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Riding a Beam of Light: NASA's First Space Elevator Competition Proves Highly Challenging

By Roger G. Gilbertson
Special to SPACE.com
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MOUNTAIN VIEW, Calif. - After three days of grueling competition and friendly shoulder-to-shoulder innovation, over \$100,000 in prize money remained in the vault at the close of the Space Elevator Games - the premier event of NASA's new X-Prize-styled series of [Centennial Challenges](#).

First envisioned in the 1960s, the [space elevator](#) concept began garnering serious attention with the discovery of ultra-strong [carbon nanotubes](#). If built, space elevators would provide an incredibly low-cost route for sending payloads, and eventually humans, to Earth orbit and the universe beyond. NASA has funded studies of the space elevator concept, which have given promising conclusions.

Two Events - Many Approaches

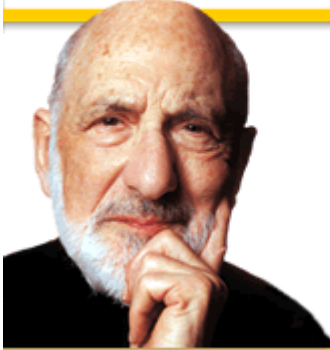
Designed to address the technical as well as "social engineering" issues of the space elevator, these [two engineering challenges](#) are intended to generate interest and excitement in academia, the space enthusiast community, and the general public.

The Beam Power Challenge tasks designers with building an unmanned machine, weighing 50 to 100 pounds (22 to 45 kilograms), capable of pulling itself up a 4-inch (10-centimeter) wide, 200-foot (61-meter) long ribbon suspended from a crane,

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The University of Bri entry makes its way NASA's first Centen competition, which c competitors to build of climbing a ribbon energy. Credit: R. G to enlarge.

and powered only by the energy beamed up from a 10,000-Watt xenon searchlight.

Seven teams vied for the \$50,000 first prize, five from across the U.S. and two from Canada.

The University of Saskatchewan team, led by Edwin Zhang, reached the highest altitude under beamed power, about one third of the full distance. At that point, their 10.7-square-foot (one-square meter) array of space-grade solar cells yielded insufficient energy to continue. Other entrants used various solar array schemes and even Stirling engines driven by the searchlight's thermal energy.

In the second event, the Tether Challenge, four teams offered their best formulation for an ultra-light, ultra-strong ribbon material. During one-on-one tug-of-wars, each of the entrants were tested to their breaking points.

In the final round, the strongest contender, fielded by Centaurus Aerospace of Logan, Utah, yielded at 1,260 pounds of (571.5 kilograms) force, giving way to the "house ribbon" which broke at just over 1,300 pounds (589.6 kilograms) of force, and leaving the \$50,000 first prize unclaimed.

Getting High on Engineering

"Clearly these are hard problems," said Marc Schwager of the non-profit Spaceward Foundation, which manages the Space Elevator events for NASA. "And getting the next generation of engineers inspired to solve these problems will bring us untold benefits."

"It is the pioneering spirit," said Spaceward's Falline Danforth. "Everybody pulling together to do something new. We haven't seen enough of that recently. It gives me a lot of hope for the future."

As in the first year of the [DARPA Grand Challenge](#) for autonomous vehicles, the Space Elevator Challenges set high goals, and seek to inspire innovation as well as public attention.

"This year's unclaimed prize money will be added to next year's, and that alone should boost the number of entrants," said Brant Sponberg, manager for NASA's Centennial Challenges program. "This is an exciting start. We don't need to try to pick and choose which approaches might be successful. We simply invite all new ideas to come and give it a shot, and then reward the best," he said.

With the 2006 climber and tether challenge first prizes set at \$150,000 each, and with smaller awards for second and third places, over 20 teams have already signed up. Indeed, some of next year's hopefuls were seen in attendance, learning from this year's events and taking notes.



The University of Sa team prepares their test run during NASA's Beaming Centennial Challenge. Credit: R. Gilbertson enlarge.



The University of Bri entry climbs ever high NASA's 2005 Power Centennial Challenge. Gilbertson. Click to e

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However, the 2006 rules include added challenges and requirement. "We're raising the bar technically, and we will really need to stick to the time limits and all the rules for the entrants," said Schwager. "But all the teams I they'll be back!"

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