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With the amateur—but serious—rocketeers out on the Mojave Desert, it's

FOURTH OF JULY THE YEAR AROUND

By Shep Shepherd

WHEN MAN finally ventures into actual space travel his first step will be "Space Station No. 1." The building of that space station isn't as far in the future as many of us believe. What's more, many of the problems of working and living in space have already been solved!

To most of us the idea of man venturing into space is something for distant generations to cope with. However, there are groups in Southern California that are keeping pace with the scientific minds of today who probe beyond the stratosphere.

The Pacific Rocket Society, with headquarters at 428 South Verdugo Road, Glendale, Calif., is made up of people from the ordinary walks of life: Doctors, merchants, mechanics, housewives, stenographers and the like. There is a goodly smattering among them of technicians in the field of aeronautics, people employed by the aircraft and instrument companies.

The PRS builds small, functional rockets, but they are not model-building hobbyists. The rockets they build may not travel as high as the Vikings, but they will travel as fast and as accurately. The purpose of the society is to "promote study and active research and to disseminate information in the fields of rocketry

Members of Reaction Research Society fired this 12-foot, two-stage rocket over the Mojave Desert

Not all tests are successful. Here a rocket is exploding because "throat" in a vital valve was too small

and space travel." They design and build rockets, fly them and study the results, to see if they performed as expected and if not, why not. And then they build another rocket that will outperform the previous one, solve new problems and test new theories.

The men and women who are the PRS know what's going on in the field of aeronautics every minute. Monthly meetings are usually addressed by such leading authorities as Dr. Walter Riedel, well-known German scientist now with North American Aviation, Gerald Heard, author of the book *Are Other Worlds Watching?*, Dr. Heinz Haber, author of *Man in Space,* and many other leaders in the field.

When the first flight to the moon becomes a reality there will have been no mystery in its accomplishment for members of the PRS. Man has the knowledge, ability and materials today to build a space ship capable of reaching the moon and returning. There are but two obstacles in the path of such a flight. The first is the tremendous amount of money needed to build the ship. The second is man's inability to withstand the rigors of space travel. We can build ships that will go through space but we haven't yet found how to keep the crews alive. Considerable attention and effort are being devoted to this particular problem by every agency concerned with space travel, including such layman groups as PRS.

Though they keep abreast of developments in all the kindred branches such as space medicine and the human body in space, the chief interest of PRS is building and firing rockets.

Out in the Mojave Desert, a hundred miles from Los Angeles and near the town of Mojave, there is a fenced-in area of an acre or so containing a Quonset hut, two barrackslike buildings, a blockhouse and several launching towers. This is the Mojave Test Area of the PRS. Here they go to test new fuels, telemetering equipment, altitude-recording devices, radar-tracking systems and new ignition systems. They also make static tests and conduct actual firings.

Long before the firing takes place, the project has been born in panel discussion. The rocket is first designed, then its construction planned. Various members are assigned portions of the work which is carried out in scores of private garages, basements and workrooms. The building may require several months as was the case with the latest PRS project, the XDF-23 rocket.

This rocket is a liquid-solid type, using liquid oxygen and rubber as fuel. The XDF identification puzzles many who come in contact with PRS, including some of their newer members. It comes from their first rocket which used wood in conjunction with liquid oxygen as fuel. The X indicates experimental and the DF stands for Douglas Fir, which was the wood used. The number 23 following the initials indicates the present rocket's place in evolution of the PRS series.

Following the first liquid-oxygen-wood engines, the society experimented with other solids combined with liquid oxygen. Among them were cotton and paraffin. The present solid component is a commercial rubber known as Thiokol. Some younger members of the group are testing a new fuel using liquid oxygen and commercially sold fireplace logs.

