

AN INTERVIEW WITH VERN AND GLEDA ESTES

THE GOLDEN DAYS OF MODEL ROCKETRY

part 1



Editor's note: For several years now I've been asking Vern Estes to write an article about the early days of model rocketry. But it's often difficult to get started writing an article, so at NARAM-47 Vern suggested that I submit a list of questions to him, and he and Gleda would respond. I was certainly pleased with the result, and I hope you enjoy it too. Part 1 appears below.

Sport Rocketry: Let's start with some biographical information. Where were you born and raised, where did you go to school, what were you doing prior to getting into the rocket business?

Vern: I was born in 1930 in St Joseph, Missouri, and spent the first 13 years of my life near there. I mostly lived on farms where I helped with the farm animals, plowed fields, and did many other activities young farm boys do. My parents encouraged us to do things. Once a neighbor told my father that I was too young to be driving a tractor and might get killed. Dad told him, "I'd rather have a dead boy than one that doesn't know how to do anything"

and went on about his business.

When I was 13 the family moved to a small farm a couple of miles west of Fountain, Colorado. World War II was going full tilt. Dad had a fairly large operation raising turkeys. I remember on one occasion we had some German prisoners sent over from the local military base, Camp Carson, to help with a special project. Dad had to leave to run into town. He handed me a rifle and told me to guard the prisoners. I'm glad they didn't want to escape, as I do not know what I would have done.

My older (by one year) brother Earl and I had cleaned out an old chicken shed, patched up most of the holes in the walls and roof, and moved in. We set up an electronics shop in one room and used the other for a bedroom. A radio repair shop was closing in Pueblo so Dad bought some closeout supplies so we could have some parts and components to work with. I still have a lot of very old resistors, capacitors, and other items of that day. I guess I should look for someone who collects that kind of stuff and get rid of it.

Gleda, daughter Betty, and Vern Estes holding their payload rockets at the first international rocket meet in Dubnica, Czechoslovakia (1966). Gleda won 3rd place in the payload event, and the Estes family as a team won two large glass trophies.



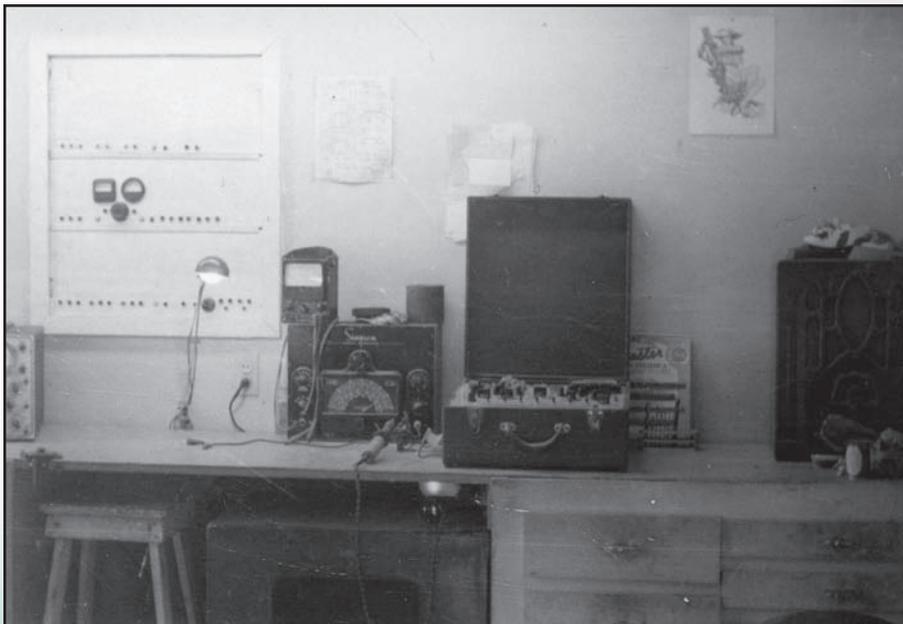
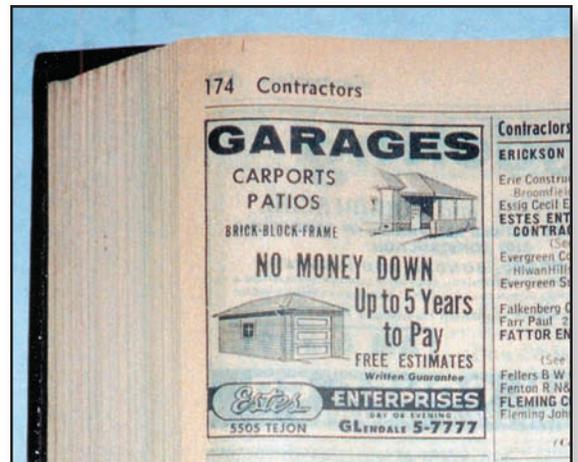
Above: Rag-tag Missouri farm kids in 1936. Left-to-right: Vern holds a goat, sister Carol a pony, and brother Earl is holding the Estes family dog.

Below right: The Estes Enterprises ad in the 1959 Denver yellow pages. Estes Enterprises built garages, additions, and similar projects in Denver in the 1950's.

Then in 1945 disaster struck. A disease hit the turkey flock and completely wiped out the operation. Dad sold everything at auction and in the spring of 1946 we moved to a 5-acre tract on North Tejon Street in Denver. Earl and I set up our electronics shop in the pump house and did occasional radio repairs. I had a part-time job at a soft drink bottling plant and earned enough to buy an NC-173 ham radio (which I still have). I wanted to get a ham radio license, but never had the ambition to learn the required Morse code. After graduating from Westminster (Union) high school, I began studies at Central College in McPherson, Kansas.

My studies at Central College ended early. It all happened in chemistry

1948—Vern and his brother Earl repaired radios for friends and neighbors in their electronics lab in Denver. Just as model rocketry played a role in the interest and careers of many Estes customers, this activity helped guide Vern's interest into technical areas.



class. A young lady across from my lab unit kept flirting with me (she says it was the other way around). Gleda and I started seeing a lot of each other and toward the end of the year we decided to get married. That was the end of my college studies except for some part-time classes at the University of Colorado Extension in Denver over the next several years.

Gleda: I was born in 1932 and grew up in the farming community of Clarinda in southwest Iowa about 90 miles from where Vern was born, but we didn't meet until we went to the same college in McPherson, Kansas.

SR: What were you majoring in at Central College?

Vern: Central College, at the time, was a 2-year Christian college. I had not established a major. I was in my freshman year with an interest in "everything." In addition to my regular studies in English, Economics, and Chemistry I took a machine

shop class where I learned electric welding, rudimentary lathe operations, and a few other things. Not a very advanced course of study but it no doubt was helpful when it came to building Mabel (our first rocket motor production machine).

Central College was also referred to by some as a "match factory." So I guess the most important things I got from my college days at Central were learning to weld and run a lathe, and hooking up with a wonderful wife and helpmate. Even our classmates at Central forecast how our future would play out. At the Valentine Banquet a fellow classmate made the prediction, "Estes made his fortune on inventions it is true... With Gleda as his helpmate didn't you expect him to?"

SR: Did you build models when you were young (airplanes, ships, trains, anything)?



Early model rocket manufacturers (1963). Left to right - Vern Estes, John Rakhonan, Irv Waite, G. Harry Stime, and Lee Piester.

think I lean more toward taking chances than many. So delving into an unknown future, based on gut feel and imagination, was sort of to my liking. Without a clear picture of just how I might accomplish the task, I told Harry I would make motors for Model Missiles and would do so at a price that would be a lot less than they were currently paying. That optimism would soon meet reality.

First, there was a matter of the time and cost of building Mabel. I didn't have much in the way of financial resources and my construction business suffered because



Vern stands by the Astron Scout display behind his desk in 1964. This display was originally built to exhibit the young company's products at a meeting of the Mile High Section in Denver (when the Astron Scout was their only kit).



Oldest daughter Betty launches a rocket from the front yard in 1967.

of the time I was spending on this project. Then the biggest dose of reality came when I was ready to ship: MMI was not in a position to buy the quantity of product I had worked so hard to provide. Not realizing it at the time, it was my misfortune that turned into my fortune.

Gleda: The first Mabel was designed to produce the 5,000 motors per day at the request of MMI, but that turned out to be more motors than MMI could sell. We had a considerable investment of time and

Gleda conducts business by phone in the new office building while waiting for office furniture to arrive in 1968.



Gleda and Vern receive an award from the Boy Scouts in 1973 for their contribution to build the Scout Service Center in Pueblo, Colorado.

Vern at his desk in his new office, shortly after they moved into the new office building on the corner of Highway 50 and H Street in 1969.



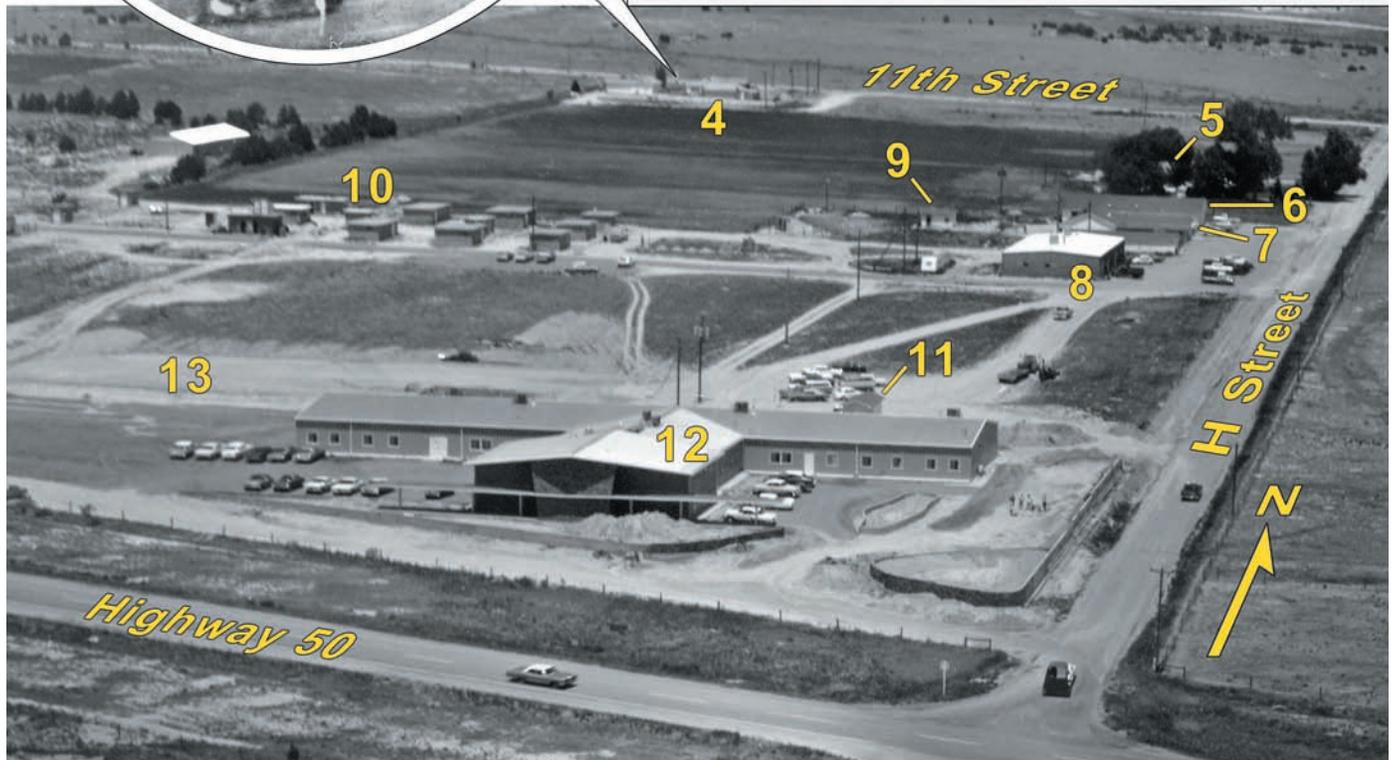
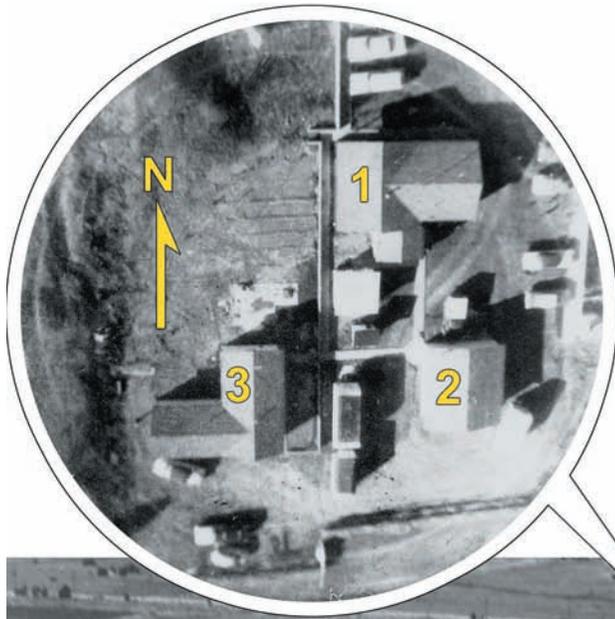
money in Mabel and the only way to recover that was to market the product, so in self defense we formed a company to produce and sell the motors (and later, parts and kits).

