Is Solid Or Liquid Rocket Fuel Best?

By JACK STILLMAN
Associated Press

HUNTSVILLE, Ala. — Which method of propelling a rocket is better, with liquid or solid fuel?

Ask this question of an expert and he will tell you: It depends on what your rocket is supposed to do.

Dr. Wernher von Braun, director of the Marshall Space Flight Center, says the Russians use liquid propulsion in their biggest space missions—including the recent man-in-space flights. The Saturn space booster, the 1½-million-pound thrust vehicle that is the free world's largest space vehicle, also uses a liquid system.

But in space vehicles of the future, says von Braun, liquid and solid systems likely will be combined, and some vehicles might use nuclear and electronic propulsion systems as well.

"In my opinion, there will be in the foreseeable future important places in the science of rocketry for both liquid and solid boosters," von Braun said.

"Undoubtedly the future will see more and more a mixture of propellant in multi-stage rockets —liquid, solid, nuclear and electric. We are conducting research in all of these areas and intend to use each to the maximum practicable extent."

The solid propellant rockets are descendants of ancient Chinese rockets. When Francis Scott Key wrote about the rockets' red glare, he was writing about solid-fuel rockets.

Rocket men refer to propellants as fuel is a general sense, since all chemical propellants are composed of two constituents—a fuel and an oxidizer.

Getting a giant booster off the ground without it blowing up is not like shooting a firecracker. One scientist said that should a rocket the size of the Saturn booster blow up, it would wreak untold havoc for many miles.

Solid propellants, which look something like hard rubber, have built-in oxidizers and are ready to go at the touch of a spark. Those working on the Saturn system frankly admit they would not relish working with such a booster filled with solid fuel.

"If it went off accidentally, you wouldn't have a chance," said one. "But that goes for a liquid motor, too, although the chances of a liquid engine exploding are considerably less."

The solid rocket comes already loaded, since the solid fuel first is liquified and then must be cooked to its hardened state. This must be done at the factory.

Thrust Is a Factor

The advantage of solid rockets for military use is obvious. They are ready to go at a moment's notice.

But solid propellants are unable to produce the thrust that liquid propellants produce. The power of a propellant is determined by its "specific impulse." A pound of solid propellant would produce only about 75 or 80 per cent of the thrust obtained from the same amount of liquid propellant.

The second major drawback is that the entire casing of a solid fuel rocket is subjected to the full pressure of the combustion chamber. This is because the flame burns inside the entire length of the casing.

There are several arguments in favor of liquid propellants. They give a higher thrust; they are safer; they are easier to control during flight, and they are easier to make.

In a liquid propellant rocket, the fuel is stored in tanks at modest pressure. Pumps force the fuel into the high pressure combustion chamber of the rocket chamber shortly before firing.

But liquid propellants have drawbacks, too. There are hundreds of nozzles, valves, pumps, regulators and other parts necessary to control the flow of the liquid. If they all work properly, that's one thing. But when one goes wrong, chances of a failure are high.

Looking To the Future

A nuclear rocket would be similar to conventional chemical rockets except that the fuel would be heated in a reactor rather than burned in the nozzle. This would mean a lighter rocket, since the fuel tanks or solid-fuel casings would not be needed.

The nuclear rocket also would have a higher specific impulse.

D. E. Cleveland
... Past President's Award

Paper Wins First For Cleveland

A paper, "Driver Tension and Rural Intersection Illumination" by Donald E. Cleveland has been selected as first choice in the competition for the Past Presidents' Award of the Institute of Traffic Engineers.

Cleveland is assistant research engineer, highway design and traffic engineering section, Texas Transportation Institute, Texas A&M. He will present the paper at the 31st annual meeting of the Institute to be held August 24 in Washington, D.C.

He is a graduate of Massachusetts Institute of Technology, BS degree in civil engineering, major in transportation engineering, 1949 and the master's degree in civil engineering, Yale University, 1959. He is also the holder of a certificate in highway traffic studies, Bureau of Highway Traffic, Yale University.

Cleveland came to A&M in 1959. Prior to that he was research assistant, Bureau of Highway Traffic, Yale University, 1950-51; enlisted instructor, The Engineer School, Fort Belvoir, Va., 1951-52; traffic engineer (lieutenant), office chief of transportation, Washington, D. C., 1952-53; traffic engineer and chief traffic engineer, Ramp Buildings, Corp., New York, 1954-56; research associate, Bureal of Highway Traffic, Yale University, 1956-59.

He is a member of many scientific and professional organizations and the author of numerous publications on traffic.

Railroads Consent To Combine Tracks For Underpass

The railroads through College Station have consented to combine their tracks for the building of the underpass at the junction of FM 60 and FM 2164. These plans will be sent to the Interstate Commerce Commission for approval.

According to C. B. Thames, District high engineer, the project could be ready to contract in the spring of 1962.

The city of College Station will furnish the right-of-way. The highway department will pay 80 per cent and the railroads 20 per cent of the remaining cost.

Two years ago, the plan was to build an underpass for the two tracks. The addition of 51 feet, gained by using only the west track, will cause a revamping of the highway intersection plans.

Aggie Born Same Time, Same Place As His Father

Were you born on the same date that your father was born?

This is easy, according to Manuel Camacho, a 19-year-old A&M student from Colombia.

Manuel, and his father, Don Andres, weren't only born on the same date, but they were born in the same room, in the same hospital, and both were delivered by the same doctor.

Both father anr son were born in Cali, Colombia, on April 19, in room 319, General Hospital, and in both occasions Dr. Mauricio Salas was the obstetrician.

Says Manuel, "All I hope now is that my son follows the example set by his father and grandfather."