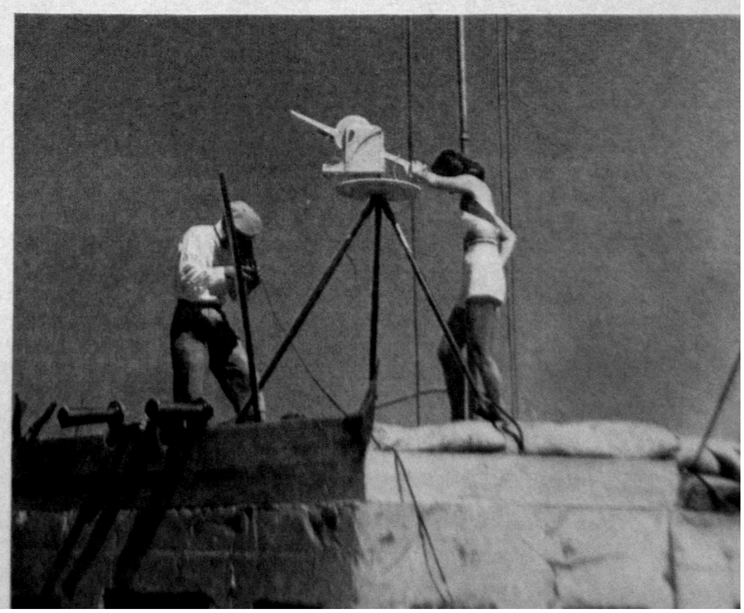
The XDF-23 is four inches in diameter and six feet long. The rubber is cast in a hollow cylinder in the rocket's aluminum combustion chamber. The liquid oxygen is injected at 300 pounds p.s.i. pressure in the form of a spray entering through a center hole at one end of the chamber. Rubber burned under such conditions behaves something like high-powered smokeless-type gun powder, according to designer Jim Nuding, and produces great thrust and safe, stable performance. Fully loaded, the XDF-23 carries a small radio transmitter in the nose section, altitude recording and timing devices and a parachute recovery system with two chutes. The weight of the rocket is 18 pounds empty and 29 pounds loaded. It has a thrust of approximately 6000 pounds at take-off.

XDF-23 is a two-stage rocket, consisting of a primary stage and a booster. Proponents of space

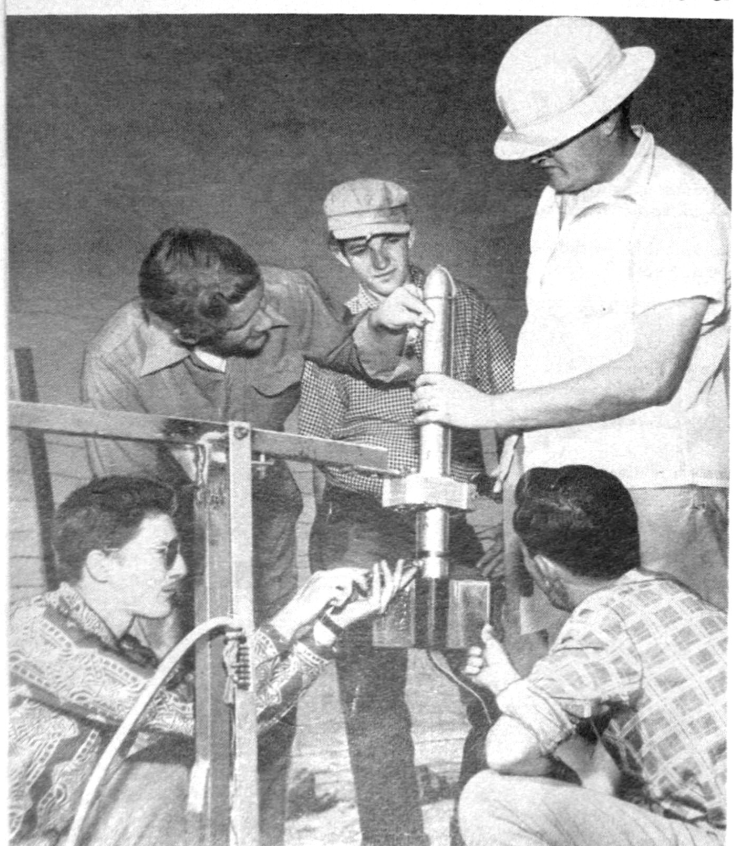
Rigid safety rules are enforced at the trials. Spectators are shielded by stout barricades when the firing button is pressed

Doctors, mechanics and salesmen are among amateur rocketeers. A gun camera, above, records instrument readings during firings

Rockets are tracked by both radar and visual methods. If the atmosphere is clear their flight can be followed by telescope



Weighing 29 pounds loaded, the Pacific society's XDF-23 uses a commercial rubber combined with liquid oxygen as its fuel. In a static test of this new fuel, below, the rocket is bolted down and the thrust of its fuel measured by a strain gauge



travel agree that the first rocket to reach outer space will be a multi-stage type, with only the final or primary stage reaching its objective, the other stages falling away in flight. The second stage, or booster, of the XDF-23 is 4½ feet long by 2½ inches in diameter, weighs 10 pounds empty, 20 pounds full and uses a micrograin fuel as a propellant. The micrograin fuel is a type developed for use in military rockets.

