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Mars Balloon Could Offer Supersharp, Superfast Surveys

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The craft would use these celestial guides to find its way to locations transmitted to it from Earth a day or two prior, Pankine said.

En route from one destination to the next, the balloon would cruise at some optimal height, currently estimated at six miles (about ten kilometers) above ground. The chosen elevation would allow it to float clear of most Martian topography—though volcanoes towering up to 15 miles (25 kilometers) high would present some formidable steering challenges.

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Floating Science Lab

On the drawing board, the balloon is about a hundred feet (30 meters) in diameter. Its four-micron-thick (about 156 millionths of an inch) envelope will be constructed of composite materials engineered for maximum strength and lightness.

"We're looking further into the future," Pankine said, "perhaps ten years, when more advanced materials will be lighter, more efficient, and more reliable."

The Earth's stratosphere provides a relevant test lab for how materials may function in the thin Martian atmosphere. Altitude-record-breaking balloon ascents are providing Pankine's team with valuable feedback on balloon construction.

The craft would be delivered to Mars by conventional rocket technology. After release, the balloon would descend through the planet's atmosphere and automatically inflate.

The beefy apparatus is being designed to carry a payload of 185 pounds (84 kilograms)—including a suite of scientific equipment.

From its bird's-eye position above the Martian surface, the balloon should be able to record the planet's topography, geology, and polar caps with high-resolution cameras.

Instruments on the balloon itself should capture valuable atmospheric measurements that neither orbiters nor rovers can acquire. "One example is to measure methane in the atmosphere," Pankine said. "Recent discoveries of methane in the atmosphere of Mars may indicate biological activity on the surface."

Direct measurements from a balloon may enable scientists to trace the gas's source—biological or otherwise.

A circling balloon could also drop instruments onto the planet's surface for closer looks at particularly intriguing locations. "It could drop small rovers the size of coffee mugs, because you don't need them to travel very far," Pankine said.

Miniature chemical and/or and biological labs to collect and analyze samples could also conceivably be deployed. Seismological stations might be distributed around the planet at the poles and equator to measure and map Mars's quake activity for clues to its internal structure.

One of the project's most intriguing aspects is its longevity. The balloon requires no power for propulsion and very little to change the angle of its steering wing.

"We also need power to keep instruments warm and operational," Pankine said. "It's on the order of a hundred watts. It can easily be provided by a solar panel."

With the sun providing a potentially limitless power source, it's not clear how long such a craft could transmit its unique perspective on Mars.

"It will probably terminate because of a mechanical or an electrical failure or excessive leakage of buoyant gas," Pankine said. "At some point it would just collapse. But it should be pretty robust."

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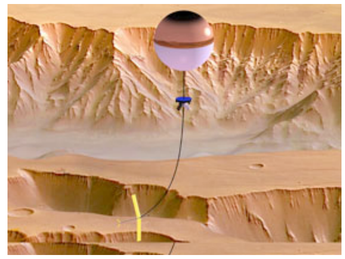

In an artist's conception, a proposed balloon-based Mars spacecraft surveys the planet's surface. A wing suspended below the balloon is designed to aid in steering. Planetary scientists say that such a craft could conduct detailed surveys of the red planet in a fraction of t

Illustration courtesy Global Aerospace Corporation, based on background image of Mars © ESA/DLR/FU Berlin (G. Neukim)

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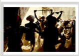

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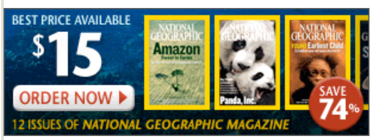

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