



Stanford eCorner

Why is Space Travel So Expensive?

Elon Musk, *SpaceX*

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According to Musk, some causes of the high costs in space exploration are: The energy to launch a rocket into space is very high, all the calculations have to be right and this is very expensive given the low launch rate. His final analysis is that rockets should be a lot cheaper and presently there are a lot of inefficiencies.



Transcript

Why is it so expensive to send something into space? Well, let me tell you what makes a rocket hard. The energy in the blasting required to get into orbit is so substantial that compared to, say, a car or even a plane, you have almost no margin to play with. Typically, a launch vehicle will get about 2% of it's lift off mass to orbit. And that's the case for Falcon. So if you can only get 2% of what your rocket weighs, to begin with, to orbit. If you're wrong by 2%, you're not going to get anything to orbit. You know, come crying down at the Pacific for it. That means all of your calculations have to be right. If you miss calculate something. You get an answer wrong.

It blows up. And it's very expensive trying to get all your answers right. And then double checking if they're right. And testing them all and doing as much as you can on the ground. I think that's a lot of what makes rockets expensive. The low launch rate, typically, is also what makes rockets expensive. If you had thousands of flights a year then it would be a lot cheaper. Or it's a bit of a 'chicken and egg'. Because it needs to be cheaper in order to have thousands of flights a year. But at the end of the day, in the final analysis, I would say, that rockets really should be a lot cheaper than they are today.

And I think the way they're bought, the way they're operated is just very inefficiently. And I think with Space X and Falcon we're going to show that that's the case. Our vehicle will sell for about \$6 million a flight. Our nearest competitor is the Pegasus from Orbital Sciences which is about \$25 million a flight. And that has less capability than our rocket. So Falcon will represent a pretty substantial breakthrough on the cost backs of space.