Kimberly (*left*) and Rebecca Yeung show off the spacecraft they designed.

The launcher carried a LEGO R2-D2 toy and a photo of their cat.

Space Race

How two sisters sent their invention to the edge of space

Sisters Rebecca and Kimberly Yeung set a lofty goal last year. The girls, from Seattle, Washington, wanted to launch a balloon to the edge of space. The cargo: scientific sensors, a LEGO® figure of R2-D2, and a photo of Loki, their cat.

Rebecca, 11, and Kimberly, 9, named their craft the Loki LEGO Launcher. They set three **criteria**, or standards, for success. They wanted to film the blackness of space. They hoped to measure how high the craft flew. Most importantly, they wanted to find the launcher once it fell to Earth.

CHRISTY KINSKEY FOR BUDDINGSTEM GIRLS CLOTHES (KIMBERLY & REBECCA); COURTESY OF THE YEUNG FAMILY (R2-D2 & CAT)

The Yeung sisters worked on the launcher in their family's garage.

COURTESY OF THE YEUNG FAMILY (KIMBERLY & REBECCA)

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Aiming High

The plan was simple: A special balloon would lift a platform of equipment into the sky. Then the balloon would pop and the platform would fall back to Earth.

The girls' parents helped gather materials, and Kimberly plotted the basic design. The sisters built a triangle of thick plastic pipe, with plywood in each corner to support their equipment. They attached a GPS unit to track the spacecraft's position, as well as height sensors, cameras, and a parachute to slow the platform's fall. They added R2-D2 and Loki for fun.

The sisters knew they could use the balloon only once. That meant they couldn't perform any test flights. But they knew how much the balloon could lift, so they weighed their platform. They realized it was too heavy.

The girls replaced the plastic pipe with the lightweight shafts of archery arrows. Now the spacecraft passed the test!

Ready for Liftoff

Finally, it was time to launch. The family drove to an open area. "We turned on the sensors, blew up the balloon, and let go," says Rebecca.

Three hours later, the balloon popped, and the launcher fell to Earth. The GPS signal showed that it had landed in a field 82 kilometers (51 miles) away. The Yeungs found it right-side-up and almost perfectly intact!

The sensor data showed that the launcher had risen 24,000 meters (78,000 feet). Video from the cameras showed the blackness of space. "We were really proud," says Kimberly.

After sharing their project online, the girls were invited to show it to President Barack Obama at the White House Science Fair this past April. One thing about the launch that impressed the president: Loki and R2-D2 never fell off!

—*Katie Peek*

Investigate It!

Engineers solve problems, often by designing new things. They start by defining a problem and setting criteria for success. Next, they create a design. Then they test and improve their design until it works just right. Think about how Rebecca and Kimberly used the engineering process. Then answer the questions.

1. What were the sisters' criteria for success?
2. Which pieces of equipment allowed them to meet each of their criteria?
3. How did the girls test and improve their design?
4. If you were to launch a platform to the edge of space, what would you put on it?