# GOING UP

## A conversation with NSS Space Elevator Team leader Bert Murray

INTERVIEW BY BART LEAHY

**Q: How would you describe a space elevator (SE) for those unfamiliar with the concept?**

A: Take a rope tied to a rock. If you swing it around over your head, it will stay up. If you had a rope thousands of kilometers long on Earth, it would stand up from the surface into space. That is the essence of the space elevator. If you attach an elevator (climber) to this rope, you can move things back and forth to and from space.

**Q: What is your background and experience with SE? How did you get involved?**

A: I was a member of the Denver L5 Society when a bunch of us split off to help Martin-Marietta (now Lockheed Martin/LM) do a baseline reference mission to Mars. LM did the study and supplemented it with volunteers. One of the ideas we kicked around was [Arthur C.] Clarke's idea of including a space elevator in the architecture. More recently, Liftport Group founder Michael Lane and Carbon Designs Inc. founder Brad Edwards did a study on SE concepts using NASA money. I followed SE pretty intently after that. Currently, I'm head of the NSS team to compete on NASA's Elevator 2010 Challenge (www.spaceward.org/elevator2010). The Challenge is to create a climber that can scale a one-kilometer cable suspended from an aerostat (stationary blimp). They plan to do this in Meteor Crater, Arizona, pending government approval.

**Q: What aspect of the space elevator is your team working on?**

A: [We need to work on getting the] most horsepower per pound (not necessarily efficiency) at the required speed (11 miles per hour), which requires a laser for power. Four or five teams have partnerships with Trumpf, Inc. (www.us.trumpf.com), which uses industrial lasers to cut metal. They're bringing their 8,000-watt laser, which has an 8-millimeter beam width. The team has to provide optics that convert the laser's power into mechanical energy. Tracking the target with the laser is critical, so we're putting significant effort into that.

**Q: What progress have you made so far?**

A: Not enough! [*Laughter*] Check out the video that BBC made of the team at www.nssspaceelevator.org/news.html. We have the laser from Trumpf. We have a couple of guys working on software for the laser tracking. The climber and optics we will provide. We have a reasonable chance to compete and win. If we don't win, a lot of us will be there again next year.

**Q: What, in your view, are the critical technologies necessary to make space elevators a reality?**

A: The whole world is in love with the carbon nanotube ribbon attached to the equator. If we have nanotubes of such quality that can do that, then that is one possibility. For me, it's more of a financial and political issue than a technological one. I think a country has to build SE. I don't think a company can build it. It would take 10–15 years to get it done. The technologies are available today that can do it.

Back in the '80s, Paul Birch came up with the idea of a hollow orbiting ring with a supra-orbital wire inside it. The resulting unbalanced centrifugal force would support shorter space elevators hanging from the ring, producing a low-altitude space elevator. That approach would be very expensive. You'd have to get the materials from the Moon or space. Now you're talking about building a base on the Moon—but that's certainly possible, if the funding and vision were available.

A climber ascends the ribbon into space in this artist's rendering.

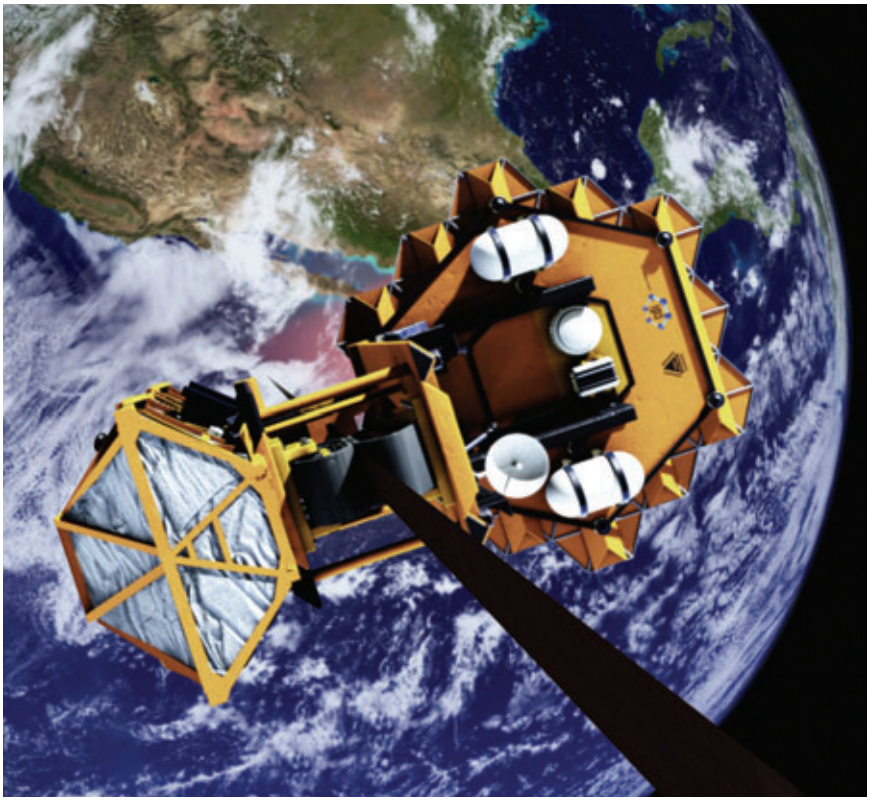
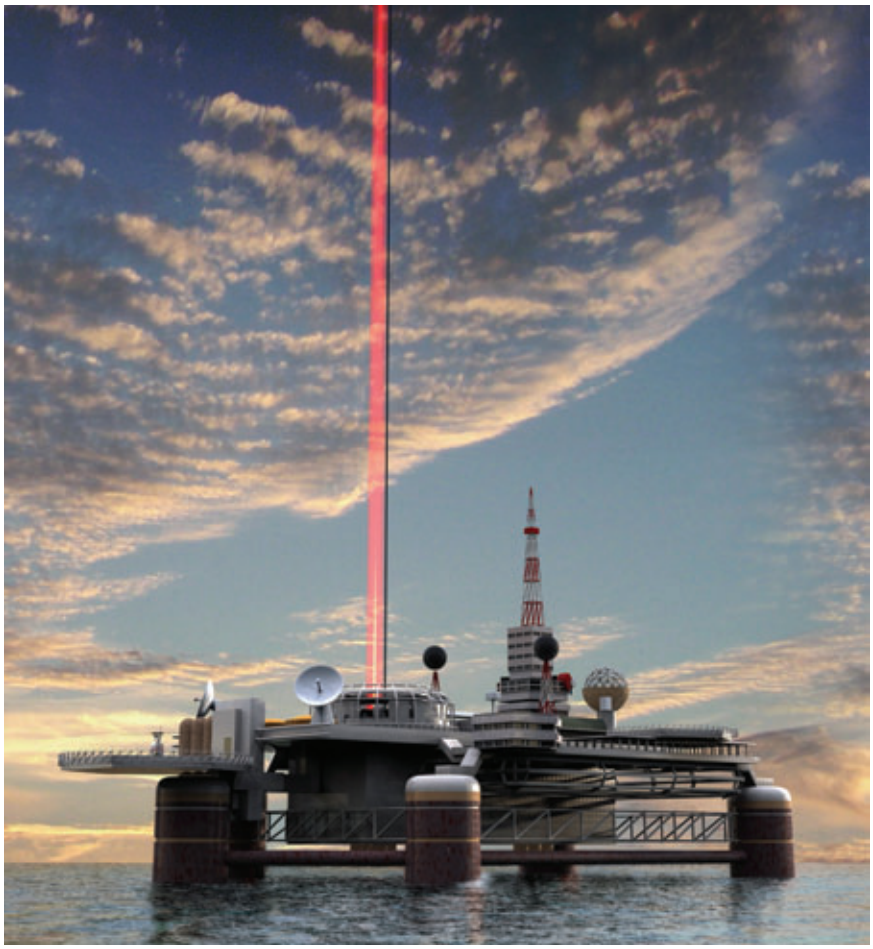


