

**CASH  
AWARDS**



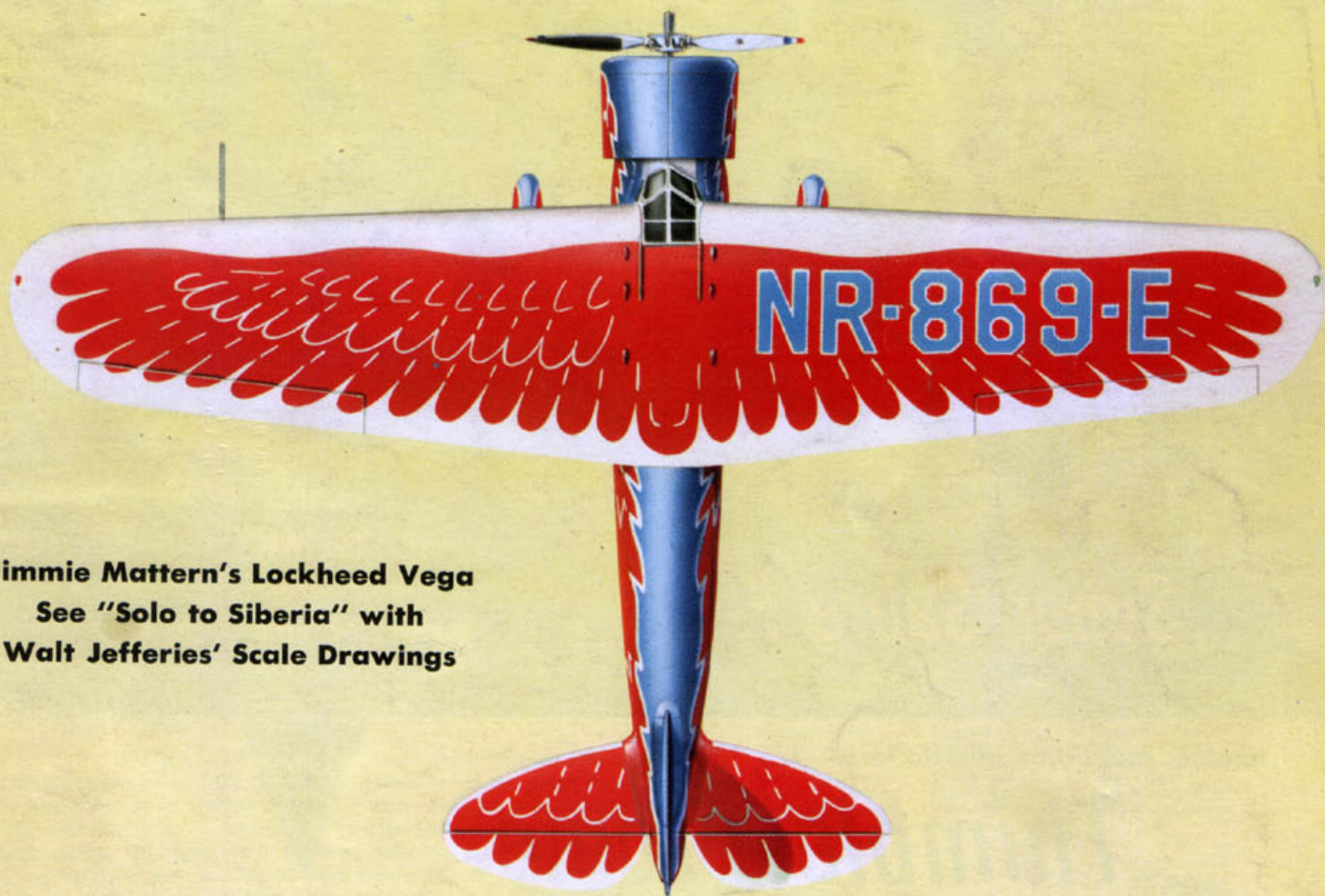
**NEW SPOTTERS CONTEST**

See Page 32

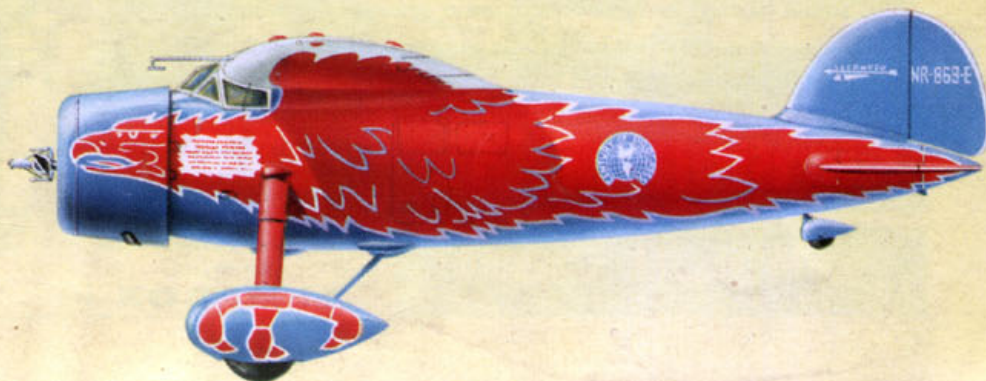
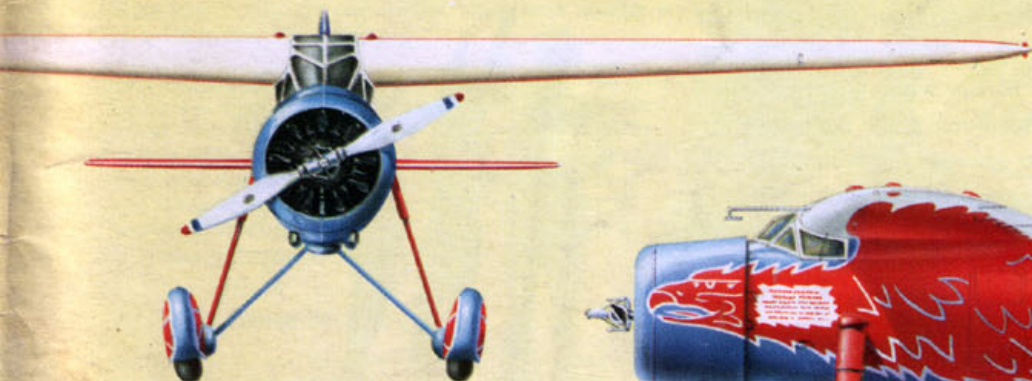
*American*

DECEMBER 1958 • 35 CENTS

# Modeler<sup>®</sup>



**Jimmie Mattern's Lockheed Vega  
See "Solo to Siberia" with  
Walt Jefferies' Scale Drawings**

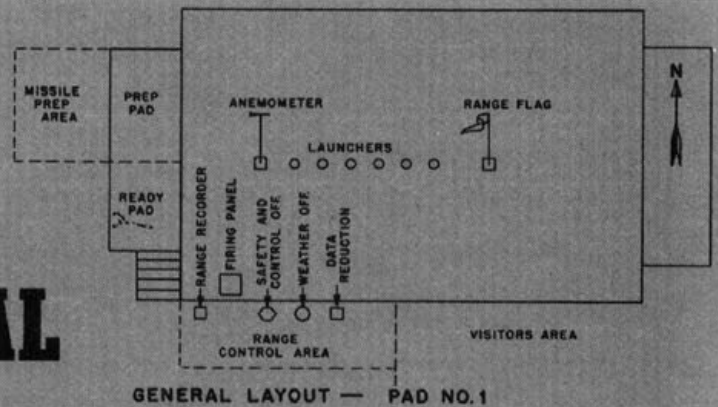


*Jefferies*

What's it like to fire a model missile?

Come along with G. Harry Stine to ...

# Colorado's LITTLE CANAVERAL



■ There is a lot more to model rocketry than building and flying your own missiles. Sooner or later, you're going to want to know how well your missile performed and how high it went.