SR: When did you decide to form Estes Industries?

Gleda: We decided to form Estes Industries strictly for the Model Rocket business. We had another business (construction) at the time and needed to differentiate between the two: costs, assets, income, labor, etc.

Vern: I was making a living as a contractor in Denver. I started this business shortly after Gleda and I were married in the early 50's. My focus was on small jobs with an emphasis on building garages. At the time I became interested in providing motors to Model Missiles, I had six employees. Gleda, one of the employees, ran our small office, made appointments, and did the bookkeeping. The company was called Estes Enterprises. As I began to see the potential of model rocketry I decided to sell the construction business. The name of the new company would be Estes Industries with the initial address of 5505 Tejon Street, Denver 11, Colorado.

Unfortunately, I can't tell you the exact date we formed Estes Industries. The early corporate records were stored in the attic of the original office in Penrose. This



Above, right: 1961 photo of the original Penrose office. Art Hunter and Freeland Gafford are digging a foundation trench for the first addition to the building.

Above: The circular image at the top is a 1965 Camroc photo of the original Estes office site showing the main office (1), shipping (2), and R&D (3) buildings.

The R&D building also housed the printing and photography departments. The large image above is a 1968 aerial photo showing the original office site (4), Estes family residence from 1961 to 1972 (5), woodshop (6), machine shop (7), packing department (8), original Mabel I building (9), newer engine manufacturing area (10), small wind tunnel building (11), and the nearly completed new main office building (12). The cleared area (13) is where the main warehouse was constructed that same year.

building had been converted into a residence for my brother and his family when he came to work at EI. After he moved out, the building was put up for rent. A fire broke out when the new occupants were moving in and all the old records were lost.

Both Estes Enterprises and Estes Industries existed simultaneously for a while. After I made a final decision on a career change I sold Estes Enterprises to an employee of the company (that was shortly before moving to Penrose). The construction company is no longer in existence.

SR: When and why did you decide to move Estes Industries to Penrose?

Gleda: Sometime in 1960, after we had an explosion of the propellant in Mabel, we felt we were a little too close to our neighbors (they thought so too) so we began looking for a larger area to locate our plant and our living quarters. We looked at land in and around Denver, but it was pretty pricey. Then we looked farther afield: Henderson, Roggin, Wiggins, etc., but found nothing suitable with access to a major highway, a railroad to get our powder delivered, and an available workforce.

Then the wife of our one employee, John Schutz, suggested we look at land in Fremont County. Her father was a realtor and she wanted to move

The Machine shop, left, Woodshop, right, and Mabel I house in the background, as they appeared in February 1963. Both shop buildings were expanded with additions later.



closer to her family. We four spent the day with her father and looked at several properties. The small 35-acre farm we ended up buying was priced within our means, had a (barely) livable house on the property, and an adjacent five acre property, which we also purchased, had a building we could use for an office and shipping facility for a while.

Vern: Our operation on Tejon Street just north of Denver was in a sparsely settled residential area. While we had never had a problem with any officials (I don't think they even knew about our operation) our closest neighbor was not at all pleased. So, following an explosive incident with Mabel we began looking around. John Schutz was our Mabel operator and knew we were looking for a suitable location. He and his wife Betty had previously lived in the Cañon City/Penrose area and suggested we drive down and take a look. Betty's father was a realtor and showed us several properties including a small farm in Penrose. It was available at a reasonable cost, located on a major highway, and had an old farmhouse for living quarters as well as an open space for a fledgling business to grow. We acquired an adjoining property that had a small two-room cabin from a couple that lived in Oklahoma. This building became our first office, kit assembly, and shipping facility.

Construction on three additional buildings was started almost immediately. I was busy laying cement blocks for a foundation when a local news reporter stopped by. Clippings from the Florence Citizen captured the construction scene in their photos and offered headlines that declared "Toy Rocket Firm Now In Penrose."

SR: How did the move to Penrose affect the Estes family life?

Gleda: I was born and raised in a rural setting. They say you can take the girl out

of the country but you can't take the country out of the girl. I was more than ready to leave the metropolis of Denver and move to a quieter place where we could raise our children. We had trouble getting used to drinking "irrigation" water, even when heavily chlorinated, and for a few years things were a little primitive. However, the girls enjoyed being able to have a dog, horses, and many cats. They enjoyed going to good schools with good caring teachers and much less crowded classrooms than they would have had in Denver. I don't think any of our family was disappointed that we left the city for the country. We used to watch the New Year's Eve fireworks on Pikes Peak from our dining room window in Penrose. Yes, it was quite a change, but a welcome one.

When we moved to Penrose our youngest daughter, Linda, had just come into the world, Sharon was 5, and Betty 9. Actually, Vern moved to Penrose in early July of 1961 before the girls and me. Before operation could begin in Penrose, facilities for the operation had to be constructed, so Vern went on ahead along with Andy, an employee from our construction business. Vern, Andy, and a local carpenter, Art Hunter, took about a month to construct a building for Mabel, a machine shop, a wood shop to make nose cones, and a warehouse. In the meantime I was taking care of a young baby (Linda, born May 23, 1961) and running the operation in Denver.

All three of our girls built rockets and participated in one way or another as the company grew. Betty was one of our early "kit instruction" testers. She also worked as a tour guide and attended many rocket meets, including competing in the first international rocket meet in Czechoslovakia in 1966 (as a family team we brought home three trophies). Linda learned to build rockets at an early age and was an enthusi-

astic member of the Astron Rocket Society. Her first "rocket" attempt consisted of an Aerobee Hi plastic nose and some plastic fins with paint and added decals when she was 3½ years old. She later went on to become a very good model builder and flew competition with us at local meets and as a team at NARAM. All three girls participated in competition from time to time. Sharon also helped run the retail store at NARAM, but her main interest was in the two horses she kept in the pasture across the street from our house. As the girls grew up, they enjoyed a variety of opportunities provided them by the "country life."

SR: What was the first rocket each of you built? Did Harry give you a Model Missiles Aerobee Hi kit to build?

Vern: The Aerobee Hi kit Harry gave me to build is still in its original box. I may get around to building it (if I can find it).

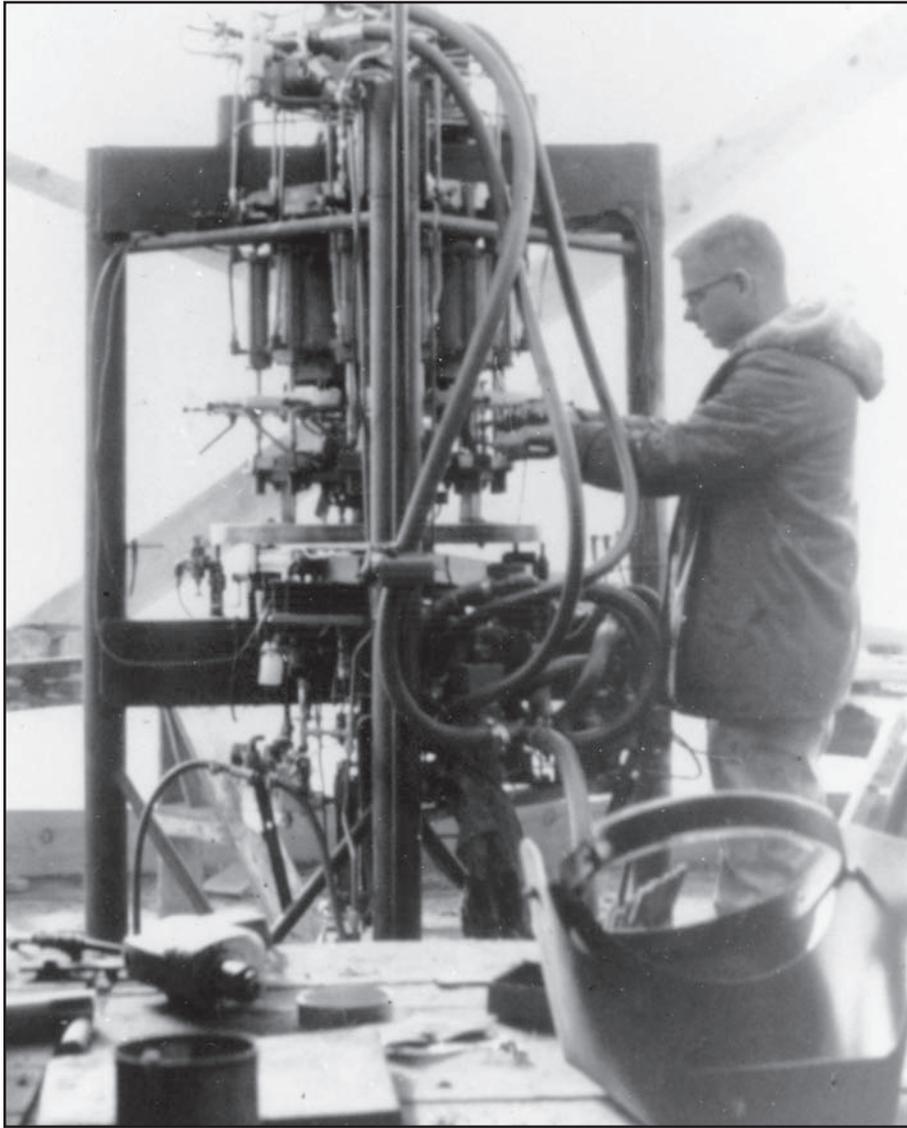
When Harry demonstrated his Aerobee Hi rocket to me, my observation was that it flew well but the fins seemed a bit weak. I knew I could build a better rocket. So into the machine shop I went to build some durable fins. The brass fins were durable all right, but the flight was something else. That rocket took off the pad, turned sideways, and selected the place I was standing as its destination. After that I was convinced of the merit of what Harry had been saying about the relationship between the center of pressure and center of gravity.

