

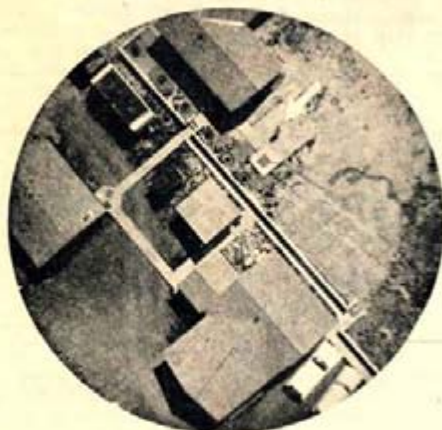


*These menacing-looking rockets, jet planes and spacemen are some of the models manufactured by Estes Industries, Inc.*

# Arsenal for model missilemen

**A Penrose, Colo., factory sells  
5,000 small rocket engines daily**

By **BERNARD KELLY**



*Rocket-borne camera took this photo of  
of Estes Industries offices. Man who  
launched rocket is indicated by arrow.*

**W**HAT is the rocket center of the world? Cape Kennedy? Wrong. Siberia? Wrong again. The United States sent up 82 research rockets and missiles during 1964. But during this same period Estes Industries, Inc., of Penrose, Colo., sold 5,000 rocket engines a day—and it is fair to presume that most were used.

The difference is that while the birds that soar from Cape Kennedy are big ones, those that Estes sells are models in kit form. The models are tiny, but the operating principle is the same.

Vern Estes, president of Estes Industries, estimates that his firm makes 80 per cent of all model rockets. The company also sells great quantities of parts and materials from which rocket fans can assemble their own creations.

About 20 per cent of the kits the company makes are scale models of existing rockets. The rest are designs by Estes or members of his staff, or have been submitted in contests conducted several times a year by *Model Rocket News*, a quarterly publication issued by Estes.

One unusual rocket, which should be on the market by the time you read this, is the Camroc. It soars

**continued**



The company's artist, Gene Street, right foreground, and its vice president, Bill Simon, left rear, are a team in designing new rocket models.



#### MODEL MISSILES continued

into the sky, turns and takes a picture of the earth before it floats to the ground. The camera and the rocket to launch it cost \$5. Film and developing are extra.

All of the Estes model rockets have these characteristics in common: (1) They are launched by one or more Estes-produced "engines." The typical engine is cylindrical, 2 $\frac{3}{4}$  inches long and .7 inch in diameter. (2) They go up, guided by a rod which holds the rocket in a vertical position until it has left the launching pad. (3) After reaching its maximum height, the rocket is returned to earth by a parachute so that the owner can recover it, put in a new engine and send it up again—any number of times.

The model rocketeer can select an individual rocket from the firm's catalogue and assemble it from the plans enclosed, or he can buy parts and design and build his own rocket. The rocket can be powered by one or more engines. As in full size rockets, these may be arranged in clusters and in several stages.

Because he does not want young experimenters to be working with propellants, Estes does not reveal the formula which powers his engines. Estes says the engines work well and are inexpensive (21 cents to 35 cents), so young scientists can get better results by buying the engines than by trying to make them.

How high can these rockets go,

and how fast? The height and speed are governed by the number and power of the engines, the weight, the wind resistance, and the excellence of the design. One-engine rockets weighing one ounce might rise from 300 to 1,500 feet, depending on the size of the engine. One Estes rocket, the Astron Farside, 25 inches long with three stages, has reached a height of more than 2,500 feet. It could go higher with more stages. It reaches a top speed of 400 miles an hour! The Astron Farside, without engines, is priced at \$2.75.

Estes, 35, a "native of Missouri," was in Denver in the building contracting business in 1958 when he took on a contract to manufacture model rocket engines for another company. By 1961 he decided to go into the rocket kit business for himself. He wanted a favorable labor market, also a place where he could buy acreage reasonably, and Fremont County turned out to be the answer.

Estes Industries, Inc., now has 80 acres of rolling land near Penrose, between Colorado Springs and Canon City. The site is just off U.S. Highway 50 near the intersection with Colorado Highway 115. The firm now has 55 full-time employees and the company shops are open 24 hours a day.

In 1951 Estes met and married Gleda Kane of Clarinda, Iowa, and both are officers of the company, he

as president, she as secretary-treasurer. Bill Simon, who also edits the company catalogues and publications, is vice president. Gene Street is the company artist, and Simon and Street now do more of the designing work than Estes himself. "A great team," he says of them.

Why build model rockets? First, they sell. Also, says Estes, the company feels it is helping young scientists who one of these days may design the vehicle which will take passengers to the Moon and the planets.

"The destiny of almost every great engineer, scientist, physicist, mathematician and chemist was started early in life," Estes says. "The principles of rocket design, acceleration, thrust, aerodynamics, stability, trajectory, tracking and many other fields are identical for model and professional rocketry."

The ideas that have been combined to make a big business of small rockets did not take shape in one session of thinking.

"It all came out of many 'think' sessions, on many occasions," Estes says. "I thought about rockets and motors all the time—nights, Saturdays, Sundays, holidays—and while I was working at my contracting business and while I should have been sleeping.