To do this job for its big missiles, the government has spent several hundred megabucks in such places as White Sands and Cape Canaveral. Fortunately, you don't need to have this sort of money to set up adequate proving ground of your own.

And if you're going to do something more than just fiddle around with model rockets, you'll need a proving ground. Once you get a reliable missile on your hands, the whole field of rocket testing opens up before you.

And model rocketry is best as a group hobby. You can accomplish a great deal more by getting together with kindred souls and pooling your resources—intellectual, technical, and financial. Per-

haps you'll form a Section of the National Association of Rocketry. This will give you a pipeline to the latest information.

It takes people to operate a good range. There are many jobs to be done. And you can have a complete rocket testing ground for as little as \$100 outlay!

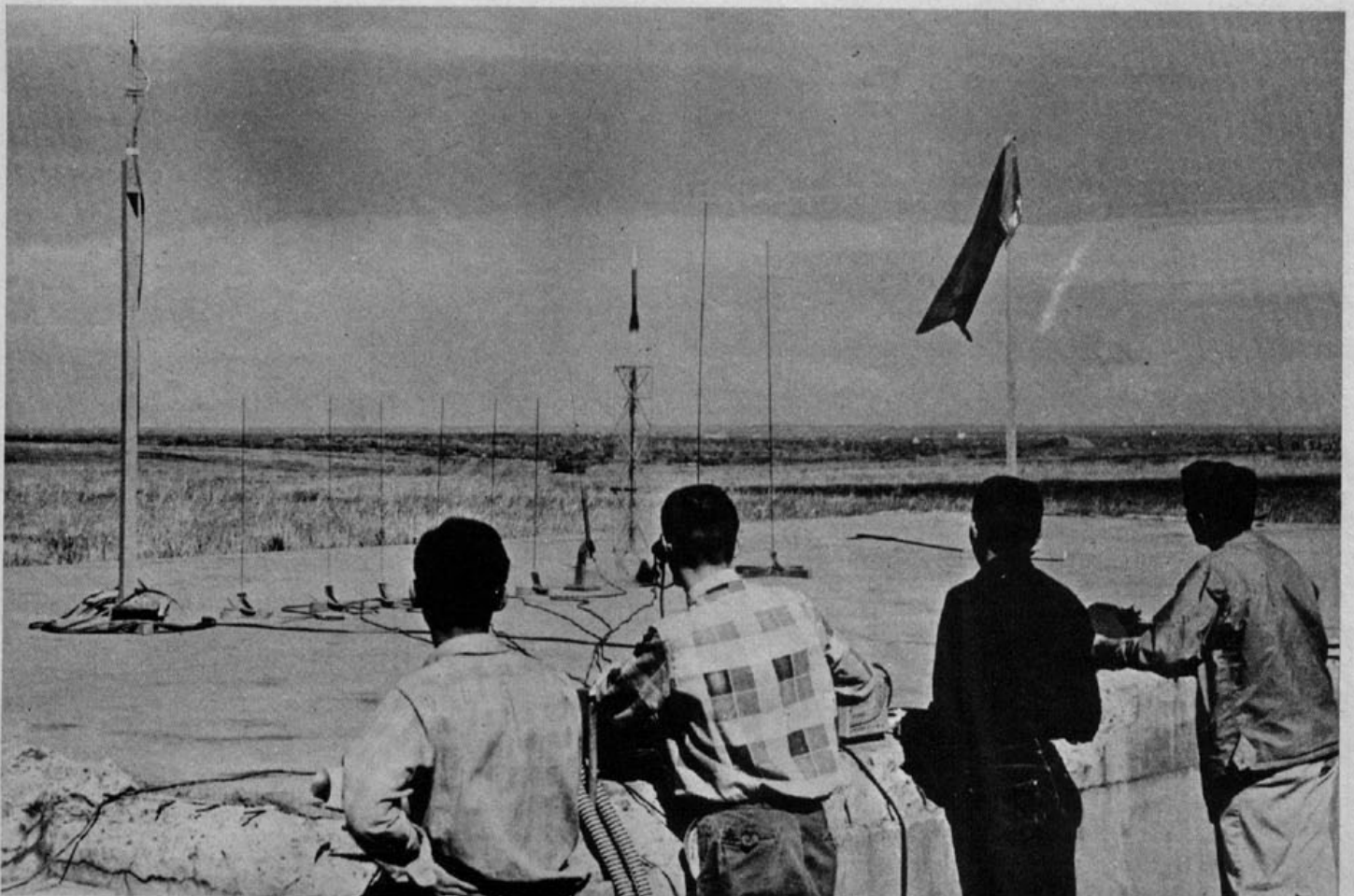
To give you some idea of what a model rocket proving ground is like, how it is set up, and how it is operated, let's take a look at what is probably the world's smallest instrumented rocket testing area.

