The Space Elevator

On June 28, we saw the end of an era. It was the last time that a shuttle ascended on a pillar of fire into the heavens. All three of NASAs orbiters are to be decommissioned this year (1). However, the end of the shuttle does not have to be the end of space travel for the United States. There is something that can be obtained via modern sources and materials, something that will usher in a new era of space exploration and travel. This thing is the space elevator.

The space elevator is an achievable goal within today's technical limitations. It is possible to build a fully functioning space elevator using current technologies. However, the space elevator would be expensive. The price tag of a space elevator is estimated to range from ten to twenty billion dollars.

The question now poised is why we should build the space elevator. Currently, the main problem with the space elevator is the cost. It is doubtful that the United States government would ever pony up the money for such an expensive project. It is far more likely for the space elevator to be built by a consortium of nations than by one single one. Though it is possible a Space Elevator could be considered a private operation and built and run by a corporation. Yet it is still more likely to see such a project undertaken by groups like the EU, UN, NATO, WP, and NAFTA.

In today's world, the space elevator has another major problem. It is a big target. With the advent of global terrorism, any major construct built by a first world country is a target. Security, both for during construction and after completion of the project, is essential. However, this will add to the cost of the elevator, and is a reason not to start the project in the first place.

Now that we have heard the downsides, we should take a look at the upside. The space elevator will be able to loft things into the outer atmosphere at a fraction of the cost of current methods. According to NASA, it cost four-hundred Million dollars for each shuttle mission, on top of the 1.7 billion dollars it cost to build the shuttle in the first place. While the startup cost for the space elevator is much higher than other programs, it would be much cheaper than those same programs. Also the elevator would have a much smaller turnaround time than other methods. Turn around being how long between missions you wait before launching a new mission.

Because the turnaround time is lower, and the rides are cheaper, the space elevator opens the door to human colonization of space. The main problem with building space stations in the current environment is the cost of getting materials up there. With cheaper transport, such as the space elevator offers, stations will be much more attainable. Among the projects that have been suggested are orbital power stations, habitats and manufactories. It is also possible to build elevators to lunar stations and mars colonies; however, these elevators could not be connected to the earth.

Now that we have discussed why we should build the space elevator, now we should talk about how we would construct a project that is on such a grand scale. Earlier, it was mentioned that a space elevator needed to go to geosynchronous orbit.

Currently, there are several different ways in which we could build a space elevator. The design which has the most support is the idea of building the earth side station on a platform akin to an oilrig. Having the station on a mobile platform allows the entire ribbon to be moved in order to avoid orbital debris, debris that could damage or destroy the ribbon if involved in a collision. By locating the rig away from established shipping lanes and air traffic the ground station is at less risk of attack. The ground station is also easier to defend. If you know who is supposed to be in the area, uninvited guests stick out like a hippie at the pentagon.

You could also construct the platform on land, but that idea has much less support. In fact I was not able to find any sources that actually recommended or advocated a land based ground station.

As stated earlier, the space elevator needs to reach geostationary orbit in order to function at its maximum capability. However, according to howstuffworks.com, the space elevator would reach farther than just geostationary orbit. Its center of mass would be at that orbit, but in order for the center of mass to be there the elevator would need a counter weight system. Projections call for the counterweight to be located at a height of approximately sixty thousand miles, or a quarter of the way to the moon.

As to what the counterweight is to be made out of, there is several proposals for that too. These ideas range from small meteors to satellites, though one of the more accepted and feasible options is to assemble the counterweight from cast off and left over building materials. Say you launch several unmanned rockets up with supplies for the up station and the elevator itself. Leaving the rockets and construction equipment behind is hazardous, and would be a constant danger to any other space based project undertaken. Creating a counterweight out of these materials will kill two birds with one stone.

So far in our little elevator, we have the top floor, we have the bottom floor, and we have the guy that busses people in. What we are missing is the elevator itself, and the cable that carries it to the heavens. The cable is the most important part of the space elevator. It tethers the top station to the ground, and serves as the primary guide for the elevator car. Because of the stress put on the cable, it needs to be strong. The best bet would be carbon nanotube; however it is far more expensive than steel cable. On the other hand carbon nanotube is several hundred times stronger than regular steel.

Carbon nanotube is basically a microscopic rope. However, instead of fibers, it is made of pure carbon. With making the guide cable, or ribbon, there have been two propositions. First, there is the relatively old fashioned cabling. Cables are made by taking individual strands of fiber, steel, or in this case nanotube, and winding them around each other. Then you can continue wrapping the cables around each other. The second idea is to use binding agents to glue them together and make something like an actual ribbon. Unfortunately, we do not currently have binding agents to stand up to the stresses of space. In direct sol light, the glue will boil, and when there is no sol, the glue will freeze instantly and fall apart.

The car of the elevator won't be the type of car that you think about when you think of an elevator car. Elevators on earth are of two types; hydraulic and cables. Cable elevators are the most

like the space elevator, but with a few differences. First earth elevators are moved by something either above the car or below it. Not that that could not be possible for a space elevator, but another big problem is the distances. On earth, the taller elevators only ascend no more than several thousand feet. The space elevator has tens of thousands of miles between its start and end points. So the current design of the space elevator calls for a climber powered by beamed energy. Yes, the space elevator will be powered by LASERs. A free electron LASER situated either on the base platform or on a separate platform will beam energy up to a collector on the elevator, powering it. The elevator will also have friction treads to crawl up the ribbon. It will take a while, but it is less energy intensive than that of a rocket launch.

In conclusion, the space elevator can be, and in my honest opinion, is the future of orbital travel. Yet I don't want you to take my word for it. Think of this article as more of a primer to space elevators. Do your own research, form your own opinions'. Maybe in you research you will find something better than the space elevator, advocate for it, and someday in the future, you'll have something named after you.

The author would like to state that this paper is a result of his views, opinions, and speculations on the papers subject. It is no way an actual scientific paper and the author has not done any first hand research on this topic. All sources used are second hand sources. The author would also like to remind the reader that the reader should never take anything at face value and that the reader should do his own independent research and form his own opinions on this topic. The author would also like the reader to know that the author has no formal degrees or training in this field or any other. The reader is reminded that this article is an introduction to the topic but is by no means fully covers the topic.

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useful for current news, also has a great video introduction to the project.