This experience proved important in how we approached the market with our products. We placed an emphasis on proper balance in our literature and built the Astron Scout to carry the point home. I called the Scout the rocket that could fly "up" but couldn't fly "down." I'll admit the fins on the Scout were not a strong point, but the lesson on balance was still there.

Gleda: I participated in the first group testing the instructions and the kit itself for the Astron Scout. My next rocket was built from one of our plans, the PeeWee. This was done after we started the Astron Rocket Society in Penrose.

Vern: Gleda has always been a better model builder than me. Unless it is a very special model I do not have the patience to do a good finish job. I just want to get something that works and "watch her go." I admire those that have the patience to do beautiful modeling work. After spending hours and hours getting it just right I often wonder how they have the courage to press the button.

In Part 2 we will learn all about Mabel, the motor making machine.



AN INTERVIEW WITH VERN AND GLEDA ESTES

ALL ABOUT MABEL

Editor's note: This is a continuation of the interview from the previous issue of Sport Rocketry. This installment focuses on "Mabel," the rocket motor manufacturing machine that Vern built in 1958.

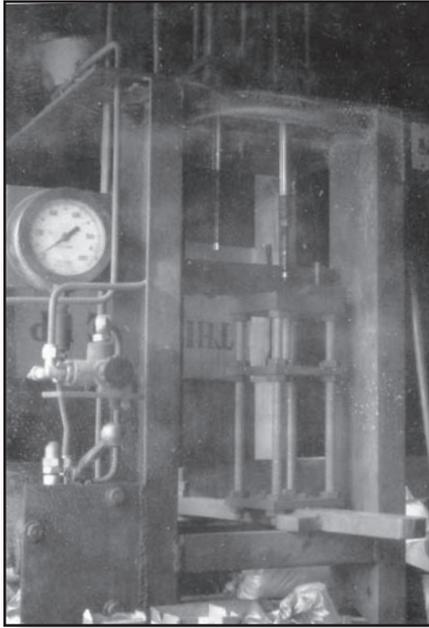
Vern Estes working to complete Mabel in late 1958. The plastic tent that Vern built to house Mabel when he started construction in July proved woefully inadequate against cold winter weather, but it was the best shelter available. Vern continued work on Mabel and Gleda even operated it for short periods while it was still in the plastic tent.

SR: Can you give us details about building your first motor making machine?

Gleda: During the time Vern was preparing to build the machine, later known as Mabel, he was looking for help on how it might be accomplished. His first effort was to contact an Engineering Consulting firm in Denver. An engineer came out, went over Vern's preliminary thoughts and

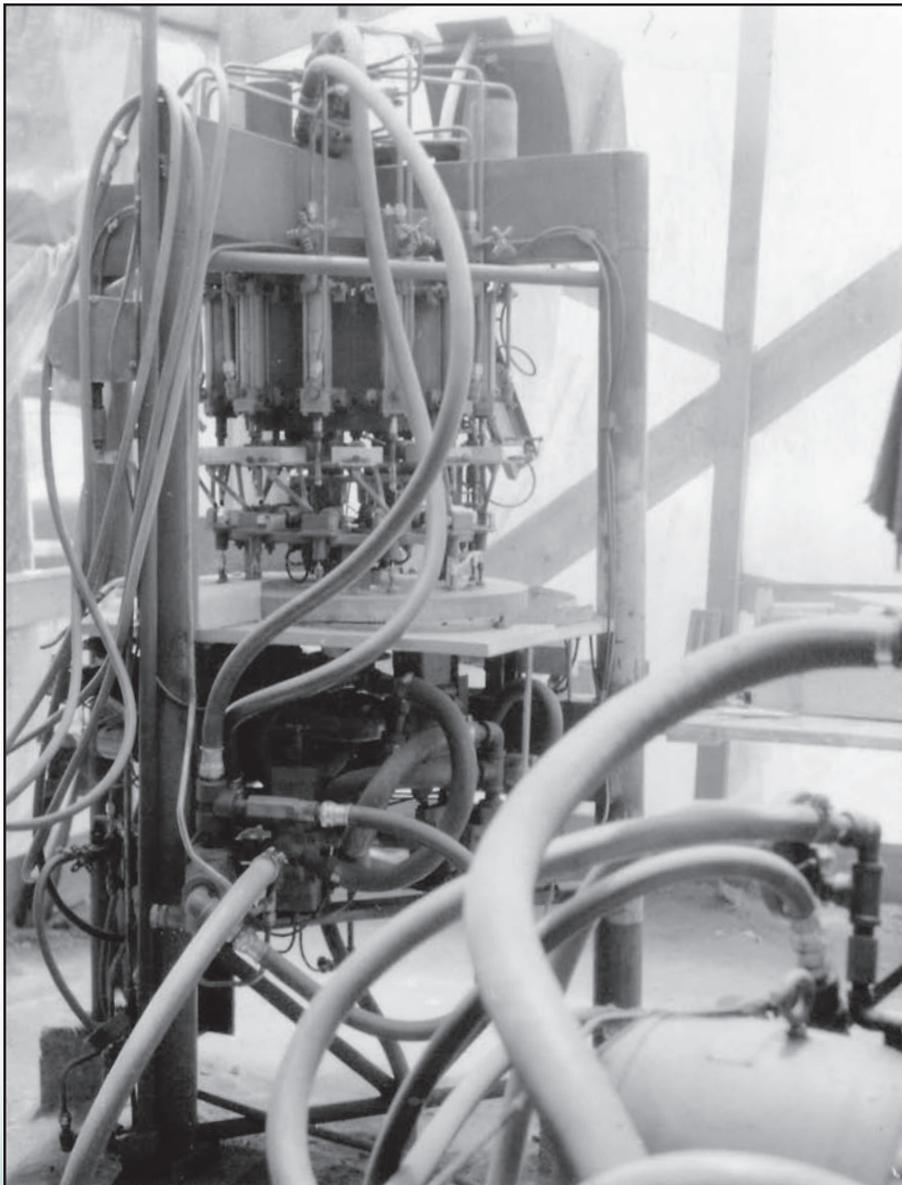
ideas, and then said, "It can't be done!" That seemed like a "red flag to a bull" as Vern simply could not resist the challenge or give up on his project. He told me "I think he's wrong and I believe I can do it and make it work" and he was right. During Mabel's construction I frequently woke up in the middle of the night to find Vern gone. He would have come up with another way of doing something and would have to go to the workshop *right now* and try it out. It seemed like all of his thoughts and energy were directed toward just this one thing. Everything else had to wait.

Vern: I am an inventor at heart. I have always enjoyed making things, especially



making them with very little to work from. I'd as soon work from some old pieces of scrap iron as a piece of shiny new metal. So the fact that I had little resources to work with did not seem like a major problem. First I began thinking about what it would take. I knew I would be working with explosives so the first consideration was to not use electricity on the machine

Vern built this test press in 1958 to determine how much compression pressure, what type and grain size of black powder, and what type of the engine tubes were needed to make successful rocket motors. These preliminary experiments were an important part of the development process that led to Mabel.



itself. Yet compressing loose black powder into a solid mass required a lot of force. Hydraulic pressure could easily do the job and the motors to run the pumps could be in a separate room with hoses run through the wall to the machine. Good enough—so with little to work with, how could this be accomplished?

Realizing that I did not have enough specific information to proceed, I first built a small test press. This enabled me to determine such things as how much powder could be pressed at a time and how much pressure it would take, the best grain size for the propellant, the type of material to use to press the ceramic nozzle and the strength and type of tubes needed for the casings. Armed with this test information I had confidence it could be done and was ready to move ahead.

I began looking around. I visited a surplus store in south Denver and found a couple of used electric motors. I knew that for most of the cylinder travel time very little hydraulic pressure would be required. But, when the actual compression took place a lot of pressure would be needed. I began to think about a dual volume/pressure system. All I needed for such a system was two motors, two hydraulic pumps, and an appropriate valve setup for control so each system could do its specific job.

I had already spotted some suitable motors but not the hydraulic pumps. New pumps were expensive and not my first choice. So off to the junkyard I went. This time it was to an automobile salvage yard. I found just what I was looking for: two power steering pumps from wrecked Buicks. I got both of the pumps I needed for almost nothing.

I decided the best configuration for the machine was to use a circular table with multiple stations. My idea was for tubes to be fed onto the table at the first station, and then as the table advanced various components would be added until each motor

Mabel I nearing completion in December 1958, still inside the plastic tent. The hydraulic pumps can be seen in the lower right with hoses running to Mabel. Because the pumps were powered by electric motors, this was not a satisfactory situation. When Mabel was moved into its special building in back of the Estes home in Denver, the air compressor and hydraulic systems were housed in a separated part of the building, which had its own outside entrance.

was completed. Then, at the final station, the completed motor would be ejected from the table. As it was ejected, the motor would drop into a printer for labeling.

