Re: Fusion Propulsion

Source: http://sci.tech−archive.net/Archive/sci.space.policy/2007−03/msg00088.html

- *From*: Willie.Mookie@xxxxxxxxx
- *Date*: 5 Mar 2007 01:39:02 −0800

On Mar 4, 6:56 pm, "Williamknowsbest" <William.M...@xxxxxxxxx> wrote:

> Let's engage in a bit of fantasy...
>
> An ovoid disc shaped craft with thick polyethylene skin penetrated
> every 10 nm with a fiber channel of the type described here, with each
> fiber fed by a MEMs based injector that takes depleted metaboric acid
> (beta phase) and produces oxygen along with generating 11−boron nuclei
> and proton streams from the fiber channels, to produce 3 alpha
> particles with a combined energy of 8.54 MeV − at a rate sufficvient
> to generate up to 3500 kg per sq m of thrust.
>
> Each sq meter masses 100 kg of fusion systems described here, that are
> 5 cm thick and is backed by a 20 cm thick layer of metaboric acid in a
> segmented tank covering the entire inner surface of the vehicle.
> Massing another 500 kg for the metaboric acid. The outermost layer,
> penetrated by crystal fiber channels every 10 nm is 40 kg of
> polyethelyne (UHMWPE) per sq meter − 4.3 cm thick.
>
> So, an ovoid disk consisting of an aluminum skin, with a 20 cm thick
> tank surrounding the entire surface, 5 cm of fiber crystals and high
> voltage accelerator and mems based injector, and a 4.3 cm thick layer
> of ultra−high density polyethelyene. Massing 320 kg per sq m.
>
> So, the total mass is 640 kg per square meter and the total thrust
> capable of 3500 kg per sq m. With half the surface producing thrust
> the maximum take off thrust is somewhat less than 2.73 gees − for the
> empty vehicle. 1.37 gees maximum takeoff acceleration fully loaded.
>
> Assuming the propulsive skin and structure is one half the total mass
> of the vehicle, another 640 kg of payload is carried per square meter
> of surface area. Thus a disc 22 m in diameter and 10 m thick at the
> center with 640 sq m of surface area can produce masses 819,200 kg of
> which 409,600 kg is craft, and 409,600 is payload. 320,000 kg is
> metaboric acid. 232,700 kg of this represents an oxygen supply for
> the cabin.
>
> Load per unit volume is double that of large aircraft like the B747.

Total capacity is 9x that of a B747. In appearance it may look something like this (without the vortex)

http://media.popularmechanics.com/images/tb_saucer−lg.jpg

With an exhaust velocity of 12,000 km/sec ideal terminal velocity of a 819,200 kg aircraft with 320,000 kg propellant is;

Vf = Ve * LN(1/(1−u)) and u = Mp / Mt

u = 320,000 / 819,200 = 0.39

Vf = 12,000 * LN(1/(1−0.39)) = 5,943 km/sec

At full acceleration this will require; t = V/a = 5,943,000 / 9.82
= 604,800 seconds −−> 7.00 days
At 1 gee acceleration − 20 days
At 1/10th gee acceleration − 200 days
At 1/100th gee acceleration − 2000 days

Distances span the inner solar system in a matter of days
Span the outer solar system in a matter of weeks to months

3200 cubic meters of volume is 5x the volume of a 747 cabin. 1000 passengers with full spacesuit and gear can be carried across the solar system by this vehicle. Cargo versions carry 400 tons of useful payload. 2,000 lbs of oxygen per day are needed with 1,000 passengers − obtining this from the metaboric acid requires that no less than 1/5th gee be pulled during transit. This provides a 100 day supply. 500 passengers can operate at 1/10th gee for 200 days.

The skin structure and fuel choice provides substantial radiation protection during transit. Quick transit times through the inner solar system (hours to the moon and days to Mars at 1 gee) also avoids substantial radiation loads. Actually 1/3 gee for a mars bound flight along with a 1/6 gee for a moon bound flight allow passengers in transit to acclimate to the local gravity at their destination.

1,000 people per day can be sent to Mars with a fleet of 14 − assuming reasonable turn around. The same fleet could send 7,000 people per day to the moon. Supplies would require an additional 6 freighter versions of this craft. With 1 ton per person year on the moon and mars using current technology, 200 tons per day to mars supports 73,000 people, and 1,400 tons per day to the Moon supports 510,000 people. Shifting the fleet from passenger to freighter after 70 days provides for expansion of this population. Once each colony has learned to 'live off the land' by growing food, generating their own air, their own water and so forth, from local resources, shifting back to passenger configurations from freighter configurations allow continued expansion of the populations on each world. Self−generated population growth, by those born on each of these worlds would tend to

