SPACE

U.S. and Russia Both Launch Probe to Mars

➤ THE UNITED STATES and Russia in late November both launched space probes designed to pass close by Mars.

The Soviet craft, however, was reported to have run into trouble, having lost half its power supply. The Zond-2 was hurled toward Mars on Nov. 30.

Two days before that, the U.S. sent Mariner IV hurtling toward the red planet. The Martian probe carried equipment to take 20 still TV photographs of the planet's surface, as well as to monitor the environment on the long journey from earth.

Both vehicles were launched close to the deadline in the month-long period starting Nov. 4 during which a rendezvous with Mars is most feasible. Because Mars and earth are constantly changing their relative positions, favorable opportunities for shooting spacecraft from earth to Mars occur only about every 25 months.

Mariner IV was identical in design to Mariner 3, which was launched on Nov. 5. The four solar panels designed to furnish the vehicle's power failed to unfold as planned after Mariner 3 was kicked into space so its batteries soon gave out.

The unsuccessful probe was expected to go into orbit around the sun no more than halfway between earth and Mars, the planet next out from the sun.

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SPACE

Photocell Locked Star With Mariner Craft

➤ THE SAME KIND of photocell that automatically opens doors locked Mariner IV onto the second brightest star in the sky, Canopus, at the start of its Mars flight.

The difference is that the photocell used on the Mariner was very carefully designed to respond within narrow limits only to the light from stars of about the first magnitude.

Although Mariner's photocell locked onto four other stars before Canopus, the system nevertheless performed magnificently. The Canopus-seeking system in the space probe was unlocked by command from earth each time it latched onto the wrong star.

The Mariner probe when it did its star selecting had already been stabilized in its position in space with respect to the sun in two dimensions. Both its pitch axis (nose up or down) and yaw (nose left or right) were fixed. The lock on Canopus was needed to stabilize the roll axis, the one about which turns are made, in order to aim the radio antenna directly toward earth.

The Canopus-seeking system had another test when a mid-course correction was made on Dec. 4, in order to put the probe on a path bringing it closer to Mars. Then both the sun and Canopus sensors were unlocked and rockets fired. After that, the light-detecting photocells again sought the sun and Canopus to lock the spacecraft into the desired position on its new course.

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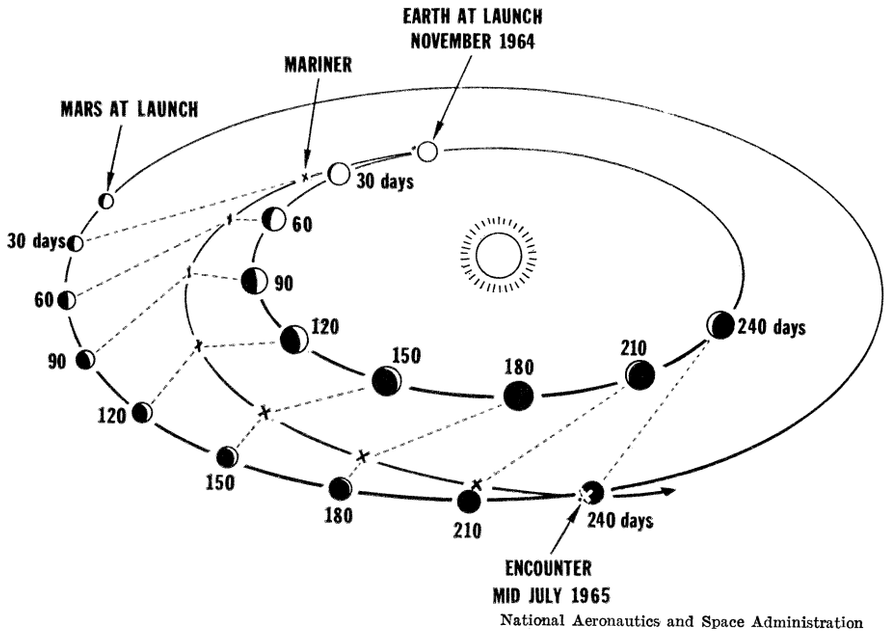

National Aeronautics and Space Administration

MARINER TRAJECTORY TO MARS—As it travels through space, the Mariner is expected to provide engineering experience on the operation of a spacecraft during a long-duration flight away from the sun and to perform scientific measurements in interplanetary space between the orbits of earth and Mars and in the vicinity of Mars.

SPACE

Power Biggest Problem

Power shortages that have troubled Russia's Zond 2 Mars vehicle have also been a problem to United States space vehicles such as Nimbus 1.

➤ THE POWER SUPPLY troubles that may have doomed the Russian Mars probe are by no means foreign to United States space scientists.

A number of important American satellites and probes have suffered from power shortages that severely hampered their performance. Nimbus 1, the remarkable weather satellite that took the first night photos of the earth's cloud cover, succumbed to a power failure less than a month after it was launched.

Friction, built up in the motor that controlled the position of the solar cell power supplies, had "frozen" the cells at an angle away from the sun. With no way of recharging, the energy from the satellite's batteries drained away until the receivers aboard could no longer pick up commands from earth that might have restored the satellite's power.

The Orbiting Solar Observatory, OSO I, went beserk in late May 1962 and started spinning wildly in space, making it impossible for its solar panels to fix themselves on the sun. So much power was used in attempts to slow it down that the batteries went dead and all data transmissions to earth ceased.

Eleven weeks later, however, without any warning, transmissions started again. Either the earth's magnetic field or friction in the satellite itself had caused a slow-down to the point where the solar panels could aim themselves at the sun and recharge the batteries.

A satellite does not have to carry fuel, since it can use the energy of the sun, but its power supply is still a critical item. Misdirected solar cells are not the only problem.

One day last year Telstar II, Bell Telephone's communications satellite, just stopped working. Apparently a meteorite, traveling many miles a second, had smashed into Telstar's power supply. All the solar cells in the world would not have made any difference. The satellite came to life 26 days later, although no one is certain how power was restored.

One of these problems may have beset the Soviet Union's Zond 2 Mars vehicle. Perhaps Zond can get itself "out of the hole," although scientists are pessimistic.

Power will always be a problem in space even though fuel may be easily obtained. Scientists are designing countless experiments for future space missions, and the experiments will probably work, if the power is there.

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