

Re: Size of the proposed "new" space vehicle?

Source: <http://sci.tech--archive.net/Archive/sci.space.shuttle/2005-10/msg00105.html>

- *From:* "tomcat" <jlavine@xxxxxxxxxxxxxx>
 - *Date:* 6 Oct 2005 17:46:17 -0700
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Mike Dennis wrote:

> I'm not convinced you know much more about these subjects than the buzzwords
> you're tossing about. Characterizing the shuttle as a waverider is quite a
> stretch. The nanotube cloth will be cool someday, but not quite yet. I
> agree it looks very promising. The atomic hydrogen approach, something I've
> worked with a little, has it's own problems and is more likely better suited
> to "NERVA"-like Nuclear or Inductive Reactance motors. But since neither
> exists today, there's a lot of work to be done. Free Enterprise by itself
> could make any of these work individually, but it takes a National effort
> (or a really really long time) to integrate it. It could be done by Free
> Enterprise, but free isn't really free—if you know what I mean.

The building of a waverider SSTO (Single Stage To Orbit) HTOL (Horizontal Take Off and Land) is easier than many believe. And it can be done quickly!

The secret is to stay with tried and true technology, off-the-shelf, as much as possible. But the design can be challenging.

Even without nanotube cloth, without 'atomic hydrogen', the equilateral triangle waverider can be built.

Triangles are easy to build, not difficult. Old ballistic nose cone technology works: Corelle ceramic on carbon carbon on metal, with a vacuum bottle outer inner hull — as on the Shuttle — to keep the cabin cool.

Use SSME's because they use cryogenic fuel that also helps keep skin and cabin cool and have a high isp as well as 450,000 pounds thrust. The cabin can be roomy but use titanium or an even lighter composite for things inside. The ship has to be very light because of 'dry weight' requirements.

Use hydrogen slush tanks to keep fuel volume minimal. They exist. They work — it is just super compressed hydrogen.

Rig GLOW (Gross Lift Off Weight) to a 1:1 thrust to weight ratio.

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Forget about Tsiolovsky's rocket equations because they apply only to tubular vertical rise rockets, not HTOL waverider spaceplanes.

A rocketplane, spaceplane, spaceship, or whatever you call it, needs a long (35,000 foot) runway and enough fuel for a good 5 minutes of burn time. In your calculations include the fact that thrust to weight ratio will increase rapidly as fuel is consumed. A 1:1 at takeoff will become 4:1 near final 30 seconds of burn. So calculate the average of 2:1, not the takeoff 1:1.

The biggest waverider problem is aerodynamic surface heat. It can exceed 7000 deg. F. Corelle ceramic can take more heat than that and so can carbon carbon. Metals, however, cannot, so the surface has to protect any metal underneath. Hence the importance of nanotube cloth, but ballistic nose cone tests have proven that the protected metal can be adequately protected from the heat. Cooling liquid hydrogen helps as it picks up hull heat on it's way to the combustion chamber.

Now you know why thrust vectoring needs to include 'reverse thrust' capability. So that reentry speed — usually faster than entry speed — can be braked by rocket thrust. Main reason for this is to keep hydrogen cooling to the hull and interior in operation. And, at the same time, it reduces the heat caused by hypersonic air friction.

Note: You can also enhance braking with air brakes. Never heard of air brakes? Jet fighters, and other aircraft, have them already! Why weren't they used on the Shuttle. Well, they were but not fit for early reentry braking. Nobody thought to make them strong and heat resistant enough for that back in the 70's.

Use 'reverse thrust' along with 'air brakes' and reentry heating problems may disappear. No need for ancient heat shields and parachutes! Really!

Engine/tank fuel lines must be made of the most heat resistant materials available. Titanium/tungsten alloy if necessary. **DO NOT USE HIGH TEMPERATURE SOLDER TO SOLDER FUEL LINES.** Seamless welds only. Temperatures in the engine compartment will probably exceed 3500 deg. F. High temperature solder turns to watery liquid at 2500 deg. F. Enough said.

Don't worry about short burn times like 3, or 4, or 5 minutes. Glideslopes from 60 miles high and speeds of mach 20 will take you anywhere on Earth. The Shuttle has proven it. It is a waverider and it works well, except for easily broken silica tiles and low meltpoint aluminum plate.

Because of extreme heat and the possible thermal shock of passing through ice cold thunderheads when super heated use Pyrex glass for canard portholes or canopies. Use an inside layer of polycarbonate to stop UV rays — wicked at high altitudes — and for strength. Put

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vacuum between the two layers to stop convected surface heat during entry and reentry.

Understand that this triangle spaceplane would require 'real' American backing. You have to 'really' want a spaceplane to . . . make one before you die of . . . old age!

Really!

tomcat

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• ***Follow-Ups:***

◆ ***Re: Size of the proposed "new" space vehicle?***

◇ *From:* Jeff Findley

• ***References:***

◆ ***Re: Size of the proposed "new" space vehicle?***

◇ *From:* Mike Dennis

• Prev by Date: ***Re: No more shuttles for another YEAR?***

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