

China's Mission to Lunar Far Side Opens New Frontier for Mankind

by William Jones and Marsha Freeman

... If this capsule history of our progress teaches us anything, it is that man, in his quest for knowledge and progress, is determined and cannot be deterred. The exploration of space will go ahead, whether we join it or not, and it is one of the greatest adventures of all times, and no nation which expects to be the leader of other nations can expect to stay behind in this race for space.

—John F. Kennedy, speaking at Rice University, September 12, 1962

Feb. 6—China announced Jan. 14 that it was committed to landing a rover on the far side of the Moon in order to make *in situ* surveys of the lunar surface. In this way, China is on the verge of opening up a new frontier for mankind's exploration of the Galaxy. While China has only been a space-faring nation since the 1990s, its pace of development—as with China's economic development generally—has been mind boggling. While the United States, under George W. Bush, and even more under Barack Obama, has been dismantling space capabilities built up over four decades, China is proceeding by leaps and bounds, not just to repeat what other space-faring nations have done, but now to chart new paths.

The mission of Chang'e-4 to land on the far side of the Moon before 2020 is indeed going above and beyond what other nations have achieved.¹ “The implementation of the Chang'e-4 mission has helped our country make the leap from following to leading in the field of lunar exploration,” said Liu Jizhong, chief of the lunar exploration center of the State Administration of Science, Technology and Industry for National Defense.

In fact, Chinese scientists decided at the start of their lunar exploration program that each new mission would break new ground. China's Chang'e-3 mission, which soft-landed the Yutu rover on the Moon in 2013—the first spacecraft to do so in almost 40 years—has taken the first deep subsurface lunar radar measurements ever, and made the first astronomical observations from the lunar surface. The latter were obtained with its ultraviolet telescope, called a “cosmic observatory.” A second ultraviolet instrument will study Earth's ionosphere.

The next lunar mission, the Chang'e-5 craft,² now being developed for a 2017 launch, will be the star of an even more ambitious mission—landing on the Moon and then returning lunar samples to the Earth.

Mission to the Far Side

The follow-on Chang'e-4 mission to the far side of the Moon, to be launched before 2020, possibly as

2. Chang'e-5 will be launched before Chang'e-4.



Chinese National Space Administration

The Chang'e-4 relay satellite in this concept drawing from June 2015.

1. “Chang’e” is the name of the Moon goddess.

early as 2018, has generated great interest in the space science community. While the lunar far side was first photographed by Russia's Luna 4 spacecraft in 1959—and was seen and photographed by Apollo astronauts as they orbited the Moon—we have yet to investigate the soil and understand the evolutionary history of this mysterious, crater-filled landscape.

Because the far side of the Moon never faces Earth, due to its synchronous orbit,³ the radio waves it receives from outer space can be detected without interference from the radio waves we produce on Earth. And the radio waves which cannot even be detected by ground-based radiotelescopes—since they do not penetrate Earth's ionosphere—will be detectable.

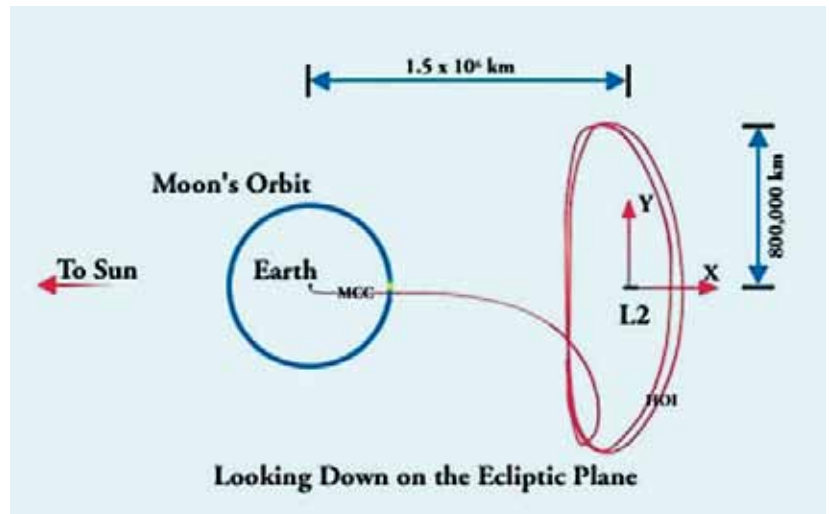
Speaking to the Yangguang network, Liu Jizhong said, “Chang’e-4 will utilize the distinctive features of the far side which are screened from the Earth’s radio waves to develop a space science region in a forward position for a low frequency radio astronomy survey that hopefully will fill in some of the blanks in our knowledge.”

