SPACE

Mariner Has Enough Gas

➤ AMERICA'S MOTORISTS have good reason to be jealous of the Mariner spacecraft—it looks like a good bet to travel 350 million miles to Mars without running out of gas.

Mariner's gas is not a favorite brand of high octane, however, or even rocket fuel. If Mariner completes its mission, sending 22 pictures of the "red planet" back to earth, it will owe success to five pounds of compressed nitrogen.

Two titanium bottles aboard the craft each contain 2.5 pounds of the gas, pressurized at 2,470 pounds per square inch, which is about 170 times the pressure of the air you breathe. Each bottle feeds gas to six gas jets mounted at the outer ends of Mariner's four solar panels.

These jets have several jobs. The most important of these is keeping the solar panels aimed at the sun.

Light-sensitive sensors keep watch on the sun and tell an electronic computer which jets to fire in order to keep the spacecraft on target. Without the sun's energy, Mariner's batteries would be dead in nine hours.

Another group of sensors stay fixed on a bright star, enabling a high-gain antenna aboard the craft to send a continuous stream of data back to earth.

During most of the journey the star will be Canopus.

However, an object one-third the size of a human hair can throw the sensors off the track if it should pass between them and their star.

This has happened, but since the antenna can be repointed by a radio signal from earth as long as the sensors are locked on a star, the National Aeronautics and Space Administration was content to let Mariner ride along fixed on a star called Gamma-Vela until it re-aimed itself.

When the big moment arrives and Mariner approaches Mars, the jets will be responsible for pointing the spacecraft so that its television camera is facing the planet.

Besides all these aimings and pointings, the gas jets are used to make corrections in the route to Mars. The corrections are not automatic, but require signals from tracking stations on earth.

How can all these tasks be done over such a long journey on a mere five pounds of gas? The answer, says NASA, is that under 2,470 pounds of pressure, a little gas goes a long way, Each jet does its job with only .004 pounds of thrust.

One Mariner project official estimated that the craft could make a correction every six days the size of the recent "midcourse maneuver" and still be in no danger of running out of gas. Another informed source said that Mariner has enough gas to make a 360-degree turn every day throughout the trip. A full turn would take 47 minutes.

• Science News Letter, 87:29 January 9, 1965

SPACE

Plane to Aid Spacecraft

➤ FUTURE UNMANNED spaceships like the Mars-bound Mariner vehicle may someday benefit from a device that is helping to land planes right here on earth.

The device, a radioaltimeter, is a super-accurate instrument that tells airplane pilots to within a few inches how high they are above the airstrip. It was recently shown as part of a system that can land a plane automatically with no help from the pilot.

The extreme accuracy of a radioaltimeter, compared with a conventional altimeter which works by measuring air pressure, was essential for the "hands-off" system. However, this accuracy was also the cause of a problem, very similar to one now facing the Mariner spacecraft.

The instrument was so sensitive at low altitudes that even a ditch or small piece of equipment on the runway would cause the indicator needle to jump. Rough ground leading up to the runway would make the altimeter dial an unreadable blur.

The solution, developed by Lear Siegler Inc., builders of the "no hands" landing system, was to "desensitize" the radioaltimeter so that any object on the ground that passed in and out of range in less than one-tenth of a second would not register on the dial.

The Mariner spacecraft has a different problem, but one National Aeronautics and Space Administration official said that a similar kind of desensitizing might be just the answer.

Mariner is equipped with a number of light-sensitive trackers that stay pointed at certain stars in order to guide the various antennas and solar cells. However, even very tiny objects can detract the trackers from their targets, leaving the spacecraft spinning aimlessly until it can be refixed on a star. A micrometeorite only one-third as thick as a human hair can confuse the trackers if it catches the light of the sun.

A possible solution for future missions may be to desensitize the trackers so that any object that flashes through their field of view in less than a certain length of time will not break the hold on their target. This could be done quite simply, said a Lear Siegler engineer, by designing a circuit that would amplify signals lasting beyond a set period of time. Besides insuring the accurate aiming of the antennas, such a system could reduce Mariner's dependence on the gas jets that must make corrective maneuvers every time the trackers lose their hold.

• Science News Letter, 87:29 January 9, 1965