

To Boldly Go . . . Or Not: A Public Hearing Case Study

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Part I—Prelude to Space

The following case study presents a transcript of a fictionalized conference held at the Jet Propulsion Laboratory in Pasadena, California, attended by NASA officials, space scientists, aerospace engineers, space enthusiasts, ardent NASA supporters, and strident NASA critics. The panel of experts consists of the following fictional cast: James Everett, Administrator of NASA; Susan Bowman, the founder of the Ares Society, a space advocacy group with the goal of sending astronauts to Mars; and Richard Greene, Executive Director of the Space Exploration Society, a space advocacy group interested in exploring the entire solar system. Apart from NASA, any resemblance to real persons or societies with these names is strictly coincidental.

The topic of the conference was President George W. Bush's Vision for Space Exploration (VSE, or Moon-to-Mars Plan). Those in attendance were able to listen to experts debate whether the VSE is what NASA should be committing to and also voice their own opinions. The Vision for Space Exploration, announced by President Bush in January 2004, outlined an ambitious plan to return to the Moon before voyaging to Mars. Moreover, the Space Shuttle is to be phased out upon completion of America's obligations in the construction of the International Space Station around 2010 (Sietzen, 2004). The Space Shuttle will be replaced by the Orion Crew Exploration Vehicle, an enlarged, modernized Apollo capsule, that will use proven technology developed four decades ago. The plan calls for NASA to return humans to the Moon by 2017 at the earliest, and 2020 at the latest (Sietzen, 2004)—a full half-century after the first landing on the Moon in 1969. The Bush administration has not allocated any additional funding for NASA to meet these goals, yet the current NASA administrator, James Everett, is adamant that NASA can make VSE a reality on its existing annual budget of about 17 billion dollars. Everett has earned the ire of many space scientists who have found their pet projects either indefinitely delayed or canceled outright as money is reallocated to meeting the proposed VSE timetable (Stover, 2004).

Questions

1. Should America return to the Moon? If so, why? If not, why not? What reasons could justify the great expenditure of funds, time, and national will?
2. Is this return long overdue or should NASA be focusing on other goals? Should America skip the Moon and head onto Mars? Why might it make sense to return to the Moon before voyaging to Mars? Consider such factors as the length of journey and hazards involved.
3. Is the cost of human spaceflight justifiable with the numerous problems confronting the nation today or could robotic exploration return comparable results at a fraction of the cost?
4. What factors were involved in President John F. Kennedy's mandate of "landing a man on the Moon and returning him safely to the Earth?" Are any of these factors present at the current time?
5. Do you think there is wide public support for a return to the Moon or is the American public indifferent or even hostile to the idea?

Part II—Public Hearing

Note: The members on the expert panel portrayed below are fictitious and the transcript contrived; however the views expressed by the audience comments and technical responses correspond to actual views held by leading space advocacy groups such as the Mars Society and the Planetary Society as well as NASA. These fictionalized quotes should not be interpreted as belonging to any representative of these organizations.

Moderator: “Now that we have outlined the basics of President Bush’s Vision for Space Exploration, we will open up the floor to members of the audience who may put forth a comment, opinion, or question. Members of the panel will be given a chance to respond, as will others in the audience; there will be ample time for rebuttals, so please refrain from interrupting the speakers.”

Armchair Space Enthusiast: “I’m not a scientist or engineer, but I have closely followed the space program since its inception half a century ago. The President’s plan is exactly what NASA has been in desperate need of for the past 35 years—a mission. NASA has been without direction or mandate for far too long. John F. Kennedy challenged NASA to land a man on the Moon and return him safely to the Earth by 1970. NASA rose to the challenge and got there half a year ahead of time. NASA has not had a major goal since Eugene Cernan and Harrison Schmitt left the agency in 1972. Yes, there were some impressive feats such as *Skylab*, *Pioneer*, *Voyager*, and the Martian rovers, but no major goal to strive for. The Shuttle never lived up to its promise of cheap, reliable access to low-Earth orbit, as evidenced by the tragic disintegration of *Challenger* in 1986 and *Columbia* in 2003, as well as the half a billion dollar price tag per launch. Returning to the Moon will help to channel NASA’s attention in the coming years and will culminate in an achievement that will captivate the public in a way that has not been done in nearly four decades.”

Aerospace Engineer: “I’ve been employed here at JPL for nearly 40 years; I worked on the *Voyager* mission in the ’70s and ’80s and the Martian rovers in the ’90s to the present. These robotic emissaries returned vast amounts of knowledge. Robotic probes cost a fraction of comparable manned missions and don’t jeopardize human life; no special consideration has to be paid to radiation shielding or artificial gravity. How can you possibly justify the financial cost and the imperilment of human life when we have the ability to construct competent robotic probes to go in our stead?”

