

Lunar Touchdown For China

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Recently, the media has experienced another cascade of reports on the possibility of a Chinese manned lunar program. Translations of an article from a Hong Kong newspaper have hit the wires, and even found their way back into English-language versions of mainland Chinese publications.

The year 2024 has been slated as a possible date for China's first manned mission to the moon in most reports, although some caution needs to be exercised. Were Chinese officials misquoted? Is this a landing date, or merely the date for starting work on a manned lunar program?

Does this refer to circumlunar missions, orbital flights or an actual landing? Mistranslations of earlier reports on Chinese lunar missions previously suggested that the Chinese would land astronauts on the moon in 2017. It was later explained that this date referred to robotic landings, and that reports had been misinterpreted.

So caution needs to be exercised with specific details, especially dates and times of missions. But the report seems to reinforce perceptions that China is serious about sending astronauts on the moon. At some point, this will presumably lead to a landing. Regardless of the accuracy of these recent translations or reporting, a landing in 2024 does seem feasible, if China maintains a steady pace of missions and hardware development.

How could China land astronauts on the moon? It's slowly assembling the elements in an incremental form. The Shenzhou orbital spacecraft

would probably play an important role, just as the Russian Soyuz was originally expected to support lunar missions. Shenzhou could be sent on circumlunar or orbital missions. Later, it could perform an "mother ship" role in lunar orbit while a Chinese lunar module touches down.

China will also need large boosters to support a landing mission. Earlier this year, reports suggested that the development of the Long March 5 series of rockets, which will outstrip any previous Chinese vehicles in lifting capacity, has been officially sanctioned.

Long March 5 rockets could potentially hurl modified Shenzhou spacecraft on circumlunar missions, or possibly orbital flights. But their capacity will still not match the Saturn 5, which could launch two spacecraft together on a landing mission.

China will probably use some form of Earth Orbit Rendezvous strategy for a landing, and may also elect to do this for a circumlunar mission. Separate launches will deliver hardware such as Shenzhou vehicles, landers and rocket stages to boost the spacecraft out of Earth orbit. The docking practice obtained by the upcoming Shenzhou 8, 9 and 10 missions should provide much groundwork for such a flight.

In fact, a circumlunar mission could be accomplished without the massive Long March 5 rocket. China's existing fleet of rockets could be used to unite a Shenzhou spacecraft with a booster stage in Earth orbit, then send it moonward. Such a flight could be accomplished soon after 2015. But what else lies in the wings?

We have seen Shenzhou. We have seen models and drawings of the Long March 5. We can take educated guesses about the design of booster stages for lunar missions, which could easily be modified versions of existing Long March rocket stages. But the appearance of a Chinese lunar module remains a mystery. China has apparently never exhibited

so much as a simple drawing of a manned lunar landing spacecraft. Perhaps no plans have been drawn yet for such a vehicle.

Your correspondent hereby presents a possible outline for the design of a Chinese lunar module. If China is serious about attempting a lunar landing a few years after their robot landing program reaches its climax with a sample return, then a connection could exist. China could be planning to incorporate technology and hardware from its robot landers into its manned landing program.

China has released illustrations of box-like lunar landers in official presentations. One mission would deploy a small rover down a ramp. Another is reminiscent of the Soviet Luna sample-return missions, blasting a rocket stage with a small capsule back to Earth. The "descent stages" in both missions seems to be identical. It also seems vaguely reminiscent of China's Dong Fang Hong satellite bus, which has already been modified to support the Chang'e Lunar orbiter. Engineers typically modify existing technology to serve new purposes, which saves time and money, as well as importing reliability. So the gradual evolution of the DFH satellite bus to new applications is understandable.

If the basic technology of this bus were modified even further, increased in size, and given more capacity, it could serve as the platform for a Chinese lunar module.

The crew cabin for a lunar module could be sourced from the Shenzhou spacecraft itself. China could modify the Shenzhou orbital module, which is like an autonomous spacecraft in its own right, to fulfil this requirement.

The Shenzhou orbital module offers a fair amount of pressurized volume for up to two astronauts, and would arguably be no more cramped than the Apollo lunar module. It also contains an EVA hatch and a docking

system, which will all be demonstrated on upcoming Earth orbit Shenzhou missions. The Shenzhou orbital module is also capable of independent flight with its own thruster system, as demonstrated by the lengthy "solo" missions every Shenzhou Orbital Module launched by China has flown.

The EVA spacesuits designed for the Shenzhou 7 mission could be modified to allow Chinese astronauts to walk on the moon and carry tools.

An ascent engine system will need to be added to the Orbital Module to lift it off the lunar surface, but afterwards, it could easily fly China's moonwalkers to a lunar orbit rendezvous with an orbiting Shenzhou.

China will probably not carry solar panels on its lunar module. They can obstruct rendezvous and docking operations. Panels would also add weight to what must, by necessity, be a fairly light landing craft. Apollo performed well with batteries, and a Shenzhou-derived lander can do the same.

A single illustration from China could render this speculation irrelevant, but in the meantime, speculation is all we have. The moon awaits human footprints yet again.

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