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Russian project Luna-Glob: goals and status

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After an interval of more than 30 years Russia is resuming its studies of the Moon by means of space robotic technique. It will look for water at the Moon's poles, identify the presence of the core, if any, and determine its size more correctly than before. "Roscosmos" (Federal Space Agency, Russia) planned lunar program, called Luna-Globe, is scheduled to start in 2012 (or recently) with unmanned exploration of mineral deposits, remote sensing, and inner structure of the Moon (1). After that, the Russians plan to land onto the Moon an advanced heavy rover of the new generation. As to the manned lunar mission, Russia plans to launch it in 2025 with a subsequent establishing of a permanent lunar base within the years 2027 – 2032 (2). According to international agreement, robotic missions will be linked to space cooperation with India, which will provide scientific equipment, the rover, a transfer rocket, and even a launching site for the Russian lunar flights. A joint lunar mission that India and Russia had agreed to undertake may pave the way for long-term, far-ranging collaboration between them in Moon exploration and tapping of its natural resources (3). The Moon mission will be a cross between the two countries' phase-2 programmes for lunar research, Chandrayaan in India and Luna-Globe in Russia. In phase 1, India and Russia will proceed alone. One of the most intriguing riddles of contemporary Moon exploration is the presence or absence in the polar regions of so-called "cold traps" - craters whose bottoms are always shaded from the Sun. The Moon is known to have experienced many collisions with comets. Their evaporation would produce a short-lived atmosphere of water vapor, which would then condense and settle at the bottom of such "cold traps." If there were many such collisions (the history of the solar system is known to have had periods of high cometary activity), then large amounts of water ice

could have accumulated over millions of years. It is the search for water on the Moon that will be central to all the world's next space missions. The search for water in the polar lunar region will be one of the main goals of the Luna-Globe mission. In order to explore small traps a few kilometers in diameter from the orbit of an artificial lunar satellite, it was necessary to combine the neutron detector with telescopic devices accurate enough to match measurements with crater dimensions. These measurements will yield a map of hydrogen occurrence on the Moon's surface. The Russian instrument is sensitive enough to register a hydrogen presence when water content in the Moon's surface is as low as one-tenth of a percentage point by weight. Water ice in near-polar craters, if it exists, will be highlighted as bright specks showing high hydrogen content. Under Chandrayaan-I India, in the first half of 2008, will launch a space probe that will circle the Moon but will not land on its surface. Foreign input into Chandrayaan-I is limited to two research instruments built by the United States and Bulgaria. Russia's first Luna-Globe mission, scheduled for 2010, does not envisage landing any spacecraft on the Moon either. In the second stage, Russia plans to soft-land a 400-kg sophisticated moon rover, which will be carried to the moon aboard an Indian rocket. The Russian programme also provides for phase-3 and phase-4 missions to the Moon between 2012 and 2015. These may also become joint India-Russia projects if the agreement will be effective till 2017 and can be extended by mutual agreement. According to the plans of Russia's Lavochkin Spacecraft Design Bureau, in phase-4, the Luna-Globe programme is planned to look for mineral resources on the Moon. The next stage of exploration will be sampling lunar soil and transporting the samples back to the Earth. It will be followed by the Lunny Poligon program, which will set up some infrastructure near the Moon's poles for a future habitable base to carry out a wide range of scientific and technological studies. The most suitable areas for such a base will be sites with discovered water. Because they are also areas always exposed to the Sun, they could use solar generators to produce electricity to obtain hydrogen fuel from ice for interplanetary ships and the needs of the base.

References: (1) Moon race – 2008 // http:// en.rian.ri/12.01.2008. (2) Russia to lunch space base for mission to Moon, Mars after 2020 // http:// en.rian.ri/12.01.2008. (3) Lunar mission to help long-term collaboration // www.thehindu.com/14.11.2007.