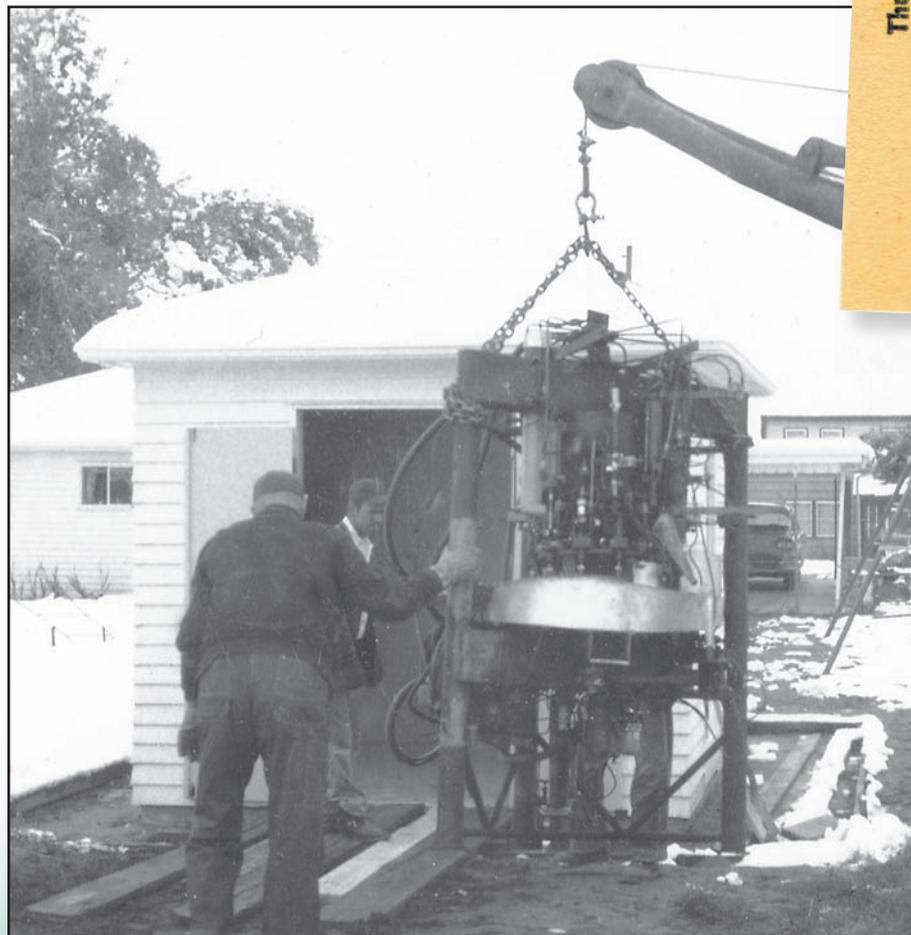
I began to look around for a suitable circular table. There was a big scrap yard on South Santa Fe Drive that I had visited a couple of times in the past. Climbing through the mounds of scrap material I came upon a 2" thick by 24" round piece of steel that had been torch-cut from a larger sheet. I have no idea what someone was making when they carved out this little gem for me, but there it was and available at scrap metal prices. Although a bit heavy it was available, it would stand the pressure exerted by the hydraulic cylinders, and I just knew I could make it work.

Now a big piece of round heavy metal is not a rotating table. I needed to find a way to make it rotate. A friend of mine had torn apart the rear end of a truck that had the bearings and hub intact. He gave it to me and this served as the pivot mechanism for the table. I then rigged up a way for an air cylinder to engage the table to move it forward, then retract ready to repeat the operation after each compression cycle.

It took a lot of time and my other work

suffered. I'd lay awake at night thinking about my project. Then, frequently an idea would pop into my head and I'd jump out of bed and head for the shop. It was as though I was driven by some strange force to make this project work.

So on and on it went. With no electricity on the machine, all the logic to make it run had to be done with compressed air (pneumatic logic). In simple terms this meant that as each operation was completed a small air valve would trigger signaling the start of the next operation. When all operations were completed the sequence would start again and continue to repeat until the operator pressed the stop button (or Mabel detected a problem and shut itself off). Much of the information on how to hook things up and make them go came from reading catalogs and other publications from suppliers. Day after day I learned new things and it all began to come together. From start of construction to first production the proj-



Man Severely Burned in Blast Of Fireworks

A Denver man suffered severe burns over 50 percent of his body Wednesday in a fireworks explosion at Estes Enterprises, 5505 Tejon st., Adams County.

James Berns, 26, of 1475 Downing st. was admitted to Denver General Hospital. He is in serious condition.

Berns was operating a machine that stuffs black powder into a 2-stage rocket tube. The powder was ignited. Flames filled the room, setting fire to Berns' clothes.

He ran into an adjoining room where the firm owner, Vernon Estes of 5551 Tejon st., Adams County, quenched the fire on Berns with a hose.

Berns said he believed a metal plunger which tamps the powder into the tubing may have struck a hard object in the powder, causing a spark.

"I was checking the compression because several tubes were expanding when it went off," Berns said.

Above: Newspaper clipping from October 1959 describing the first Mabel accident that seriously injured the operator and nearly led to Vern abandoning the model rocket business.

Left: A special building to house Mabel was constructed behind the Estes home in Denver. Mabel was moved into her new home on September 30, 1959, with the help of Rudy Strong (a neighbor and part-time employee) and Andy Gunderson.



ect took about six or seven months.

No plans were ever made of the machine that later became known as Mabel—just sketches of various parts and pieces as they were made, assembled and tested. Although Mabel was rather crude by comparison to today's machines at Estes she helped launch a hobby that is still enjoyed by millions.

SR: *Were the later motor making machines something very different, or basically refinements of the first Mabel?*

Vern: Later Mabels operated on the same basic principles as Mabel I. With experience behind us, a new method of loading and unloading the motor casings and completed motors was devised. The label printing was removed from this operation and the motor casings were printed before being loaded. New electric motors, hydraulic pumps, and rotating tables were now economically possible. In the original Mabel the motor casings were not mechanically supported, so sometimes they were deformed from the extreme pressure of compressing the propellant. Later Mabels

Below: John Schutz at outside controls operating Mabel in Denver in 1961. These controls outside the building were an attempt to improve safety. But in practice it was not always practical to "follow the rules." On a very windy day, John took refuge inside when another ignition incident occurred and he suffered moderate injuries.

Above: This photo taken by G. Harry Stine in 1960 appeared in his first edition of the *Handbook of Model Rocketry*. Vern expressed concern that it might provide too much information to competitors, so it was left out of future editions. John Schutz is making adjustments to one of the powder measures.

At the top of the photo is the motor tube hopper (black). The mechanism at lower right prints the markings onto the completed motors.

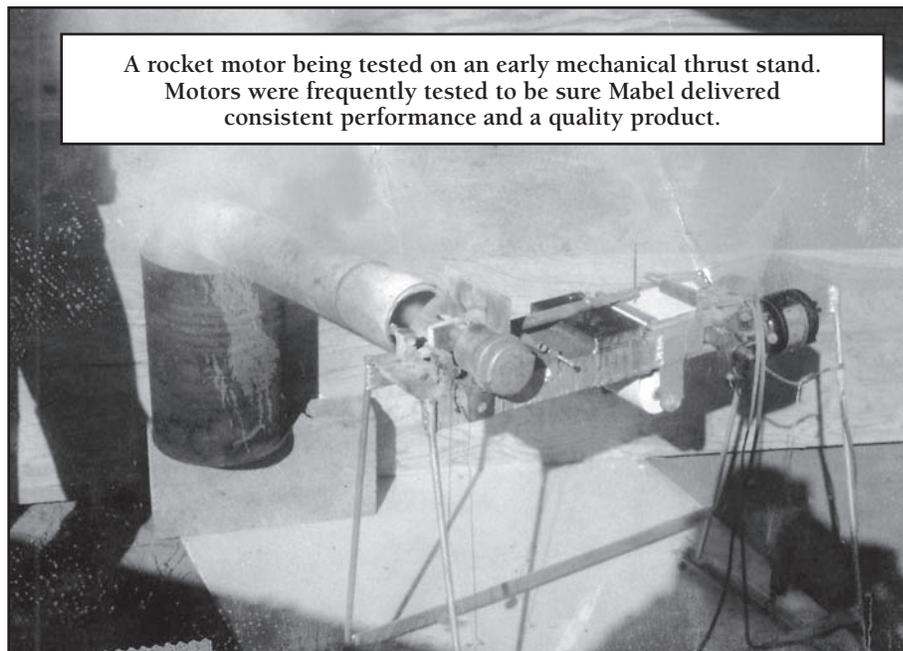
At upper right are the feed-out and take-up reels for the paper tape from which the paper ejection charge retaining end-caps were cut.



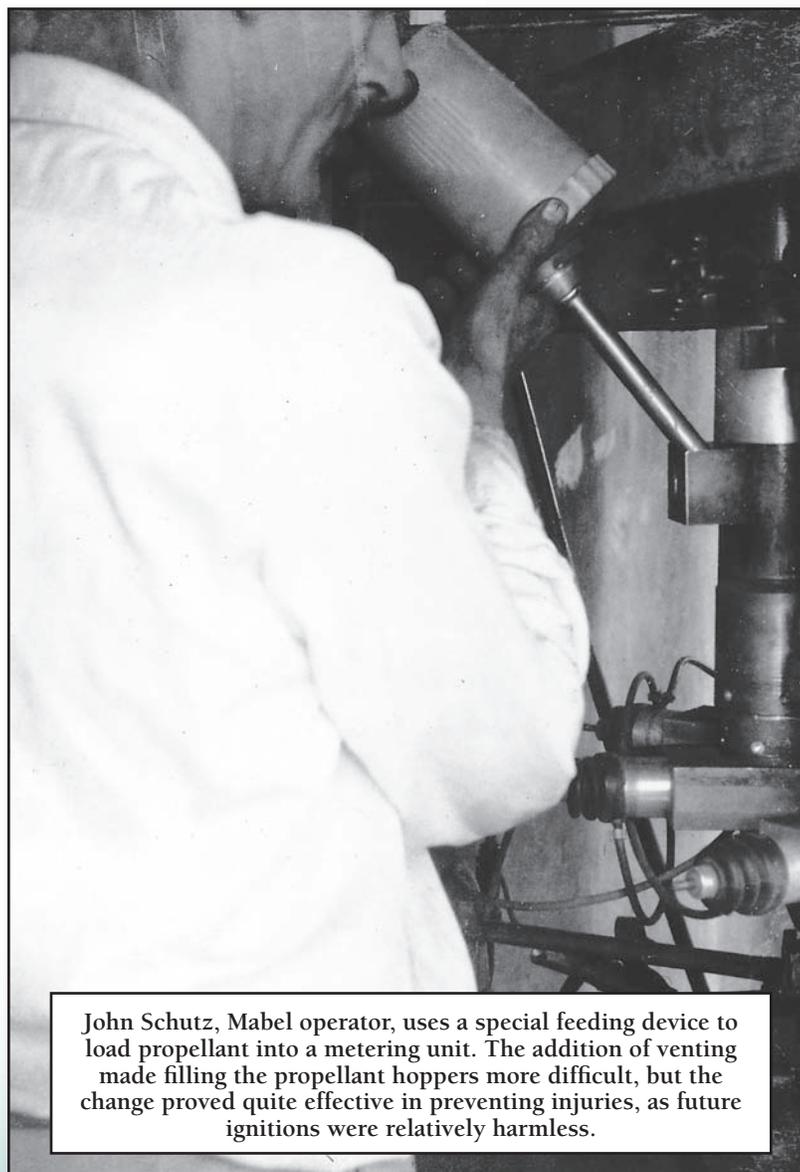
corrected this problem. One of the most important changes was a safety enhancement involving the way the propellant was stored and fed onto the machine. Some later Mabels cut production time to less than half of the original.

SR: *How long did it take the first Mabel to go through all the steps needed to make an engine?*

Vern: The original Mabel was capable of producing a completed motor every 5½ seconds. There were several fixed stations positioned above the rotating table. At the first station empty casings, picked up from a hopper, were loaded onto the table, then the table rotated and at the next station the nozzle material was loaded and pressed. This was followed by multiple positions where a small amount of propellant was compressed, then the delay would be load-



A rocket motor being tested on an early mechanical thrust stand. Motors were frequently tested to be sure Mabel delivered consistent performance and a quality product.



John Schutz, Mabel operator, uses a special feeding device to load propellant into a metering unit. The addition of venting made filling the propellant hoppers more difficult, but the change proved quite effective in preventing injuries, as future ignitions were relatively harmless.

ed and compressed. Next was a station that dropped in a small amount of ejection powder and also provided for cutting, forming, and placing the paper end cap. At the final station the motor was ejected and sent through the printer and then dropped into a box below. If Mabel's inspection of the motor indicated a defect, a small air cylinder activated to divert that motor into a separate reject box. A counter kept track of the number of good motors produced.

