32-A $ .50 each

**BATTERIES:** Extra strong size D photoflash batteries pack the power needed for rocket launching. These are the type specified for the Electro-Launch, delivering up to 16 amperes of current on a complete short when fresh. Shipping weight 4 oz. each.
Cat. No. 641-PFB-1 $.30 each

**BATTERY PACK:** Handy power supply. Use it as a booster for your Electro-Launch, use two with your Astro-Launch, or use battery packs for any other range power application. Gives longer battery life and faster, more reliable ignition when used with the Electro-Launch. Hook two packs together and get 12 volt power for operating multiple launchers, phones, etc. Durable and convenient, comes in kit form with complete instructions, requires four size D cells (not included). Shipping weight 1 pound.
Cat. No. 641-BP-1 $ 1.35 each

**ASBESTOS DEFLECTOR:** Protect wooden launchers with this asbestos deflector material. Just glue to the launcher over the area to be protected. Comes in four inch square sheets. Shipping weight 1 oz.
Cat. No. 641-AD-1 $.20 each

**BLAST DEFLECTOR PLATE:** Durable pressed steel plate deflects engine blast out and away from launcher. Two inches wide, five inches long. Ideal for any launcher that receives extensive use. Shipping weight 5 oz.
Cat. No. 641-BD-1 $.60 each

**TWO PIECE ROD:** Handy collapsible two piece rod for easily portable launchers. Pieces slip together to make a rod 36" long. Base rod has a diameter of 1/8", Shipping weight 6 oz.
Cat. No. 641-RLR-1 $.35 each 3 for $.70
Each half is 18 inches long

**ADD-ON ROD:** Now pick your launch rod length -- 36, 54, or 72 inches. Use a longer rod for heavy models or rockets of marginal stability. Each add-on rod set contains one 1/8" diameter, 18" rod drilled on both ends and a 3/32" diameter connector piece to fit the 1/8" rod. Solder, epoxy glue, or contact cement is required for a good joint between rods. Shipping wt. 6 oz.
Cat. No. 641-RLR-2-Add-On Rod $ .20 each
Add-On Rod

**Connector Piece**
COMPUTING EQUIPMENT

2-D COMPUTER: Build your own easy-to-use altitude computer. Get this set of charts and instructions—everything you need except tape, thumbtacks and glue— assemble the 2-D computer in a few minutes. Designed for use with one or two Altiscopes, easily used with other tracking systems. Shipping weight 2 oz.
Cat. No. 641-AC-1 $ .25 each

5" POCKET SLIDE RULE: Ideal companion to the Altiscope. Find altitudes, solve problems in multiplication, division, proportions, reciprocals, etc. A,B,C,D,CI, and K scales accurately calibrated on white face of hardwood rule. Great for beginners. With easy-to-follow instructions. Shipping weight 4 oz.
Cat. No. 641-SR-1 $.40 each

10" TRIG SLIDE RULE: Perfect slip-stick for your rocket math. Durable plastic 10" rule has all nine basic scales: A,B,C,D, CI,K,S,T, and L. Do complex problems quickly and easily. Use it for math and science classes, designing and building rockets, and finding altitudes. Comes with protective carrying case and complete instructions. Shipping weight 9 oz.
Cat. No. 641-SR-2 $2.10 each

BOOKS & LITERATURE

Design Booklet
Make sure you have this up to date and authoritative model rocket design and plan booklet. Contains complete plans for the Arrow-C, Sky Bird, Orange Bullet, and other well-known and much-flown model rockets. Also includes basic tech reports and lots of information on rocket construction. Thoroughly illustrated, this is a "must" for all beginners, and a good review and reference book for experienced rocketeers. Shipping wt. 4 oz.
Cat. No. 641-P-1 $.50 each 3 for $1.00

Note: HB-1, HB-2, and HB-5 may not be included in discount orders.

