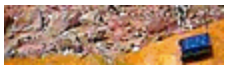

MARSDAILY

Exploring Mars With Balloons

Altadena - Feb 11, 2004

illustration only

Balloons outfitted with innovative steering devices and robot probes may be the best way to perform detailed surveys of Mars in preparation for human exploration. Dr. Alexey Pankine, a project scientist at the Global Aerospace Corporation, presented an analysis of balloon applications for Mars exploration at the Space Technology and Applications International Forum in Albuquerque, NM on February 10, 2004.

His presentation, entitled Mars Exploration with Directed Aerial Robot Explorers, is based on research funded by the NASA Institute for Advanced Concepts.

At the center of the presentation are guided balloons that can float in the Martian atmosphere for months. Balloons have long been recognized as low-cost observational platforms and are routinely used in observations of the Earth's atmosphere. In 1985, two balloons were successfully deployed in the atmosphere of Venus for a short mission.

However, what has restrained the wider use of balloons in planetary exploration was the inability to control their paths in atmospheric winds. Attaching an engine to a balloon would convert it into an airship and likely make it too heavy, too power dependent and too expensive to send to another planet.

Faced with this problem, Global Aerospace Corporation has proposed to use an innovative device called the StratoSail balloon guidance system that allows the user to control the path of a planetary balloon. The device is essentially a wing that hangs on a long tether (several miles) below the balloon.

Relative wind differences between the two altitudes create a force that pulls the balloon across the winds. Dr. Pankine reports that a small, lightweight wing can pull the balloon with a velocity of about 1 m/s across the Martian winds. This may not seem much, but applied constantly (without consuming power) over a 100-day mission, it would allow for pole-to-pole exploration, as well as targeted reconnaissance of possible sites for human exploration on Mars.

Guided balloon platforms would carry high-resolution cameras and other instruments to study the atmosphere and surface of Mars. The extended range of guided balloons can provide opportunities for highly adaptive observations during science missions. Just like rovers, if an interesting site is found, a guided balloon platform can be commanded to observe it.

However, the range of the guided balloon is the entire planet, not the immediate vicinity of a rover landing site. A guided balloon can deploy a small rover, miniature geo-chemical laboratory or a small navigation beacon at the site of interest with greater precision than if it were delivered from orbit.

Rocket-propelled airplanes are also being considered as a means of surveying Mars; however, such airplanes would only make pre-programmed flights over very limited areas which makes them ill suited to meeting global or regional reconnaissance objectives of future human exploration.

"The ability of long-duration guided planetary balloons to alter their flight path in the atmosphere, to deploy surface probes, and to carry out detailed reconnaissance make them a very powerful tool for future Mars exploration," says Dr. Pankine. The figure illustrates a guided balloon platform operating at Mars.

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MARSDAILY

How to Land Softly on a Hard Planet

Pasadena (JPL) Mar 25, 2002

Just one of the many problems in landing on another planet, after it's been determined where to land and the method to get there, is landing safely. For JPL, a

safe landing is "the name of the game," as engineers work to prepare two rovers for the journey to Mars.

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