James Everett: “We are not trying to supplant robotic craft; they will play an important role in the Moon-to-Mars Plan. However, astronauts offer versatility and flexibility; they won’t get stuck on a rock or have a power connection fail. They also have the potential to conduct novel experiments beyond automated analysis. As just one example, David Scott, commander of *Apollo 15*, in a simple yet powerful demonstration dropped a hammer and feather in front of a camera while on the Moon’s surface, illustrating Galileo’s discovery that objects fall at the same rate regardless of their mass (Chaikin, 1994). Also, on many occasions during the Apollo missions, humans proved their worth, while the onboard AI proved to be the weak link. During the descent of the *Apollo 11* LEM, Neil Armstrong took manual control of lander guidance, overriding the descent computer, when he noticed that the computer was guiding the lander down into a patch strewn with boulders (Chaikin, 1994). Also, this time we are returning to the Moon for good; we fully intend to stay. The astronauts will construct a permanent lunar base that will be manned on a continuous basis, with one batch of astronauts being relieved every few months.”

Astronomer: Hello. I am an astronomer and have worked as part of Project Spaceguard for several years, helping to discover and track near-Earth asteroids that might at some time cross paths with Earth. Many of my colleagues and I are concerned with the precarious state humans find themselves in. We have placed

all our eggs in one basket, so to speak. We must establish an off-world colony as insurance. If something untoward were to happen to Earth, at least humanity would survive in some form. Space exploration should thus involve humans, as its most critical concern is the survival of the human race. A lunar colony would be the first step in that direction.”

Female College Student: “Hello. I attend UCLA and have worked with international relief agencies the past two summers. I can’t see how you can justify such a waste of money when we have so many pressing problems right here on Earth: the war on terrorism, the national debt, a failing public school system, AIDS, and global warming. All these things deserve higher priority than planting footprints and a flag on some dusty alien world.”

James Everett: If Christopher Columbus had waited for every social problem of his day to be remedied, the timbers of the *Santa Maria* would be rotting in a Spanish harbor to this very day. In the 1960s, America was involved in a Cold War, entangled in a war in the jungles of Southeast Asia, and facing massive social unrest at home, but still managed to pull off Apollo. America must meet its goals in a parallel manner.”

Retired Person: “A generation of baby boomers is set to retire in just a few years. They will place an unprecedented burden on Social Security and Medicare. Many experts claim these social service programs will go bankrupt. Millions will need money to offset medical bills, prescription drugs, home care, and heating bills. I agree with the last audience member. It is unjustifiable at the present time to spend billions on the Moon. Why does it have to be now? I mean, it’s been 35 years since we last landed on the Moon, why can’t we wait a bit longer?”

James Everett: “There are several reasons why sooner is better. In the 15th century, China was arguably the world’s greatest power. The Ming Dynasty sent grand fleets with tens of thousands of mariners as far as eastern Africa (AHRG, 1997). But the emperor decided to recall the fleet and isolate China. As a consequence, China grew withdrawn and introverted and the world scene became dominated by Portugal, Spain, and England.”

Heckler #1: “Any other reason than an obscure Chinese emperor?”

James Everett: “Yes. If you had not interrupted me, I would have gotten to it. The American historian, Frederick Jackson Turner, in his book, *The Frontier in American History*, argued that the presence of the frontier, a region where independence and self-reliance and inventiveness were fostered and nurtured, was instrumental to maintaining the vitality of American democracy (Turner, 1920).”

Richard Greene: “Also, there is an innate drive within humans to explore, to go where no one has ever been before, whether that be the jungles of central Africa, the Marianas Trench, or the surface of the Moon. It is what compelled Edmund Hillary to scale Mt. Everest—simply because it was there. This drive is an integral part of what makes us human.”

Female College Student: “But what about all the social ailments?”

James Everett: “Man does not live by bread alone. Where there is no vision, the people perish. America needs an inspiring goal. Simply meeting basic requirements is not enough. Returning to the Moon will encourage more American students to study science and engineering, for one thing.”

Male College Student: “Hi. I’m a student at UCLA and was wondering why it is deemed necessary to return to the Moon before going to Mars? The Moon was the destination of my parents’ generation. Why not skip it and go directly to Mars?”

Susan Bowman: “As President of the Ares Society, an organization of dedicated amateurs and professionals with the collective goal of sending a manned mission to Mars in the immediate future, I completely agree with the young man. We have already been to the Moon. Six lunar modules descended to its surface, twelve men walked around, collected rocks, set up experiments, and even played a round of golf. The Moon has been done. Mars should be our objective, not the Moon.”

James Everett: “I must disagree. As the President outlined, America will be going to Mars, but only after returning to the Moon. There are several reasons for this sequence. The Moon is the ideal testing ground for the equipment that astronauts will use on the Red Planet. Divers test their scuba tanks in a swimming pool before descending to great depths. The Moon is only three days away; if anything goes wrong, there is a good chance we could send a rescue mission. But Mars is nearly a year out; there will be no chance of earthly assistance.”

Susan Bowman: “But we don’t need to use the Moon as a testing bed. The Ares Society runs several Martian analog camps around the world. Equipment can be tested in Chile’s Atacama Desert, the Utah Desert, or Devon Island in Canada. All these environments are startlingly similar to Mars.”

Heckler #2: “So what good is the Moon? Do we need more Moon rocks?”

