Committee on Human Spaceflight

"Real Heroes: A Case for Continued U.S. Involvement in Human Space Exploration"

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Introduction

Some thirteen thousand years ago the forebears to all the indigenous people of this land walked across the exposed Bering land bridge from Siberia to North America. Archaeological evidence shows this migration to have unfolded at a relatively rapid rate, humans spreading from modern day Alaska south to the tip of Argentine in just one thousand years.

We are, as a species, explorers. Our feet, our wagons, our powered vehicles have taken us to the furthest reaches of the continents, across and beneath the surface of the oceans; through the skies, into orbit, and to the Moon. Since pre-history, we have pressed to the furthest reaches of hospitable lands in search of food, to expand kingdoms, and simply to learn about the world beyond our safe realm.

Those individuals who lead these ventures gain heroic status in the legends of their times.

With the Earth nearly completely explored, the population of humans exploding, this innate, internal drive will soon carry us beyond the only planet we inhabit. In the coming decade humans will return to the Moon, place foot on Mars, and even make temporary homes on the asteroids.

This is not a new technology play, for all that is required to make these journeys exists today in the knowledge and experience of government space programs and private aerospace corporations. The true challenge is the allocation of resources, tight collaboration in a multi-national endeavor, and leadership of what will be recorded in history as our greatest accomplishment.

In this time inspired by Hollywood films more than real life unfolding, the United States has an opportunity to rekindle the kind of hero the Apollo missions gave the world more than forty years ago —people whose courage and strength of character became recognized around the globe for generations.

The Birthplace of Heroes

> *"We need heroes first and foremost because our heroes help define the limits of our aspirations. We largely define our ideals by the heroes we choose, and our ideals -- things like courage, honor, and justice -- largely define us."* —Scott LaBarge, Santa Clara University

According to a recent, national poll by the *Gloria Barron Prize for Young Heroes*, only one-half of teenagers ages 14 to 18 could name a personal hero. Of those who could, more than half named a movie star, musician, or athlete. Fictitious heroes such as Superman and Spiderman were named twice as often as Abraham Lincoln, Mahatma Ghandi, or Martin Luther King. Female heroes were rarely identified at all. One in five teens aspires to be on the *Real World* or *Survivor*, and one in ten considers Ruben Studdard and Kelly Clarkson heroes because they won *American Idol*.

"We need to teach our children the difference between a hero and a celebrity by telling them stories of heroic people they can look up to," states Barron. "We need to remind them that anyone -- regardless of gender, age, or race -- can make a heroic difference in the world." [1]

In every exploration a hero is born which transcends time through oral narratives, the written word, and now film and video. The textbooks teach us of the memorable explorers and conquerors in far away and ancient times: Hercules and the monsters, David and his sling, King Arthur and his knights; on the North American continent our shared heritage includes Moctezuma, Sacajawea, Geronimo, Louis & Clark, John Wesley Powell, Richard Byrd, Neil Armstrong, Carl Sagan, Sally Ride, and James

Cameron for his recent descent to the deepest ocean trench.

The early astronauts were celebrities, national heroes and leading symbols of the U.S. space program. Both NASA officials and the astronauts themselves carefully molded and controlled their public images every bit as successfully as movie idols or rock music stars. [2]

This global vision is unique to the United States, a kind of collaborative leadership that our country has historically embraced. We maintain a prominent place in history as a country which led the exploration of space through both human and robotic missions since the early 1960s. Mariner, Mercury, Apollo, Viking, Voyager, the Space Shuttle, Galileo, Spirit and Opportunity, the International Space Station, and Curiosity (to name a few) are all U.S. owned or U.S. led initiatives.

We are but a decade away from the first human exploration of another planet. The United States has the unique opportunity to continue to be a birthplace to modern day heroes, the kind of people who inspire generations to come. It is not a coincidence that the first words uttered by Neil Armstrong were neither praising the U.S., NASA, nor a particular brand of religion, rather they upheld all of human kind as we together pressed the boundaries of our capability and knowledge.

The Value of Space Exploration

> *"It's human nature to explore. By going to difficult or dangerous places, we carry the rest of our species along with us. These stories become part of our culture, part of our heritage, part of our shared need to explore the worlds around us. It's a human endeavor that is part science, part inspiration."* —Jim Bell, Ph.D., Prof. at ASU's School for Earth and Space Exploration, President of the Planetary Society, and Chief Photographer for the Mars Rovers.

Each mission beyond the Earth is more than a venture in data collection. Space explorations are extensions of ourselves, a cognitive, imaginative, exploratory proving ground for what we can do. At the same time, with each vehicle that leaves the gravitational confines of our home, we learn about our own planet in a way that is impossible via any other means.

The scientific knowledge we have garnered includes a deeper understanding of our atmosphere and how it shields us from cosmic radiation, the cyclical output of our sun and how it affects the weather, otherwise impossible breakthroughs in pharmaceutical, bio-chemical, and biological research have been the result of the U.S. space program. The history and future of our own solar system, surrounding galaxy, and universe as a whole are, in part, the result of leaving the confines of Earth.

Each success story in space exploration provides a beacon for the next generation of students. From primary school through the university, students are motivated to engage Science, Technology, Math, and Engineering (STEM).