The booster develops approximately 500 pounds of thrust for 9/10 second. Its function is to get the primary stage out of the launching tower and up to flying speed quickly enough that it will continue on its way in straight, vertical flight under its own power. The booster has its own parachute which is pulled from its socket by the primary stage as the booster falls away.

Out at the test area an actual firing is carried out under the supervision of several members, working as a team. Each official is identified by the color of his safety helmet and arm band. There is a test-area coordinator, test director, six members of a firing crew, safety police and an information officer. The firings are open to the public, the latest one drawing 125 spectators without a word of publicity or advertising.

The booster is placed in position first in the launching stand. The rocket is then lowered into position, resting on the booster. The ignition system is hooked up and tested. At this point the green flag flying over the blockhouse is pulled down and a yellow flag is hoisted, indicating that the testing of the circuits has been completed and loading the rocket with liquid oxygen is about to begin. Everyone but the firing crew and official photographers retires to places of safety behind the blockhouse or other solid objects.

The tank of liquid oxygen is raised to a platform alongside the launching tower, connected to the rocket, the valve is opened and liquid oxygen flows into the chamber. The loading requires about 10 minutes, after which a red flag replaces the yellow one, indicating that pressure is starting to build up. The nose section is bolted on and the igniter wires connected.

Inside blockhouse, a cameraman waits for man at right to press firing button after a 10-second count-down

The crew now retires to the blockhouse where the pressure gauge on the rocket is observed through a telescope. When the pressure reaches 300 pounds p.s.i., a 30-second warning is sounded. At 10 seconds a red flare is fired and the 10-second count-down begins. At the word "Fire," a button is pressed and the rocket and its booster take off in a burst of white smoke.

If every preparation has been carried out with the minutest precision the rocket will rise with a roar, the booster will fall away and float to earth on its parachute and the primary stage will continue on its way out of sight. It will reach an altitude of several miles and travel at supersonic speeds. A radar-tracking system will follow its flight. At its maximum altitude, the slender aluminum cylinder will turn nose down and start back to earth. At 5000 feet a barometric switch will explode a small charge of black powder to separate the nose section from the main body and release the two recovery chutes. A recovery crew in a Jeep will recover the rocket if possible.

The society plans to hold at least three public firings per year in the future. There are numerous problems aside from those concerned with actual firing. An example is determining and allowing for the effect of expansion and contraction when a vehicle is in a launching tower at ground level in 100-degree temperature one minute and perhaps 40,000 feet high, in a 40-degree-below atmosphere, the next.

There are other problems more mundane in nature but equally important to the over-all success of the project. Persons with any of the more ordinary talents are invited to join the society.

Between the drawing board and the launching tower, the building of a rocket will have need of the talents of people proficient in photography, engineering, radio, astronomy, chemistry, writing, painting, carpentry and many more of the mechanical crafts.

There are many men now living capable of building a space ship that could fly to the moon or Mars. When the human weaknesses have been overcome and the first space ship stands ready for the greatest of all adventures—the first flight into space—there will be no lack of volunteers for the voyage. They will come from knowledge-seeking groups like the PRS who have had a hand in the countless failures that will lead to the final success. ★ ★ ★

To the Editor:

The article "Fourth of July the Year Around" in the April 1954 issue, was well written and excellently illustrated. However, there are several errors of fact which need correcting.

The micrograin propellant, mentioned in the article as "a type developed for use in military rockets," was actually discovered by two members of the Reaction Research Society, George James and John Cipperly, in 1943 and has never been used by the military in any way. Its low cost and ease of handling have made it an excellent solid propellant for the civilian rocket societies to whom the RRS has made the formula available without restriction or charge.

The Reaction Research Society, whose flight rocket graces the first page of the article, has erected a 40-foot launching tower and a two-ton test stand—largest facilities ever built by a nonprofessional group—at the Mojave Test Area. Its address is: Box 1101, Glendale 5, Calif. The Pacific Rocket Society address is: Box 698, Hancock Station, Los Angeles 44, Calif.

With thanks and appreciation of your interest in us and also in our friendly rivals,

Arthur Louis Joquel II,
Reaction Research Society,
Glendale, Calif.