Press Release
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PIONEER ASTRONAUTICS DEMONSTRATES NEW MARS BALLOON REMOTE INFLATION TECHNOLOGY

Lakewood CO, August 29, 2000. Pioneer Astronautics announced today that it had successfully demonstrated a new technology suitable for use as a means of automated inflation of Mars exploration balloons.

The experiment, which involved the use of methanol to inflate a solar-heated balloon, took place at an altitude of 100,000 ft over Byers Colorado, on the morning of Saturday, August 26. It was witnessed by observers from Edge of Space Sciences (EOSS) which provided flight telemetry and tracking support, and Jet Propulsion Lab (JPL), which funded the experiment as part of a Small Business Innovative Research (SBIR) program.

The Principal Investigator at Pioneer Astronautics for the experiment was Dr. Robert Zubrin. Dr. Gary Snyder served as Pioneer's electronics lead for the program, while Dean Speith served as Pioneer's thermal physics lead engineer. Jack Jones was JPL's technical monitor for the program.

Mars balloons are of considerable interest as a means of performing aerial photography and other forms of remote sensing science from highly-mobile elevated platforms near the surface of the Red Planet. A major impediment to the planning of such missions, however, has been the lack of demonstration of a simple and reliable technique for the automated inflation of such balloons suitable for incorporation into lightweight robotic Mars exploration systems.

As a way to solve this problem, the Thermal Physics Division of Jet Propulsion Lab has been conducting research for the past several years on solar heated balloons. Such balloons employ a black or metalized coating to heat their interior, allowing them to function as hot air balloons on Mars. The Martian air is 95% carbon dioxide. By using heated native CO2 as their float gas, such systems can perform a day-long Mars aerial reconnaissance mission without the need to carry heavy high-pressure compressed gas cylinders to Mars. The elimination of such high-pressure systems both saves weight and greatly simplifies the balloon inflation and deployment process. However the payload capacity of such hot CO2 balloons is relatively limited.

In order to increase the payload of solar-heated Mars balloons, Pioneer Astronautics proposed that such balloons be sealed in the capsule with a volatile liquid, such as water, methanol, or ammonia pre-inserted in the balloon bag. Such fluids all have molecular

weights lower than that of CO2, and could thus serve as float gases on Mars. Pioneer predicted that when such balloons were released from their capsule under low-pressure Mars atmospheric conditions, the heat from the solar balloons would cause the liquids to vaporize, thereby inflating the balloons autonomously. Other analysts, however, had predicted that rather than vaporize, the fluid would pool at the bottom of the balloon, where little or no solar heat from the balloon film would be available to gasify it. In the experiment conducted on August 26, however, Pioneer's predictions proved to be accurate, and the 25 cubic ft., half-mil black polyethylene experimental balloon inflated without difficulty in less than a minute. The experiment was conducted at an altitude of 100,000 ft, where the 10 mbar pressure and –50 C atmospheric conditions are similar to those found on Mars. Inflation was verified by both live TV transmissions and recorded video recovered after landing. Altitude was measured by both GPS and barometric systems.

Commenting on the results of the experiment, Dr. Zubrin said; "This is a significant step forward for Mars balloons in general, and solar heated Mars balloons in particular. By using a preinserted self-vaporizing positive float fluid, the payload of a Mars solar balloon can be tripled, without increasing balloon size or system complexity. We can now envision using such systems to land large payloads on Mars, or to carry highly capable aerial reconnaissance platforms rapidly across the surface of the Red Planet. The winds of Mars are its highways. We've just demonstrated a fine way to take the open road."

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