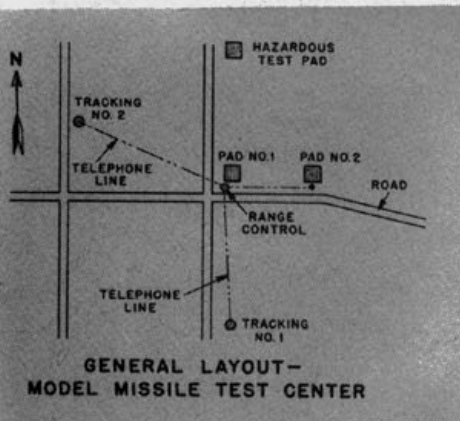
Back in the summer of 1957, we were flying the Rock-A-Chute model missiles in any field that was convenient. But we all knew that sooner or later we were going to have to get a permanent testing ground. So, in October 1957, we acquired 560 acres of land west of Denver on a use-only basis. We dubbed it the Model Missile Test Center.

The site was ideal for model rocket testing. Situated in the foothills of the Rocky Mountains at an elevation of 5800 feet, it is rolling grassland. There are 18 concrete building foundations, plus numerous small concrete pads, located all over the area. These are the remains of old ammunition storage structures located there during World War II. They are about 4 feet high, and each has an area of about 500 square feet. Because of the raised foundations, we did not need a blockhouse; if something goes wrong, all you have to do is duck!

These pads are also ideal locations for tracking stations.

When we initiated the MMTC on 3 November 1957, we had no tracking equipment—with the possible exception of several pairs of calibrated eyeballs—and we lofted missiles from only one of the pads. Now we operate three pads; those educated eyeballs have been re-

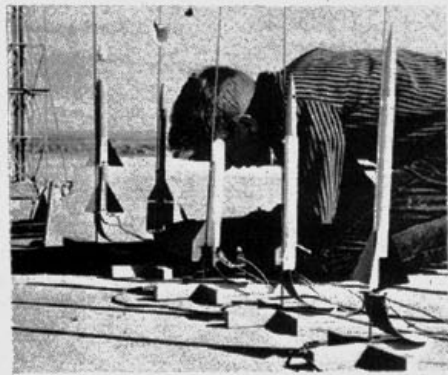




placed by accurate optical trackers.

Three of us were there to witness that first firing at MMTC. Now we have a trained crew of 18 rocket bugs plus numerous visitors.

Even though MMTC is small by ordinary rocket proving ground standards, we discovered that we had to have an organizational set-up if we were to run the place with any semblance of order. When you load two station wagons full



Model missiles come in a variety of shapes. Norman Mains hooks up igniter on a special two-stage mini-Bird.

of equipment and people and drive 10 miles to get there, it's hard to be sympathetic when somebody discovers he forgot to bring the firing panel! And it's totally impossible to ride herd on 18 people when everything has got to click with safety. Each *must* be where he is supposed to be, with the equipment he is supposed to have, when somebody's prized experiment is thrashing around up in the wild blue yonder.

We also wanted to fly model missiles—a lot of them. This takes top-notch coordination. We set a goal of firing 12 missiles per hour per pad, safely, and under conditions such that we could learn what they were doing upstairs.

