

Re: We can meet all our needs through space development

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Source: <http://sci.tech-archive.net/Archive/sci.space.policy/2008-01/msg01022.html>

- *From:* Willie.Mookie@xxxxxxxxxx
 - *Date:* Wed, 30 Jan 2008 11:56:27 -0800 (PST)
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This is a repeat of the post I responded to above. 40% has already been achieved by solar cells made by Spetrolab – NREL has tested them and found them 40.7% efficient. I go into more detail.

You did not say how you would power your ion rockets. Ion rockets have very low thrust to weight when compared to laser powered rockets of the same specific impulse (see Kares papers on Laser Sustained detonation rockets) –

Rubble piles are moved – if needed – by attaching thrusters to dense metallic asteroids and then navigating dense metallic asteroids near them and then moving both where desired at an acceleration equal to the gravity between them. The rubble pile's volatiles are propellant for the engine. The size of the engine needed is 200,000 kgf – acceleration times are 36 months. Transfer times are 7 years – to get a total process time of 10 years.

Solar sails use 15,000 times as much energy as laser powered rockets. While they use no propellant, they do use materials to form the sails. At the asteroid belt they'd need to be 115,000 larger than the solar power satellite I've proposed to carry out this mission. Again, sunlight is in short supply in the asteroid belt. Materials are not.

The alternative is to lower the mass flow rate – but this increases the build time and makes the entire system unsustainable using asteroidal materials.

Terminal navigation around Earth and through the asteroid belt is non-trivial. However since the asteroid belt has an orbital period of 4.599 years (Ceres) – and less than one year is spent imparting the initial boost for a hohmann transfer orbit – the system will not spend several revolutions in the asteroid belt.

Even though the thrusts are 15,000x higher for my system than for your proposed light sail system– the acceleration rates are on the order of microgravities (millionths of a gee) and gravity tugs and adequate time for maneuvering in non-trivial ways is allocated in the three

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year boost phase (sum of both ends)

The system i've proposed, far from being pie in the sky – is nearly optimal. Systems you have proposed are not.

On Jan 29, 10:55 pm, Einar <eina...@xxxxxxxxxx> wrote:

It's all interesting and all that to observe your pye in the sky figures. The problem with them your assumptions are so far beyond what one hears ellsewhere, which explains my deep scepticism...like expectations of 13% efficiency not 40% as you appear to assume with solar energy. A large difference.

The program I find believable assumed that it will take some years to achieve that 13% efficiency, as current mass produced solar cells do not achieve more than 10%, so federal funded development effort is assumed to bring the efficiencies up to 13%...which they assume to be the necessary minimum to make theyr program work.

I can only assume that you are expecting what is now only possible in controlled laboratory settings will become practical mass production, which by the way is not an obvious assumption.

I simply must disbelieve your figures until you can give some idea how you are arriving at them.

By the way, the asteroid project you appear to be assuming sounds really seriously expensive. It would be cheaper to send small ion powered probes to check on the asteroids. After all they'd need to be observed close up, as you appear to realize. The problem with Earth observatories is that at the distance we are talking about, the pixels have become pretty large. So even the best of them will only give a very rough idea what to expect.

The problem with rubble piles is that they can't be shifted, lest they come apart. You'd need some sort of a factory ship on the spot, is my expectation.

You appear not to consider solar sails as propulsion method, but they have the merit of not needing fuel and would also benefit from your lasers you assume will be plased in the vicinity of the Sun.

The thing with asteroids, would be gentle movements. Sounds very doubtful that even the solid ones would be able to handle rapit rates of movement, so gentle acceleration perhaps like 0,001g or even 0,0001g which would make solar sails ideal. In addition, as you think rubble piles can be strapped together in some fashion...a delicate operation for certain, I think you'd prefer towing to pulling. In fact towing may be preferable to pulling.

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In addition it's necessary to consider the effects on the other asteroids. The path chosen has to be very carefully worked out, as after all you really don't wish to make other asteroids careen out of their orbits. That means it's very unlikely that some sort of a direct trajectory towards the Earth will prove practical. More probably it will be necessary to take several orbits around the Sun, before an asteroid can be finally moved out of the belt proper.

I think it would be reasonable to reckon with 5 – 10 years of gentle moving and nudging until Earth orbit. It may even be that 15 – 20 years would even be necessary for the more fragile or distant ones.

Now, your ideas sound very nice, but your figures sound too good to be true.

Einar