The mission will study the geology and the dust features, and how they were formed. Liu explained, “Utilizing the very old rock of the lunar crust preserved on the far side of the Moon, we can investigate its geological characteristics, and hopefully by doing that, pull together for the first time a topographical configuration of the far side, its shallow structure, the composition of the lunar material of a particular cross-section, and attain a picture of its evolution, creating new knowledge about the history of the planet.” Russian scientists have contributed a lunar dust surveyor.

The mission will also measure lunar surface residual magnetism and study its interaction with the solar

3. The Moon rotates on its axis as it orbits the Earth, but the far side never faces Earth. To understand this, consider that *you* are the Moon. As you orbit Earth, if you do *not* turn, you will alternately show your face and your backside to Earth. But you *could* politely turn as you go, always facing Earth. (But why does the Moon maintain this synchrony? Is it really a result of gravitational interaction with Earth?)

FIGURE 1



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The relay satellite will be parked in a halo orbit around the Earth-Moon L2 Lagrange point. The diagram view is of the ecliptic plane, the plane defined by Earth's orbit about the Sun. In a two-body gravitational system such as the Earth-Moon system, there are five points in space in which a small satellite can be parked with stability or near-stability. These are called Lagrange points or libration points. It is possible to put a satellite in "orbit" around the near-stable points (Lagrange points 1, 2, and 3), even though there is no mass at the Lagrange point. These are called "halo orbits." The satellite's trajectory is not a true orbit around the Lagrange point, but is best described a periodic trajectory around it. The Lagrange point (and the halo orbit) move with the Moon. The diagram shows the trajectory of the satellite from the time of its launch from Earth (line in black, then red).

wind—a magnetized plasma consisting primarily of protons and electrons.

China will send a relay satellite to orbit the Moon, enabling communication with the lander and rover from mission control, and for sending data back to Earth. The relay satellite will be launched from Earth orbit into a lunar transfer orbit first, followed by the lander and rover. The relay satellite will enter a halo orbit around the Earth-Moon L2 Lagrange point (see **Figure 1**), located about 37,000 miles (60,000 km) beyond the Moon. This is considered the best location for a near-stationary communications satellite covering the Moon's far side, while the line of sight to Earth for radiowave communication is never blocked by the Moon. The satellite is expected to be operational for three years.

International Support for Chang'e-4

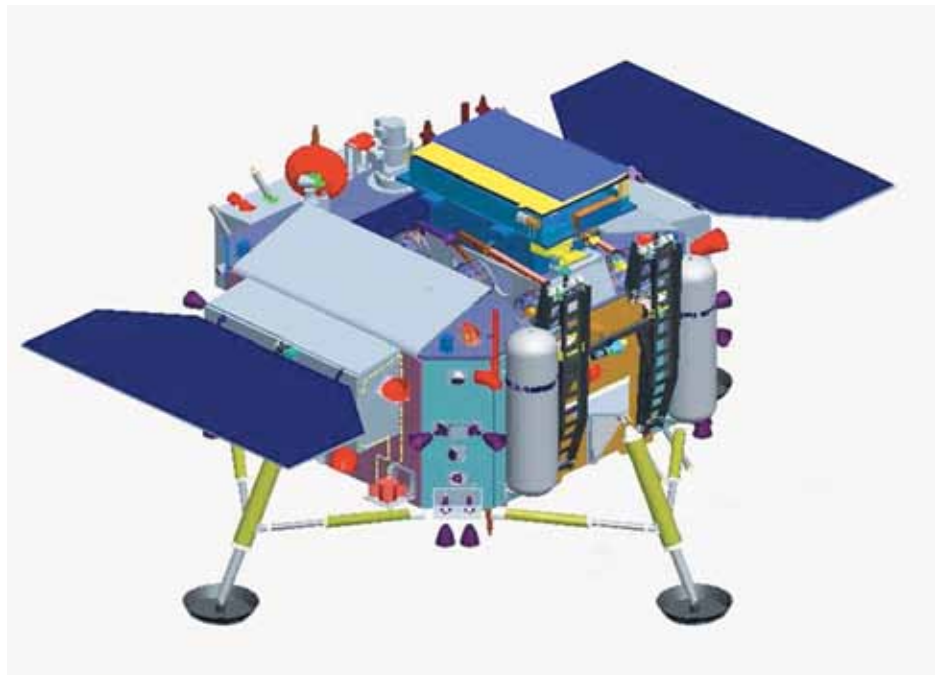
While the usual suspects in Washington are unnerved by the prospects of “Communist” China making such progress, the U.S. and international sci-