James Everett: “Aside from its use as a testing bed, the Moon has many other appealing features. The Moon offers a unique window from which to observe the cosmos. It is geologically dead; there are no ‘moonquakes.’ This offers the ability to achieve something called optical spectrum long-baseline interferometry, which involves linking many telescopes together so that the effective telescope is equal to the distance between the telescopes. With such a telescope array, astronomers could see farther into the cosmos than ever before. Radio telescopes on the lunar farside would be isolated from the radio noise emanating from Earth: this would block out annoying bogies that plague the SETI program. No turbulent atmosphere means access to the full EM spectrum; Earth’s atmosphere blocks the infrared, microwave, x-ray, and gamma ray portions of the spectrum. Deep craters at the poles may serve as natural cold-traps to establish IR telescopes. The low lunar gravity means very large telescopes can be constructed without the optics sagging under their own weight.”

Businessman: “Hello. I am a small business owner and have always prided myself on my ability to deliver a desired product or service to the customer at a reasonable price. Aside from its scientific returns, which can only be appreciated by a tiny minority of people in the rarefied heights of academia, what practical, tangible returns can the public expect? After all, it is the public who is footing the bill, and they should be able to expect some return on their investment.”

James Everett: “The space program has always been one of America’s wisest investments. The space program has spawned entire industries and innumerable technology spin-offs ...”

Heckler #3: “Like Tang and Teflon! How could we live without those breakthroughs?”

James Everett: “Actually, those two products existed well before the Apollo program. But how about communication satellites? How about XM radio, GPS, weather and climate satellites to assist weather

forecasting and crop monitoring? How about the miniaturization of the computer? There are personal computers today because the onboard navigation computer of the lunar module had to be shrunk down. Fuel cells were developed from a chemical novelty into a practical technology to provide the astronauts with potable water and electricity. Were it not for the space program, and specifically the Apollo program, the contemporary world would be very different indeed.”

Businessman: “But does the Moon offer anything directly worthwhile to the public?”

Richard Greene: “As a matter of fact, it does. There exists on the Moon a rare isotope of helium called helium-3, which arrives via the solar wind—the stream of ionized particles traveling at hundreds of kilometers per second emitted from the Sun. However, helium-3 particles carried by the solar wind cannot penetrate the Earth’s magnetosphere. Consequently, they circle the Earth until striking the Moon (which has no blocking magnetosphere) and embed in the lunar regolith—the finely granulated soil pulverized by billions of years of asteroid and meteoroid bombardment (Zubrin, 1999). This isotope is the ideal fusion fuel because all of the products of the fusion of helium-3 are easily contained and non-radioactive (Schmitt, 2004). There is enough He-3 available on the Moon to provide for the entire energy needs of humanity at current consumption rates for 10,000 years. If the Shuttle’s cargo bay were loaded with He-3 (25 tons), it could power the entire United States for a year.”

Heckler #4: “And all we have to do to make use of it is to develop nuclear fusion!”

Astrobiologist at JPL: “The Moon-to-Mars program is a total waste. To fund it, NASA has robbed worthwhile space science programs such as the *Terrestrial Planet Finder*, an array of space-bound telescopes designed to seek out Earth-like planets in orbit around other stars. It has also led to the cancellation of the *Jupiter Icy Moons Orbiter*, a craft that would have probed the Galilean moons for signs of subsurface water, a potential indicator of alien life (Planetary Society, 2006). These are projects that my colleagues and I have been planning for years. I can’t adequately convey how devastating it is to suddenly have your life’s ambition terminated on a political whim.”

Susan Bowman: “I agree completely; from a biological point of view, the Moon holds no interest. It is a dead world. On the other hand, Mars, Europa, an icy satellite of Jupiter, and Enceladus, an icy satellite of Saturn, offer tantalizing hints of past or present existence of water. And where there is water, there may be life (Science@NASA, 2006). The search for life, no matter how basic, is much more compelling than establishing a lunar base. If we discovered life elsewhere in our solar system, we could determine whether it was based on DNA, or whether there was a Second Genesis. If the latter were the case, and life arose independently in two different locations within one stellar system, we could feel comfortable in assuming life must abound throughout the cosmos.”

Richard Greene: “The Space Exploration Society has launched a petition-based campaign to keep NASA from pilfering its space science budget to pay for the Moon-to-Mars program. We still support the President’s Vision for Space Exploration, but not at the expense of space science. So far, we have been successful in getting Congress to provide some extra funding for certain space science missions that otherwise would have ended up on the chopping block.”

Moderator: “I’m afraid we are out of time. Please give our panel of experts a round of applause for sharing their views on the Vision for Space Exploration. And thank you for coming out.”

Questions

1. After reading the above transcript, do you think America should be returning to the Moon? Are there more worthy destinations? Are the potential returns worth the investment?
2. Is the human space program unnecessary? can robotic probes accomplish just as much? What are the advantages and drawbacks of human spaceflight?
3. Do you think America will return to the Moon? Or do you think that after the current administration, the next president will cancel it? What other factors could set back or altogether prevent a return to the Moon?

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