Space Volunteers by Terence Kay
A fascinating introduction to Space Medicine. Tells the story of the tests leading up to the first manned flights into space, of the unsung heroes who risked their lives to make space travel safer. Shipping weight 1 lb., 6 oz.
Cat. No. 641-HB-1 $3.20 each

Rockets and your Future by Stanley Beilner
Looking for a space-age career? Rockets and your Future is an information-packed career guide and an easy-to-read manual on basic astronautics. You'll want this one on your bookshelf for sure. Shipping weight 1 lb., 6 oz.
Cat. No. 641-HB-2 $3.75 each

Guide to Rockets, Missiles and Satellites by Homer E. Newell
Written by the Director of the Office of Space Sciences, NASA, this book tells all about the big birds, Aeolus to Zuni, and over 160 in between. Filled with clear pictures and basic information on size, thrust, range, etc., this book is a must for the scale model builder and the student of astronautics. Shipping weight 1 lb., 6 oz.
Cat. No. 641-HB-3 $3.50 each
TECHNICAL REPORTS

STABILITY REPORT: All about rocket stability. Easy to read, tells how to design your rockets to fly properly. No rocketeer will want to miss this one. Shipping wt. 1 oz.
Cat. No. 641-TR-1 $ .25 each 3 for $.50

MULTI-STAGE REPORT: New, revised version tells all about the latest discoveries in multi-stage technique. Complete, easy-to-understand and well illustrated. A necessity for designing, building and flying multi-stage birds. Shipping weight 1 oz.
Cat. No. 641-TR-2 $ .25 each 3 for $.50

TRACKING REPORT: The classic work on simple altitude tracking for model rocketeers. Covers thoroughly tracking and altitude computation. Easy to understand and apply. Shipping weight 1 oz.
Cat. No. 641-TR-3 $ .25 each 3 for $.50

BOOST-GLIDE REPORT: Basic information to help you understand the operation of rear-engine boost-glders and design your own. Covers design and construction for proper upward flight and good glide characteristics. Shipping weight 1 oz.
Cat. No. 641-TR-4 $ .25 each 3 for $.50

WIND TUNNEL REPORT: Full plans and information for building a wind tunnel to study rocket stability. Covers motor and hand-powered versions, finding center of pressure, checking multi-stage rockets, etc. Great for clubs and experienced modelers--science fair projects too. Shipping weight 2 oz.
Cat. No. 641-TR-5 $ .25 each 3 for $.50

CLUSTER REPORT: The complete report on clustering engines in model rockets. Thoroughly illustrated, easy to understand. Especially valuable for the modeler who wishes to loft larger payloads. Shipping weight 1 oz.
Cat. No. 641-TR-6 $ .25 each 3 for $.50

MODEL ROCKET NEWS

Here's the number one source for valuable information and ideas on model rocketry. Get these back issues for useful tips 'n' hints, rocket plans, technical reports and interesting and enjoyable reading. Sorry, separate issues from Volumes 1 and 2 are not available. Shipping weight on each MRN is 2 oz.

THE BEST FROM VOLUMES 1 AND 2

VOLUME 3, No. 1: Features science fair projects, plans for Buchanan Buster, Part II of TR-3, Idea Box, parachute cutting info.
Cat. No. 641-V3-N1 $ .25 each

VOLUME 3, No. 2: Includes information on Estes Industries, plans for Big Bertha, demonstration rocket.
Cat. No. 641-V3-N2 $ .25 each

Cat. No. 641-V3-N3 $ .25 each

Cat. No. 641-V3-N4 $ .25 each

VOLUME 4, No. 1: Features 'chute recovery, plans for Loadlifter 1-A and MMSV-II (2 stage altitude rocket), TR-2, Idea Box and crossword puzzle.
Cat. No. 641-V4-N1 $ .25 each

MRN COLLECTION: Get the complete collection of available MRN back issues for one reduced price. Includes "The Best from Volumes 1 and 2", Vol. 3, No.1; No.2; No.3; and No.4 plus Vol. 4, No.1. Shipping weight is 11 oz.
Cat. No. 641-MRN-6 $ 1.25 each

Rocket Flight Data Sheet

A truly universal data sheet for model rocketeers, each sheet has spaces for complete data on four flights of a model rocket. Includes the following sections: Preflight, Countdown Checklist, Launch, Weather, Flight Data. Each sheet measures 8-1/2 x 11 inches; printed on both sides. Shipping weight 2 oz.
Cat. No. 641-DS-1 $ 5 for $.20