Prime factor had to be safety, and all operations had to be under the control of a single person. (The committee system doesn't work work a hoot on a rocket range!) So MMTC *always* has a Range Safety & Control Officer (usually me) at the Range Control point who is

"Missile away!" (left). Copy of Navy's ASP missile rises from MMTC pad. All firing is done electrically. At right, Dick Krushnic on phone and Art Ballah on tracker follow ASP.

American Modeler — December 1958

in overall charge of everything. Sort of a Lord-High-Everything whose very word is Law on the proving ground. The RSC Officer keeps his eyes on everything that goes on, and no missile is launched without his final okay: "Range is clear!"

Squirting model rockets up into the air on such an organized proving ground requires a "housekeeper" to take care of ten million little items. This Range Services Division is presided over by Norm Mains, an ardent young rocketeer from Denver, who in turn has various section chiefs under him such as the security boys who watch the roads coming into the area, handle all visitors, and generally make sure that people are where they are supposed to be. And the communications section that takes care of the half-mile of telephone wire that strings around MMTC and links the various stations to the Range Control point as well as the public address system which is hooked right into the telephone net.

Norm's division includes a meteorological section devoted to keeping an eye on the weather with a battery of barometers, thermometers, psychrometers, and anemometers. Weather information is often very valuable when it comes to figuring out why a test turned out the way it did (or didn't).

Of course, there is the recovery section which runs its tail off all over the area, bringing the missiles back for inspection, check-out, and refiring.

Somebody must gather information on the performance of a missile in flight. This is the job of Range Instrumentation run by Art Ballah from Cherry Hills, Colo. When a missile is launched, his crew takes over and, with special instruments, gets information on how high it went, whether it flew properly, and where it landed. To do this, they set up four optical tracking stations. Two of these stations are close-in to the launchers and track missiles up to 1500 feet high. If a bird is expected to go higher than that, the other two stations farther out are manned. The close-in locations are equipped with tracking telescopes which are nothing more than surplus rifle telescopes mounted on camera tripods with metal protractors affixed to them for determining azimuth and elevation angles. The high-altitude stations are equipped with much more powerful telescopes.

These tracking stations follow a missile to the peak of its flight. The azimuth and elevation angles from each station are then phoned back to Range Control.



John Wong prepares missiles for flight test. Photos are by Jim Katzel at Model Missile Test Center near Denver.

At Range Control, Grant Gray mans the slip stick and trig tables to reduce this angular data to altitude data by means of trigonometry. Within 5 minutes of a missile launching, we know how high she went.

Because it is quite possible to fire a model rocket completely out of sight, Art and Grant have an electronics group which is developing a super-miniature rocket-borne transmitter weighing an ounce (with batteries) and capable of fitting into a space 1 inch in diameter and 2 inches long. Using this, they will have an electronic tracking system similar to (but simpler than) the Minitrack system used for earth satellite work. An off-shoot of this is the development of a side-circuit to transmit information on such things as air temperature, solar radiation, and air pressure.

Strangely enough, most of this equipment is quite simple, straightforward, and inexpensive. It has to be. We are working with small missiles, and every fraction of an ounce means hundreds of feet of altitude. Space is also limited. (So are funds!) This has required us to take a close look at what data we want to get and the simplest way to get it. We can't afford 100 pounds of instrumentation wrapped up in a \$50,000 missile. The results of forcing people to design within limits has made us all sit down, use the old noodle and sweat.

For example, we all knew that photographs of missiles in flight could tell us a lot. But who can afford a high-speed telephoto camera at \$1500 a throw? Forced with this sort of limitation, we worked out ways to get the poop using ordinary 16mm movie cameras (second-hand). We learned how to paint the missiles for maximum visibility and with contrasting paint patterns which could tell us roll rate and attitude. We learned how to track missiles with a camera to get the best results. So we got hundreds of feet of film, and you'd be surprised at the amount of information we can extract from this film using our second-hand action film editor. Slow motion studies of launchings in color have told us a lot about igniter action and performance of missiles as they leave the launcher.

