Re: sci space policy targeted by disinformation experts?

Source: http://sci.tech−archive.net/Archive/sci.space.policy/2008−03/msg00502.html

- *From*: Ian Parker <ianparker2@xxxxxxxxx>
- *Date*: Thu, 27 Mar 2008 04:59:50 −0700 (PDT)

On 27 Mar, 02:52, Willie.Moo...@xxxxxxxxx wrote:

> A lot of speculation − I recall reading really interesting stuff, that just falls off the radar screen so to speak for no damned good reason. Usually when something doesn't work for a sound technical reason, you can find some arcane journal article explaining why. When you cannot find that, there is a possibility − if the ideas are sound otherwise, they've been taken black.
>
> One way to check that out is to track the researchers. Are they teaching and not doing a damned thing, or are they busy and have moved from where they were to points West and stopped publishing?
>
> Thats another inferential point to anyone who cares.
>
> Energy is a problem with high speed flight. Aurora nominally burning hydrogen in air in an external combustion scramjet − and a 10% structural fraction − producing thrust by intercepting the shock waves. You eject the fuel into the stream at the stream velocity − right at the shock wave at the nose − so its stationary in the flow. By the time it reaches the thrust structure at the rear of the aircraft, its mixed with an oxidizer − you stablize that with an expansion shock, and detonate it with a laser or spark or particle beam − and the shockwave and thrust surface are shaped to interact to produce thrust.
>
> Mach 6 and drag coefficient gives you an estimate of power. The X−15 had a drag coefficient at hypersonic speeds of Cd = 0.095
>
> Drag force is equal to
>
> F = 1/2 rho V^2 * Cd * A
>
> http://en.wikipedia.org/wiki/Aurora_aircraft
>
> area looks to be in the 30 sq m range
>
> http://en.wikipedia.org/wiki/Scramjet_Programs

http://en.wikipedia.org/wiki/Mach_number

Mach 6 is around 1,800 m/sec, and rho=0.01 kg/m3

So,

F = 1/2 * 0.01 * (3.24e+6) * 0.095 * 30
= 46,170 newtons
= 4,701 kgf
= 10,343 lbf

at around 50 km altitude

Force times distance is energy.
Force times speed is power

So, 46,170 newtons x 1,800 m/sec = 88.106 megawatts

Hydrogen when burned in air releases 143 megajoules per kg. Assuming 1/4 of this energy is usefully applied to the propulsion system,and 3/4 of the energy is wasted in various ways − means 35.75 megajoules of propulsive energy is available per kg of hydrogen. This gives us a burn rate of 2.46 kg/sec to maintain that thrust. With a 50% cycle efficiency − fuel use is cut in half 1.23 kg/sec

This is the likely fuel consumption of hydrogen for the aircraft at this speed − from first principles.

Going back to our models of Aurora − it likely has a 600 cubic meter fuel volume. and hydrogen has a density of 70 kg per cubic meter which obtains 42,000 kg fuel mass. Enough to power the aircraft for 4 hours and 45 minutes at Mach 6 cruise − at thelower efficiency, and 9 hours 30 minutes at the higher efficiency. Enough to fly 3/4 of the circumference of the Earth at cruise at the lower efficiency, and 1.5x around the world at the higher efficiency.

One can imagine a number of interesting missions for such an aircraft if it exists.

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We can only argue plausably in this. 0.095 is in fact quite good for supersonic speed. It should be recalled that a typical subsonic aircraft has an L/D of about 20. Flying wing configurations improve this as the drag from the fusilage is eliminated.

It will be recalled that Concorde was about 7:1 and with most of its take off weight fuel just about limped to Washington from Heathrow. We don't know whether Aurora was 10.5:1 or some worse figure. Discussing

an L/D ratio for hypersonics is a little bit misleading as airflow is
so integrated with engine performance.

− Ian Parker
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