Re: Spaceship One stepping−stone or dead−end?

Source: http://sci.tech−archive.net/Archive/sci.space.policy/2004−10/0407.html

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From: Lawrence Gales (*larryg_at_u.washington.edu*)
Date: 10/03/04

Date: Sun, 3 Oct 2004 00:14:30 −0700

On Sat, 2 Oct 2004, Hop David wrote:

> Date: Sat, 02 Oct 2004 10:32:39 −0700
> From: Hop David <hopspageHATESSPAaMmM@tabletoptelephone.com>
> Newsgroups: sci.space.policy
> Subject: Re: Spaceship One stepping−stone or dead−end?
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>
> Rand Simberg wrote:
>
>> Because, unlike Greg, I actually have experience with aerospace cost
>> analysis. I don't necessarily know what's right, but I damn sure know
>> what's wrong, just as I can confidently say that the earth isn't flat,
>> even if I can't describe its exact shape.
>
> When Greg suggests a 9−fold cost increase between orbital and suborbital is
> off by at least an order of magnitude, you confidently say he's wrong.
>
> Sorry, but given the rocket equation, I don't think an 81 fold increase is as
> wildly ludicrous as a flat earth.
>
> −−
> Hop David
> http://clowder.net/hop/index.html
>
>

.....

I hear a lot about how the mach 3 speed of SS1 is so vastly less than the mach 25 orbital speed that SS1 is a dead−end. However, the Holy Grail of launch vehicles is a reusable SSTO. While some engineers believe that such a vehicle is not possible with present technology, others disagree. But suppose that you could easily and economically transport an SSTO at a relatively slow speed to an altitute of 10−13 miles and release it at a few hundred MPH. The consequences would be:

(1) The ground handling operations, infrastructure, and range safety

provisions would be dramatically simpler and less expensive: from 0 to high altitude it would differ little from an ordinary aircraft flight: no tall vehicle assembly buildings, gantry cranes, flame trenches, etc.

(2) The engines would not only be more efficient but would last far longer than ground launched engines due to much lower pressures. For example the SSME needs *major* overhauls after 1−3 flights compared with 40 flights between *minor* overhauls for lower pressure RL−10 engines, according to Len Cormier. This would dramatically cut costs.

(3) The structure would weigh significantly less because slow ascent and gentle release would eliminate the need for agressive streamlining and would greatly reduce the dynamic loads which in the case of the ground launched shuttle would rip it to pieces if it did not throttle back its engines

(4) The mass ratio would be reduced form 9.7 for a ground launched SSTO using SSME engines (ISP average = 425), to 6.7−7.1 for existing RL−10 engines, depending on the particular model. A huge reduction

(5) The required minimum size is reduced from about 400 tons for ground launch to about 80 tons −− thus the initial development cost can be far less

(6) The re−entry heat load is far easier to handle than the shuttle because it is a very low density vehicle and enters high in the atmosphere as opposed to the shuttle which is very dense (no empty tanks) and enters low in the atmosphere

(7) Its low density makes it a much better flyer than the shuttle (the flying brick)

(8) It would land at less than 70 MPH compared with the 220 MPH of the shuttle, making it far safer, less expensive, and lighter

So we see that a high altitude air launch would dramatically reduce the costs and simplify the develpment of an (assisted) SSTO.

Now all we need is someone to develop a method of slowly transporting a rocket to a high altitude and releasing it at a few hundred mph. Oh, wait, that is almost exactly what Rutan's SS1 has done.

−−− Larry