

To Reach for the Moon

China's lunar program is about more than national pride. Try this: a limitless supply of clean, safe energy.

BY MELINDA LIU AND MARY CARMICHAEL

WESTERN ANALYSTS STILL can't say what Beijing was thinking when it shot down one of its aging weather satellites. True, the recent test was a fine show of marksmanship, destroying a refrigerator-size target sailing at orbital speed 500 miles up (as high as U.S. spy satellites). But was it worth risking a new arms race? Was it even worth the mess it caused? The Union of Concerned Scientists says the test left some 2 million pieces of shrapnel in orbit, each one a threat to any country's passing spacecraft. That's why Washington and Moscow gave up such tests decades ago: the space lanes are already littered with too much potentially lethal debris.

The drifting wreckage is a danger not only to other countries' spacecraft but to China's own ambitions for the heavens—which go far beyond blinding the U.S. military. Beijing put its first man into orbit less than four years ago. Today the Chinese are reaching for the moon. The first step, the launching of an unmanned lunar orbiter, is tentatively scheduled for April 17. A three-man mission will orbit the Earth

later this year, and a spacewalk is planned for next year. Two years after that, the plan is to put down a lunar rover, followed in 2020 by a craft that will collect lunar samples and bring them home. Eventually Beijing wants to put people on the moon, although the target date remains undisclosed. "Their timetable is absolutely realistic," says Jim Benson, president of SpaceDev, a private space-exploration company in Poway, Calif. "Some of it actually seems a little conservative."

National pride is a big force behind China's moon program, but not the only one. The Chinese are aiming to do more than "just set up a flag or pick up a piece of rock," says Ye Zili of China's Space Science Society. What are they after? A limitless source of clean, safe energy to feed their voracious economy. The stable isotope helium 3 (^3He), a potential fuel for nuclear fusion, was first found in moon rocks brought back by the Apollo missions. It is one constituent of the "solar wind" constantly given off by the Sun. The stuff bounces off Earth's magnetic field, but the moon has no magnetic field, and its surface has been soaking up ^3He for billions of years. If you could dig it up and put it into a fusion

reactor you would get ordinary helium 4 (as in balloons), ordinary hydrogen (as in H_2O) and an abundance of radioactivity-free energy. According to Gerald Kulcinski, director of the Fusion Technology Institute at the University of Wisconsin at Madison, a mere 40 tons would be roughly enough to serve America's electrical needs for a year.

Or so the theory goes. The April mission is supposed to learn more about the distribution of ^3He on the lunar surface. If significant deposits are found, China's engineers still need to design the world's first lunar mining machines and send them up—while the rest of us shrink in horror at the thought of strip mines on the moon. And meanwhile someone will have to develop a practical reactor. Kulcinski operates what he believes to be the only working model ever built, a device about the size of a basketball that sucks up far more energy than it produces. "We're not even close to breaking even," he says. What would that require? "It couldn't happen for less than tens of millions of dollars and at least 10 to 20 years," he says.

But don't count the Chinese out. "When you have a communist regime in a capitalist network, you have huge amounts of cash and the ability to direct it," says Lawrence Taylor, a director of the University of Tennessee's Planetary Geosciences Institute in Knoxville. "They could run away with this." And if they fail? At least they will have walked on the moon. ■

Mining the Lunar Dust

Regolith, the loose soil on the moon's surface, contains more than 1 million tons of helium 3. In theory, this nonradioactive isotope could provide an abundant source of clean nuclear energy. How it might be done:

