

NASA to test part of Einstein's theory of relativity

The National Aeronautics and Space Administration has started the development of a space experiment to test the equivalence principle which is a cornerstone of Albert Einstein's General Theory of Relativity.

Called the "Gravitational Redshift Space Probe Experiment," the project is being managed by the NASA Marshall Space Flight Center for the NASA Office of Space Science. Preliminary design of the hydrogen maser experiment is being done under contract with the Smithsonian Institution Astrophysical Observatory. That contract is expected to be amended later this year to provide for the design and development of the experiment, which will be launched by a Scout-D rocket from Wallops Island, Va., in late 1974.

The equivalence principle asserts that there is no way to distinguish in a small region of space between the pull of gravity and an oppositely directed mechanical acceleration. A consequence of this principle is that when two identical clocks are in two locations in which the gravitational pull is different, the clock rates will appear to an observer to be different.

It should be noted that the clock rates themselves are not changed; it is the geometry of space and time that is warped by gravity. Because a light wave escaping

from the strong gravitational field of the sun or other massive body will have its frequency decreased or shifted toward the red end of the light spectrum as it travels to a weaker gravitational field, this effect is called the "gravitational redshift."

In this experiment, a clock will be launched in a 3 1/2-hour elliptical flight trajectory over the Atlantic Ocean. During the flight, this clock will always be in a

weaker gravitational field than an identical clock which will remain at a Bermuda Ground Station. Hence, the frequency of the clock in the probe, as observed by telemetry, will always appear to be greater than that of the clock on the ground and the observed effect will actually be a "blue shift." Moreover, as the clock rises from the Earth through the increasingly weaker field to its maximum altitude of

18,000 kilometers (11,185 statute miles), it will appear to run increasingly faster.

Its rate will then progressively appear to decrease as it returns to the stronger field at lower altitudes. During the flight, the difference between the clock rate in the probe as indicated by the telemetry signal and that on the ground will be compared with the shifts predicted by Einstein's Theory.

The Smithsonian Astrophysical Observatory will develop hydrogen maser clocks for the redshift experiment. These clocks are the most stable ones available for the period of a few hours in which the experiment will be conducted. They are stable to a few parts in one quadrillion and will provide a measurement accuracy within two thousandths of one percent for the predicted effect.

After completing the design

study, which is scheduled to be done by June 30, the Marshall Center will begin building the payload support system (payload structure, transponder batteries, antenna and thermal control), concurrently the Smithsonian group will build the space maser clock with its control and signal processing equipment as well as the ground station clocks and associated ground equipment. MSFC will be responsible for payload

integration and testing. John Stone of the Marshall Center's Program Management Directorate is manager of the experiment. Richard F. Jenkinson of the Smithsonian Astrophysical Observatory group will contribute to payload development and is coordinated by Fritz Weiler. Rudolf Decher of the Space Sciences Laboratory is providing scientific support for the project.

Summer graduates file for degrees

A&M students who expect to complete undergraduate degree requirements and graduate during the first summer session should make formal degree application by June 16.

Registrar Robert A. Lacey emphasized the application is the responsibility of the graduating student.

Application should be made in Room 7 of the Richard Coke Building, after the \$5 graduation fee is paid at the Fiscal Office. The fee receipt must be presented to make application.

Graduate degree filing will be conducted separately during the second summer session.

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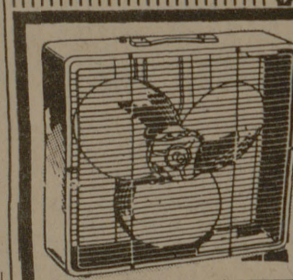


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