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## Science & Technology

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# What science loses when it loses the Solar Polar Mission

by Marsha Freeman

Last month, in a burst of budget-balancing stupidity, the House Appropriations Committee eliminated funds for the most important project remaining in the space program of the National Aeronautics and Space Administration (NASA)—the Solar Polar Mission. The action brought immediate protest from the European Space Agency (ESA), which had already spent \$30 million on the joint project. The Europeans are still hopeful they can pressure American policymakers to restore the program.

They have weighty arguments on their side: The Solar Polar Mission would give scientists a “new window” on previously unexplored aspects of solar, interstellar and interplanetary space. It exemplifies the crucial role of space exploration in answering the most far-reaching questions of basic science.

The Solar Polar Mission would launch two spacecraft to probe the sun from opposite poles simultaneously, providing our first three-dimensional view of the heliosphere (the solar “atmosphere”). Because the polar regions of the star are less active than other regions, scientists believe, measurements and observations of activity underneath the surface or corona could reveal much about the nature of the thermonuclear fusion process. The sun, in effect, is the nearest working fusion reactor to the earth.

The two solar spacecraft, one built by NASA and the other by ESA, would include both stationary instruments targeted in fixed directions, and spinning platform-mounted instruments. The mission would be the first to send craft outside the solar system’s plane of the ecliptic—no previous spacecraft has had sufficient boost—thereby obtaining a view of interstellar space free of the interferences of the solar system.

NASA’s Space Shuttle would launch the two spacecraft on a trip to Jupiter. Making X-ray measurements as they fly by the giant planet, the craft would be boosted by Jupiter’s immense gravity into a path above the ecliptic plane.

The craft would then explore the following:

- **The corona:** Mariner 2 verified theories of a solar wind blowing continuously outward from the sun’s outer, halo-like layer in 1962. Scientists learned that some high-speed streams in the wind cause magnetic storms on earth, which they believe originate from “holes” in the corona. A white-light coronagraph and an X-ray/UV (ultraviolet) telescope will provide a three-dimensional view of the corona, and peer down into the “holes”—the aim is to predict geomagnetic and auroral activity as much as 10 days in advance, important for short-wave radio communications, navigation and geological exploration systems using magnetometers.

- **The convection layer:** The sun’s magnetic fields apparently originate in a layer closer to the thermonuclear reactions at the sun’s core. Fusion heat cannot escape as fast as it is produced, producing a convection layer of circulating fluids and energy which, in conjunction with the sun’s rotation—faster at the equator than the poles—produces effects like sun spots, solar flares and prominences. Some mission instruments are designed to explore all of these phenomena.

- **Solar bursts:** High-speed protons and electrons sporadically burst from the sun at near the speed of light, believed to originate from huge, fiery eruptions on the surface—solar flares. Some seem to linger, then flash across space; others stream instantly outward. The spacecraft will “listen” to the radio waves these flares emit, and try to track them. They will also “listen” to other waves generated locally in interplanetary space; they interact with the solar wind.

- **Interstellar space:** Most matter and energy entering the solar system never reaches earth. Interstellar gases are blocked by the solar wind, whose magnetic field keeps out low-energy charged particles and robs cosmic rays of their energy as well. Operating above the ecliptic plane, the Solar Polar mission craft will detect cosmic rays in their pristine state, and throw open a new window on galactic space and these many interstellar phenomena.

There is another issue—apart from the specific benefits to be realized from the Solar Polar Mission itself. Its temporary cancellation by certain fools in the U.S. Congress is one more step in dismantling NASA, and ending all space exploration. Yet, space exploration itself must be returned to at least 1960s levels if U.S. economic and scientific strength is to be revived—in the way NASA and the space program effected mighty improvements in U.S. education, effected important spinoffs for industrial applications, and captured the popular imagination around the Idea of Progress. So, the issue of this particular space mission is a broader issue—industrialization versus deindustrialization. The Europeans stand for the first, but currently, both the White House and Congress stand for the other.