Somewhere in this lash-up there has to be someone to get the missiles off the ground in the first place. This is the province of the Flight Test Operations Division under the iron fist of Del Hitch, a Denver engineer. A position on Del's

(Continued on page 57)

Meanwhile back at the pits—10 year old Don Miller, who was only 4½ feet tall and who had been forced to run around the taller fliers, calmly signaled for the release of his model, continued the race and won it. Some flier, this guy; he's got plenty of savvy and in time will be real tough to beat.

The biggest troublemaker for all was grass; the contest was held on a football and practice field. Some stunt jobs just wouldn't move without a push. Speed models more often than not wouldn't get off. Wheels and the dollies were the biggest we had ever seen but the blubbering engines necessary at take-off for good speed runs gave a lot of trouble. Some elected to hand launch with horrible results. But in spite of all these obstacles Arnold Nelson managed a C flight of 161 plus for a new WAM record.

Earl Cayton seemed to be the busiest man at the contest, helping everyone who needed help, fueling tanks, tuning starters, running out lines—this man just didn't stop.

**One's No Good?** We saw some marvelous scale models, one in particular was an amazing piece of work. John Geora and Bob Olsen were the builders of this SE-5A, it had everything. Shutters on the radiator which worked from the cockpit, wing-mounted gun which operated on a track just like the real one, spring locked folding windshield, side mounted gun complete with rounds of ammo, turn-buckles on each guy wire which actually worked, a small flask as a "cockpit warmer" in the pilot's hand. One can go on and on about the work in this model but—they didn't have a chance, they had only one engine. There was quite a discussion, too, about this—all friendly till someone asked whether these scale contests were contests for how many engines or a contest for scale models.

**Hi, Mom.** They had an event for the most unusual model. Mom Robbers brought down the house by flying Pop's old record holding rubber powered helicopter—it still goes good, too! Mom is quite a gal—much experience and savvy in running these model contests; she never stops working or stops buying those lovely huge hats. One thing for sure, if you hear that Mom Robbers is at a contest, just look for the prettiest large hat there—Mom will be under it. She is "Mrs. Model Building" for our money.

## Canaveral

(Continued from page 29)

missile prep crew or launching crew is the most sought-after job on the proving ground, for these boys prepare and fire the missiles. It calls for constant attention to small details, careful work at all times, and an unbending adherence to the safety rules.

When somebody shows up with a missile having doubtful characteristics or a high element of danger, Del and his trained crew fire it by remote control from a Hazardous Test Pad 100 yards away from anybody. Maximum safety precautions are used in this case, and nobody takes any chances at all. Brother, we've had some dandies that were whipped up in a basement with a chemistry set! But we handled them properly at MMTC.

But most of the missiles flown at MMTC are not dangerous in the least. With our safety system, we are all safer during model firings than on the 10-mile American Modeler — December 1958



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**Robert McMinis**

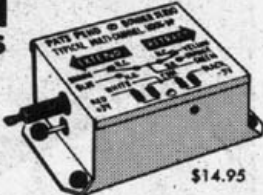
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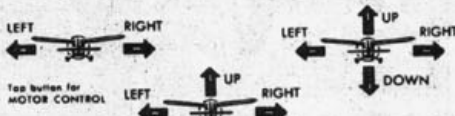
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drive on the highways to get there and back! We've flown nearly 4000 model missiles there since November 1957, and nobody has even been scratched; this is a safety record we are all mighty proud of!

Let's follow the action at MMTC in the case of a "home-brewed" design known as "Cool Yule," a slender missile 3/4-inch in diameter and about 15 inches long. It is the creation of Dick Krushnic of the Prep gang. The missile was so-named because of its gaudy red-green paint job! It is taken to MMTC on Saturday morning in the big suitcase full of missiles and is laid out on the prep pad.

Dick fills out a Fight Test Data sheet with the pertinent details about the missile, then packs the parachute and installs a Rock-A-Chute motor with igniter. Nothing flies at MMTC without a data sheet; this gives us a permanent record of what a missile did under certain flight conditions. Dick then places it (proudly) on the ready pad with its data sheet under it.

