



China's Lunar Space Situational Awareness—An Update

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China has three new projects for lunar space situational awareness (SSA) that will increase its ability to observe progress on the Moon and detect changes in the surrounding volume. This brief report is an update to prior research on China's ground and space-based systems for SSA beyond geosynchronous Earth orbit (GEO).¹ That paper described different Chinese capabilities for tracking known and scanning for unknown objects beyond GEO, capabilities which China is also expanding and will be discussed elsewhere.²

This update describes China's new plans for lunar orbit optical observation satellites and two lunar surface radio telescopes. Based on currently available information, only one project is an expansion of the Chang'e Lunar Exploration Program (CLEP), and all three projects include a lead or supporting role for the China Manned Space Engineering (CSME) Office.³ There does not yet seem to be a role for China's new Deep Space Exploration Lab (DSEL), but this could change.

Lunar orbit Moon observation satellites

CMSE in February 2025 posted bidding information for a low lunar orbit remote sensing satellite project and in March awarded the contract to the state-owned enterprise (SOE) China Academy of Space Technology.⁴ The project bid does not specify numbers of satellites nor a launch timeline. The bid notes that the lunar observation satellites will support the first and follow-on crewed lunar missions, which should start in the next few years. The bid further notes that the remote sensing project is intended to encourage participation from "social strengths to increase efficiency," which in the past has meant enabling non-government financing.⁵ The term recently also means broader public participation.⁶ As more information becomes available, observers can determine if the satellites' orbit could also support lunar South Pole observation.

Lunar surface synthetic aperture radar (SAR) for Earth observation (simulation)

As China completes projects included in the 14th Five-Year Plan (FYP) (2021-2025), space watchers should look for updates on China's lunar near-side SAR simulation for Earth observation. Chinese researchers proposed this project in 2022 and it launched in 2023.⁷ The

project proposal states that the simulation will first make breakthroughs in the high-precision space-time positioning technology that is needed for a “SAR imaging width of around 3,500-4,500km and spatial resolution better than 100m.”⁸ If the project has made progress, China’s technology proposals under the 15th FYP (2026-2030) should describe next steps, which may include infrastructure for the lunar near-side.

At the time of approval, the project was framed as a “young scientist” project, and the advisory committee was composed of mostly China Academy of Sciences (CAS) experts, including CAS’s representative on the CMSE Leading Small Group, Zhang Peng.⁹ A representative named Liu Zhifeng from the SOE China Aerospace Science and Industry’s (CASIC’s) 23rd Institute, which is a major contractor for ground radar systems, was also on the advisory committee.¹⁰

Lunar far-side radio telescope

Probably as a result of ongoing 15th FYP (2026-2030) discussions, Chinese unofficial media outlets have recently reported that Chinese researchers proposed a three-step plan to build a large lunar far-side radio telescope with 7,200 antennas covering 30km.¹¹ The first stage would include 16 test antennas deployed robotically on the upcoming Chang’e 7 (CE-7) and CE-8 missions. The second and third stage would include astronaut support. According to Chinese media, in the second stage, astronauts would deploy another 100 antennas through extravehicular activity, and in the third stage, astronauts would complete the antenna’s construction as part of the International Lunar Research Base.¹²

As discussed in a prior report, deep space radars are tuned for distant signals and usually filter out larger, closer signals to protect the antenna’s sensitivity.¹³ With this in mind, the Chinese proposal for a lunar far-side radio telescope is in line with the trend of increasing Chinese participation in international deep space radio astronomy and planetary defense. Chinese researchers have included deep space astronomy goals even in early design discussions of CE-4.¹⁴ Since then, each follow-on CLEP project has included a Chinese domestic or international radio astronomy payload.¹⁵ As part of the British Royal Society’s 2024 meeting, Chinese participants presented on a plan for a telescope called the Large-Scale Array for Radio Astronomy on the Farside, which they described as starting with 252 antennas robotically deployed around 2030 near the CE-4 site.¹⁶ If China’s lunar far-side telescope includes a planetary defense mission, China’s DSEL will likely be involved.¹⁷

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Endnotes

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