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China in space: conquests, reversals – and revival

The success, relapse and then partial resuscitation of its lunar explorer Yutu, or Jade Rabbit, should awaken us to the broad advance China has achieved in space

After six weeks successfully mapping the lunar surface, China's six-wheeled, radar-equipped Moon buggy explorer ran into some tricky surface conditions – most likely, our silver companion's glassy and notoriously abrasive dust. Yutu then lost contact with its controllers just before it was due to go into hibernation over the course of the Moon's 14-day, -180°C night. Yet after a national outpouring of grief, a new, unprecedented [euphoria has swept China](#), now that signs of life have once more been detected. As we go to press, the situation is hopeful, even if full recovery may be deemed unlikely. Indeed, the whole Jade Rabbit affair has, according to one American expert, 'revealed both sloppiness in the Western media and a stubborn lack of openness by the Chinese government' – despite the latter's recent conversion to a certain new transparency about its [drive into space](#).

Still, let's get one thing straight. For it to combat poverty in the countryside, China, like India, has no choice but to develop its expertise in space. A quarter-century after America developed its global positioning system (GPS), it ought to be obvious that satellite technology is essential to modern telecommunications. For China to pursue [precision agriculture](#), for its isolated rural areas to pursue [e-commerce](#), for Chinese ships and planes to navigate, and for general weather forecasting, prowess outside the atmosphere is nowadays indispensable. TV, broadband, mobile telephony and the People's Liberation Army (PLA), which runs China's overall space programme and launch facilities, all depend on space technology. So too, after 2030, will the tracking of China's energy, environment, forests and water, as well as the country's handling of natural disasters, [depend on space](#).

Therefore let's not think that going back to the Moon, as China has, or going to Mars, as it intends to do, are simply prestige undertakings – even if they definitely help China project 'soft power' in international culture and diplomacy. These efforts have their uses. Surface probes have prospected very little of the Moon's surface, and Chang'e 3, the lander which brought Yutu to the Moon, is [equipped with instruments](#) that could shed new light on excavation, the presence of oxygen and other elements,

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and their processing. China is barred by the US from any collaboration in space matters; but in satellite-based global positioning, the BeiDou Navigation Satellite System, is already half-way toward a full-scale, 35-satellite rival to GPS (BeiDou will also be a [rival to Europe's own Galileo project](#), which China once joined and was then excluded from). In pure science, China aims to put an X-ray telescope and a gamma ray experiment into space soon, supplementing the near-ultraviolet telescope it has on Chang'e 3. And in commerce, [China sells and helps finance satellites](#) – often designed for observing conditions on Earth – to Pakistan, Laos, Nigeria and the Democratic Republic of Congo.

As Jade Rabbit shows, it is not all plain sailing. A mission to Mars failed in 2011. China's 200th orbital launch, to put an earth resources satellite into space in a [collaboration with Brazil](#), foundered in December 2013. Some argue that, with its first Taikonaut circling the Earth as far back as 2003, and its full-size, modular, permanently-crewed space station perhaps not due for completion till after 2020, China is, despite learning from and at the same time going one better than the engineering of other nations, still taking its time in space. Moreover China's fourth spaceport, the [Wenchang Satellite Launch Center](#) on Hainan island, may not see its first launch till next year – a year behind schedule.

Yet in orbital launches, China now jostles with the US for second place behind Russia, putting payloads into space at an average rate of more than one a month (Russia: three a month; Europe, about one every other month). In rendezvous, proximity and docking manoeuvres, China is, once more, only behind Russia and the US. [China has a quarter of a million people engaged in space activities](#) – many of them, unlike their foreign counterparts, in their early 30s. China's Tiangong ('heavenly palace') programme established a three-person laboratory module up last year, and is expected to see an 18m, 22-tonne core module blasted off in 2015. Last, by contrast with its three other launch pads, Wenchang will benefit from sea links (good for transporting big rockets) and near-equatorial velocities (good for geosynchronous and heavyweight missions, as well as for saving fuel). Because it isn't a remote, Cold War location, Wenchang will also do a fair bit for all-round economic development in China.

It's hard to get good statistics about China's activities in space, and especially its R&D expenditures in the field. However, in terms of the revenues it gains from satellite services, China ranked only 13th among the world's nations in 2011: China SatCom received just \$178m from 13 satellites, while Intelsat, Europe, got \$2.6bn from 61. Yet for the money it puts in to space, the Middle Kingdom reaps disproportionate benefits – while the US spent \$48bn in 2012, China spent just \$3bn. No wonder China hopes to take 15 per cent of the world market for commercial satellite launches before very long.

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Altogether, China's prospects in space mirror those that it has on Earth. Technologically and economically, it has made some impetuous breakthroughs, but still has much to conquer. In the international plane, it collaborates with Canada and has signed an agreement with the EU to try to ensure that BeiDou and Galileo do not suffer frequency interference with each other. Militarily, too, [China is far from being in hibernation mode](#) in space: in 2013, for example, it was able to test a satellite with a mechanical arm that could be used to hit other satellites or change their orbit.

Already the architect of America's GPS, Colonel Bradford Parkinson, has warned that its civilian variants are [vulnerable to cyber attack](#), and, although jamming is possible from the ground, US Director of National Intelligence James Clapper [recently warned](#) that 'Chinese military writings highlight the need to interfere with, damage, and destroy reconnaissance, navigation, and communication satellites'.

We're likely to hear a lot more about China's capabilities in space warfare. In the meantime, though, it might be an idea to visit the Wenchang spaceport on Hainan island. You may not be able to get in; but later this year, a theme park devoted to space is scheduled to open nearby – complete with its own roller-coaster.