When launcher space on Pad No. 1 becomes available, John Wong picks up "Cool Yule," gives it a final inspection, and places it on Launcher No. 2. He notes this information on the data sheet, which he then gives to the recorder at Range Control.

Once all the launchers on Pad No. 1 are loaded with a "flight" of missiles, Del Hitch mans the master firing panel. Putting on his telephone headset, he calls out, "Ready on Pad No 1!"

"Trackers, man your stations! All personnel stand by for launchings from Pad No. 1!" I order as I take my position at Range Control as Range Safety & Control Officer. The key to the firing panel is my pocket where it has been since the last flight of missiles from Pad No. 1.

"Stations manned?" I ask.

"Tracking No. 1?"

"Tracking No. 1 ready!"

"Tracking No. 2?"

"Tracking No. 2 ready!"

"Trackers ready!"

I look around. The pad is clear. Everybody is standing at the edge of the pad where they can duck down if there happens to be a wild missile. There are no recovery crews in the area surrounding the pad. The roads are clear. There are no aircraft flying in the vicinity. Everything is ready.

"Range is clear!" I remark, slipping the safety key into the firing panel and turning it. "Panel is armed!"

"All stations, stand by for 'Cool Yule' going from Launcher No. 2!" Del intones as he flips the proper selector switch on the panel. He flips up the red guard over the firing switch. "Five . . . four . . . three . . . two . . . one . . . FIRE!"

There is a spurt of gas as the igniter goes. Then "Cool Yule" swishes aloft, straight and true, trailing a plume of thin grey smoke.

"Wowie!" That's Dick Krushnic.

"Straight and true!"

"It's spinning!"

"Sure it is! I put spinnerons on it last night!"

"Coming up on peak!"

"Parachute!"

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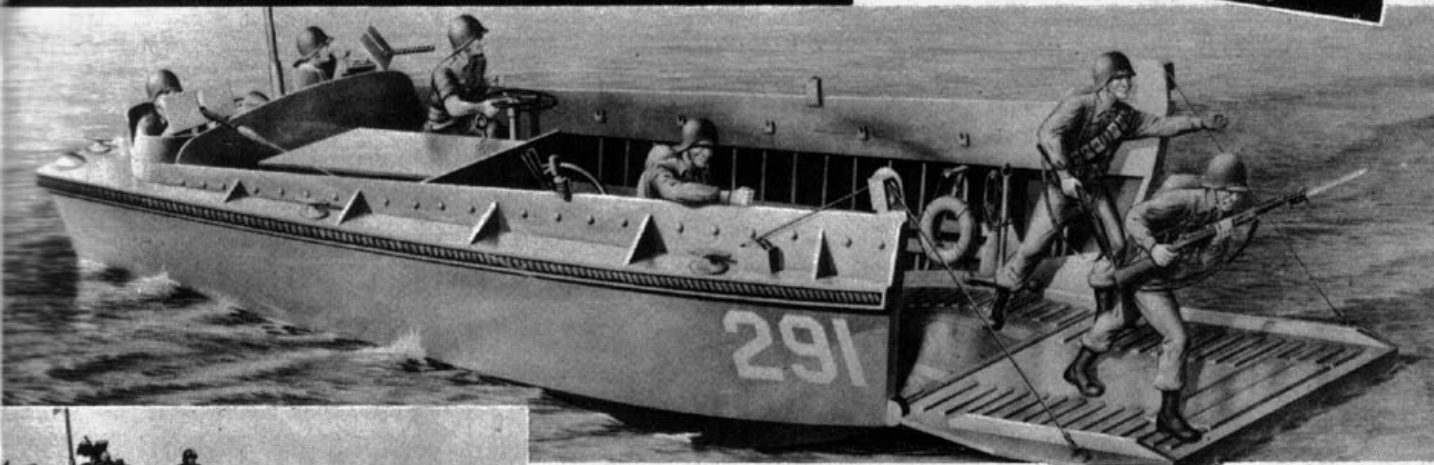
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"Recovery crew, get ready. That was a high one!"

