Mars Surveyor Missions: 2001 and Beyond

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NASA's Mars Surveyor Program (MSP) will launch two missions to the red planet about every 26 months (determined by energy considerations) from 1996 through 2005 at an annual cost of $100 million dollars pcr year (excluding the launch vehicles). Mar Global Survey (1996) and Mars Surveyor 98 are described in other papers. This paper will focus on the planning that is under way for the MSP missions to be launched in 2001 and beyond.

Onc of the missions to be launched in 2001 will be an orbiter, most likely carrying an updated version of the final clement of the lost Mars Observer payload, a gamma ray spectrometer. The baseline for the second launch is a lander with a science payload focusing on some aspect of the MSP theme of "life, climate, and resources." It might be similar to the 1998 lander, but reduced in size. Alternatives to the baseline will also be considered. For one of these two missions, NASA is exploring the possibility of a joint venture with the Russians.

Another partnership is being investigated for one of the 2003 missions, this one with the European Space Agency (ESA). In this concept, called INTERMARSNET, ESA would launch a European orbiter and 3 or 4 MSP landers on an Arianne 5. The INTERMARSNET Science Working Group has identified a model payload for the lander with various instruments focused on the Mars interior, the surface, and the atmosphere. A second mission in 2003 would be launched on a Delta-Lite launch vehicle. It might be similar to the 2001 lander or it might carry numerous micro-landers.

Options for the 2005 launches are less well developed, One possibility is to collect and prepare samples for the Martian surface for later return to Earth.

The U.S. landers and orbiters for all of these missions will continue to be provided by Lockheed-Martin Astronautics.This cost-effective approach for the MSP will result in real savings because of the high heritage among the orbiters and landers and from one launch opportunity to the next. The long-term planning will also efficiently infuse new technology at each step, for example, to reduce the size and mass of the vehicles. For example, these improvements will allow the equal or better quality science to be acquired in the 2001 opportunity as compared to the 1998 opportunity even though the energy requirements are considerably higher and, at least for the lander mission, the launch vehicle will be less capable. This paper will describe planned advances in avionics, propulsion, and structures as well as the processes which will be used to rapidly and cost effectively infuse these technologies while staying within the MSP annual funding limits.

The system design proposed for 2001 would make use of many aspects of the 1998 spacecraft while selectively infusing advanced low mass technologies. Technologies which provide a high, level of leverage in mass reduction and cost savings for the 2001 mission are high density avionics assemblies and high energy density batteries. Each kilogram of electronic mass reduction is matched by an additional kilogram of mass reduction in the spacecraft structure and propulsion. Therefore the launch mass is reduced by two kilograms for each kilogram of avionics mass savings. Lander lifetime at high latitudes will be extended by the application of advanced thermal control technologies, and the use of electronic assemblies designed for low temperature survival.