



Stanford eCorner

Positioning and Competition: Space Travel

Elon Musk, *SpaceX*

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There is quite a lot of capital entering the entrepreneurial space sector, says Musk. He shares some models of competitor vehicles and talks about the differences between them and the SpaceX vehicle. The long term goal is to build human transportation vehicle. He talks about the first SpaceX launch, which will happen in 2004.



Transcript

So a little about each one. That's a picture of the Burt Rutan effort. It's called the White Knight. It's the carrier plane and then SpaceShipOne is the thing that's held in the belly there. And this project is supposedly funded by Paul Allen. So despite all the capitals -- I should make that point -- a lot of capital that's entering this entrepreneurial space sector as well, the only problem I could think of this architecture is that it's not really scalable for something that would get to orbit. This is pretty good for sub-orbital but it actually needs to change for orbital vehicle. And there's John Carmack's effort. He's a little irreverent. This is from his website.

His vehicle is a vertical "take off and landing" vehicle. He's made really incredible progress for somebody who has no background in aerospace engineering. And he's also kind of doing it all himself, with him and three buddies. And I think they will make something that works. You can check out their website, Armadillo Aerospace. It's pretty interesting stuff. But in order to get into orbit, this would require a substantial improvement in the mass efficiency and the engine efficiency, and probably be a two-stage vehicle. Jeff Bezos, who I'm sure almost everyone here has heard of. He is a pretty huge fan of space and in fact, his high school valedictorian speech was about the necessity of humanity expanding to other planets. So it's pretty important to him, from what I understand.

This is our effort. We're spending quite a bit more than the three prior entities that I mentioned. In some cases, probably in the order of magnitude or more, because what we are doing is we make an order of magnitude more difficult. If we're building an orbital launch vehicle, that's a two-stage, very high efficiency engines, very high mass efficiency launch vehicle. And it's targeted to the satellite delivery market. So our perch is really to make this a solid sound physics. And it's predicated on a strategic plan on a known market, something that we know for a fact exists, which is the need to put small to medium-sized satellites into orbit. So that's what we are going after initially. And then with that as a kind of a revenue base, we will move into the human transportation market. The long-term aims of the company are definitely human transportation.

I think a smart strategy is to first go for cargo delivery, essentially, satellite delivery. And our eventual upgrade path is to build the successor to the Saturn V or a super-heavy lift vehicle that could be used for setting up a moon base or doing the Mars mission. That's the Holy Grail objective. On the upper right there, you could see a test-firing of our engine. And on the lower right, you could see the upper stage attempt. This is an engine test of our main engine, which is called Merlin. And that generates about roughly 75,000 pounds of thrust. At sea level. This is our upper stage engine. That's about it.

That's about 75 per pounds thrust in a vacuum. And this is an accelerated version of our launch sequence. The first launch would be from the Space-6 Launch Complex at Vandenberg Air Force Base in approximately March of next year, basically early next year. And we will be applying a Navy satellite, a Navy communications satellite. So it's notable because often, launch vehicle companies are not able to get a paying customer on their first flight. But we've been able to do that. This is also the Falcon development at SpaceX. It's the fastest launch vehicle development in history, including war time. That's actually Vandenberg Air Force Base, which is about two hours away from Sta. Barbara.