"Panel is safe." Del turns the key off.

"Trackers, got any readings yet?"

"Tracking No. 1! Azimuth: two-zero degrees! Elevation: five-zero degrees!"

"Tracking No. 2! Azimuth: three-seven degrees! Elevation: six-two degrees!"

"Roger! Recovery, it's on the ground now! Mark it for pick-up. Dick will want that one back. It's a flying jewel!"

"I almost expected it to go ape," Dick mutters in relief. "Ape" is an MMTC term meaning that a missile has gone wild in the air. According to Grant Gray, it means, "Almost Perfect Experiment!"

But Grant is busy now with his slide rule while Paul Hubble is noting the wind direction and velocity, barometric pressure, cloud cover, and temperature. Grant gets the data sheet and writes the computed altitude on it.

"2085 feet! The record for today!" he announces as the recovery crew brings the missile back to the pad.

Dick may fly his missile several more times that day, just to check it out and see if it can reach the same altitude again. Or he may engage in a "drag race" with somebody else. A drag race with missiles means a salvo firing to see which one gets off first and reaches the highest altitude. Drag races, by the way, drive trackers and observers nuts. One parachute in the sky at once is enough. Two make you cross-eyed!

And so it goes, every weekend at MMTC. We like to think of it as a proving ground that other people can model theirs after. It is safe, smooth running, efficient, and very useful. We have fun there, and we learn things. Everyone swaps jobs often so they will get to know how everything works.

American Modeler — December 1958

We build model rockets, and we take them there to fly them. We learn about rockets there. If they don't fly, we find out why. If they do fly, we know that our theories are right. Everybody learns things there, even me, the hardened old rocketeer.

But most important, I think, are the teen-agers there who are laying the foundations for their future professions in science. They're using their high school mathematics, physics, and chemistry. They're learning aerodynamics, meteorology, optics, and electronics. They're getting to know rockets—how to design them, how to build them, and how to fly them for information, *safely*.

One of these days in the very near future, they'll be able to walk through the gates of White Sands or Cape Canaveral and feel perfectly at home.

## R/C Regs

(Continued from page 8)

The FCC doesn't care a darn about our receivers, of course. They have allocated a set of frequencies unusable with present receivers, but it's up to us to develop receivers which can work on the five new spots. Incidentally, when we do get such receivers we will find they are a lot more reliable than those we now use; it is expected that many receivers will be crystal-controlled too—thus you will never have to tune them. If you want to work on a different frequency you just insert the appropriate crystal.

There have been rules in effect for some time requiring that a continuous check be kept of the Conelrad frequencies, as long as you have a transmitter on the air. The new docket again stresses

this matter. Conelrad is a system set up among the broadcast band stations which will minimize navigational aid to be obtained by an attacking enemy "homing in" on such stations. In case of such attack or threat of it most broadcast stations will go off the air, but a selected few will remain on the frequencies of 640 and 1240 kc. Transmission will be automatically shifted among such stations in widely different localities; the shift might come in the middle of a word.

How does that affect us? Well, far-fetched as it may seem an enemy *could* home in on an R/C transmitter or some other transmitter in the CRS frequencies. The FCC wants us to keep a continuous monitor receiver going on the BC band; if the BC station to which you are tuned goes off the air you should cease R/C transmissions immediately till you find out why. Any small BC receiver will serve the purpose, and the handiest would be one of the new tiny all-transistor pocket receivers.

Summarizing, here's what the new regs mean to you:

1) You still have the 27.255 mc spot for R/C—but there will probably be more and more non-R/C transmitters using this spot.

2) You have five new R/C spot frequencies, which are so close together that no presentday receivers can make full use of them. This will force development of new receivers so they can be utilized—and will obsolete most present receivers, though some might be usable with converters. We have assurance that no transmitters will be allowed on these five new frequencies of more than 5 W input. We will have to accept interference from any "industrial, scientific or medical" equipment that might be emitting a signal on