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Building Jack's beanstalk

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An elevator stretching all the way up beyond 36,000 kms could become a reality this century, if not sooner, according to specialists. It could replace costly launches.

Even while more serious sessions at the International Astronautical Congress 2007 at Hyderabad discussed with concern the problem of space debris and exploitation of space, more audacious technical sessions saw experts take dreams to the heights of reality.

Space Elevator was discussed in all sombreness as experts looked at the progress so far and the hurdles encountered. It should take off in the next 10-12 years said some while others pegged it at a more realistic century!

But all agreed that it was an idea that had to be explored, given the way it can slash costs of space transport from the present \$10,000 for a kilo of payload to \$100!

To describe space elevators, it was Arthur C Clarke who first talked of making "space transport cheap and affordable" in his 'Fountains of the paradise' in 1978. The same man who had first mooted the idea of geosynchronous satellites at a time when it was met with cynicism!



But the original idea came from a Russian scientist named Konstantin Tsiolkovsky in 1895 when he suggested a fanciful 'Celestial Castle' in geosynchronous Earth orbit attached to a tower on the ground.

That is essentially what scientists and engineers are working towards today. A long cable extending from our planet's surface into space with its center of mass at geostationary Earth orbit (GEO), 35,786 km in altitude and electromagnetic vehicles travelling along the cable transporting people, payloads, and power between Earth and space. The payloads could be gently tipped into suitable orbits.

The cable (called tether or beanstalk!) will be strung between an anchor on earth and a counterweight in space. This weight would keep the cable from tumbling to earth while the opposing forces of gravity and centrifugal force would keep it taut.

It is suggested that the counterweight could be a satellite, a recovered asteroid, or some very heavy weight, but as Prof Arun Mishra of McGill University said, "this weight could be impractical. It is being suggested that the mass of the cable above the geo orbit could act as this weight."

He for one is optimistic that the elevators will soon be in place. "The individual components and the dynamics of how it works have been researched quite a bit. It is now a matter of stringing it along." He noted that tethers as long as 2 kms are already in place in experiments of the atmosphere.

The objects released at the top end would have enough energy to escape into orbit or if taken further up, can also escape to moon or other planets! One speaker even said that it could provide the ideal way to get rid of messy payloads like nuclear waste! Or even space debris.

The challenge for now is to find a material that could make the cable strong. But as David Raitt (Netherlands) said, the solution is not far off.

But, as Stephen Cohen of McGill University said, the material has to be light and of less density while its tension must be below yield strength. However there is demand for such materials from the construction sector too and that should propel research where space elevators may not be able to!

Carbon-nanotube-composite ribbon made of small pieces set side by side could be the answer, said Peter Swan, US. But while carbon nanotubes have been made, commercial fabrication to

the lengths required still are a way off.

It's happening fast enough, if one believes the experts. However, as Mishra noted, the problem is the huge quantities of this that will be required, stretching to 100,000 kms!

Powering the climbers is one other aspect being studied ([Elisenda Bou of Spain](#) talked of using the laser as a power source) as also the need to study the environment of the climber, the vibration of the elevator, reduction of the cable oscillation as the climber goes up or down, nature of release of payloads once at the top, etc.

Many private companies are taking part in the research. This month around 24 teams will begin qualifications in US for the Space Elevator Power Beaming and Tether Strength Competition for a chance at a \$1,000,000 offered by NASA through its Centennial Challenges.

So, if you are envying the lucky rich who can take that space ride for Rs 1 crore, perhaps it pays to be optimistic and wait for the elevator, for one smooth ride to the skies.

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