'Mars Direct'

The wrong program for the wrong reason

by Marsha Freeman

In January 1997, President William Clinton will convene a bipartisan summit at the White House, on the future of the U.S. space program. He announced the summit on Aug. 7, in response to the excitement generated by news that day that scientists believe there may have been life on Mars. The increased interest in planning for future manned trips to Mars, spurred on by both the possibility that there may have been life there, and the fact that the United States is launching two unmanned spacecraft to Mars this year, has thrust into the limelight a proposal called "Mars Direct," by former Lockheed Martin aerospace engineer Robert Zubrin. This proposal, which would skip the steps of building the space station and of developing more advanced transportation systems and new technologies, in order to "save money," is the wrong approach to exploring Mars, for many reasons, including the fact that it would dramatically increase the risk to the crew.

This ill-conceived proposal for "quick and dirty" manned trips to Mars, which could supposedly be "sold" to Congress because they could be done cheaply, has been promoted by Zubrin in space magazines over the past few years. But, since the August announcement of the possibility of life on Mars, it has become the object of national media attention. For example, the NBC-TV "Today" show featured Zubrin on Sept. 20, and that week's cover story of *Newsweek* magazine included coverage of his proposal.

Zubrin's "Mars on the cheap" has also garnered a certain amount of political support, specifically from House Speaker Newt Gingrich, who has encouraged Zubrin to pursue his dream—with the proviso, of course, that this not be a "corporate welfare" program, but be done by the private sector.

The reason there would be any resonance in the scientific and technical community for such a flawed proposal at this time, is the lack of any long-term goals for the manned space program. Space enthusiasts had taken as genuine President George Bush's announcement in July 1989, at the 20th anniversary celebrations of the Apollo 11 Moon landing, that the United States would return to the Moon and go on to Mars. But without major changes in economic, social, and strategic policy, such a proposal was a chimera.

The Congress was then still debating whether the United States should build a space station in Earth orbit, much less plan manned missions to anywhere else. President Bush had no intention of vectoring advanced U.S. science and technology capabilities to colonizing the Solar System—he was gearing his administration, and U.S. "high-technology" capabilities, toward wars against developing countries, such as Panama and Iraq.

Neither President Kennedy, who initiated the lunar program, nor the space visionaries who brought it to fruition, considered Apollo to be the end of space exploration, but just the beginning. Space mission planners have been enumerating the follow-on steps to the Apollo program periodically since the first lunar landing in 1969; but no President since Kennedy has made the commitment to accomplish long-range projects in space.

This has led to the mistaken notion on the part of demoralized partisans, such as Zubrin, that a bold, exciting space program could only be "sold" to politicians in Washington if it could be done in a decade (like the Apollo program), and if it did not cost "too much."

Dramatically increased risk

The initiators of "Mars Direct" readily admit that their plan would entail higher risk to the crew than any previously considered manned mission. Advocates say that no new technology would need to be developed, and claim that for less than $50 billion, over ten years, the first men could plant their feet on the soil of Mars. This mission would supposedly be an order of magnitude cheaper than Mars missions proposed by NASA, aerospace industry contractors, and mission designers, because it would require neither space infrastructure (such as a space station or lunar base), nor the research and development required for new technologies. The basic idea is to use a 1960s Saturn V booster to send a small crew to Mars directly, the way we sent astronauts to the Moon.

Instead of sending large spacecraft, which Zubrin describes as on the "Battlestar galactica" scale, he proposes that small spacecraft, which have been likened to tunafish cans, be used: The crew will only take enough fuel with them to reach Mars—not to return. Before they arrive on Mars, a robotically operated factory will process the Martian atmosphere and produce the fuel for their return trip.

In today's real world, in which the NASA budget is projected to *shrink* in current dollars by the turn of the century, it doesn't matter how "little" a manned Mars mission would cost: NASA does not even know if it will have the resources to fly the Space Shuttle.

The conservative revolutionaries in Congress and elsewhere say they have a solution to the problem of maintaining a space program within a disappearing NASA budget: privatize. Pro-technology free-marketeer Arthur Robinson has pro-

posed, in his *Access to Energy* newsletter, in which he supports the "Mars Direct" proposal, that any NASA Mars program would be a "30-year welfare program for a generation of bureaucrats."

Because Zubrin's proposal is based on using only existing technology, Robinson asks: "Would it not be better to use private enterprise?" Indeed, Zubrin's original collaborator at Martin Marietta, David Baker, has given up on a government-supported Mars mission and thinks private enterprise will raise $40 billion, according to the April/May 1995 issue of *Air & Space* magazine.

