

Rocket Testers Guard People's Eardrums

► **LOUD, ANGRY** rumbles from rocket engine tests that could shatter windows and eardrums more than 10 miles away are prevented by a team of weather-watchers at one of the nation's biggest space installations.

When the U.S. Army Corps of Engineers supervised the building of the National Aeronautics and Space Administration's Mississippi Test Facility (MTF) in Bay St. Louis, Miss., they were careful to leave as much of the dense surrounding forest standing as possible. In addition, they separated the MTF from the surrounding area by a five-mile-wide "buffer zone" of trees covering more than 127,000 acres. But this was not enough.

MTF is the test site for the S-IC and the S-II, the first two stages of the huge Saturn rocket that will carry three Apollo astronauts to the moon in 1969. The S-IC will produce 7.5 million pounds of thrust, while the S-II will add a million more.

Weather presents an additional problem. In the warm, humid climate around the MTF, alternating horizontal layers of warm and cool air called temperature inversions are quite common, and can often work almost like a mirror to reflect sound waves out over the top of the buffer zone and into surrounding communities.

There is no way to eliminate temperature inversions, so a team of weathermen at the MTF uses radar and other instruments to spot them in advance. When an inversion appears likely to be at the wrong place, the test is postponed.

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GEOPHYSICS

Space Waves Give New Information About Sun

► **STUDIES** of waves that have traveled millions of miles through space are providing scientists with new information about the sun and the space between it and earth.

Discovery and analysis of these waves, called hydromagnetic waves, are bonuses of space exploration. Although their existence and some of their behavior have been predicted theoretically, they cannot be tested in a laboratory but only through scientific probes in outer space.

Hydromagnetic waves are caused by disturbances in a plasma, a gas electrified internally but neutral as a whole, when affected by a magnetic field.

Dr. Paul J. Coleman Jr. of the Institute of Geophysics and Planetary Physics at the University of California, Los Angeles, has probed the behavior of plasma in interplanetary space using records from scientific instruments

carried aboard Pioneer V and Mariners II and IV.

In interplanetary space, the plasma flowing out from the sun at speeds up to 300 miles per second is magnetized through its interaction with the solar magnetic field. The plasma flow, called a solar wind, is very hot, about 360,000 degrees F. It has one of the lowest known densities.

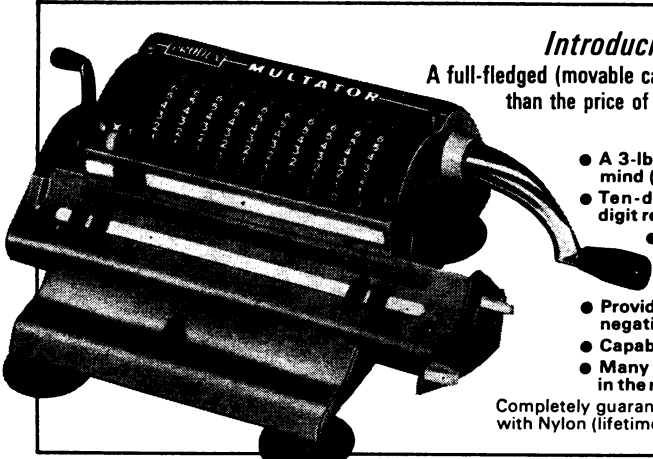
This solar wind, however, causes some major effects on earth. It pro-

duces the aurora borealis in the northern night sky, affects the transmission of shortwave radio signals, and is believed to produce the Van Allen radiation belt encircling the earth.

By carefully analyzing variations in the solar wind, a skilled observer can deduce some of the properties of the plasma's apparent source, the sun, and the interplanetary space through which it has traveled.

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There are basically just two kinds of calculators that make economic sense. If you can keep one of those \$800 electric machines whirring a good part of every working day then anything less is no bargain. But if you are a businessman, engineer, a shipping clerk or plant foreman (who figures bids and such), a doctor, storekeeper — anyone who spends even 30-minutes a day writing figures on paper — then this last word from Germany can definitely save you expensive time and costly mistakes, without making a major capital investment. The MULTATOR-4 not only multiplies and divides at a brisk clip, but it can perform tricks only a few of those very expensive machines have been taught: such as automatic re-entry* and read-out of negative balances (bookkeepers take note!). This compact wizard from Hamburg naturally extracts square roots, but then, quite a few of those expensive machines can do that also.

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*What is automatic re-entry? To take a simple example, suppose you want to figure $3 \times 4 \times 5 \times 6$. Except on the most expensive calculators, you would have to remember and then re-enter manually the results of the first two calculations to reach the final answer. That's how mistakes happen. But not with the MULTATOR-4. Re-entry is automatic, so the whole calculation is performed in one continuous operation. You memorize nothing. Re-enter nothing. The MULTATOR-4 does it all for you. Automatically.

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