SPACE

Ion Engines: Key to Space

Astronauts could fly to Mars between 1975 and 1980 in electrically propelled spacecraft powered by ion engines. Trips as far as the planet Pluto may be possible.

See Front Cover

➤ BY 1975 or 1980, United States astronauts may be ready to make a round trip to Mars in an electrically propelled spacecraft powered by a cluster of ion engines.

The ion propulsion system was described as the possible key to very long-range travel in deep space—not only to near planets such as Mars and Venus, but for the much longer trips to Neptune or even Pluto, more than 3.5 billion miles away.

Ion engines do not provide enough thrust to boost a space vehicle out of the earth's gravitational field. But after a chemical rocket engine provides the initial boost, low-thrust ion engines can take over to provide the continuing, steadily increasing velocity needed for long hauls.

Payloads may be as big as 50% of the spacecraft's initial mass. Ion engines may require 20 or 30 times less fuel than conventional chemical rockets.

An experimental engine was demonstrated at Hughes Aircraft Company's research laboratories, Malibu, Calif. Hughes began work on the engine September 1, 1960, under contract from the National Aeronautics and Space Administration.

The engine is seen being readied for testing in simulated space on this week's cover.

Scientists from NASA and Hughes are predicting space tests of a more advanced engine by late next year, and a test of a complete ion propulsion system by 1965. Unmanned, instrumented probes driven by ion engines would follow, possibly leading to manned flight by 1975 or 1980.

In space, the engine's main power source will be a reactor that converts nuclear energy to electricity. Cesium is the chemical used as fuel. The atoms of cesium are converted to ions when cesium vapor is diffused through a hot tungsten element. The ions are accelerated to a high exhaust velocity by applying voltage to a system of electrodes. Electrons are then injected into the high-velocity ion beam to provide space-charge neutralization.

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ASTRONOMY

Ancient Meteor Split To Hit Earth Twice

➤ AN ANCIENT meteor bombarded earth and made two hits, one in the United States and one in Australia, after circling the earth as a natural satellite.

Dr. H. J. Axon of the University of Manchester, England, suggests this explanation to account for the fact that two meteorites, although found half a world apart, are remarkably similar in their structure. He believes the meteor from which the meteorites came could have been heated up and then cooled down as it journeyed around earth in a non-circular orbit.

The meteorites, a 500-pound one from Bear Creek in the United States and a 71-pound one from Narraburra in Australia, are not only chemically identical but have the same microstructure, Dr. Axon reports in Nature, 191:1287, 1961.

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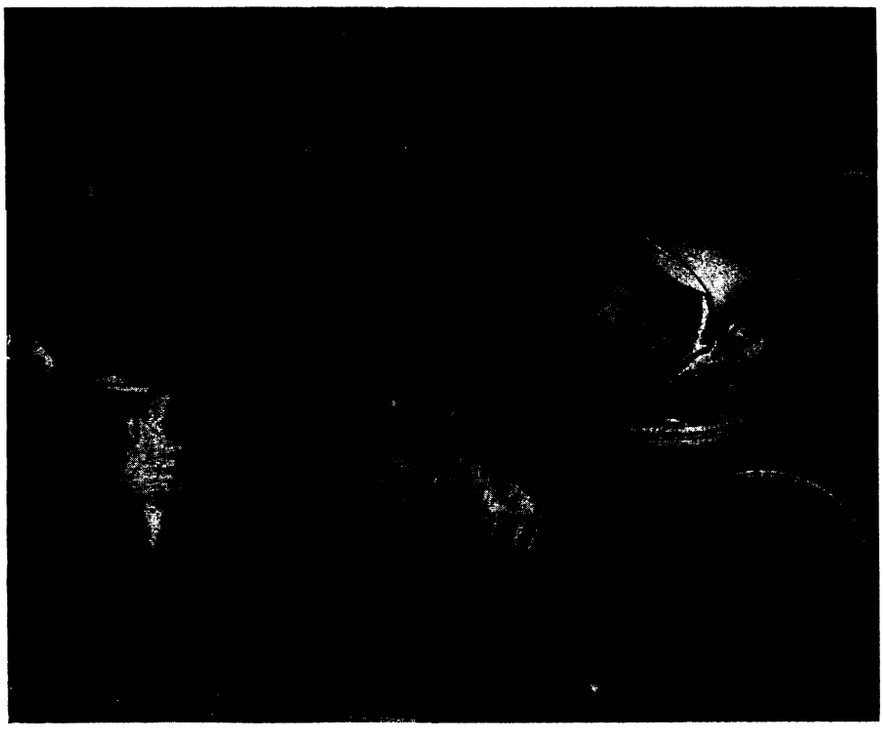

SET FOR SPACE—"Space technician" makes pressure adjustments on self-contained space engine whose batteries are recharged by means of solar cells.

SPACE

Space Engine to Run Indefinitely on Battery

➤ A COMPACT, electrical space engine, capable of operating indefinitely by battery and solar cell power, has been developed.

The lightweight engine, which obtains its thrust from the magnetic "pinching" of an inert gas such as nitrogen, was described by scientist Alfred E. Kunen, of Republic Aviation Corporation, Farmingdale, N. Y. He said the company expects to have a "flyable" model ready for space flight early next year.

The new engine meets practical requirements, both size and weight, for actual space ship and satellite use. It can be operated continuously in near and deep space for years without the need of service of any kind, Mr. Kunen said. Engines of this kind will be needed to propel and "steer" space ships from planet to planet with pinpoint accuracy, and for other missions that include control for reconnaissance, and communication satellites for military and commercial purposes.

Mr. Kunen said it is the ideal acceleration system for: 1. maintaining spin rates in satellites that are spin stabilized, 2. changing a satellite orbital path when such changes are necessary, 3. maintaining a satellite in a low-altitude position offsetting the effects of outer atmosphere drag, 4. maintaining a satellite in a 24-hour orbit to perform such delicate functions as rendezvous or docking of smaller satellites with larger space stations, and 5. preserving the relative position of a host of satellites performing a single mission.

The pinch plasma engine, Mr. Kunen explained, uses readily available inert gases for fuel. The fuel becomes ionized after injection into the engine and the resultant plasma is electromagnetically accelerated and exhausted out the nozzle at extremely high velocities. The high velocity of the exited plasma results in economical use of fuel. Exhaust gas velocities of over 100,000 miles per hour and ejected gas temperatures in the order of 200,000 degrees Fahrenheit have been measured.

Yet relatively cool wall metal temperatures of 200 to 300 degrees Fahrenheit are maintained, eliminating need for auxiliary cooling effects. Practically no erosion of primary engine components ever has been encountered. There are no moving parts in the engine.

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