In an article in the November/December 1996 issue of the Massachusetts Institute of Technology's *Technology Review,* titled "Mars on a Shoestring," Zubrin reveals where some of his worst ideas have come from. He recounts that in the summer of 1994, he was "invited to dine with Rep. Newt Gingrich (R-Ga.) and some of his staff to explain my ideas about Mars exploration." The House Speaker was enthusiastic, but proposed that it be done "in a more free-enterprise kind of way than just gearing up the NASA budget to go to Mars."

Zubrin later met with Jeff Eisenach of the Progress and Freedom Foundation, Gingrich's think-tank, and out of this collaboration came the proposal for the government to post a $20 billion prize to be awarded to the first private organization to successfully land a crew on Mars and return it to Earth!

A more imaginative "alternative" to the budget crisis in the space program was put forward by longtime anti-manned-spaceflight scientist James van Allen, who suggested in 1994 that the new Republican Congress sponsor a "Lilliput initiative." "It is rumored," he wrote in a letter to the editor in the Dec. 12, 1994 *Aviation Week,* "that the incoming Republican leadership of the Congress will urge NASA to negotiate a personal services contract with the foreign ministry of Lilliput for flight crews of miniature astronauts. The Lilliput initiative, if successful, will permit drastic reductions in the sizes and costs of shuttles and the international space station, thereby eliminating the most conspicuous and embarrassing exception to the 'faster, cheaper, better and smaller' mantra of the U.S. space agency."

But, more important than the pragmatic considerations that make "Mars Direct" a pipe dream, the outlook behind such a "quick and dirty" Mars program, which Zubrin has elaborated since first presenting his proposal in 1990, could not inspire a nation to take on the great challenge of colonizing new worlds. It never has in the past.

'Yankee ingenuity' and Mars

In the September-October 1994 issue of *Ad Astra* magazine, Zubrin posits that Mars is the new frontier for America, as the West was in previous centuries. He quotes historian Frederick Jackson Turner, who proposes that the American "intellect" and "soul" were shaped by the frontier and are characterized by "that coarseness of strength combined with acuteness and inquisitiveness; that practical, inventive turn of mind, quick to find expedients; that masterful grasp of material things, lacking in the artistic but powerful to effect great ends; that restless, nervous energy, that dominant individualism, working for good and evil." These may be characterizations of television cowboys, but are not the outlook that enabled us to get to the Moon.

It was the conception of the endowment by God of the capacity for creativity in man, developed during the European Renaissance, not nervous energy or pragmatism, that created the philosophy, science, technology, and motive force for the great Age of Exploration which, in turn, created America. (See, for example, "Henry the Navigator and the Apollo Project that Launched Columbus," by Timothy Rush, in the Summer 1992 issue of *21st Century Science & Technology*). Actually, Zubrin is familiar with this history, because he was both a contributor to, and reader of *Fusion* magazine, and a subscriber to *EIR.*

Zubrin correctly states that "free societies are the exception in human history." But, he says, they "have only existed during the four centuries of frontier expansion of the West," and "the frontier opened by the voyage of Christopher Columbus is now closed."

But, it was not the closing of a physical frontier that produced the "human misery" that Zubrin notes this society is moving increasingly toward. There were just as many evil policies promoted by the British oligarchy in this country during the 400 years of its exploration and settlement, as there are today. The frontier was not what determined the path the country would follow; it was the struggle to make the idea of progress the organizing principle of society, through the development and contribution of each and every individual.

The space science driver

In his *Ad Astra* article, Zubrin observes that "anti-human" and "pathological ideologies" are a great threat to humanity. "Malthusianism is scientifically bankrupt," he argues. The alternative, Zubrin states, is to "create resources by the development of new technologies that find use for them. The more people, the faster the rate of innovation." His recognition of this truth makes his call for a manned mission to Mars based on off-the-shelf technology, all the more contradictory.

Economist Lyndon LaRouche has developed the only scientific method by which an economic policy can be judged. The key criterion is an increase in the relative potential population-density of a society. The pathway to greater human capabilities is through breakthroughs in science that create new technologies that redefine man's relationship to nature on a higher and higher level.

Throughout history, the major impetus for developing revolutionary new technology has been war. The Apollo program was the greatest *peacetime* mobilization of science and technology. Meeting the challenges of this radically different

space environment required new materials, industrial processing techniques, machine tools, medical equipment, advanced energy technologies, and a level of education new to America's children.