entific community is extremely excited. One of the largest known impact craters in the Solar System, the Moon's South-Pole Aitken Basin, may feature exposed mantle materials, according to Clive Neal of the Lunar Exploration Analysis Group affiliated with NASA. "There has been no surface exploration of the far side," Neal told Agence France Presse. "I am sure the international lunar science community will be very excited about this mission. I know I am."

In 2015, China sent out invitations internationally to institutions that might wish to take advantage of this mission by making proposals for experiments to be carried out on the lunar far side. While China's space program began, as did the U.S. and Soviet programs, as primarily a military venture, it has been placed in a civilian agency. The China National Space Administration has expressed great interest in cooperating with other space agencies, and many agencies have shown a great deal of interest in such cooperation. The only outlier is the United States, where legislation passed by Congress has placed draconian restrictions on cooperation with China in space. In many respects, the Chinese program has replaced the role the U.S. program traditionally played, in encouraging space activities in all the countries of the world. For the Chang'e-4 mission, China has invited private enterprises to take part, and is conducting a competition to fly a small scientific instrument on the orbiter or lander, which will undoubtedly engage the interest of students.

China-Russia Collaboration

The success of the Chinese space program has been greatly assisted by Russia, its great neighbor to the north, which inherited the bulk of the Soviet space program. And as the Chang'e-4 mission shows, their cooperation continues. While Russia is rebuilding much of the capabilities destroyed during the Yeltsin period, it is continually under fire from the United



Chinese National Space Administration

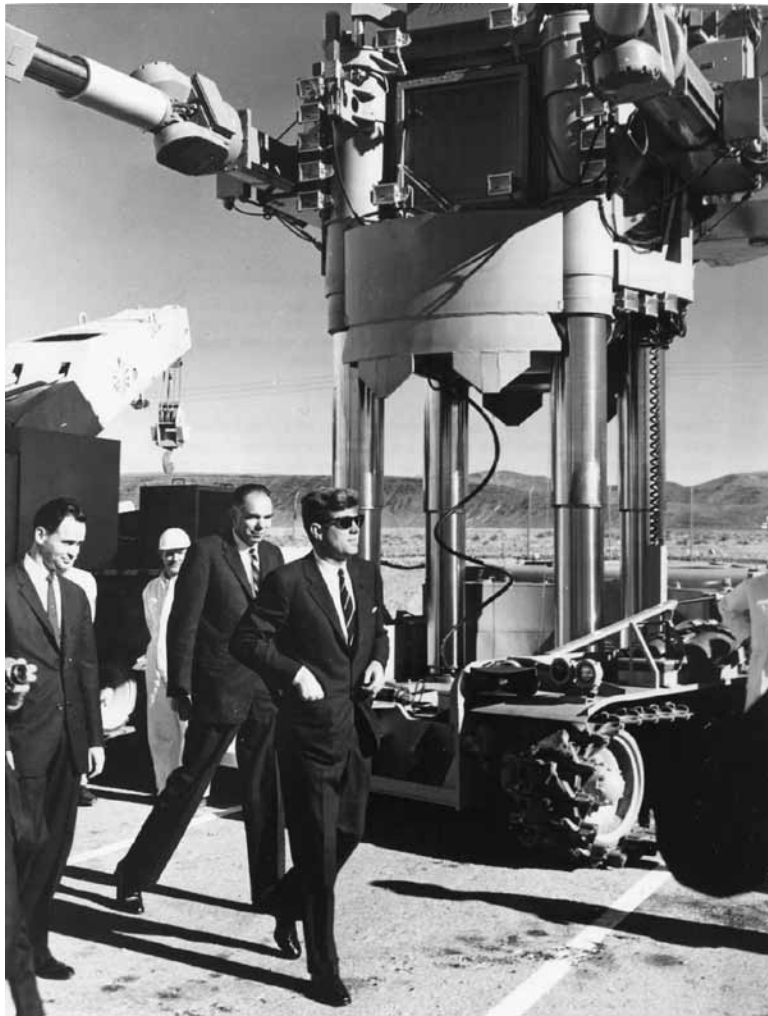
The Chang'e-4 lander concept as of June 2015.