In the 1970s, following the Apollo program during which twelve humans walked on the surface of the Moon, the United States saw an unprecedented enrollment in aerospace engineering at the undergraduate and graduate level, increasing by a factor of ten a full twenty years later. [3]

The U.S. government-funded, human space exploration bolstered the private sector as an explosion in the aerospace industry in the 1970s and '80s and the development of interactive children's science centers and planetariums. The California Science Center is currently undergoing a major renovation in order to house the Space Shuttle Endeavor. The automobile industry was literally reshaped as aerospace

engineering was applied to automobiles with improved aerodynamics, mileage, and safety. At the same time, there was a continuous melding of science fact and science fiction in books (Asimov, Clarke, Sagan, to name the most popular), television and films (Solaris, 2001: A Space Odyssey, Star Trek, Star Wars, and many more).

While human astronauts visit schools and provide direct motivation to the next generation of learners, robots are left to burn during re-entry or cease communication when their fuel cells fail. While the data returned from Mar rovers is invaluable, no one will ever be able to interview Curiosity for its personal experience on Mars. Jobs are created and engineers are motivated, but heroes are not born of robotic explorers without Pixar applying a face or Disney a personality.

The Challenge of Human Space Exploration

It is not the intent of this paper to address the extensive, technical challenges of human space exploration. We will respond only to the frequently provided reasons to reject continued human space exploration: cost, radiation, and a need to focus on the issues on our home planet:

a) The NASA budget in 2012 was less than one half of one percent of the national budget. [4] The NASA budget is not and has never been a significant portion of the total national budget.

b) The unshielded radiation on the surface of Mars was found by Curiosity to be nearly identical to that received by astronauts on-board the shielded International Space Station. [5]

c) We send tens of thousands of our youth to front-line confrontations in the name of war, yet claim that two astronauts, engaged of their own volition, are too great a risk of public funds for such an incredible, potential reward.

At a time when our nation is in need of *real* heroic figures more than time any since the Apollo space program, astronauts, scientists, engineers, and explorers provide *real* role models who show school age children the path to such a career.

From Earth to Mars: A Case for U.S. Human Space Exploration

> *"[I]f humanity wishes to become a multi-planet species, then we must figure out how to move millions of people to Mars,"* —Elon Musk, founder Space-X Corporation

> *"In my lifetime, I'm determined to being a part of starting a population on Mars. I think it is absolutely realistic. It will happen."* —Richard Branson, Chairman of the Virgin Group

Dennis Tito and *Inspiration Mars* are set for a January launch in 2018. Seven months later two humans will come within one hundred miles of the surface of Mars as they slingshot around the red planet and return to Earth again.

With the technology proved, the stage is set for a Mars colony. "At Mars, you can start a self-sustaining civilization and grow it into something really big," stated Elon Musk, founder of Space-X Corporation. Musk estimates that of the eight billion humans that will be living on Earth by the time the colony is possible, one in 100,000 may be prepared to go, equating to a potential 80,000 migrants. [6]

If we accept that maintaining a permanent settlement on Mars is not only possible but inevitable, there are two, clear, immediate benefits relevant to the focus of this document:

1. An opportunity to again focus on humans doing incredible things, a new hero for the world beyond those we see on the big screen. As with Apollo and the Space Shuttle program, the US has opportunity to again be a leader in this arena.
2. An opportunity to use the isolated time in transit and on Mars as a time for self-reflection, to not only look back at the Earth as we have done from the Moon, Voyager, Space Shuttle, ISS, and Cassini, but to look to the future when humans will again work toward a common goal. The US has opportunity to lay the groundwork for this important, philosophical endeavor.

It is paramount that we, as individuals and as both privately and publicly funded organizations take this opportunity to not only look up and beyond the boundaries of our daily lives, but use our movement off our planet as a point of reference to look back, around, and inside.

In "*Pale Blue Dot: A Vision of the Human Future in Space"* astronomer Carl Sagan refers to the photograph taken by Voyager I of the Earth, from beyond the orbit of Pluto, "From this distant vantage point, the Earth might not seem of any particular interest. But for us, it's different. Consider again that dot. That's here. That's home. That's us. On it everyone you love, everyone you know, everyone you ever heard of, every human being who ever was, lived out their lives. The aggregate of our joy and suffering, thousands of confident religions, ideologies, and economic doctrines, every hunter and forager, every hero and coward, every creator and destroyer of civilization, every king and peasant, every young couple in love, every mother and father, hopeful child, inventor and explorer, every teacher of morals, every corrupt politician, every 'superstar,' every 'supreme leader,' every saint and sinner in the history of our species lived there – on a mote of dust suspended in a sunbeam."

There is no need to list the extent of pain caused by warfare, poverty, disease and famine across the face of this planet to make clear the conditions into which we arrived to the twenty first century.

Our science has since the Apollo program saved millions of lives, improved living standards for many, and provided a global network for communication. Yet it has not again given us a unified goal.

The means to solving problems is always working right here, right now balanced with a sense of what can be even better tomorrow. *Is not the space program a proving ground for what we have learned, a focused application of real science for a better tomorrow?*

Conclusion

The first humans to arrive to Mars will lay a foundation. Not just one of concrete and steel, air conditioning and hydroponics, but a social construct that will set in motion a means by which that colony is measured in its success or failure. This might just give us a new kind of hope for our original home.

When humans walk on the surface of Mars in less than ten years time, the whole world will be watching, eyes lifted to the night sky. When we receive that first, landed transmission from those who made the journey, we will again be repeating words that have the power to lift generations.

The United States has a unique opportunity to be a leader in the next migration of our species and to inspire generations of children world-wide with *real* heroes.

Notes

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