Studies by Chase Econometrics and other institutions have estimated that for every $1 invested in the Apollo program, $10 in new economic activity was generated. LaRouche has estimated that sending men to Mars will "increase the average productivity of labor by at least tenfold over the coming 30 to 40 years," through the new technology the effort will require. He insists that investment in space exploration does not *cost* anything. It is not a budgetary expense, but a relatively minuscule *investment,* which provides the returns to the econony that create growth.

Mars is not the Moon

Proposing to go to Mars using a chemically propelled 1960s Saturn V launch vehicle contradicts the admirable agitational effort Zubrin engaged in over several years, which he has since jettisoned, for the development of nuclear fission and fusion technologies for space propulsion and other applications.

In *Ad Astra* in June 1991, Zubrin said that first generation chemical space transportation technologies are appropriate for Earth orbit and brief visits to the Moon, but that "for colonization of the Moon and Mars, we must move to 'second generation' systems, typified by nuclear thermal rocket propulsion." For the sake of expediency, Zubrin now instead proposes the use of chemical rockets to go to Mars, greatly increasing the risk of the mission.

As LaRouche explains in "The Science and Technology Needed to Colonize Mars" (*Fusion,* November-December 1986), you cannot colonize Mars with 1970s technologies. "Essentially, the difference boils down to the fact that Mars is a far greater distance from the Earth than the Moon is." LaRouche proposes to wait to colonize Mars until breakthroughs in physics provide the enabling technologies for the mission.

The limits of available technology have dramatic consequences. Using chemical propulsion requires that the astronauts spend on the order of eight months cruising through interplanetary space toward Mars, compared to the one day it took them to get to the Moon. En route, they will be exposed to levels of radiation that would make today's anti-nuclear-power hysterics blush. If anything goes wrong during the eight-month, up-to-35-million-mile trip, there is no possibility of turning back.

In 1960, space visionary Krafft Ehricke had decided that at minimum, a nuclear-powered sister ship to the main crewed vehicle must be ready to launch at a moment's notice as a rescue vehicle. He explained this concept: "We want to avoid having to say, 'Well, that was just tough luck' and give the crew's families big insurance checks while their men slough around in some eccentric orbit between Mars and Jupiter. We want to get them back."

Using chemical propulsion systems for the return trip requires that the crew spend up to 500 days on the Martian surface, waiting for the next planetary alignment between the Earth and Mars that allows them to take a ballistic (unpowered) trip home. With only a chemical propulsion system, the crew does not have enough energy to quickly leave the surface of Mars and get back to Earth if any one of a number of unforeseen circumstances arises, but must wait for the next least-energy planetary alignment, which could be months away.

Nuclear energy specialists Steven Howe and Stanley Borowski criticized Zubrin's chemical propulsion-based proposal in an op-ed in *Space News* on Aug. 29, 1994: "For the initial piloted mission to Mars to last for over two years seems somewhat irresponsible to the crew."

In order to keep the cost of Zubrin's "Mars Direct" program under $50 billion, there is no plan to build a space station, nor to return to the Moon. Rather, he proposes to send astronauts off to Mars a decade from now, without any experimental data on what effect the one-third Earth's gravity on Mars will have on the crew, for the short-term, or over his required stay of 500 days. Without a space station or lunar base, there will be no *in situ* testing of the equipment the crew will depend on during an eight-month journey through space, and one and a half years on Mars. The international space station now being built will eventually allow studies of not only microgravity, but also partial-gravity environments that will be encountered on the Moon and Mars.

Without infrastructure or new technology, Howe and Borowski do not believe it possible to carry out a manned mission to Mars for $50 billion. For example, in 1991 studies, they point out, "NASA estimated that recovering Saturn 5 technology—which is not on the shelf, but in a number of NASA museums—would take 10 years and cost $10 billion. . . . Scaling for inflation . . . the cost of the Apollo program would be around $70 billion in current dollars. Do the proposers really believe a Mars mission could be completed that is 200 times more distant and 200 times longer in duration at a lower cost?" A Mars mission "cannot be pursued in the faster, cheaper mind-set that currently preoccupies the American space program."

Nineteenth- or 21st-century technologies?

The promoters of "Mars Direct" claim that a manned Mars mission ten years from start-up is possible because only proven technology will be used. While Zubrin wrote in the July/August 1992 *Final Frontier* that "the Apollo program contributed to the economic growth in America during the 1960s," his claim that his Mars scenario would "drive our economy forward [in] the same way," is false, because no new technology would be developed.

