

China blasts off on lunar exploration

China's Moon exploration programme has kicked off with the launch of its first lunar orbiter. Launched on 24 October from Sichuan province in southwest China, the orbiter is a small step in an ambitious, and not yet official, plan to send astronauts to the Moon sometime after 2020. But its significance lies in China's hopes of becoming the fifth power to put a probe into lunar orbit.

"It's a technological confidence-builder," says Joan Johnson-Freese, a China space analyst at the Naval War College in Newport, Rhode Island.

As is often the case when China flexes its muscles, the world has taken notice. Analysts say China's space programme is spurring competition among its Asian neighbours, even as it seeks assistance and collaboration from Europe. Meanwhile, the United States, wary of military competition in space following China's anti-satellite weapons test in January, is monitoring the programme carefully.

The 2.3-tonne, US\$190-million Chang'e-1 spacecraft — named after a mythical Chinese goddess whom legend says flew to the Moon — rode on a Long March 3A rocket that blasted off from the Xichang launch centre. If all goes to plan, by 5 November the probe will have parked itself in an orbit around the Moon. It will then begin a year-long geological and mineralogical analysis as it inspects the surface for future landing sites.

Chang'e is carrying a camera and an altimeter to build a three-dimensional map of the lunar surface, spectrometers to determine the Moon's elemental composition, a radiometer to map soil depths by measuring reflected microwaves, and detectors to monitor the solar wind.

That will set the stage for Chang'e-2, which aims to land a rover on the Moon by 2012. The rover would transmit video footage and analyse soil samples. Scientists in Shanghai are developing a nuclear-powered prototype that resembles NASA's current Mars rovers Spirit and Opportunity, although it is not clear if China's space agency will select this design. A possible subsequent Chang'e-3 mission would gather lunar rock samples and return them to Earth.

China's space missions are organized as five-year plans, each designed to make significant technological advances over the previous one. "By Western standards,



China's lunar probe lifts off from the Xichang launch centre, aiming to reach the Moon by 5 November.

it's painfully slow," says Phillip Clark, head of the Molniya Space Consultancy in Hastings, UK, who has studied the history of China's space programme.

Johnson-Freese notes that the Chang'e missions are exploratory science missions managed by the nominally civilian China National Space Administration, as opposed to China's manned missions, which are under the control of the People's Liberation Army. In 2003, the Shenzhou 5 mission carried the nation's first

astronaut, Yang Liwei, into orbit, making China the third country to do this after the United States and the Soviet Union. Two astronauts flew aboard Shenzhou 6 in 2005. A spacewalk is the next milestone, planned for next year.

Eventually, the capabilities of the two programmes are expected to merge. But there have been few official pronouncements from the top levels of government. A deputy commander for the Shenzhou programme has said China could have people on the Moon by 2020; Clark thinks such a date is optimistic, but possible. Top Communist Party officials have avoided committing to a specific date, probably for fear of making it too much of a competition with the United States, says Vincent Sabathier, director for space initiatives at the Center for Strategic and International Studies in Washington DC. "They're trying to avoid this race," he says.

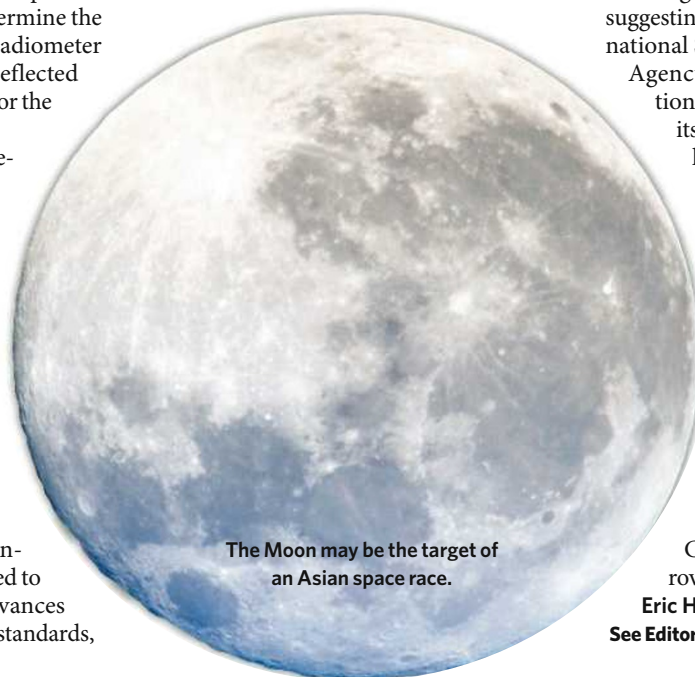
Yet in September, NASA administrator Michael Griffin evoked the language of the old US-Soviet space race when he said China might very well beat America in sending astronauts back to the Moon. Some observers, including Johnson-Freese, say this was perhaps more a case of Griffin expressing his frustrations with NASA's progress in returning to the Moon than a reflection of any race with China — after the Chang'e launch, Griffin sent congratulations to his Chinese counterpart. NASA is planning to launch its own Lunar Reconnaissance Orbiter into a low polar orbit late in 2008.

China has made a few overtures towards working in space with other governments, suggesting that it might want to join the International Space Station. The European Space Agency has encouraged such collaboration, for instance allowing China to test its tracking stations for Chang'e by following the 2003 launch of Europe's SMART-1 lunar orbiter.

Any new space race will be mainly in Asia, says Sabathier. In September, Japan launched its SELENE mission, a sophisticated lunar orbiter nicknamed Kaguya, which has reached lunar orbit and released two small satellites. It is checking its instruments and will begin measurements in December. Meanwhile, India is planning to launch a lunar orbiter and impactor in April, called Chandrayaan-1, with potentially a rover to follow. ■

Eric Hand

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The Moon may be the target of an Asian space race.

NASA