9/24/93

Abstract of Proposed Paper for
IAA International Conference on Low-Cost Planetary Missions
April 12-15, 1994

TITLE: Mars Relay Satellite: Key to Enabling Low-Cost Exploration Missions

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ABSTRACT:

Recently there has been increasing evidence of a renewed focus on Mars exploration both by NASA and the international community. The thrust of this renewed interest appears to be manifesting itself in numerous low-cost missions employing small, light weight elements, which utilize advanced technologies including integrated microelectronics.

A formidable problem facing these low-cost missions is communications with Earth. Providing adequate direct-link performance has very significant impacts on spacecraft power, pointing, mass and overall complexity. Additionally, for elements at or near the surface of Mars, there are serious connectivity constraints, especially at higher latitudes, which lose view of Earth for up to many months at a time.

This paper will discuss the role a Mars relay satellite can play in enabling and enhancing low-cost missions to Mars. The potential for a series of low-cost Mars exploration missions makes the multi-mission application of a Mars relay satellite especially attractive. Key attributes of a Mars relay satellite architecture will be presented including: *in-situ* and Mars-Earth connectivity, performance and operational benefits for the mission elements and the Deep Space Network, and integrated radio metrics for navigation. Other issues that will be included are reliability, robustness, relay satellite lifetime, and application to other planets. in addition, the paper will discuss potential non-relay support functions including: serving as a science platform (e.g., for an atmospheric sounder), and/or a delivery system (e.g., for penetrators, landers, balloons, etc.).

The paper will be based on studies that NASA's Office of Space Communications has been sponsoring on planetary relay networks. Those studies were begun in support of the Space Exploration Initiative with the ultimate goal of human exploration of Mars. But, during the last few years this effort has been re-directed toward support of small robotic planetary missions.