Astronomy

Speeding to the solar system's edge

Could blowing a magnetic bubble into space propel a spacecraft to the edge of the solar system?

Funded by NASA, Robert M. Winglee of the University of Washington in Seattle and his colleagues are beginning to test this novel means of transport in the laboratory.

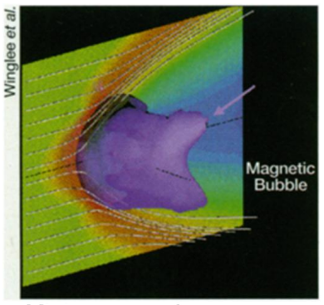
The design depends upon the interaction between the solar wind—a breeze of charged particles that blows out from the sun—and a magnetically confined cloud of particles. This bubble acts as a miniature version of Earth's magnetosphere, the region around the planet controlled by the terrestrial magnetic field.

Just as the magnetosphere shields Earth from the solar wind, the craft's magnetic bubble deflects the wind. When the swiftly moving solar breeze is diverted around the cloud, it imparts a kick that the cloud transfers back to the spacecraft.

Unlike proposed solar sails, which will get their power from sunlight bouncing off their mirrored surfaces (SN: 8/21/99, p. 120), this means of propulsion does not require special materials or the deployment of huge structures in space, Winglee notes.

Inside a jar-size container on the craft, electrical coils would generate a magnetic field of about 1,000 times the strength of Earth's field. A plasma of ionized helium atoms and electrons that fills the container would then be spewed gradually into space. The expelled particles would drag the magnetic field along, creating a magnetic bubble some 30 to 40 kilometers in diameter that envelops the craft. The researchers plan to produce a bubble 1 m in diameter in the laboratory.

Winglee estimates that just 3 kilograms of helium fuel would keep the magnetic bubble intact for 3 months. He calculates that in that time, a spacecraft weighing a modest 136 kg could attain speeds of 288,000 kilometers per hour.



Minimagnetosphere, or magnetic bubble, to be produced by the proposed propulsion system is shown in blue and purple. The solar wind (white lines) is deflected around the cloud, imparting its momentum to the spacecraft. Red indicates high density, where the solar wind piles up.

At that velocity, an airplane would only take about 10 seconds to fly from Seattle to New York. The spacecraft could reach the edge of the solar system in about 10 years. If launched by 2008, it would beat Voyager 1, even though that craft began its journey 22 years ago.

Propulsion expert David Alexander of the Lockheed Martin Solar and Astrophysics Laboratory in Palo Alto, Calif., says it could be difficult to steer a magnetically driven craft. He adds that the system might not be well-suited for a long-term mission that requires many changes in direction. Nonetheless, "the big advantage over alternative advanced-propulsion concepts is that it is apparently achievable using current technology," says Alexander.

"[It's] a nifty idea, but we don't know if it will work as advertised until it has been tried out and really blows up [and sustains] a 40-kilometer plasma balloon," says Robert L. Forward of Forward Unlimited in Clinton, Wash. —*R.C.*

Looking for alien life from home

Searching for signals of extraterrestrial life has become all the rage among earthlings. Since May, more than 1 million people have downloaded software that sorts through signals collected by the Arecibo radio telescope in Puerto Rico, which is looking for patterns that an intelligent extraterrestrial might have created.

Dubbed SETI@home, the program requires only a desktop computer and acts like a screensaver, crunching data when the computer is idle. The analysis shows up on the user's screen and then is routed back to researchers at the University of California, Berkeley, who consolidate the data.

"SETI@home is now the largest computation ever done on this planet—we've accumulated more than 50,000 years of computing time," says project scientist Dan Werthimer of Berkeley. The software's widespread use illustrates the power of distributed computing, in which large computations are split among many small computers.

Sporting a receiver 300 meters in diameter, Arecibo is the world's largest single-dish radio telescope. It records radio emissions around the clock. Since the inception of SETI@home, scientists have dramatically diminished the telescope's backlog of data. They are now updating the software so it can search for more complex signals from space. So far, no sign of alien life has turned up.

To help with the search, go to either of the following Web sites: http://setiathome.ssl.berkeley.edu or http://planetary.org. —*R.C.*

Mars spacecraft gets a landing site

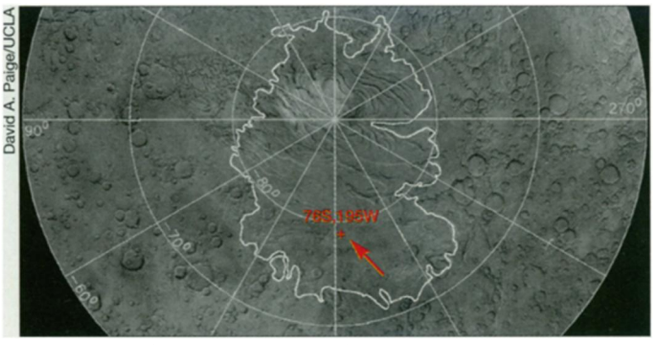
It doesn't look like much, just a strip of gentle, rolling plains. And that's precisely the point. The region on the Red Planet that NASA has chosen as the landing site for the Mars Polar Lander, expected to touch down on Dec. 3, has slopes no steeper than 10 degrees. Most of it is considerably flatter.

"We chose a location with some surface features but no cliffs or jagged peaks" so that the spacecraft can land safely yet still accomplish its research goals, says project scientist Richard W. Zurek of NASA's Jet Propulsion Laboratory in Pasadena, Calif. Unlike Mars Pathfinder, which landed on a hillier region in 1997, the lander won't have airbags to cushion its touchdown.

The smooth region lies near the northern edge of the Mars south pole's layered terrain. NASA announced its decision Aug. 25 at a press briefing in Washington, D.C.

The mission will study the layers of dust and ice that cover the pole. Changes in the thickness of these layers may indicate variations in climate over the past hundreds of thousands of years. The lander will also look for soil particles that could have formed in ancient Martian seas and later blew into the polar areas.

Ultrasharp images and laser altimeter measurements gathered by the Mars Global Surveyor spacecraft, which continues to orbit the Red Planet, were key to selecting a site. Launched in January, the lander will arrive at the end of Martian spring, a time when the sun never sets. The continuous sunshine will power the craft for 90 days. The beginning of Martian fall, when the sun dips below the horizon, will signal the end of the mission. —*R.C.*



Chosen site (designated by cross) for the Mars Polar Lander lies about 800 kilometers from the Red Planet's south pole. The carbon dioxide polar cap is outlined in white.