‘The Martian’ and Obstacles to Manned Space Exploration

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The initial box-office success of "The Martian," following on the hits "Gravity" in 2013 and "Interstellar" in 2014, reflects the extent to which space exploration continues to captivate public imagination. Polling suggests that more than 50% of Americans favor sending an astronaut to Mars. In 2010, Pew found that 63% of Americans expect that the U.S. will succeed in doing so by 2050.

Yet such optimism seems at odds with reality. Humans haven't set foot on the moon since 1972, and the last space shuttle flew in 2011. Right now, the U.S. space program lacks even the ability to launch astronauts into low-earth orbit; American astronauts hitch a ride from Russia to get to the space station. So are films like "The Martian" inspiring far-fetched dreams -- or might astronauts land on Mars in the coming decades?

Putting humans on Mars is NASA's goal. President Barack Obama's space policy, issued in 2010, sets "the mid-2030s" as the target date, and NASA has sketched out a pathway for getting there.

The challenges to a human mission to Mars are immense. The effort would require a rocket more powerful than any the U.S. has ever developed. Known as the Space Launch System (SLS), the rocket's first, unmanned iteration is scheduled for launch in November 2018. Beyond that, new technologies would need to be developed to propel spacecraft between Earth and Mars. Also needed are means of safely and accurately landing a manned craft on Mars; the landers used to put robotic rovers on the red planet are designed for smaller payloads and subject their cargo to forces humans could not withstand.

Just as important as the technology for getting astronauts to Mars are the technologies needed to keep them safe during the journey. Outside Earth's magnetic field, humans would be exposed to enormous quantities of radiation, and they would need protection against cosmic rays and solar wind. As the film "The Martian" underscores, outside help will be physically unavailable should emergencies arise. Then there is the cost of carrying supplies into space. NASA is working to resolve some of these challenges -- for example, astronauts on the International Space Station have grown lettuce and 3-D printed tools -- but huge obstacles remain.

Paying for all this may be the biggest practical challenge. NASA's budget has declined in real terms in recent decades. A National Research Council report projected in 2014 that NASA's budget would need to increase 5% per year to make a manned mission to Mars achievable. NASA represents only a sliver of federal spending, but such

increases are unlikely in today's budget environment. And despite public enthusiasm for high-profile space programs, only about 20% of Americans thought that the U.S. spends too little on space exploration, a 2012 survey found.

In light of these technical and political challenges, many have called on NASA to adopt a different route to Mars. The 2010 Obama strategy ditched the Bush administration's plan -- around which some other countries had oriented their space programs -- to return humans to the moon as a stepping stone to Mars. The Obama administration's plan would replace a lunar landing with an "asteroid retrieval mission" that has been criticized as too focused on dead-end technologies and unlikely to prove useful to later stages of the Mars mission.

Regardless of the technical pros and cons, reverting to a moon-to-Mars pathway has a strategic appeal. Reestablishing U.S. leadership in space could forestall a rival assuming that role and put the United States in a position to ensure that others' space programs prioritize shared and peaceful goals. Because other spacefaring countries remain focused on lunar exploration, exercising this leadership and distributing internationally the financial burden of a manned mission to Mars may require a moon-first plan. By providing high-profile milestones on the way to placing an astronaut on Mars, such an approach could help sustain public and congressional support for what will be a decades-long effort.

Michael Singh is the Lane-Swig Senior Fellow and managing director at The Washington Institute. ❖

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