

China Sends its First Spacecraft to the Moon

by Marsha Freeman

At 6:05 PM local time on Oct. 24, the China National Space Administration successfully launched its Chang'e spacecraft into Earth orbit. After its on-board systems are checked out on Oct. 31, it will be sent on a translunar trajectory to the Moon. Six days later, it will begin a one-year mission to explore Earth's natural satellite from orbit, as China joins the United States, Russia, Europe, and Japan in demonstrating the capability to explore the Solar System.

It was reported by *China Daily* that at least 1,000 foreign and Chinese journalists were on hand to cover the launch, which was carried live on television. Chinese citizens had been invited to be on site at the Xichang launch center for the event, in the first-ever real-time public coverage of a major Chinese space launch. Prior to the launch, according to a survey of more than 10,000 respondents, conducted by *China Youth Daily*, 99% said they expected to follow the mission, and 68.9% said they would watch the broadcast live. More than 90% of the respondents said they expect to visit the Moon one day.

China's Vice Premier Zeng Peiyan, was at the lift-off, and at a post-launch press briefing, he thanked the scientists and engineers working on the lunar program, and outlined the challenges and risks that lie ahead in achieving mission success. President Hu Jintao sent his congratulations to the launch team.

Following the launch, NASA issued the following statement: "NASA applauds China's achievements in human and robotic space exploration, and wishes China the best, with the Chang'e mission." The reference to China's manned space program is notable, as the U.S.A. has, so far, been unwilling to cooperate with China in manned space flight. A week before the launch, on the sidelines of the 17th National Congress of the Communist Party of China, government officials once again expressed their interest in participating in the International Space Station, which would require the agreement of the United States.

The Chang'e orbiter is the first phase in China's lunar exploration program. In 2012, China plans to carry out the second phase, with the launch of a craft to land on the Moon, which will release a rover. In the third phase, another rover will land, and then return to Earth with samples of lunar rocks and soil, around 2017. Chinese space officials have also indicated that a manned lunar mission could take place in approximately 2020. NASA administrator Mike Griffin recently stated that, at the rate the U.S. exploration program is being [under]funded, China may land men on the Moon before the United States does.



Chinese Academy of Space Technology

On Oct. 24, China launched its first deep space mission, Chang'e, seen in this artist's drawing of the lunar orbiter.

Although much of the world media has tried to turn the current crop of lunar missions into an "Asian space race," between Japan, which launched its Selene craft in September; China; and India, which will launch its Chandrayaan-1 lunar craft next year, each nation has been determined to take this difficult step forward only when it is ready.

Goddess to the Moon

China's lunar spacecraft is named for the mythical goddess, Chang'e, who flew to the Moon in a Chinese fairy tale. Interest in a Chinese lunar program actually began in 1978, when the United States presented the Chinese government with 1 gram of a lunar sample, brought back from the Moon by Apollo astronauts. In 2004, the government approved a three-phase lunar program, which is China's first foray beyond Earth orbit.

Chang'e will be placed into a 200 kilometer polar orbit, so the entire Moon will be visible to its instruments. Its objectives include a three-dimensional "portrait" of the Moon, using its stereo cameras, with particular interest in the poles. Previous spacecraft have indicated there may be caches of water ice trapped inside the eternally dark craters at the poles, which would aid in later human settlement.

Chang'e's five scientific instruments will also analyze 14 minerals on the surface of the Moon, to determine its chemical composition, in more detail than earlier missions. Between the Earth and the Moon, the spacecraft will study the cislunar environment.

According to lunar chief scientist Academician Ouyang Ziyuan, China will also focus on improving the understanding of reserves of helium-3 on the Moon. This rare isotope of helium, not available in any abundance on the Earth, will be needed as a fuel for tomorrow's fusion power plants. "The current estimate is between 1 million and 5 million tons [of helium-3 in the lunar soil]," Ouyang told *China Daily* last



People's Republic of China

China's lunar mission is named after the mythical goddess Chang'e, who flew to the Moon.

year. Were fusion to be used to meet global energy needs, he explained, "each year three Space Shuttle missions could bring enough fuel for all human beings across the world." But, as of now, a more refined estimate of the lunar helium-3 reserves is needed.

China has established an "expert committee," involving up to 100 universities and institutes to carry out research using the data that will be sent back to Earth by Chang'e. One major purpose of the program is to attract talented young people to aerospace science and engineering studies. During a roundtable discussion on China Central Television following the launch of Chang'e, Dr. Guan Xingzhong, Assistant Professor at Beijing University, explained that if there are not exciting space projects, there could be a "brain drain," where young people may go into other careers.

It is estimated that China has spent about \$175 million for its lunar program, so far. To the criticism that this money could be better spent on other "Earthly" programs, Ouyang responds that there will be huge benefits to the population, and that the same amount of money builds three kilometers of subway in Beijing.

Participating in the post-launch roundtable discussion, Dr.

John Lewis, Professor of Planetary Sciences at the University of Arizona, and now teaching at China's prestigious Tsinghua University, said that some of his Chinese students "ask why China should be spending money exploring space." He explained, emphatically, that "a mission such as this, costs *one yuan* per Chinese citizen. That's nothing," he insisted. When asked the same question, NASA Administrator Griffin has similarly pointed out that each U.S. citizen spends 15 cents per day on its space program.

A Worldwide Great Project

One issue that is a frequent topic of discussion is, how much technology in the Chinese space program is indigenous rather than imported, and what did China have to develop to carry out this deep space mission. A second question is, why it is important for China (or India or Japan), to do what the United States and the Soviet Union already did nearly 50 years ago?

Discussing the technical aspects of the Chang'e program, Dr. Peng Jing, senior engineer at the China Academy of Space Technology, explained that China "looked back at the past lunar missions of the U.S. and the U.S.S.R.," and "learned a lot." Some components, China did buy abroad, he said. But other things, China had to "develop by ourselves; for example, the solar arrays, and the integration of the systems."

Dr. Lewis added that this mission "represents exploration done by a new partner in the game, and represents the application of year 2007 technology, instead of 1959 technology." China is taking this program "step by step," he said, and is "learning from experience."

Zhang Wei, director general of the Foreign Affairs Bureau of the China National Space Administration, stressed the importance of international collaboration, telling a China Central TV reporter that the Chang'e mission could not be successful without participation from the European Space Agency, Italy, and Australia. The European Very Long Baseline Interferometry network allows China to monitor the health and position of the spacecraft 24 hours per day. This would not be possible, if China had to rely only on its land- and ship-based radar observation system.

Zhang, who was interviewed last year by *EIR* (see Aug. 25, 2006 issue) said that this first step in lunar exploration has been taken alone by China. "For the second stage, of returning and landing, we should consider international cooperation," he proposed. "Science has no boundary of any country," he added. "We have already agreed to cooperate in data applications" with the European Space Agency, the Japanese space agency, "and other countries," he said. "We will continue to open our door to science and exploration programs, worldwide."

Asked by the television commentator why mankind wants to go to the Moon, Dr. Peng said that "curiosity is the nature of humankind. We want to know more about other worlds. We send robotic probes to know more about ourselves, about the origin of the Earth, about the origin of life."