ILLUSTRATION: NASA



At its base, the carbon nanotube ribbon is attached to a mobile platform located in the Pacific Ocean, near the equator.

ILLUSTRATION: © SPACE ELEVATOR VISUALIZATION GROUP

Jerome Pearson, president of STAR, Inc., proposed building the first space elevator on the Moon to work out the kinks in the technology, avoid political issues, and steer clear of space junk, among other things.

**Q: The 2006 Centennial Challenges at Las Cruces faced a lot of challenges with the ribbon twisting in relatively low winds (20–30 miles per hour), and that was on a 60-meter cable. Won't the problems be magnified for something 1 or 37,000 kilometers long?**

A: I attended an SE demo at Massachusetts Institute of Technology in a snowstorm, and it worked fine. It'll work as long as you have your solar array in a geometry that's symmetrical around the cable. What I am worried about is wind loads when the crawler gets up there, so it doesn't get ripped apart. That would be more of a problem.

As for the real thing, only the first 100 miles of the cable is in the atmosphere. A more significant problem may be atomic oxygen eating away at the ribbon.

**Q: What do you think of the prize-based method of developing and proving space elevator technologies?**

A: I'm all for prizes. They stimulate these ideas. If you look at the first practical locomotives or aircraft or the X PRIZE, they worked because of timing. The technology had to almost be ready so that someone just needed to go out and build it. A lot of prizes depend on timing and technology. An SE is more like a Manhattan Project or an Apollo project right now.

**Q: What do you think National Space Society members should know about space elevators?**

A: SE is very close to happening. There's a major incentive to build solar power satellites (SPS) right now, but what's left out of that is that you have to have an operational SE, on the Moon or Earth.

The whole purpose of SE is to reduce the cost of getting stuff to space by a couple of orders of magnitude. Right now it's around $10,000 a pound. SE is going to put something in orbit for hundreds of dollars, one percent of the cost. Once SE is in place, it opens new, renewable energy and resource options for the planet. It would be an environmentally friendly method of opening space resources to the Earth like Helium-3; platinum-group metals from the Moon or asteroids, which would reduce the cost of fuel cells; and of course SPS—either by bringing materials from the Moon, Earth, or orbit, or all of the above. I see this as part of a green movement.

**Q: What can NSS members do as private citizens to move space elevator progress forward?**

A: Education's one. There's still a large segment of the population that doesn't even know about SE. Also, explain that there are multiple configurations of SE. Some are feasible now, some are massive efforts that would take the resources of the whole planet to build, but would be a good thing. I see this as a path to a cleaner, greener, more environmentally friendly planet. That's why I do this.

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Bert Murray is a system staff engineer with Lockheed Martin in Maryland. He has 30 years of experience in aerospace and transportation project management. He became the NSS Space Elevator team leader in 2007.

Bart Leahy is a technical writer working in Alabama. He is currently chairman of the NSS Space Policy Formulation Subcommittee, chairman of the NSS Space Settlement Calendar, and a regular contributor to *Ad Astra*.

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Please contribute to the NSS Space Elevator Team at www.nssspaceelevator.org.