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For India, the sky is not the limit

Startup reaches for the moon in global competition

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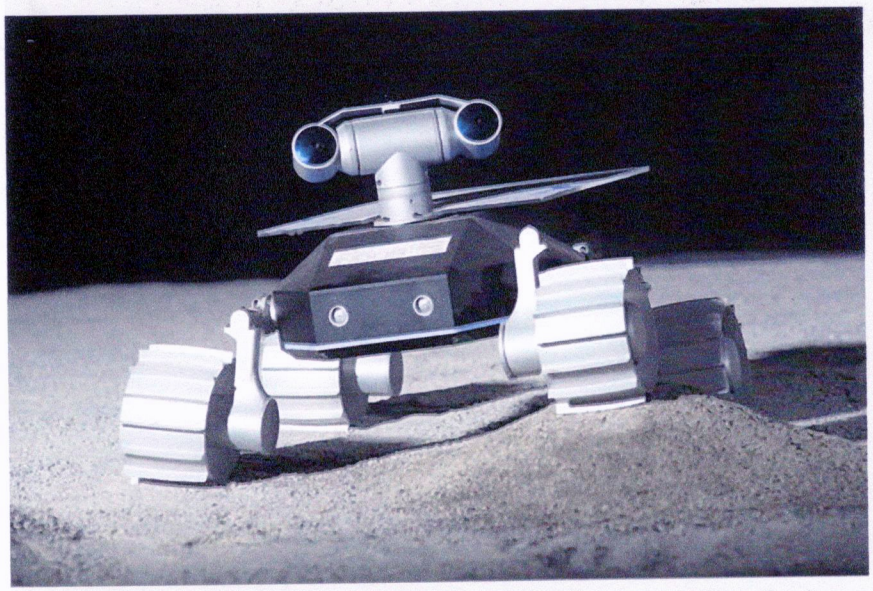

Image of a planned lunar landing which form part of the entry by India's Team Indus for the Google Lunar XPRIZE contest to land on the moon. (Photo courtesy of Team Indus)

NEW DELHI -- Just after Christmas this year, the spindly Team Indus Spacecraft, weighing 210 kg, will be shot into lunar orbit atop a Polar Satellite Launch Vehicle.

The rocket will blast off from the Indian Space Research Organisation's range on Sriharikota island in southeastern India. The countdown will begin on Dec. 28, which just beats the New Year's Eve deadline set by the rules of the Google Lunar XPRIZE -- a global race among five finalists to land and maneuver a low-cost robotic rover on the moon's surface and transmit high-quality data, pictures and video back to earth.

Under the rules, the launch must take place before Dec. 31. But scientists and engineers have a two-week window until Jan. 12, 2018 to factor in other spacecraft in orbit and weather conditions for the actual launch. The launch date will dictate the trajectory. Either a 14-day sling-shot, or a 28-day curve ball that will arc the spacecraft toward a soft landing on the Sinus Iridum ("Bay of

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Rainbows" in Latin), a large plain of basaltic lava on the moon's surface dotted with ridges.

Touchdown is targeted for Jan. 26, 2018, India's Republic Day, and a successful moon landing would mark a major milestone for the country's ambition to be a low-cost, high-tech space player. The 98-member Bangalore-based Team Indus is determined to sprint to the finish line in the $30 million XPRIZE competition.

The competition was launched in 2007 with a pledge to "challenge and inspire engineers, entrepreneurs and innovators from around the world to develop low-cost methods of robotic space exploration." The winning team must secure at least 90% of its funding privately.

Once the lander's 16 thrusters and one main engine, manufactured by Japan's IHI, have switched off, Team Indus's 8-kg, four-wheeled lunar rover, christened ECA (which stands for Ek Chhoti si Asha, or "one small wish" in Hindi, and is pronounced "ikaa") will roll out onto the lunar landscape. The rover will be powered by Swiss motors made by Maxon.

In a sign of the team's confidence, its 17-kg payload will include a second 5-kg rover made by a rival team, Japan's Hakuto. Alongside will be micro-cameras made by French space agency CNES, which will help sensors detect obstacles. Announcing the tie-up in Toulouse in June, CNES president Jean-Yves Le Gall said: "CNES must look for excellence where it is to be found, for today's space technology will drive tomorrow's technology revolutions and growth ... The average age of our new partners is 30, so we will learn as much from them as they will from us."

The rover will also carry a 250-gram experiment from Lab2Moon, a competition that Team Indus launched among Indian universities that drew 3,000 entries; the winner will be picked from 25 short-listed projects. This leaves about 20-kg of commercial payload, which Narayan hopes to sell at up to $2 million a kilogram.

New and improved rover

Team Indus is working on the fifth generation of its rover. By July this year, it aims to have the fifth prototype of its lander ready; that is the version that will travel to the moon. The rover is key, for the first XPRIZE of $20 million will go to the team that not only lands a spacecraft on the lunar surface, but also deploys a rover that will travel at least 500 meters and transmit data as well as high-definition video and images back to earth.

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ISRO was not deterred by the fact that the $57 million Chandrayaan 1 lasted for 312 days despite a target of two years. In November 2013 it launched its Mangalyaan mission, which placed a space probe in Mars orbit in September 2014. The Mars mission cost just $74 million. In May 2016 ISRO successfully launched a scale model of a reusable space shuttle; that project cost $15 million. The country's low-cost but successful space launches compare with NASA's $19 billion annual budget.

If successful, the $65 million Team Indus mission will be a powerful boost for robotic technology in India, which must move quickly up the value chain if it wants to create millions of jobs for its young population over the next decades. "One of the biggest outcomes is that we will have a positive impact on what people think is possible," Narayan told the Nikkei Asian Review, adding: "This is building capability. Whether space tourism happens now, or in 10 years or 20 years, at some point it will happen."

Space is a huge market, Narayan notes. "There is a lot of spending. Until some 10 years ago, two-thirds of spending on space was government money. Now it's the other way around: two-thirds is private money."

As commercialization kicks in, anybody with the infrastructure and capacity to take part in the space business will stand to reap big money. India's successes will also challenge billionaire space entrepreneurs like Elon Musk and Jeff Bezos.

Musk's SpaceX aims to send an unmanned craft to Mars in 2018, while Bezos's Blue Origin, which wants to popularize space travel. Both are developing reusable, low-cost rockets that will make inter-planetary travel possible.

For the moment, Narayan, a Star Trek fan whose work title is Fleet Commander, is busy looking for more young engineers to join his team. He and his Jedi Masters ("thoroughbreds always at hand to guide the colts") are also looking to close their budget gap with a soon-to-be-launched crowdfunding drive.

Every Indian who contributes as little as 500 rupees ($7.25) will get his or her name etched on an aluminium cube that will ride to the moon on board the spacecraft. Narayan reckons he will far surpass the targeted $10 million from 1.4 million donors.

The crowdfunding exercise will inevitably counter critics who view Team Indus's quest as fantastical. "We were the last team to register in the competition. We will be among the first to launch," Narayan said.

"I would blame the cultural mindset that we have as Indians, to not accept that such a thing is possible or doable from India. Had I set up this company in Silicon Valley, people would have said, 'Yes, this is possible.' I believe one big impact this mission is going to have is

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to do away with that mindset forever. It really is possible to start from scratch."

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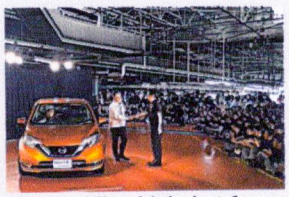

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