Introduction: Mars exploration is a very special public interest. It’s preeminence in the national space policy calling for “sustained robotic presence on the surface,” international space policy (witness the now aborted international plan for sample return, and also aborted Russian “national Mars program”) and the media attention to Mars exploration are two manifestations of that interest. Among a large segment of the public there is an implicit (mis)understanding that we are sending humans to Mars. Even among those who know that isn’t already a national or international policy, many think it is the next human exploration goal. At the same time the resources for Mars exploration in the U.S. and other country’s space programs are a very small part of space budgets. Very little is being applied to direct preparations for human flight. This was true before the 1999 mission losses in the United States, and it is more true today. The author’s thesis is that the public interest and the space program response to Mars exploration are inconsistent.

This inconsistency probably results from an explicit space policy contradiction: Mars exploration is popular because of the implicit pull of Mars as the target for human exploration, but no synergy is permitted between the human and robotic programs to carry out the program. It is not permitted because of narrow, political thinking. In this paper we try to lay out the case for overcoming that thinking, even while not committing to any premature political initiative.

This paper sets out a rationale for Mars exploration and uses it to then define recommended elements of the programs: missions, science objectives, technology. That consideration is broader than the immediate issue of recovering from the failures of Mars Climate Orbiter, Mars Polar Lander and the Deep Space 2 microprobes in late 1999. But we cannot ignore those failures. They are causing a slow down Mars exploration. Not only were the three missions lost, with their planned science and technology investigations, but the 2001 Mars Surveyor lander; and an international cooperative effort for robotic Mars sample return were also lost.

But, NASA’s emerging plan has bright spots, and certainly our presence at this workshop indicates a belief that the slow down is temporary. A 2003 rover with large range capability is a promising development. The fear about sample return must be addressed, and hopefully, it will be as the program re-starts. For our purposes we only have to recognize that Mars is the next human destination off Earth. And further that is the allure of humans to Mars that pull the robotic exploration program and generates the significant public interest behind the Mars program. With that recognition we can make sure the robotic program leads to human exploration. Bruce Murray has proposed that the robotic program be charged with supporting the human exploration goal and that steps toward development of a Mars outpost begin after the landers of 2003 and 2005. The outpost could be sited to meet objectives for the first human mission to Mars, but its development will begin with the establishment of robotic exploratory and infrastructure vehicles. These would include both scientific vehicles -- like rovers, aerial platforms, penetrators, etc., which use the outpost as a base -- and engineering systems, such as in-situ resource utilization systems for power or fuel production, communications satellites, beacons, drills, or even habitat modules. Certainly this is the place to debate the sample return strategy. Novel means of Mars exploration such as balloon and airplanes could also be included in this rationale. These are adjuncts to human explorers as well as robotic vehicles that can extend our range and capability for in-situ reconnaissance.

How long the outpost remains robotic or how soon humans will actually fly there will depend on societal factors which will ultimately shape the political and economic decisions to that end.

A “level 0” requirement of the Mars robotic program is recommended: to select candidate landing sites for the first human mission to Mars -- the outpost site. (Doing this in the 2003-2008 time scale is perfectly reasonable, The data that will be used for such a selection will be less the analysis of returned samples and more the ancillary remote observations conducted in the Mars program). That site could be well imaged, and perhaps even the target for a small lander, penetrator, balloon or airplane in a “micromission.”. With data about that site, interactive virtual reality models and posters could be available for the public and in schools – enabling the whole world to prepare for the human landing, by virtually exploring the outpost together. The political consensus could build simultaneous with the scientific knowledge and technical readiness for a human mission.

While visionary about human exploration, this recommendation requires nearly immediate action. The Mars architecture should include the outposts, so that resources and requirement from the human space program are applied. The international partners should join in this planning – Russia may even again become a player, once the space station is up. The “level 0” requirement of new Mars missions are being specified now. And, perhaps most importantly, the post-1998 Mars mission failures review being conducted now can make recommendations based on a clear vision of where the program is leading.

Mars exploration should not slow down nor should the human goal be set further off, because of the recent failures or for any other reason. The public support for pressing forward is no less. The people of Earth are engaged in a historic quest in the exploration of new worlds. Now is not the time to lose momentum.