SPACE

Second Mariner Launch

Although the Mariner spacecraft probe to Mars will be of little help in planning future manned flights, the vehicle will photograph the Martian surface.

➤ THE SCHEDULED second Mariner Mars probe will be of relatively little help in planning future manned flights to Mars since it will neither have to land on the planet nor return to earth.

The Mariner vehicle following its unsuccessful predecessor, is intended to photograph the Martian surface from no less than 7,000 miles away, after a 350-million-mile journey from earth.

Though the eight-and-one-half-month journey poses numerous problems for Federal space agency scientists, it is a simple task compared to landing a man on the red planet and getting him safely home.

In the first place, the "orbit" of Mariner will not really be an orbit at all. The spacecraft will just fly out to Mars and beyond, except for a slight dip behind the planet to measure its atmosphere by sending radio signals through it.

A future manned landing, however, is another matter. That will probably require the use of a preliminary orbit around Mars, from which some sort of flying crew capsule will descend to the surface. Even if the crew never sets foot on the ground, getting in and out of an orbit will multiply the problems of a fly-by several times.

The planet Mars offers its own special set of difficulties when it comes to actually setting down a spacecraft.

Early studies indicate that winged gliders or jets would allow a slow enough descent to prevent overheating, and a controlled touchdown at the end. However, early this year scientists at Mt. Wilson and Palomar Observatories and Jet Propulsion Laboratory discovered that the Martian atmosphere is only about one-third as thick as had been believed, making it as thin as the earth's atmosphere 15 miles (79,000 feet) above sea level.

A thinner atmosphere, requires more wing area for a glide approach. Therefore, any winged landing capsule would have to be extremely large. The same problem would apply to parachutes, leaving only one solution—rocket brakes, or retrorockets.

Retrorockets would eliminate the need for wings, but the fuel they need would probably weigh more than the fixtures they replaced.

While getting down is easy, it is the stopping that causes trouble.

Assuming that six or eight astronauts have landed on Mars, the job is still only half done.

The return trip is slightly easier. The gravity of Mars is only 39% of the earth's, which means that less fuel and less weight are needed for the trip back to orbit and then to earth.

Even if the Mariner probes were designed to land on Mars, adapting them for the round trip would be a monumental undertaking. All the actual field work for a Mars-to-earth flight will have to be scientifically "guessed at," on the basis of information from the Apollo manned moon program.

Since the thin atmosphere of Mars poses such a problem for controlled landings, one would expect earth's heavy atmospheric blanket to be a blessing.

However, at every moment the earth's dense air threatens to burn reentering space vehicles to cinders, and her relatively high gravity, two and a half times as great as that of Mars, pulls approaching objects down 32 feet per second faster, for every second they fall.

In addition to braking rockets, therefore, a Mars-earth vehicle must carry some sort of shielding to protect it from the heat. Such a vehicle will be entering the atmosphere at almost 65,000 feet per second, compared with only 36,000 feet for the returning Apollo moonship.

The Mariner probe should provide reasonably clear pictures of the surface of Mars, but it will only show objects no smaller than about one mile across. A future unmanned crash-landing spacecraft is planned, loaded with devices to detect the presence of life. There will even be a manned shot that will go into orbit around Mars, but will return home without actually having landed on the planet.

None of these, however, can duplicate the difficulties that will be encountered on the planet-to-planet program.

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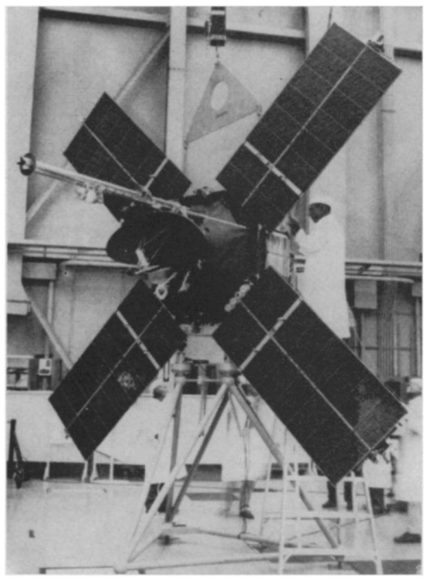

National Aeronautics and Space Administration

MARINER SPACECRAFT—Four solar panels extend from an octagonal base. The elliptical dish in the center is a high-gain antenna.

Agena Stage Important

➤ THE FIRST of the two Mariner Mars shots, launched Nov. 5, failed to perform properly and is traveling in a useless orbit around the sun.

The Agena D second stage, cause of an early failure in the first launch, is particularly important to this mission, since for the first time it will be stopped and restarted in space. The restart will serve to actually set the Mariner off toward Mars, after it has been coasting around earth for several minutes to get properly lined up with the red Planet.

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SPACE

Clear Photos Of Moon

➤ THE RANGER 7 SPACECRAFT, which crashed on the moon after transmitting thousands of beautiful photos of the lunar surface back to earth, was a much better "cameraman" than the Mariner Mars probe will be.

In the first place, Ranger was able to take pictures continuously, all the way down to a few hundred feet above the moon. Its photos revealed objects only a few inches across. The Mariner, however, will probably get no closer to Mars than about 7,000 miles.

Ranger also kept its cameras busier than will the Mariner. In barely 17 minutes Ranger took 4,316 shots. The TV camera aboard the Mariner spacecraft will run for about 14 hours with a maximum of 22 pictures.

This seeming inefficiency is not, however, the fault of the camera. The problem lies in transmitting data over 150 million miles.

Each picture consists of about 250,000 black and white dots, like those on the television screen.

The TV scanners aboard the Mariner pick up the dots at the rate of 10,700 every second, but the dots can be transmitted back to earth only at slightly more than eight dots per second. This means that the pictures must be recorded on tape and transmitted at a later time.

Since at that rate it takes about eight and one-third hours to "play back" each picture, only a few pictures can be transmitted before the spacecraft is out of range of the receivers on earth.

The relatively slow transmission rate is necessary because of the narrow band width required to keep the background "noise," or interference, as limited as possible. Ranger 7, since it was much closer to the earth, could be understood over much higher noise, allowing the use of a wider radio band and a higher data transmission rate.

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