States and its British friends, intent on "keeping Russia down."

But Russia's collaboration with China has been mutually beneficial, with Russia contributing its expertise in space and China prepared to invest in the development of the Russian Far East. The close relationship between China and Russia has also served to help China assume its rightful role in the world, even in an environment in which China is still seen by the West as a potentially hostile power. Chinese efforts to counter this impression are coming up against decades of Cold War propaganda, which have left its traces in the fears and antagonisms of the Western population, propaganda which is being consciously revived to serve the war-mongering stance of the Obama Administration.

The U.S. "color revolution" in Ukraine and the "pivot" to Asia have together soured the relationships between these two important nations—Russia and China—and the United States, and have placed them both on a war footing.

Nevertheless, China has continued to progress and has very successfully mobilized its neighbors and the world to participate in President Xi Jinping's "Belt and Road," a program of infrastructure investment that promises to transform the region into a transmission



President John F. Kennedy visits a NASA launch site.

belt of industrial and agricultural production and cooperation between East and West.

A Stark Choice for the West

At the same time, when viewing the condition of the Western economies, one is reminded of Edward Gibbon's *Decline and Fall of the Roman Empire*. The U.S. economy has become a veritable rust belt, and that includes our transportation system and overall infrastructure.

The submission to Wall Street's demands that "shareholder prices" be maintained at the cost of productive investments, including infrastructure, has driven the living standards of what were considered middle class families into bankruptcy and even homelessness. As a result, the suicide rate is increasing expo-

nentially. And our failure to continue a "war on drugs" has condemned an ever-increasing proportion of our youth population to a life-long addiction and, in many instances, to an early grave.

The wars of the Bush and Obama administrations have created a flood of refugees from the war-torn Middle East into a Europe already savaged by murderous austerity administered by that satrapy of the London banking system, the European Union.

The direction that the Obama Administration and the European powers have taken by meekly submitting to the dictates of a bankrupt financial system—rather than taking measures to protect the people from the depredations of an out-of-control financial oligarchy through an immediate return to the Glass-Steagall firewall—has condemned the populations of these countries to an early death, perhaps even through the nuclear holocaust that the oligarchs are intent on provoking.

It doesn't have to be that way. The alternative has been laid out by China, Russia, and India in the Silk Road Economic Belt, the Twenty-first Century Maritime Silk Road, and the program of space exploration. We can depart from the dangerous game of geopolitics and join in a win-win effort to begin to rebuild the world's crumbling physical economy.

As economist and statesman Lyndon LaRouche noted in conversations with colleagues on February 1: "Now if you look at the picture of a map of society, you will say that most of the society we talk about, the trans-Atlantic community is a failure. It has been a failure. As of now, it continues to be a failure. And we are trying to kick it back into some kind of effectiveness. But, the fact is, we need to depend on the leading role of Russia and China. Now Russia and China are a different part of the whole planet than the other parts in general. India is part of this group of interest."

What China has launched in Asia could become the path for moving humanity away from the imminent war danger and toward the "new frontier" of space, of which President Kennedy was an early leader, this time not as a space "race," but rather as a collaborative effort of all nations to achieve the common aims of mankind.