

Re: beanstalks (was Re: Metallic hydrogen ...)

Source: <http://sci.tech-archive.net/Archive/sci.physics/2004-06/8864.html>

From: Ian Stirling (root_at_mauve.demon.co.uk)

Date: 06/27/04

Date: 27 Jun 2004 16:13:21 GMT

In sci.physics "N:dlzc D:aol T:com \((dlzc)\)" <N: dlzc1 D:cox T:net@nospam.com> wrote:

> *Dear Ian Stirling:*

>

> *"Ian Stirling" <root@mauve.demon.co.uk> wrote in message*

> *news:40de07ae\$0\$9698\$ed2619ec@ptn-nntp-reader02.plus.net...*

>> *In sci.space.policy "N:dlzc D:aol T:com \((dlzc)\)" <N: dlzc1 D:cox*

> *T:net@nospam.com> wrote:*

>>> *Dear Ian Stirling:*

>>>

>>> *"Ian Stirling" <root@mauve.demon.co.uk> wrote in message*

>>> *news:40dde11c\$0\$8790\$ed2619ec@ptn-nntp-reader02.plus.net...*

>>>> *It depends on where you terminate the tether.*

>>>> *For example a 50GPa 1.3 density nanotube rope made into a tether.*

>>>> *If the tension at the base is 1Kg, then up to 48300Km (from the center*

> *of*

>>> *the*

>>>> *earth), the mass is 27Kg.*

>>>> *The tension is 30N, and the acceleration is .1m/s^2.*

>>>> *If you terminate here, you need a mass of 300Kg, for an overall mass*

>>>> *of 327Kg.*

>>>> *At 191000Km, the acceleration is 1m/s^2, and the tension is 4N, with*

> *the*

>>>> *tether mass being 84.4Kg below this. The counterweight only adds 4Kg,*

>>>> *for an overall mass of 87Kg.*

>>>> *Taking it right out to where the tension is 1/1000N, the mass is half*

>>>> *a gram, and the total 88Kg.*

>>>>

>>>> *You've described a tether system that can just support itself, with no*

>>>> *elevator, no load. Each lofted kilogram will require slowly-decreasing*

>>>>

>>>> *Not quite.*

>>>> *The payload is the same as the tension.*

>>>> *When you put a payload on the bottom, the tension falls to near zero.*

>

> *The tension where? The tension at the anchor, as you've described the*

> *tether is simply supporting the tether. As you add an elevator, the net*

> *tension increases. As you add payload to the elevator, the tension*

> *increases again. The tension at the Earth end is not at issue.*

Nope.

There is a preload of somewhat above the mass of the payload on the cable.

Say this is 2 tons.

If you put a car of 1.5 tons on the cable, then the tension at the earth end drops to 0.5 tons, and gradually rises back to the 2 tons figure as the car climbs.

<snip>

>> *It depends on the average strength/density of the tether.*

>> *For the above tether, the mass of each car is some 1% of the total mass of the system.*

>> *Payload maybe 0.5% or so per.*

>

> *So we can take up 0.5% of 327 kg per load (including the elevator)? That is a whopping 1.5 kilos... no room for batteries, drive motor, really not much of anything.*

No, .5% of 88Kg, so 500g or so payload and 500g car, for a 1Kg tether.

I'd hoped it was obvious that the 1Kg payload tether was only an example, and the math is exactly the same for 1 ton, or 1000 tons.