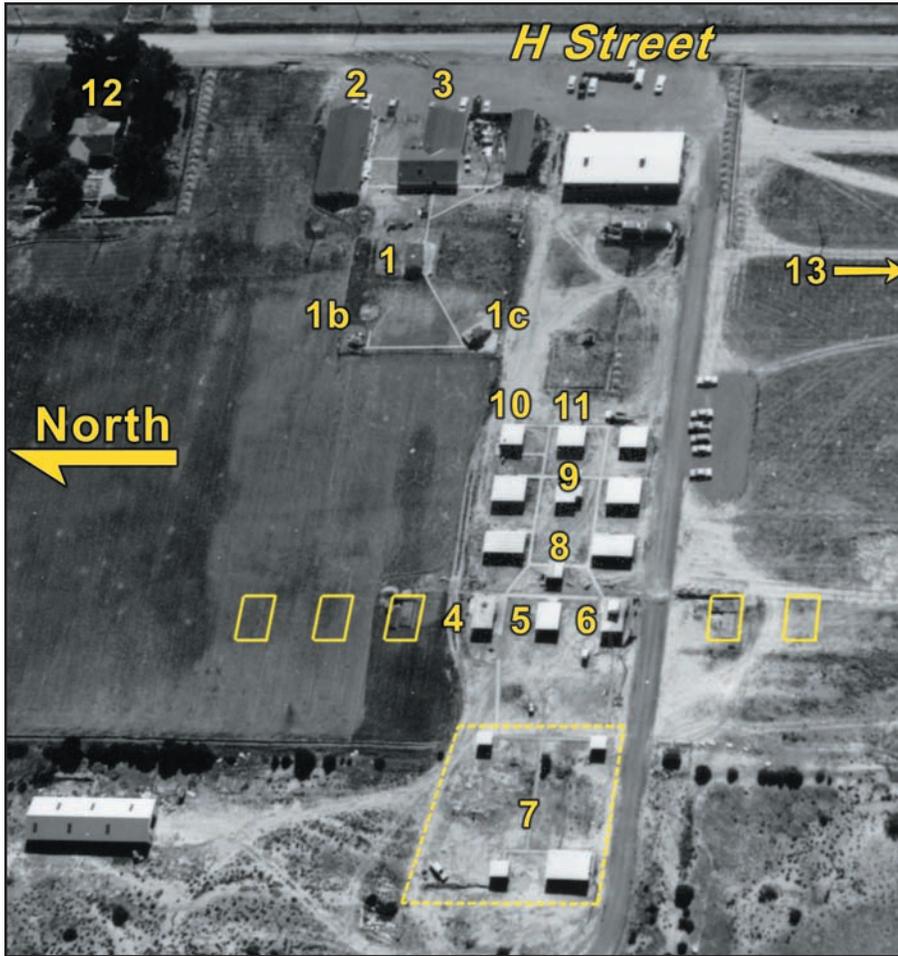
Mabel made her own distinctive sounds. The hum of the hydraulic system changed as it went from high pressure to low pressure then silenced as the fluid was bypassed during the rotating table advance. Bangs from the pick up device for the tubes was ever present as it moved up and down. Exhaust from the air valves and cylinders added to the variety of sounds—hisses, snaps, and pops. In Denver, Mabel's home was in our back yard and the sounds were ever present—real music to my ears.

SR: *Why "Mabel" for the name of the rocket motor making machine?*

Vern: For a short time a fellow by the name of Rudy Strong operated her. Mabel was designed to shut down if any part of the operation was not as it should be. On some occasions you would press the start button and nothing would happen. Then again, just when you thought you could turn your back on her and walk away she would turn off again. Rudy started calling her Mabel with the comment that he knew a lady by that name who was stubborn and acted exactly like that. Others operators agreed and the name stuck.

SR: *What did Gleda think about you making a rocket motor machine...and the possible dangers involved? And about taking time away from your other job to pursue this new scheme?*

Gleda: It was not the first time he had branched out from the construction business. However, I felt that the potential and the rewards of being able to help a young



Aerial view of the Estes engine manufacturing area in 1968. When moved to Penrose, Mabel I was first located in the small building (1) behind the woodshop (2) and machine shop (3). The small structures (1b & 1c) near Mabel's building were for powder storage and prep. Later, Mabel I was moved to a building (4) in the new engine manufacturing area, next to the compressor building (5) and Mabel II (6). Yellow rectangles mark the sites of later Mabels (construction can be seen at the sites for Mabels III and IV to the north and south). Propellant and smoke delay powders were mixed and stored in the buildings in the area (7) to the west. The static test stand (8) is located near the building where engine markings were printed (9). Series II (core burner) and Series III (short) engines received further processing in a building (10) located next to the office/lunch room (11). The other buildings in the cluster were for storage of completed engines. The Estes family residence (12) is visible, and the new main office building is off to the south (13).

generation of would-be rocketeers survive to become citizens was worth the financial risks. Also, I felt Vern was safety conscious and would not put himself at great risk. But, it wasn't easy. Vern's endless pursuit to build Mabel interfered with the time he could spend at his construction business. I was out of money to run the household and we even put our TV set up for sale. Vern tried to borrow money on the machine he was building and the banks wouldn't consider it. Eventually, we sold the construction business and that, along with the few mail orders that had begun to trickle in, gave us enough money to keep going and later make our move to Penrose.

Vern: I will let her speak for her feelings about it all. However, she was the first operator of Mabel and made the first rocket motors sold to Model Missiles. I would not have let her do this if I had been aware of the degree of danger she was subjected to. Mabel was just completed, still being debugged, and housed in a temporary plastic shelter that housed both Mabel and the electric motors to run her. It was a dangerous setup. A couple of accidents later I became agonizingly aware of just how dangerous this rocket motor making business could be.

SR: Was the operator of Mabel in the same room with the machine? I had the impression that the machines were operated automatically by remote control.

Vern: At first the operator was in the same room, which also included a few pounds of exposed propellant. When we had our first accident this propellant ignited causing severe burns to the operator. It was a very serious situation. Jim Berns, the operator, lay in the hospital in severe pain and near death. This accident almost ended my career in rocketry. (When this happened I thought I should just shut things down and concentrate on my construction business. I am reasonably certain that my quitting would have changed the development of the hobby, or perhaps even killed it. Certainly others would have followed a different course with emphasis on issues other than those we chose to pursue.) Then, just as Jim began to improve, an article appeared in the Denver Post describing in detail how a young boy was killed when a rocket he was making exploded. It seemed like I couldn't let go—I began to think about how Mabel might be redesigned to make the operation safer.

As part of this redesign Mabel's on-off controls were placed outside the building. The operating procedure was to not enter the building when Mabel was operating. On one very windy day this rule was not followed. An ignition occurred injuring the operator, but a lot less severely than with the earlier incident. Subsequent safety improvements were incorporated into the operation to make it safe for the operator to stand right beside the machine when it was running. The final improvements involved complete elimination of unprocessed propellant in the pressing room. In this case the propellant is fed from above with a concrete ceiling as the barrier between the unprocessed propellant and the room with operating personnel. The propellant hopper is housed in a structure with Styrofoam walls held in place by a steel framed structure. If an ignition occurs while a motor is being pressed, it will not necessarily transmit to the propellant hopper. If it does transmit to the hopper, the explosion that occurs will blow the Styrofoam walls to bits. Other than that, little damage occurs. No personnel are permitted in propellant storage areas when the machines are in operation. The lesson learned: Try to eliminate accidental ignitions of propellant during the operation, but just as important, make it safe to be there when all goes wrong. These final improvements have proved very successful.



Top: B.8-4 motor from 1959. Bottom: 1/2A.8-2 SM motor from late 1960 or early 1961. Both motors were produced in Denver. The “SM” stands for “smoke” —Estes had just changed the delay formulation to add smoke at that time.

SR: Were you always able to figure out the causes of the accidents?

Vern: Figuring out the exact trigger of an accident is virtually impossible in a situation like we had. Ramming black powder into paper casings can be extremely dangerous and we finally decided that we could not prevent an occasional ignition. Thus, our final solution to the problem was to have “zero” loose propellant in the room where the operations take place and installing a strong concrete barrier separating Mabel and her operator from a *limited* quantity of black powder. I learned the hard way and I hope no one else ever goes through the same thing.

One of the worst accidents in the manufacture of model rocket motors occurred in the 1960’s in California. Cox (the model airplane manufacturer) decided to get into the model rocket hobby. Six workers were killed in a single accident. This accident caused them to give up on making motors. Today Estes owns Cox, but that has no relationship to this past incident.

I cannot overemphasize how dangerous the handling of explosive materials like black powder can be. I still have newspaper clippings relating to many, many accidents where individuals were injured or killed in attempts to make their own rocket motors. I will always urge individuals to “let the experts take the risk” and concentrate their efforts on other aspects of rocketry.

SR: I remember well the literature from Estes about the dangers of “basement bombers.” Did you realize right away the danger that the basement bomber kids were putting themselves in, or was

this point only apparent from your experiences making motors?

Vern: The Denver papers had frequent articles about kids getting injured or killed attempting to build their own rockets. I do not remember having associated the dangers they faced with what we were doing. I suppose it is human nature to think that you can escape those dangers just by being prudent and careful. I must confess I did not realize until we were well into the operation just how dangerous making rocket motors could be. I expect that gaining that knowledge first hand played a role in the extreme emphasis we placed on having our customers avoid this type of hazard.

SR: Did you have patents on certain aspects of Mabel that other motor manufacturers had to license? I recall a story that AVI had to quit making motors because Estes Industries revoked their license on some critical machine part.

Vern: I think that story is pure nonsense. We had no patents and did not have any specifics as to how other companies were making motors. I suspect they found their way of doing business was ineffective against the competition so closed up shop.

SR: How did you test the engines you were making?

Vern: MMI had been using a small postal scale to measure thrust, but that didn’t give enough information. So I built a mechanical test stand that produced a thrust-time curve and let us measure peak thrust, total impulse, and time delay. The test stand used a roll of wide adding machine paper that was pulled under the writing stylus (a

ball point pen) by a small gear motor at the rate of 1.0 inch per second. A pivot arm had a motor mount on one end and the ballpoint pen was on the other. The system had a damping mechanism, which consisted of a vane that “swished” through a built-in tank containing automotive antifreeze. A spring attached to the pivot arm had an adjusting screw to provide calibration. To read the data, the operator used a clear plastic layover sheet having grid markings of 0.1" x 0.1" and counted the squares. It was several years later, when my brother Earl left his engineering job at Hughes Aircraft to come to work for us in Penrose, that we went to electronic test systems.

SR: Did you ship engines in the “blue tubes” from the beginning, or did these come along later?

Vern: The blue tubes were the third generation of shipping containers. For a very short while we used a small rectangular box just large enough for three engines. We next shipped in red/brown tubes, which were identical to the blue tubes except for color. At the time only 3 rocket engines could be mailed in a single package, but there was no limit on the number of packages. The mailing tubes were very economical for us to obtain and package, so were ideal for our operation. We used the same tube to package our first kit, the Astron Scout.

