Twin NASA craft launched to study insides of moon

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A Delta II rocket, carrying the Gravity Recovery and Interior Laboratory (GRAIL) mission lifts off from the Cape Canaveral Air Force Station in Cape Canaveral, Fla., Saturday, Sept. 10, 2011. The objective of the mission is to determine the structure of the lunar interior.(AP Photo/Terry Renna)

A pair of spacecraft rocketed toward the moon Saturday on the first mission dedicated to measuring lunar gravity and determining what's inside Earth's orbiting companion - all the way down to the core.

"I could hardly be happier," said the lead scientist, Maria Zuber. After two days of delays and almost another, "I was trying to be as calm as I could be."

NASA launched the near identical probes - named Grail-A and Grail-B - aboard a relatively small Delta II rocket to save money. It will take close to four months for the spacecraft to reach the moon, a long, roundabout journey compared with the zippy three-day trip of the Apollo astronauts four decades ago.

Grail-A popped off the upper stage of the rocket exactly as planned 1 1/2 hours after liftoff, followed eight minutes later by Grail-B. Both releases were seen live on NASA TV thanks to an on-board rocket camera, and generated loud applause in Launch Control.

The spacecraft are traveling independently to the moon, with A arriving on New Year's Eve and B on New Year's Day.

Once they were safely on their way, Zuber announced a contest for schoolchildren to replace the "working-class names" of Grail-A and Grail-B.

"Grail, simply put, is a journey to the center of the moon," said Ed Weiler, head of NASA's science mission directorate, borrowing from the title of the Jules Verne science fiction classic, "Journey to the Center of the Earth."

The world has launched more than 100 missions to the moon since the Soviet Union's Luna probes in 1959. That includes NASA's six Apollo moon landings that put 12 men on the lunar surface.

NASA's Grail twins - each the size of a washing machine - won't land on the moon but will conduct their science survey from a polar lunar orbit.

Beginning in March, once the spacecraft are orbiting just 34 miles above the moon's surface, scientists will monitor the slight variations in distance between the two to map the moon's entire gravitational field. The measurements will continue through May.

"It will probe the interior of the moon and map its gravity field 100 to 1,000 times better than ever before. We will learn more about the interior of the moon with Grail than all previous lunar missions combined," Weiler said.

At the same time, four cameras on each spacecraft will offer schoolchildren the opportunity to order up whatever pictures of the moon they want. The educational effort, called MoonKAM, is spearheaded by Sally Ride, America's first spacewoman. As of Saturday, more than 1,100 schools had signed up.

The entire Grail mission costs $496 million.

Zuber, the mission's principal investigator and a planetary scientist at the Massachusetts Institute of Technology, said the precise lunar gravity measurements will help her and other planetary scientists better understand how the moon evolved over the past 4 billion years. The findings also should help identify the composition of the moon's core: whether it's made of solid iron or possibly titanium oxide.

Another puzzle that Grail may help solve, Zuber said, is whether Earth indeed had a smaller second moon. Last month, astronomers suggested the two moons collided and the little one glommed onto the big one, a possible explanation for how the lunar highlands came to be.

Knowing where the moon's gravity is stronger will enable the United States and other countries to better pinpoint landing locations for future explorers, whether robot or human. The gravity on the moon is uneven

and about one-sixth Earth's pull.

"If you want to land right next to a particular outcrop (of rock), you're going to be able to do it," Zuber said. "There will be no reason to do another gravity experiment of the moon in any of our lifetimes."

Zuber said the Grail findings should eliminate cliffhangers like the Apollo 11 landing in 1969 by Neil Armstrong and Buzz Aldrin. They overshot their touchdown site in part because of the subtle gravity changes in the moon's surface below; they almost ran out of fuel before safely touching down on the Sea of Tranquility.

"It will be easier next time," Zuber promised.

For now, NASA has no plans to return astronauts to the moon, Earth's closest neighbor at approximately 240,000 miles away. That program, called Constellation, was canceled last year by President Barack Obama, who favors asteroids and Mars as potential destinations in America's future without the shuttle.

This is the second planetary mission for NASA since the space shuttle program ended in July, and attracted a large crowd to Cape Canaveral. NASA counted nearly 1,000 guests at Kennedy Space Center on Saturday, nowhere near the 12,000 on hand for the Juno launch to Jupiter at the beginning of August.

Grail was supposed to soar Thursday, but high wind interfered. Then NASA needed an extra day to check the rocket after engine heaters stayed on too long. High wind almost stopped NASA again Saturday; the launch team had to skip the morning's first opportunity, but the wind dissipated just in time for the second.

The year's grand finale will be the launch of the biggest Mars rover ever

the day after Thanksgiving.

"NASA is still doing business even though the shuttles stopped flying," Weiler told reporters earlier in the week.

Grail is the 110th mission to target the moon, according to NASA records. Missions have been launched by the United States, Soviet Union, Japan, China and India.

The previous moonshot was two years ago: NASA's Lunar Reconnaissance Orbiter. Just last month, the moon-circling probe beamed back the sharpest pictures yet of some of the Apollo artifacts left on the moon from 1969 through 1972 - and even moonwalkers' tracks. NASA released the photos earlier in the week.

Ride and Zuber will help pick the winning names for the Grail twins later this year, well before the spacecraft reach the moon.

Zuber said she has her own pet names, "but I think I'll keep those to myself because I don't want to influence the contestants." Some of the names used by members of her team over the four-year life of the project: Fred and Ginger, Castor and Pollux, and Tom and Jerry.

More information:
NASA: http://www.nasa.gov/mission-pages/grail/main/index.html

Sally Ride Science: http://moonkam.ucsd.edu/

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