SPACE

Need New Energy Source

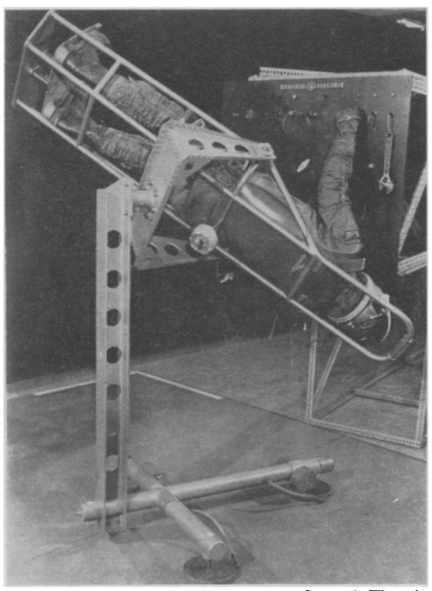
A new fundamental discovery that will provide the energies for visits to distant planets and other star systems will be needed before such trips can be made, a leading scientist says.

➤ "THE IDEA of going to visit distant planets and other star systems is in the realm of fantasy today," Dr. Hugh L. Dryden, deputy administrator of the National Aeronautics and Space Administration, said.

A new fundamental discovery in nature, providing energies to make such trips, would be necessary, Dr. Dryden said. He said improvements in propulsion can be foreseen but no revolutionary new methods are now in sight.

The NASA scientist addressed the annual meeting of the American Rocket Society at Los Angeles as von Karman lecturer, named for Theodore von Karman, famous Hungarian scientist who was responsible for the organization of the first industrial company to apply engineering principles to manufacture of rockets.

The most important space goals of the future, Dr. Dryden believes, are three possibilities beyond the present lunar program:



General Electric

SPACEWORKER—The problem of how an astronaut repairman works on a spacecraft in orbit is being studied on an earth-bound machine called the Spaceworker at General Electric Company's Valley Forge Space Technology Center. The weightlessness of space is simulated in the machine. Thus, when the worker tries to tighten a bolt with a wrench, the bolt does not turn—he does.

1. To explore the moon more extensively from established moon bases.
2. To explore the planets, Mars and Venus.
3. To launch earth-orbiting laboratories in which scientists can live while conducting experiments on such things as the effects of weightlessness and radiation.

Dr. Dryden in his lecture said that he believes solid propellants will be used increasingly in the future but that the next major advances in space will come from the application of nuclear propulsion. The exploration of the solar system beyond Mars and Venus would definitely require nuclear energy. Large amounts of material can also be most efficiently transferred to the moon, Venus and Mars, using nuclear energy.

He believes such trips will be considered in the 1970s. He said most deep space missions could be conducted most efficiently by using a space station as a take-off point.

Such a space station could also be used as a base for engineering and building spacecraft designed solely for operation in space and for assembly of still larger space stations.

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More Efficient Booster

➤ A RECOVERABLE rocket booster capable of sending one-third more men and material into space than the Saturn C-5, at one-thirtieth the cost, has been designed by a team of scientists at Douglas Aircraft Company, Culver City, Calif.

The Douglas booster ROOST (Reusable One-stage-to Orbit Space Truck) will be able to send 320,000 pounds into orbit around the earth at $35 a pound as compared to $1,000 per pound now being spent, Robert J. Gunkel, one of the Douglas team, told SCIENCE SERVICE.

The new booster not only would be more economical, it would prevent traffic jams in space from non-recoverable booster shells now accumulating in the wide vistas of outer space.

As conceived, ROOST would be made up of a cluster of 12 engines, each with a million pounds of thrust. Together with the recovery system, the space package would weigh 9,600,000 pounds at takeoff. According to the Douglas scientist, it could be adapted to shoot a 240,000-pound nuclear-powered rocket (as part of its payload of 320,000 pounds) to the moon from an earth orbit.

This would, he said, make possible a soft landing. A chemical upper-stage rocket as part of a payload could use 40 per cent of its weight to escape the earth, but it would impact hard on the moon since power for braking would be missing.

Philip Bono, a member of the ROOST team, told the American Rocket Society meeting in Los Angeles that the key to the recovery system of ROOST is an inflatable fabric cone and a doughnut shield carried into orbit as part of the rocket equipment. The cone, fashioned of heat-resistant material, emerges from the base of the rocket and inflates during reentry.

The doughnut-shaped bag girdles the rocket at its midsection to support the wider section of the cone against reentry pressures.

Heated hydrogen gas for inflation enables easy handling of the entire half a million pound weight of the empty booster and shield during recovery operations. It can be recovered from land by a trailer transporter after its feather-like descent. At sea, the 273-foot-high shell can be towed back to a land-based inspection area.

Both booster and recovery sack can be reused after reconditioning. The third member of the ROOST team is F. H. Bergonz.

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Compute Trips to Planets

➤ TWO SCIENTISTS have contrived a method for determining the best paths for astronauts who want to take a trip to Mars or Venus with the least amount of weight.

By analyzing all the possible trips to a planet, the minimum weight necessary, counting both space hardware and men, can be calculated, Robert V. Ragsac of Lockheed Missiles and Space Company, Palo Alto, Calif., told the American Rocket Society in Los Angeles.

He and R. R. Titus, also of Lockheed, used a set of velocity contour charts that gave them figures for departure and arrival speeds from earth to the planet and from the planet back to earth.

From these they were able to pick a total travel time showing both when a spacecraft leaves the earth and when it returns. By varying the time of the trip to and from a planet, they were able to determine the required mass. The method can be used either for direct departure to the planets or for the rendezvous technique of joining various pieces of a spacecraft together while in earth orbit.

The scientists said they had also determined the most advantageous time to leave earth, which is about the time when the planet is in opposition. They calculated the time for an advantageous trip to Mars as 1971.

The trips to planets for which computations have been made involve weights of about one million pounds. The lowest weights possible can be figured in each case when the transportation system to be used is chosen.

The transportation system includes the spacecraft, the number of men making the trip, the type of system selected to guide the spacecraft into orbit around the planet and the system for escaping the earth at the beginning of the space voyage.

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