> increase freighter needs. High value products returning to Earth would permit recovery of some value during the dead−head flights back. Tourists flights would also allow use of passenger craft to generate revenue without shifting use patterns − and the returning tourists would fill the passenger craft. About half the capacity for a two week flight would imply a 7,000 tourists population in place and 183,000 tourists per year for mars, and 49,000 tourists in place and 1.27 million tourists per year for the moon. Increasing tourism from these figures to nearly double these figures are sufficient to keep the fleet busy without major investments, and permit as long a period of time as needed to grow beyond the 73,000 on Mars and the 510,000 on the moon permanent populations − possible with this fleet of spacecraft.
>
> So, we're talking about 50 spacecraft total. 20 allocated to Mars, 14 passenger and 6 freighter. 20 allocated to the moon, divided the same as mars, and 10 allocated for general solar system support. 5 of these are freighter configuration, 2 are for deep space long−duration tourists (think round the world cruise of several months) and 3 are configured for scientific & research missions.
>
> At a cost of $5 billion each, this is a total of $250 billion. Another $330 billion is estimated to be the capital requirements for the support infrastructure on Earth to build out the colonies and support the engineering efforts to solve the problems of living on the moon and mars, and maintain human presence across the solar system.

A few other points;

Excess metaboric acid can be stored at Mars base, Moon base, or any forward basing system to provide local power AND oxygen. So,an additional 200 tons or so of oxygen can be supplied to a forward base per trip, along with power, just by loading the ship fully on the outbound leg, and having a means to store metaboric acid on the inbound leg.

This means that for the moon and mars, which use very little of the vehicles 'legs' could support double the population estimates given, and loading them 1/4 with emmigrants and 3/4 with tourists would allow from zero (or at least a hotel and tourist trap strip) to reach 150,000 on Mars and 1,000,000 on the Moon in two years from a standing start. Assuming vehicle development, (and don't forget infrstructure development which is important!) of 5 years, means we could have full scale planetary development on moon and mars in 7 years and manned presence across the solar system as well. 1,000,000 people on the moon, 150,000 people on Mars, 20,000 people spread throughout the solar system, 50 vehicles of the type described here built in 5 years achieve that.

Windows do not exist on this craft. Basically, small UHDTV CMOS based

color sensors cover the surface of the aircraft, giving stereo views to the limits of human vision in all directions.

http://www.cinematography.net/Pages%20DW/UltraHighDefinition−UHDTV.htm

UHDTV was deveoped by NHK and experimental broadcasts took place in Japan in 2004. HDTV has 2 million pixels and a contrast ratio of 2,000:1 and a frame rate of 30 per second. UHDTV has 32 million pixels, a contrast ratio of 16,000 to 1 and a frame rate of 60 per second. By partially overlapping fields of view on the surface of an aircraft, and placing image sensors every few cm (interoptical distance in humans) full 3D imaging is possible in any direction using any of a variety of 3D display technology.

http://en.wikipedia.org/wiki/3D_display

This will be used in the design of the control cabin certainly.

And the interior of the spacecraft can be equipped to give everyone a 'window seat' even in interior cabins. Also pre−recorded scenes on memory chips can be substituted for actual scenes at passenger discretion. 2D displays of arbitrary size and distance can be simulated by computer within this 3D environment, to create virtual control panels for ship operations (for qualified users in qualified locales) or for personal computer systems, video games, or watching your favorite old−style movie.

Dozens if not hundreds of variants of this basic aircraft design could exist using this technology, for aircraft on Earth, commercial, industrial even to the levels of package delivery and toys. Tiny remotely controlled smart fliers, 12 for 10 dollars, the had fuel supplies built in that lasted a year, would be quite popular.

A flexible aluminum pouch, looking a lot like an aluminum cookie sheet packaged in polyethylene admits the insertion of up to 1 kg of papers photos etc., and receives text information from your cell phone to allow you send packages in minutes to anyone anywhere − with recovery of the package for reuse.

Gladware like packages with similar capacities carry up to 10 kg anywhere, and are perfect for food delivery from anywhere to anywhere else. This could supply troops, victims of disaster, or people enjoying the great outdoors.

For long−range deliveries MEMs based sensors and global wireless internet access by qualified users (similar to GPS cell phone access by police) permit monitoriing for drugs, weapons, IEDs, and even pests and viruses using these devices. With proper care to design, these devices will be far safer and more reliable than today's autos ships and aircraft..

Today's movement toward greater automation of Visa processing and so forth will be expanded to a totally automated seamless system that allows people to travel anywhere at will in minutes while complying fully with the intent of all the visa and immigration laws across the world − and quickly identify and defeat anyone who attempts to use the proposed system to cause mischief.

Managing a transition to this sort of system would even help the global war on terror and combat drug use.

This system can easily be used to extend controls off−world and monitor illegal activities there. Enhanced GPS, solar system wide positioning, global wireless internet, expanded to a solar system wide wireless interplanetary internet, MEMs based detectors, secure access by authorized users, well defined rights to privacy in this meleiu of capabilities, would give folks maximal wealth with maximal security and maximal freedom.

Include an enhanced non proliferation treaty− to allow collection of all fission materials and export of them to the moon, for a UN based research center of fission research − backed by UN police equipped with fusion powered rocket packs, fusion powered rail/laser guns, fusion powered tasers, all internet enabled − backed my tele−robotic heavy UCAV fighters with fusion powered rail/laser cannons − and a fair and equitable set of engagement rules − and we maintain security across the solar system as humanity unites to expand into the next great frontier.

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