

# Manned Mars Missions: A Divisive Idea

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## **Manned Mars Missions: A Divisive Idea**

Since the Moon landings, Mars has become one of the next major goals of manned space exploration. Prominent astronauts have voiced their support of Mars missions, including Buzz Aldrin, who stated that “Mars is there, waiting to be reached” in an interview regarding his vision of the next steps in space exploration (Aldrin, 2001). Six rovers have been sent to Mars since the 1970s and billions of dollars have been spent on research on robotic and manned Mars exploration initiatives (Pittman, 2011). Currently, government agencies, primarily NASA, and private space companies, primarily SpaceX, seek to transport humans to Mars, and missions have been proposed for several decades ahead, some even as early as the 2020s. However, daunting technical and social barriers complicate manned Mars exploration.

The prospect of manned Mars missions is controversial. In the past five years, an increasing number of Americans favor such missions, and proponents have outnumbered opponents for the first time since original data from 1969 (McCarthy, 2019). Despite this, only 59 percent of Americans in a 2019 poll stated that “Conduct[ing] scientific research to expand knowledge of the Earth, solar system, and universe,” including research on Mars, is very or extremely important to them (Associated Press, 2019). The supporters and opponents of manned Mars exploration both promote their agendas.

Proponents of manned Mars missions include NASA, SpaceX, advocacy groups for human Mars exploration, and individuals who believe that the expeditions are crucial to the survival of humanity. Critics include the Congressional Budget Office (CBO), environmentalists, people who view the expeditions as unsafe, and individuals who believe manned Mars missions

would reinforce social divisions. Those who are indifferent about such ventures are influenced by these groups and the balance of power between supporters and opponents has shifted over time. The proponents and critics of manned Mars missions advance their agendas through ideological, moral, and financial means.

## **Review of Research**

### *Analogies to Historical Motives for Exploration*

The motivations for manned Mars missions are an analogue of historical reasons for the exploration of new lands. Lark (2006) contends that exploration prior to and during the fifteenth century was motivated by demand for natural resources, curiosity, and national prestige. Furthermore, she argues that in the seventeenth, eighteenth, and early nineteenth centuries, exploration was focused on settlement, colonization, and research. She asserts that in the late nineteenth and twentieth centuries, exploration was motivated by scientific investigation, national pride, and, in the case of space, the race between the United States and the Soviet Union. These values are present in the current manned Mars exploration initiative. Overton (1981) claims that the three conditions for exploration to occur, in order of importance, are “availability of land for exploration, geographical limitations to economic growth, and ... an element of individual motivation.” While these criteria apply to manned Mars missions, their scope must be considered on a planetary scale. Gascoigne (2000) contends that the British, French, and Spanish Pacific voyages between 1764 and 1806 had financial, nationalistic, and scientific motivations behind them. He claims that an argument against these explorations was the enormous voyage costs. These arguments are analogous to those commonly used by proponents and opponents of manned Mars missions.

*Rationales for Manned Mars Exploration*

Ehlmann et al. (2005) contend that manned Mars missions have economic, educational, and explorative advantages. To achieve these, they argue that the missions would spur growth in high-technology industries, inspire youth to pursue science and engineering education, and collect large amounts of scientific data. They claim that an expedition to Mars would expand markets and create high wage jobs in the medical, environmental, energy, robotics, and consumer industries. Ehlmann et al. counter the argument of high mission costs by citing that the \$20-450 billion total cost is negligible compared to the annual governmental spending on other programs. They also counter the argument that funding for manned Mars missions would diminish spending on human services programs and claim that the former would cost 0.5 percent of the annual budget of the Department of Health and Services. It is also contended that the number of students pursuing science and engineering fields was correlated to NASA's budget during the Apollo era in the 1960s. Thus, it is claimed that manned Mars missions would similarly inspire young generations. Ehlmann et al. also argue that human Mars expeditions are significantly more valuable for gathering scientific data than robotic ones. They cite that the Mars Exploration Rovers could only operate a maximum of six instruments, compared to a human explorer, who could operate up to hundreds.

Schwartz (2011) claims humans must explore space to ensure survival of the species, due to threats such as hazardous meteor strikes, resource depletion on Earth, and overpopulation. He also contends that long-term manned space travel is growing more feasible and that space resources can be profitable. Likewise, Munévar (2014) argues space exploration is necessary for long-term human survival and for understanding Earth on a large scale to solve environmental problems. Bertrand et al. (2015) found that space programs can use social media, in particular

Twitter, to foster interest in space exploration, especially in younger generations. They claim that NASA began this trend in 2009 when the agency had a social media campaign involving the *Phoenix* landing on Mars. Social media is currently being used to spread awareness and interest regarding manned Mars missions.