SR: Do you have examples of the earliest engines Estes made (I’m wondering what the markings looked like)?

Vern: I have a Polaroid photo of engines taken as we were just starting to go mail order. I also have at least two actual engines (labeled as ‘Rocket Motors’) with the 5505 Tejon, Denver, Colorado, address that are from an early production run on Mabel. These engines, now nearly 50 years old, would probably work just as well as when made. But they are very rare and I plan to keep them in their present condition and not test them just to satisfy my curiosity. They will probably end up in the Smithsonian or other National museum with other early artifacts of model rocketry.

SR: Why did you decide to use the term “engine” instead of “motor” for Estes model rocket engines?

Vern: “Rocket Motor” was the designation used in our early production. We changed to calling them “Rocket Engines” following a discussion I had with G. Harry Stine about the proper nomenclature.



Above: Early B16 and 1/2A motors with the term “rocket motor” and the Denver address on the casings (circa late 1960 or early 1961). The B16 was the first Series II (core burner) motor, later redesignated “B3” when better thrust stand data should that its average thrust was 3 pounds, not 16 pounds (these are pre-metric motors).

Years later Harry and I were discussing the old days and he asked why I had used the term engine instead of motor. I responded that I had changed to engine because he had told me that was proper (I have always considered Harry an expert on such matters). Harry then set the record straight, saying that “motor” is the correct nomenclature, and that was what he had told me in our original discussion. I apparently had misunderstood Harry. As I understand it today, motor is probably the more accurate term, although not everyone agrees on this. As you can see in this article I use the terms interchangeably. However, I expect the “engine” designation will continue to be used when referring to propellant devices manufactured and sold by Estes Industries (and perhaps others). As one rocketeer put it, “Who cares what you call it. It is still that thing you put in the end of your rocket to make it scream skyward.”

SR: *Where did the idea of making booster engines come from?*

Vern: The development of the multi-stage rocket was a joint effort between Bill Simon and myself. It is covered by Patent



Early B16 and 1/2A motors. Note the thicker casings used in these old motors, and the larger nozzle diameter of the core-burning B16.

#3,292,302, for which the application was filed in September 1964 and issued in December of 1966. Through experimentation we had learned that it was possible to ignite an adjoining stage by “blow through” and making a lower stage engine simply meant setting Mabel to leave out the delay, ejection charge, and end cap.

One of the few disagreements we had with Centuri related to multi-staging. So far as we could determine, the technique they employed with their multi-staged rockets was in direct violation of our patent. We had requested that they cease and desist their infringement but Centuri continued

its violation. At the time Damon acquired Centuri we were preparing for action through the courts. Of course the acquisition brought a halt to any such plans. I don't know who would have won that battle but I was glad it ended that way.

SR: *Estes actually produced motors for Centuri. How did this come about and how long did it last?*

Vern: Shortly after we moved to Penrose, Lee Piester came to visit following NARAM held in Colorado. Lee was starting a model rocket company and proposed our selling them rocket engines. At the time Mabel was running well and capable of making far more rocket engines than we were selling. Our fledgling company could certainly use the extra cash so we shook on a deal.

Our business continued to grow at a rapid rate and so did Centuri. In spite of running Mabel on a 24/7 schedule the day came when she could no longer keep up. It was a painful situation. We had obligations to serve our mail order customers and a conflicting obligation to provide rocket engines to Centuri. We did our best to balance the situation but it caused difficulty for both companies. Mabel II was under construction but for several months we shared the limited engine supply with our #1 competitor.

We were still selling motors to Centuri at the time we sold Estes to Damon. However, Centuri had been developing motor manufacturing equipment and facilities at their Chandler location. I believe they had just started producing on their own at the time Damon acquired Centuri. The motor equipment built by Centuri was moved to Penrose. It was not compatible with the methods and facilities we were using so it was never put into service.

SR: *What became of the original Mabel I machine?*

Vern: Mabel I, and the Centuri motor making machines mentioned above, were sold to a local salvage yard sometime in the mid to late 1970's. This was done while I was out of town and was unaware of the sale until it was too late. I believe this equipment, especially Mabel, had a place in history that should have been preserved. If she were still around, she would soon be celebrating her 50th birthday.

AN INTERVIEW WITH VERN AND GLEDA ESTES

THE GOLDEN DAYS OF MODEL ROCKETRY

Part 3



Editor's note: This is a continuation of the interview from the previous issue of Sport Rocketry.

SR: Was Estes Industries a financial success from the beginning, or were things pretty iffy at first? Or was it a case of too many orders and too little production capacity?

Gleda: When we placed our first ad in May of 1960 we also rented a post office box in our local post office about five or six blocks away. If my daily trip to the post office netted two or three orders, we felt we were on our way. However, there were many trips with no orders in those days. Also, it became clear very early on with requests from our "customers" that we needed to sell more than just the motors. They wanted body tubes, plans, kits, nose cones, and other rocket parts. The time of

overflowing orders and not being able to get them processed and out the door on the same day came about three years later.

Vern: In the beginning things were very bleak. Model Missiles had agreed to buy 5,000 rocket motors per day. That is what I was counting on when I built Mabel. After delivery of only a few thousand motors it became apparent things were not going as they had planned. After discussions with Harry I decided to try a mail order approach. MMI was concentrating on the standard channels of hobby distributors who sold to hobby shops who then sold to consumers, but it wasn't working. Yet, the time was ripe. The space race was getting under way and kids were attempting to build rockets with such dangerous things as chemicals, match heads, pipes, and CO₂ cartridges.

So we decided to try a classified ad in

The flag flies high over the new main office building of Estes Industries shortly after its completion in 1969.

one of the *Popular Mechanics* type magazines. At first we offered only rocket motors. Orders began to come in and we could begin to see some light. We built on this by offering other rocket related items such as nose cones, body tubes, and literature that encouraged safety and education.

Vern Estes and Vice President Bill Simon look over prototypes of the Interceptor and Sandhawk in 1970. Bill's duties included Research and Development—he and his staff were very creative and developed innovative models for production consideration. Prior to the publication of the annual catalog, all prototypes were reviewed and decisions made as to how they could be produced and fit into the Estes line; some made the cut, while others fell by the wayside and were never produced.

SR: How many hours per week did each of you put into Estes Industries work when you started?

Vern: For me, the amount of time I was spending was “all the time there was.” For several years this was about 80 and on occasion up to 100 hours a week. Just time to catch a nap, eat a quick meal with the family, and then get back to work. We kept hiring more help but it seemed like there was always more to do. Gleda had a more normal work schedule but also devoted a lot of time to taking care of kids and running the household.

I remember a situation in the mid 60's when a sudden increase in business left us unable to even open the mail. Boxes of mail stacked up in my office (the only room with a lock on it) as I did my best to locate new employees to get us back on schedule. I was overloaded with work so I asked that potential employees come in at night for application and interviews. Sometimes this ran late into the evening.

A lot of the applicants were housewives. It wasn't unusual when the lady came to apply and be interviewed (at 10:00 or so at night) for her husband to wait patiently in the car just outside the office. Anyway, we finally got things back on schedule so the many orders that had come in just ahead of Christmas were delivered in time.

I am a workaholic at heart and have never worked less than 50-60 hours a week. I am still on this work schedule as this is what I enjoy doing most. I like to make things happen.

SR: What were the biggest problems that you encountered in making Estes Industries a success? Any lessons learned that might benefit someone thinking of starting a company?

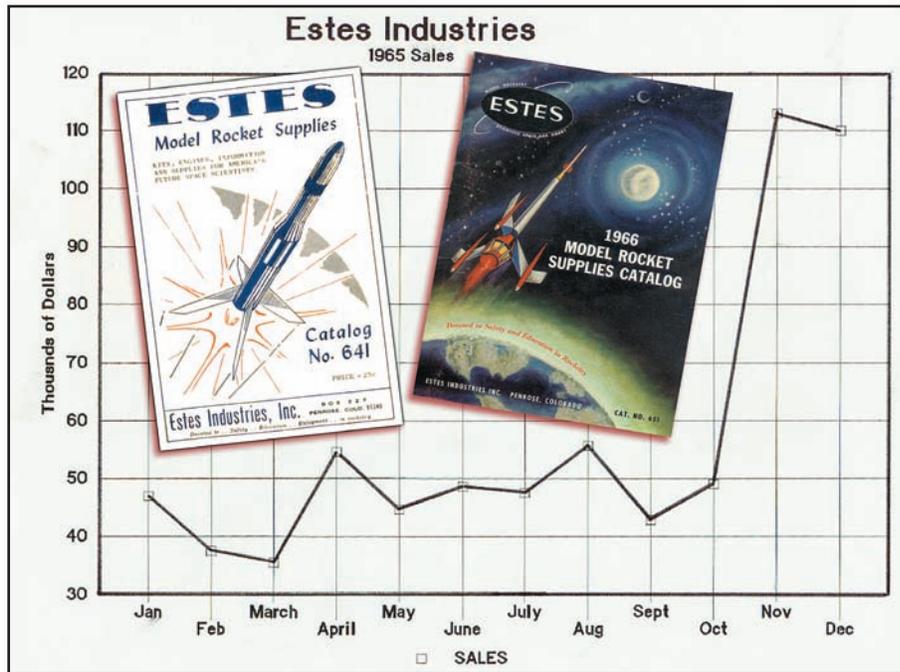
Vern: The two most important things I can mention are “having the right employees” and “treating your customers right.” Of course success also depends on having



a good product to sell and having enough markup to keep a few pennies along the way. And, perhaps most of all it takes dedication and a lot of hard work.

Now about the first item, the good people we had working for us to make it go: In most cases they possessed knowledge and skills that I did not have. Almost none of those great rocket kits that collectors pay dearly for today came from my brain. They were the brainchildren of people like Bill Simon, Gene Street, Wayne Kellner, and Mike Dorffler. Roy Burns and his crew in the machine shop made our improved Mabels, nose cone machines, and even the machine we developed to flameproof toilet paper. Of course Gleda, with the help of department heads Dianna White, Oakie Six, and June Harris, handled all of the mail processing, shipping, catalog and *Model Rocket News* processing, dealer orders, and a host of other duties. George Miller came on board to do our purchasing and Sadie Hedger ran the accounting department. John Schutz ran Mabel in the early days and designed the first boost glider—a concept that others had tried and many thought couldn't be done. Ed Brown was one of a kind and...the list goes on and on. It was the talent and dedication of these people that let us grow and prosper.

The second important item mentioned above was how we treated our customers. We felt a special relationship with each and every one. Our goal was to keep them safe while helping them become successful in pursuing their interest in rocketry and related subjects. We built on this by establishing a special relationship that transcended the normal relationship businesses have with their customers. We communicated through the *Model Rocket News*, addressing



Estes Industries sales suddenly increased after customers received catalog #651 (labeled 1966, but mailed in Sept. 1965) having the first full-color cover. The flood of orders was more than the company could handle. Vern hired people as fast as he could, but for a while the boxes of unopened mail stacked up in his office, almost to the ceiling. It took weeks to get caught up, but all orders were shipped in time for Christmas.

their interests and concerns. We helped them with science projects and even sponsored a contest to take one of our rocketeers to the Apollo 11 moon launch. Our mailroom had special personnel to answer letters because we knew how important a prompt answer could be to a young rocketeer with a question or problem.