"Mars Direct" substantially lowers the cost of the manned mission by proposing that the fuel for the return trip to Earth be produced on Mars. A fuel plant, based on 1890s chemical processes such as methanation and 1960s technology such as water electrolysis, would arrive at Mars two years before the first crew. It would produce the fuel for the return trip from carbon dioxide in the Martian atmosphere and hydrogen brought from Earth, using a small nuclear power plant for energy. But, one would be hard-pressed to find anyone in the nuclear field today who believes that a 100-kilowatt electric space-qualified nuclear power plant, which has never been developed before, could be designed, built, tested, and launched within ten years. The United States virtually shut down its limping space nuclear program in recent budget cuts.

Zubrin and his colleagues are not the first to propose using local resources to sustain exploration. Ehricke's detailed programs for industrializing the Moon are based entirely on the idea of exploiting the oxygen, mineral, and other resouces of the Moon, such as the rare isotope helium-3, to eventually make life on the Moon self-sufficient, and to export products. Unlike "Mars Direct," however, Ehricke relies on the most advanced energy sources which will be required by an energy-intensive space civilization: nuclear fission and fusion.

In a sop to the more sophisticated space enthusiast, who acknowledges that nuclear fission and fusion energy will be necessary for space colonization, Zubrin proposes the development of fusion energy, *after* people have gotten to Mars, as one on a list of reasons to go.

In the October 1996 *Journal of the British Interplanetary Society,* Zubrin reports that Mars has plentiful reserves of deuterium, an isotope of hydrogen, that can be used as fusion fuel. "Fusion power will lead to fusion propulsion, making possible spaceships that will carry hundreds of passengers and thousands of tons of payload rapidly back and forth between Earth and Mars," he writes. "Not only would such technology cause travel times between Earth and Mars to shrink from months to weeks, but travel times to the outer solar system would be reduced from years to months." All true, and necessary *before* subjecting human beings to the rigors and unknowns of travel to Mars, not afterwards.

The risk of the mission is also greatly increased by the fact that "Mars Direct" proposes to send out a solitary spacecraft, with four crew members onboard, on its own. However, the only mission profile that would ensure safety for the crew, and the only basis for the large-scale permanent colonization of Mars, is one similar to the Columbus model, using a flotilla of spacecraft. This idea was first put foward by Wernher von Braun in his 1948 book, *The Mars Project.*

The transportation, habitation, and industrial needs of the Mars colony, should be based on the technologies that lie on the frontiers of science today. LaRouche's 1986 Mars colonization plan is a phased series of increasingly complex mission activities, each depending upon breakthroughs in four frontier areas of physics: controlled thermonuclear fusion, as the primary source of energy; lasers and other forms of coherent electromagnetic energy; new developments in the biological sciences, such as optical biophysics; and more powerful and compact computer systems to assist in handling the new technologies.

With fusion propulsion, which dramatically lowers fuel weight, engines could be burned continuously, allowing constant acceleration for half of the journey, and constant deceleration for the second half, thus maintaining a normal, or partial Earth-gravity environment. The trip would be shortened to a matter of weeks, rather than eight months, and the side-effects of extended stays in microgravity environments could be avoided, lessening the danger to the health of the passengers.

Once on the surface of Mars (or the Moon), orders of magnitude more energy per capita would be consumed than in advanced industrial nations today, just to maintain an agreeable artificial environment. Energy-intensive industrial processing would depend upon fusion power plants, producing electricity, plasmas, and electromagnetic energy which will replace 19th-century chemical-processing techniques.

No "get-rich-quick" schemes for space colonization will garner support from the American people or their elected representatives, because cost is not the issue. Rep. George Brown (D-Calif.) explained in the April/May 1995 issue of *Air & Space* that, to most people, "$40 billion for Mars Direct is every bit as incomprehensible a figure as $400 billion for [the Bush-era] SEI [Space Exploration Initiative]." When the President decides that it is *necessary* for this nation to plan and execute a manned mission to Mars, the nation will set about doing it.

There is an international space station now in the process of being built. Within a few years of its operation, mankind could return to the Moon. Using the Moon as a test bed for emerging technologies, as well as an industrial park from which to supply interplanetary travelers with fuel and equipment, a sustained effort over four decades would permanently move man out into the Solar System. The very process of creating this multiplication of human civilization would, in Krafft Ehricke's words, open the "age of reason."

As it now stands, both the Democratic and Republican proposals would shrink NASA's budget by 30% over the next seven years. There is justifiable fear in the scientific community that any attempt to accelerate and upgrade future Mars missions could take resources out of other space activities, unless the whole budget were increased. President Clinton has a unique opportunity at the January space summit, to toss overboard the budget-balancing nonsense that has destroyed every past space initiative, and put the country on the pathway to exploring the planets.