"I came up with ideas and turned them over in my mind while I was driving my car — anywhere, any

time. I lived with it. And eventually I had the idea—the design—for the equipment we now use to manufacture the rocket engines. The first rocket I designed is the 7-inch-long Astron Scout, and we still sell it. The rocket without the engine costs only 70 cents. It's a good one for the youngster who wants to learn rocket balance principles and to design his own models."

Estes read books and magazines about rockets, too. One volume that proved particularly helpful, he says, was *Rocket Propulsion Elements* by George P. Sutton.

The president of the National Association of Rocketry, Harry Stine, formerly of Denver and now of New Canaan, Conn., helped with knowledge and advice. Estes took courses at the University of Colorado Denver Center that helped him with mechanical problems.

There also was trial and error. Take the Astron Scout. The first model didn't work, so he built another. It worked, but before the final design was adopted 30 to 40 prototypes were built.

When the company decides to put out a new rocket, the first model is put together with the greatest skill and attention to detail. If it flies well, one is assembled in a sloppy manner, to see how well it will fly if a poor worker puts it together.

"We try to have something truly

continued





Vern Estes, president of the company, confers with his machinist, Ray Burns. Many of the tools and machines used in manufacturing processes are made in Estes Industries shops.

A large rocket form on the lawn guides visitors to Estes Industries, Inc., at Penrose. The office building in center has the look of a pleasant suburban dwelling.



#### MODEL MISSILES continued

different now when we put out a new kit," says Estes.

The Astron Alpha, soon to appear, "is one you can't possibly goof on," Estes says. The hope is that it will fly even if crudely assembled. Another new item, the Gyroc, will use a helicopter type recovery device instead of a parachute.

The work goes on in eight one-story buildings at Penrose and three additional rented warehouses. Workmen producing engines and nose cones, for example, are on duty 24 hours a day, keeping supplies of many different varieties in stock — including a stock of 3/4 million engines. Crews work a number of shifts until the stock of a given item is well ahead of demand, then turn to another item. Some items are bought in bulk from other manufacturers and shipped in. Kits are made up several hundred at a time. In all, the plant and stock at Penrose "is valued at more than \$100,000," Estes says.

The 1966 catalogue lists 35 kits from which rockets, space planes, gliders, electric launching systems and even a flying saucer can be assembled. In addition 36 styles and sizes of rocket body tubes, 25 rocket engines, and 31 nose cones are offered. Many other items for use in building rockets are listed, plus technical information and advice.

In those days before the move to Penrose, Estes now feels he may

have been a little inattentive to wife-ly conversation. "But Gleda is pretty understanding," he says. "Now she's an active member of the local rocket club and has built prize-winning rockets."

Although scale models of existing rockets are good sellers, they generally do not fly as well as rockets designed in small size to begin with. Right now the company is marketing a 24-inch-long model of the Gemini-Titan as a "semi-scale model." It flies well, sells for \$4 and is spectacular to look at, but is not recommended as a kit for a beginner.

The president of Estes Industries, Inc., puts in a long day at the office but loves every minute of it. After a full day, he usually has dinner with the family, then returns to the office until 10 or 11 p.m.

Once a week, however, he travels to Colorado Springs, 31 miles northeast, to study rapid reading in an effort to keep up with the increasing amount of paperwork which crosses his desk. He now reads under 1,000 words a minute and hopes to raise his level to between 2,500 and 5,000 words a minute.

This will help Estes in handling the correspondence that comes to the company from young rocketeers.

"We deal with about 100,000 fans," says Estes. "We try to answer their letters, and some of them are really sharp. We're proud of them.

"They ask advice and we try to

give it to them. They have problems and we try to help solve them. Kids write us about their experiments. One built a rocket of popcorn; another used spaghetti for the body tube and a meatball for the nose cone. One boy sent his rocket up from a pig pen and it came right back down in the same place. He reported that the hogs ate it before he could get to it."

Estes has many hobbies, little time to give to them. He bowls, has a set of golf clubs he has never found time to use, and plays croquet with friends on the lawn in front of his home. But everything takes a back seat to model rocketry.

There are model rocket societies all over the United States, and many of these rocketeers belong to the National Association of Rocketry, which has nearly 3,000 members. There is a local chapter, the Astron Rocket Society, which is composed of about 30 boys from Florence and Penrose, Colo. They are 9 to 16 years of age. Annual conventions are called National Association of Rocketry Annual Meets and are numbered — NARAM 1, NARAM 2, etc. NARAM 7 in 1965 was at Aberdeen Proving Grounds, Md.

Right in their own family the Estes have three girl rocketeers, Betty, 13; Sharon 10, and Linda, 4.

"They're right in orbit, along with the rest of today's youngsters," says Estes.

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*Steven Buchanan, 13, of Canon City, uses Electro-Launch ignition system to send a Big Bertha rocket on its flight.*



*Vern Estes, president of Estes Industries, Inc., and his wife, Gleda, secretary-treasurer, are tycoons of toy rocket business.*