If a customer had not sent quite enough money for his order we shipped it anyway and asked that the difference be included with his next order. We knew that a lot of

our customers began counting the days from the moment the order was dropped in the mail until they expected to get their rockets. Think of the disappointment, if instead of a package of rocket goodies, a letter arrived telling them to send more money.

And then there were our guided tours. The special relationship we had with our customers meant they wanted to come see us. We started giving tours in the early years of the company and it grew and grew. By the time we sold to Damon, our summer tour guide crew was up to seven with more than 10,000 visitors in just three months. Our eldest daughter Betty was one of the guides. Each tour ended with the visitor participating in launching a rocket at a special site at the plant designated by a small sign as "Cape Estes." The rocket was usually a Big Bertha.

SR: I've heard the stories of Gleda stitching early catalogs on her sewing machine and rolling body tubes on the kitchen table? Could you elaborate?

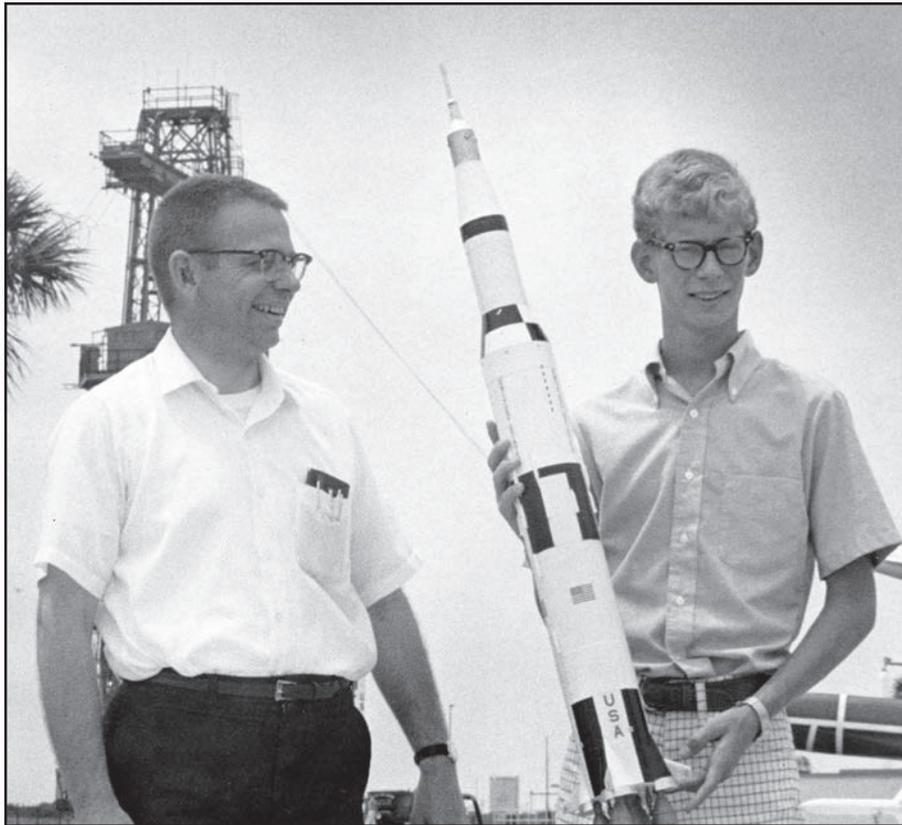
Gleda: Yes, I stitched up the catalogs on my sewing machine, after printing them on a mimeograph machine and hand folding the center sheet. Our first "catalogs" were just single sheets offering engines and later body tubes and some other parts

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along with the Astron Scout. Then shortly before we moved to Penrose we decided to expand the catalog. The new catalog consisted of three 8-1/2" x 11" and one 8-1/2 x 14" sheets of paper. After mimeographing on both sides the long sheet was folded to make all the same length, then I collated the sheets and fed them through the sewing machine using a jig (guide) Vern had made. It was a fast operation as one catalog after another landed on the floor on

the other side of the machine ready for the thread that still tied them together to be cut. Only a few hundred of these early catalogs with the Denver address were made.

However, the body tube rolling was actually done on the office floor initially—I was 7 months pregnant and that was easier for me than leaning over a table or desk. The paper for the tubes was from the heavy “negative” portion of a wet-bath copier (normally thrown away after mak-

ing a copy). After we needed more body tubes than I could produce we then bought tubes from New England Paper Tube Company.

SR: *What Estes kit surprised you the most with its popularity (if any)? What is your favorite kit?*

Gleda: Probably my favorite kit was the Space Plane. Vern had set a glide duration record with his Space Plane, and then during a subsequent contest I set a new record for duration—and since this was under the old rules, which have been retired, my record still stands in perpetuity. I really enjoyed building duration rockets such as the Drifter, Sky Slash, and Falcon. Not always kits.

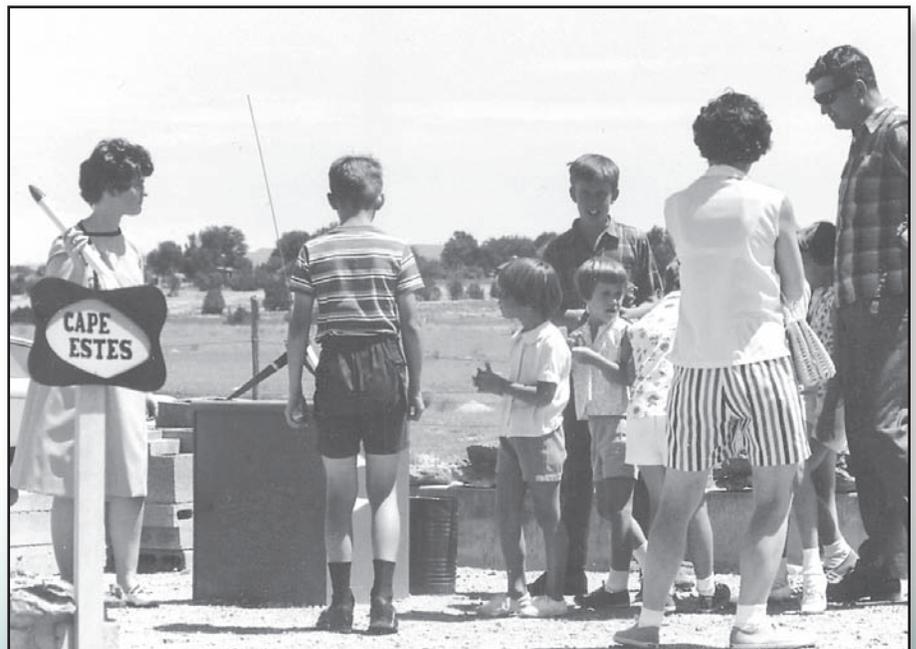
Vern: I don't remember which rocket met the criteria of “surprise” but when Bill Simon did a survey of the sales of various kits around the time we sold to Damon, it showed the award for the highest number of rockets sold went to the Alpha and the trophy for the rocket providing the most dollar sales went to the Big Bertha.

Big Bertha has always been my personal favorite. Big Bertha was an offshoot of the 3-engine cluster Ranger. We had a local rocket club called the Astron Rocket Society that met in the garage behind our house. We were all building rockets one evening and I decided my rocket would be the Ranger but with only one engine. I decorated it with decals of nice looking ladies and called it the Big Bertha. I wasn't sure a single engine would provide

Above: Vern with Sven England, the rocketeer who won the Estes contest for a trip to the Apollo 11 launch in 1969.

Right: Thousands of visitors stopped by Estes Industries each summer (one young rocketeer even convinced his family to drive 200 miles out of their way).

Estes tour guides showed visitors though the various departments in the main office building, and then pointed out the engine manufacturing facilities. At the end of the tour they prepped and launched a rocket from a pad at Cape Estes. Of course, before leaving, everyone was invited to visit the on-site retail store.
Photo from 1969.



enough power for a safe liftoff. Later when the countdown reached zero Bertha lifted gracefully into the blue sky leaving a white smoke trail behind. To me, its slow liftoff was an emulation of the birds lifting off at the cape. I still have the original Bertha and the last flight was in 2000 at NARAM 42 at the Estes Land launch site. No further flights are currently planned but...

SR: Your mention of the "Astron Rocket Society" sparks a question: Many of the classic Estes products had the name "Astron" tacked onto the beginning of their names. Was there any special significance to the term? Where did it originate?

Vern: I am frequently asked where the term "Astron" came from. I remember we decided to use it while still in Denver. My recollection has always been that the word meant "over and above" and that I had found it in a dictionary or other printed reference. Today, when I look for such a reference it cannot be found. Perhaps I coined the word with the intent of it having such a meaning. Today, when I Google for the word "Astron," I find a lot of businesses and organizations using it in their names. Perhaps, some of these entities are ones that were founded by some of our early model rocketeers.

SR: What were your impressions of your competitors, the other model rocket companies?

Vern: Back in the early days the industry had problems that needed to be solved that related to the world we were living in. Many Fire Marshals didn't understand that model rockets were not fireworks and other officials needed to be told that we had a solution to their problems and were not a part of it. This brought on a special relationship between competitors that many

industries don't share. We formed a loosely knit organization called the Model Rocket Manufacturers Association (MRMA). Our group set aside time to meet at NARAM and places like the Pittsburg Spring Convention. As we talked about our problems we also formed personal relationships.

We developed a special relationship with Leroy and Betty Piester, which included an agreement to supply rocket engines to their new company. Centuri

soon became a serious competitor. Although they were claiming a larger and larger share of the market they were also providing services and ideas that were expanding the market. Keeping ahead was a real challenge. Centuri's presence and progress made us work harder and harder just to stay ahead. While I did not like giving up a share of the market to a competitor, at the same time their presence did make for a healthier industry. And most of all that extra effort we put in to stay ahead made our company

grow even faster. I can honestly say that even though they were smart and fierce competitor, Centuri's presence was a major contributing factor in our success. And those great kits that Centuri produced are a collector's dream. Perhaps we encouraged them to work hard also.

I still have a unique gift that arrived at my office in Penrose with a postmark of Phoenix, Arizona. It contained a catalog, a beautiful full color model rocket catalog that was far superior to any we had produced. Also in the box was a second gift, a crying towel from my good friend Mr. Leroy Piester. I didn't forget his thoughtfulness, and later...well, that's a story for another day.



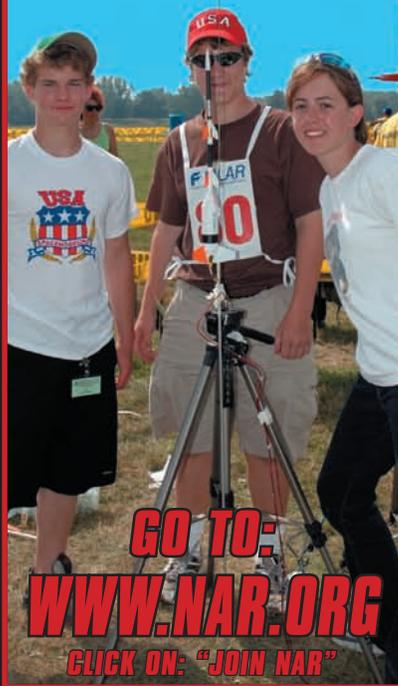
This well-worn copy of the 1961 Estes Catalog #261 was used as a reference in the manufacturing area of the Penrose plant.