### *Rationales against Manned Mars Expeditions*

Szocik (2018) argues that technological benefits and inventions resulting from space exploration could be developed directly on Earth. He claims that a manned Mars mission would not be useful, necessary, or reliable for managing earthly risks of overpopulation, pollution, or resource depletion. This agrees with the contentions of Marshall (1993), who claims that using Mars as a backup for humanity's survival is "ethically dubious and anthropocentric," citing the potential of biocide of microorganisms native to Mars. Szocik also cites the high risk of failure relative to the uncertainty of benefits of manned Mars missions. He contends that robotic expeditions result in greater progress relative to manned ones, and that research should be focused on the former (2018).

Entradas and Miller (2010) found that in the United Kingdom, disapproval of manned space exploration is caused by insufficient knowledge of its benefits and risks, and inadequate public outreach. Consistently, Scaringe (2008) claims that the U.S. public does not see a justifiable return on investment of space exploration. Launius (2003) asserts that Americans, on average, vastly overestimate NASA's budget, noting that in 1997, the average estimate of NASA's federal budget share was 20 percent, compared to the true value of less than 1 percent. He claims that such misperceptions lead many to believe that the manned space exploration budget is too large. This argument can be extended to other federal space agencies to explain opposition to Mars missions. McQuaid (2010) contends that the conflict between

environmentalists and space exploration advocates dates back to the 1970s due to lack of interest in conservational issues by the latter group. He argues that the earthly environmentalism movement, as opposed to space exploration, is the primary scientific social movement of the twenty-first century. Thrash (2004) claims that the public perceives space research as irrelevant, financially wasteful, and only beneficial for the wealthy or trained specialists. These assertions explain the current opposition to manned Mars expeditions.

### **Exploration Initiatives of NASA for Manned Mars Missions**

NASA has proposed manned Mars missions for scientific research and space exploration. In its proposal for the first manned Mars mission for 1982, NASA claimed that scientific investigation of Mars “require[s] the presence of a skilled observer functioning as an interpretative scientist” (von Braun, 1969). NASA currently seeks to explore Mars to “inspire the next generation of explorers and dramatically expand human knowledge,” an echo to its original goals for a manned mission (NASA, 2020). The agency aspires to provide technological benefits on Earth from its Mars program in fields including medicine, life support, and robotics (NASA, 2013).

NASA has furthered its initiative for manned Mars missions by public outreach and acquisition of funding for its Mars exploration programs. The agency has held outreach campaigns to excite the public, particularly younger generations, about the prospect of Mars exploration. David Mitchell, a NASA project manager, explained that the 2013 Going to Mars campaign “continue[d] NASA’s rich history of inspiring and engaging the public in spaceflight in ongoing Mars exploration” (Mitchell qtd in Brown, Jones, & Renfrow, 2013). Such campaigns are crucial, as youth generally perceive Mars exploration as less useful compared to older

generations (Joyce et al., 2009). However, any operation plan by NASA must properly allocate the investments it receives from partners to ensure that its Mars missions are successful and profitable (Dunbar, 2019). While NASA had budget cuts to its Mars exploration program in the 2010s and proposed cuts for the early 2020s, the agency hopes to increase this budget in the mid-2020s (NASA, 2019).

### **Goals of SpaceX for Manned Mars Exploration**

Private space industries, primarily SpaceX, also favor Mars missions, mainly for financial motives. SpaceX plans a manned mission for around 2024. It has a long term goal to “improv[e] the cost per ton to Mars by five million percent,” to make the cost of transportation to Mars equal to that of the median price of a house in the U.S. (SpaceX, 2016). This would allow SpaceX to have a market for travel to Mars. Consistent with this goal, Elon Musk, the founder and chief executive officer of SpaceX, posted that the selection of candidates to go to Mars “needs to be such that anyone can go if they want, with loans available for those who don’t have money” (Musk, 2020). SpaceX could thereby expand its market to an audience that would otherwise be incapable of going to Mars.

SpaceX advances its agenda through courting investors. It has already received large funds for its space exploration initiatives, including a \$20 million equity venture from Founders Fund. The managing partner of Founders Fund, Luke Nosek, claimed that he “believe[s] SpaceX will become the world leader in space transport” (Nosek qtd in Shanklin, 2008). The company has achieved a value of \$31 billion since its founding in 2002, which attracts investors (Winkler, Pasztor, & Copeland, 2018). SpaceX has also publicized applications of its ships for time-efficient public transportation on Earth, with travel time reductions of up to 95 percent relative to

those of current commercial airlines (SpaceX, 2017). This represents a developing shift in the U.S. from NASA toward private space industries, which is reflected in the latter's rapid progress toward manned Mars missions.