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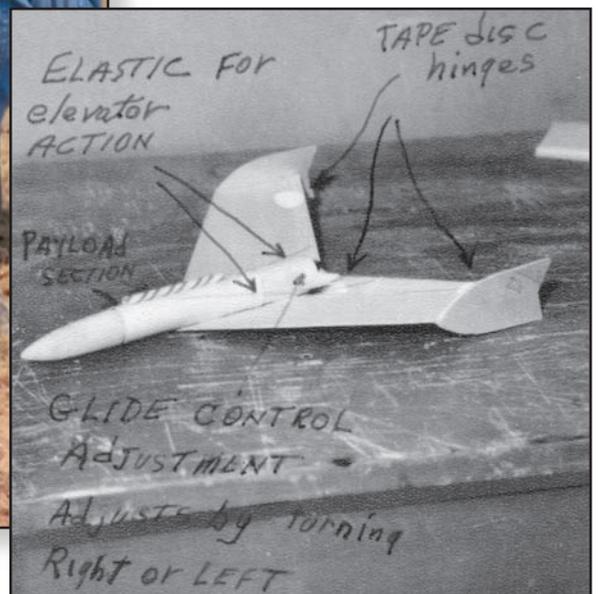
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just as friends with a common interest who enjoyed each other's company.

SR: You mentioned the difficulties of convincing some Fire Marshals that model rocketry was safe. Were there any particularly tough cases?

Vern: Yes, California. I well remember some of the antics Mr. Thomas G. Fisher, the California Fire Marshal, pulled when we visited to demonstrate the safety of model rocketry. He was thoughtful enough to gather all the fire officials together for Lee Piester and me to address. We told them about the safety of model rocketry, how it could prevent accidents, etc. Then Mr. Fisher took everyone outside, lined them up and demonstrated the dangers of rocketry in a way that only a person with a deranged mind could do. He had crushed the propellant from a large number of rocket motors, placed his concoction in a 60-gallon drum, aimed it directly at his fire officials, and set it off. KABOOM! I'm not



I will always remember the many good times we had with the Piesters, especially our trip to the 1966 International Model Rocket Meet in Czechoslovakia. Gleda, our oldest daughter Betty, and I traveled with Leroy and Betty Piester through various countries in Europe, not as competitors, but

Above: Vern readies one of his early Big Berthas for a flight at NARAM-42 in EstesLand, Colorado. This is not Vern's original prototype Big Bertha, but one he built a short time later as part of his activities in the Astron Rocket Society.

Right: Vern built many gliders while trying to come up with a kit version of John Schutz's boost glider that customers would be able to build and trim successfully. John had built the first successful boost glider—but the music wire spring he used to activate the control surfaces was nearly impossible to duplicate. The Space Plane, Estes's 3rd kit, first appeared in the Penrose edition of catalog #261 (but was not in the Denver edition, the very rare first edition stitched by Gleda).

sure what he proved by this, but he convinced most of us that, at heart, the California Fire Marshal was a first-class basement bomber.

Of course his greeting to Gleda was unique. On introduction, Mr. Fisher said something like "Welcome to California, Mrs. Estes. We have a very fine women's prison here."

SR: Who were the most important employees at Estes in the early years? What did they do that helped make Estes a success?

Vern and Gleda: Oh my goodness what a question. A lot of great people (hundreds) contributed to making the company a success. Here is a list of some of them:

John Schutz had some pyrotechnic experience and was the fourth employee to run Mabel when we were still in Denver. He was injured in one of the early Mabel incidents. He had been a model airplane builder for many years, and he developed the first boost glider. John was very "company success oriented," almost as though he were part of the family business. He ate his lunches with us in our house when we were still located in Denver (Mabel's house was in our back yard). John is retired now and lives in Cañon City. John's wife, Betty Schutz, came to work for us just before our youngest daughter, Linda, was born and helped Gleda with the mail processing, production, and shipping. She and John made the move from Denver to Penrose with us, and for a short while she was our only office and shipping employee.

Bill Simon was a very important employee in contributing to the growth of Estes Industries. He came to us in June of 1962 to edit and publish the *Model Rocket News* and other publications (he still asked Gleda to proofread all the catalogs before they went to press). Serving in many capacities he became Vice President of the company and was responsible for R&D of new kits and products, writing instructions, developing and publishing the catalog, photography, etc. Bill now lives in Mt. Vernon, Washington, and works as a recreational watercraft designer (boats, yachts, etc.).

George Miller was living in nearby Cañon City and came to us as a purchasing agent. He was extremely valuable in keeping supplies and materials on hand and keeping costs in line. Ed Brown first worked in the machine shop. His inquiring mind leaned toward rocket engines and



Leroy Piester and Vern Estes having a "friendly discussion" in 1969 over who had the better Saturn V kit, Centuri or Estes.

this led him to engine manufacturing. Ed recently retired from his position as manager of the Estes engine manufacturing plant. Roy Burns designed and built automated equipment for many departments. Oakie Six managed the mail-processing department for over 25 years. Diana White managed shipping and kit packing until kit packing was split into another department in a different building. Lucile Barber handled and supervised our rocketeer mail department. June Harris worked in customer service and as dealer sales manager. John Hood was our multitasking warehouseman who could handle more freight or mailbags than just about any one around.

Norm Avery handled public relations and did the "Launch Pad," a bi-weekly publication for our employees. Bob Cannon was our education director who really made model rocketry work in the classroom. Gene Street served as artist, print shop and darkroom manager, and in R&D. Jean Curnutte was a printing press operator and then print shop manager, followed by Charlie Wagner who managed the print shop and visual graphics department. Alice Hammock ran our in-house walk-in store. Art Hunter came to work for us in 1961 to help us construct the needed buildings, and stayed for many years doing whatever carpentry or building work was needed (including our checking tables, special bookcases, etc.). Art's wife, Louise Hunter, took over stitching the catalogs from Gleda until we began staple stitching them. Sadie Hedger took over our bookkeeping when Gleda no longer had time to do it. The list

goes on, including Dane Boles, Mike Dorfner, Earl Estes, Wayne Kellner, Carl Turse... and we've undoubtedly left out some key people, but these are the ones that quickly come to mind.

SR: Who designed and developed the Camroc?

Vern: That was my baby (patent #3,537,369). I wanted to be able to make a model rocket do more than simple launch and recovery and this seemed like a project that would advance the hobby. I deliberately chose to use a design that would provide an understanding of how a simple camera works. One of the biggest problems with the Camroc was the length of time it took from the moment one of our customers decided to order the Camroc until he (she) had a picture in hand to look at. The first step was to order the Camroc and film, then fly the rocket to take the pictures, and finally return the loaded film holders to us for processing. Not all of the pictures taken produced great results (blurry images, sky shots). However, I would speculate that in many cases just getting a picture of "something" from a rocket flight was enough to provide that feeling of accomplishment.

SR: I think it was Bob Kaplow who said the most amazing machine he saw at Estes was the one that made the flameproof wadding. Who designed that machine?

Vern: Most of the specialized equipment was a combined effort between Roy Burns and myself. I would make a few sketches, then sit down with Roy to discuss the concept and he took it from there. Sometimes the equipment looked a lot like my original thoughts and sometimes not. I don't remember exactly how we came up with this particular piece of equipment, but probably as described above. Later, Roy came up with a much more efficient process, which was strictly his baby.

Speaking of flame-proofed toilet paper, I have often wondered what those semi drivers thought as they drove up to our plant with a full load of toilet paper. There were lots of jokes around the plant about this. So far as I know we were the only employer in the world that flame proofed its toilet paper.

Prior to the flame-proofed toilet paper we used a folded paper protector, printed on and cut from the engine instruction sheets. I believe our first effort with flame-proof material was stuffing the body tube behind the chute with fiberglass insula-



landing as a point in time where interest in rocketry could begin to wane. I had enjoyed success and felt it was time to move on to other endeavors. Earlier in my life I had set of goal of being able to retire before I was 40 and I was now at the ripe old age of 39.

I had received an unsolicited inquiry about buying the company that triggered my action to sell. I contacted a firm in Denver that specialized in



Above: This is one of several order picking and packing stations used in 1969. All products were within reach allowing for efficient processing. From here the orders went to the Penrose Postal Annex room for stamping, sorting, and bagging ready for loading into mail trucks for shipment to rocketeers throughout the country.

Center: Robert L. Canon, the Estes Education Director, talks model rocketry with Egypt's representative to the World Federation of Aerospace Education (circa 1975).

Bottom: Mail was sorted and then went to the mail opening and processing clerks working at special desks. Sometimes clerks hand-wrote simple notes to accompany orders. Envelopes containing special requests were directed to the "Rocketeer Mail" department for a personal response. Orders were promptly passed along to the shipping department for processing to be mailed out the same day. 1969 photo.

tion. The flameproof wadding proved to be by far the best.

SR: Why did you eventually decide to sell Estes Industries? How did the involvement with Damon come about?

Vern: The company was doing great. It was 1969 and I saw the moon



matching buyers and sellers of companies like ours. They made the contact with Damon and handled most of the negotiations. We signed on the dotted line and I agreed to continue to manage the company. We subsequently had some disagreements on business matters. This led to my buying out my management contract and entering into a consulting agreement with Damon. I kept my personal and consulting office at the company for several years before final separation in the early 1980's.

SR: *As you reflect on the past are there any additional thoughts you would like to convey?*

Gleda: Answering your questions has given me a chance to reach back in my life and reflect on the most hectic venture I could imagine. I was managing several departments as the company grew and expanded. At the same time I was raising our three girls and running things on the home front. But most of all I remember the great relationship we had with our customers and how we were so important to each other.

Vern: Yes, just to say that those years were a wonderful time in my life—from 1958, when I first met Harry Stine in Denver, until 1969 when the company was sold



Gleda and Vern pose with two of Vern's historic Big Berthas at NARAM 42 in EstesLand, Colorado. Gleda is holding the original prototype Big Bertha model.



Photo from a newspaper article in the Cañon City Daily Record (September 1969) about the merger of Estes Industries with Damon. The story was important local news because Estes employed about 275 people with an annual payroll of over \$1 million. The article also reported that the assessor's valuation of the Estes plant had jumped from \$28,633 in 1967 to \$340,366 in 1969.

to Damon. Just eleven years to join with others to establish an activity that met the needs of the youth of the day and nearly 50 years later still provides the same benefit to both the young and "not so young." I will always be thankful for all who participated in this venture and especially the millions of America's youth who sent us their orders and then waited "patiently" for the mailman to deliver.

And thank you for this chance to answer your questions and tell about our participation in those "golden days of model rocketry." As you know, I am in the process of writing a book titled "Dear Mr. Estes." In this book each chapter begins with questions taken from letters I received from our young rocket customers during the early days. Instead of answering your questions I will be answering theirs.

Readers may contact me through my web site (www.vernestes.com) if they would like to contribute to my book by telling about their own youthful model rocket experiences or posing questions that they would like to have answered in the book.