### **Role of Advocacy Groups in Manned Mars Exploration**

Advocacy groups that support Mars missions do so due to their potential for innovation, exploration, scientific discovery, and permanent settlement. The nonprofit Explore Mars advocates for manned missions to Mars within the next 20 years. The organization believes that Mars exploration will “be a catalyst for American innovation and discovery,” “advance American leadership in space,” and “help us understand who we are, where we came from, and where we can go” (Explore Mars, 2017). The nonprofit testifies to Congress, hosts academic conferences, and engages in public relations (Holler, 2017). Another advocacy group, the Mars Foundation, hopes to “inspire the next generation of explorers through astounding new STEM projects & research initiatives.” The organization aspires to create a fully simulated Mars settlement on Earth through the professional expertise of its members. The Mars Foundation's milestones to change the public's views on the feasibility of a Mars mission include development of small-scale prototype projects into a full-scale prototype Martian research base, then into a permanent colony (Mars Foundation, 2020). Furthermore, the Mars Society strives to “educate the public, the media, and the government on the benefits of exploring Mars and creating a human presence on the Red Planet” (Mars Society, 2020). Its founder and current president, Dr. Robert Zubrin, states that “Mars is where the science is, it's where the challenge is, and it's where the future is.” He emphasizes the benefits of manned Mars missions: discovering how life developed on Mars, inspiring youth to pursue education in science and engineering, and setting



the stage for large scale colonization (Zubrin, 2014). The group organizes public outreach, promotes support for government-funded Mars research, and encourages commercial space exploration (Mars Society, 2020).

### **Manned Mars Missions as a Means of Humanity's Survival**

A subset of proponents of manned Mars exploration contends that the expeditions are a crucial step to the long-term survival of mankind. They believe that “we need to establish a second independent biosphere for the future of humanity,” in case of a global cataclysm on Earth, such as an asteroid strike, global war, or global warming (Semuels, 2015). Elon Musk has expressed similar perspectives and claims that one of the motivations of SpaceX is to create a base on Mars to repopulate Earth in the case of a global catastrophe, such as a third world war. He contends that Mars would be just far enough away that a base on it would be able to survive the conflict and restore life on Earth. However, people who share these beliefs are not restricted to formal organizations that support manned Mars missions. It was found in a poll of the general public that “Ensure humanity’s survival” was the most common reason for support for colonization of space (Makukov and Shcherbak, 2014; Space Settlement Institute, 2014). Such beliefs have recently propagated amongst the public due to cautionary statements by renowned scientists, including Stephen Hawking, who stated in a 2017 speech that he “[doesn’t] think we will survive another thousand years without escaping our fragile planet” (Hawking, 2018).

### **Financial Concerns of the CBO Regarding Manned Mars Missions**

The Congressional Budget Office (CBO) influences progress on manned Mars missions through its regulation of NASA’s budget. In the 1980s, the CBO had to choose between funding

NASA's efforts to send a manned mission to Mars between 2005 and 2015, or focusing on robotic expeditions. The organization reported a contrast between "ambitious manned space initiatives, which require substantial increases in funding" and the "more modest funding demands of unmanned, robotic space exploration and research programs." Key advantages of manned exploration addressed in the report were competition with the Soviet Union and, to a lesser extent, technological benefits for use on Earth (CBO, 1988). In the early 1990s, the former goal became obsolete and unmanned Mars exploration was endorsed. Currently, despite NASA's fervent initiative for manned Mars missions, the CBO remains skeptical about the necessity of such ventures. The CBO has faulted manned space exploration as uneconomical and hazardous. It estimates that elimination of human space programs, except for telecommunications projects, would save \$89 billion between 2020 and 2028 (CBO, 2018). The agency has considered this option as a way to reduce the federal budget deficit since 2013 (CBO, 2013). However, a new space race for Mars between NASA and other space agencies, including the European Space Agency, the China National Space Administration, and the Russian Roscosmos State Corporation for Space Activities, may promote additional funding for NASA (Geere, 2017).

### **Environmentalist Concerns about Manned Mars Exploration**

Some environmentalists argue that manned Mars exploration would be detrimental to the Earth's environment. They contend that space exploration competes with more urgent sustainability needs on Earth, and prioritize global warming, pollution, and desertification over space exploration (Hanbury-Tenison, 2017). Those environmentalists believe that Mars colonization is "an incomplete solution to an unlikely contingency," and that "the window of opportunity for us to work together to solve our planet's most pressing problems in closing"

(Etzioni and Etzioni, 2018). They assert that colonization of Mars will be insufficient to preserve humanity in the case of a global catastrophe, so resources should be allocated to protect life on Earth. This resonates with the views of 63 percent of Americans, who believe that monitoring key parts of the Earth's climate system should be the top priority, compared to the 18 percent who believe that sending astronauts to Mars is (PRC, 2018). Conservationists are also concerned about the environmental costs of mission launches and argue that the annual 4000 tonnes of carbon released from SpaceX's planned launches "will rapidly become a bigger problem" (Whittaker, 2018).

A subgroup of environmentalists is concerned about the impact of manned Mars missions on the Martian environment. They are uneasy about the possibility of harming microorganisms found on Mars through contamination or infrastructure, which could "destroy [Mars'] potential as a scientific testing ground" (Mann, 2013). Catharine Conley, a former NASA Planetary Protection Officer, shared this doubt, and warned that "it only takes one entity to decide that they're going to be selfish, and ... screw up the possibility of finding Mars life anywhere forever" (Conley qtd in Crane, 2016). However, other environmentalists believe that "microorganisms hitchhiking on our spacecraft wouldn't stand much of a chance against super-specialized Martians in their own territory" (Fairen, 2017). Conservationists also cite the 300,000 pieces of macroscopic litter surrounding Earth and worry that the same situation may occur on Mars after multiple missions (Mann, 2013).

### **Ethical Concerns Related to the Safety of Manned Mars Expeditions**

A subset of opponents of human Mars missions argues that the risks of such ventures are too high. NASA has cited that the top risks during manned missions are space radiation,

isolation, long distance travel from Earth, lack of gravity, and hostile environments (Whiting, 2019). Despite NASA's attempts to optimize safety, critics cite a federal memo from the Apollo 11 mission, which stated that in the event of failure, "Fate has ordained that the men who went to the moon to explore in peace will stay on the moon to rest in peace" (Safire, 1969). Objectors claim that in the event of a disaster on Mars, governments may be passive in taking responsive action due to their national pride or insensitivity to the lives lost (Massey, 2015). Other opponents argue that manned Mars missions are considered unethical due to the currently undefined standards of using colonists as human test subjects for research. They contend that strict ethical requirements must be set in this regard (Chambers, 2013). Critics of the missions argue that due to the sociotechnical difficulties regarding safety hazards, "the notion that we can start colonizing Mars within the next 10 years or so is an overoptimistic, delusory idea that falls just short of being a joke" (Regis, 2015). While unorganized, people who are concerned about the safety risks of manned Mars missions oppose them by arguing for robotic ones, lessening financial priority given to manned expeditions by agencies such as the CBO (Etzioni, 2017).

### **Apprehension Regarding Socioeconomic Effects of Manned Mars Missions**

A fraction of critics opposes human exploration of Mars as they believe that expeditions will benefit only the affluent in society. These opponents view transportation to Mars, not as a scientific feat that will have widespread benefits on Earth, but as "a lifeboat for the elite" or as "arks to escape oncoming environmental crisis" (Rushkoff, 2018; Penny, 2019). They claim that only the wealthy will be able to use the technology if global catastrophe occurs and will create "a galactic upper class that rests on the backs of the earthbound" (Zimmerman, 2015). These critics believe that the affluent will be "leaving the other 99 percent to suffer on a dying, warring

planet” (Maney, 2015). Elon Musk, Richard Branson, the head of Virgin Galactica, and Jeff Bezos, the founder of Blue Origin, have been criticized as “space barons” who are “counting on us to be awestruck by whatever it is they (astronauts) do in space, and to overlook the fact that their motives are not exactly pure, nor are their methods of getting us there egalitarian” (Dovey, 2018). Musk responded to claims of Mars missions benefitting only the wealthy by citing that “your probability of dying on Mars is much higher than Earth” and that any colonists would not have leisure time. He then asked, “Now, does that sound like an escape hatch for rich people?” (Musk, 2018). Nevertheless, while unorganized, people with socioeconomic concerns regarding manned Mars missions can diminish public support for them.

## **Conclusion**

The agendas of proponents and critics of manned Mars exploration are increasingly relevant as the technological feasibility of missions improves. In the past seven decades, public and governmental interest in space exploration, particularly of Mars, has changed drastically. Widely supported government initiatives for space ventures towards nationalistic goals have given way to federal and private space programs acting simultaneously to promote their agendas and gain moral, ideological, and financial backing from a largely apathetic public. Rapid advances in space technologies and newly emerging arguments for and against manned space exploration have created a wide spectrum of opinions regarding Mars missions. The timescales of human Mars expeditions depend heavily on public, private, and governmental opinions and knowledge, which are influenced by the arguments of supporters and critics. Whether or not the drive for a manned presence on Mars reaches the levels seen in historical exploration of the Earth or during the Space Race of the 1950s and 1960s remains to be seen. However, the extent of

support for initial human Mars missions will correspond with the establishment of permanent colonies on Mars and may be a turning point in humanity's extraterrestrial expansion.

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