

Jeff Bezos at Space Symposium  
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edited for topic

you can see the new shepard booster, this is the first rocket powered vehicle to fly above the karman line into space and land vertically under rocket power on earth. it's an incredible achievement with a lot of very hard working blue origin teammates built over a large number of years.

you can see it's a little scarred, we have tortured this vehicle, including on its last flight where we did a very stressing escape test...you'll see there's kind of a table top thing in the center. that's where the solid rocket escape motor is located. right at maximum dynamic pressure...we decided we would torture this beautiful booster by lighting that solid rocket on earth to see what would happen to the booster. we were pretty confident that things would go well for the crew capsule, but the booster was never designed to survive the...event, why should it really, the whole reason for escaping is to...

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this is all about reusability. reusability is to getting millions of people living and working in space. it has to be real operational reusability, it can't be just theoretical reusability. if you recover, and spend a lot of time and money extricating everything, revalidating everything, refurbishing everything, it's not actually going to lower cost. you have to get much more like airline operations. you have to be able to...refuel, make some minor inspections and then off you go again. and that's what we're going to get to.

this vehicle between flights has very small amount of refurbishment, we had to touch up the thermal protection system on the aft, that's easy...wasn't very difficult. then we inspected it. and we learned a lot. all of the learnings that we're getting from new shepard are going into our orbital vehicle, new glenn. we've already learned so much, just by designing, building and flying new shepard and all of those learnings are already incorporated into our new glenn design.

so with that..questions...

Q: When do you expect new shepard test flights and going into service?

short answer to your question is when it's ready. I always remind the team that we're not racing, this vehicle is going to carry humans. we're going to make it as safe as we can make it. we're gonna test it. we're not going to...we're really not constrained by our be-4 activities. both are fully staffed so we're making great progress on be-4 and we're making great progress on new shepard.

I think it's very...slow is smooth and smooth is fast. it's a mistake to race to a deadline when we're talking about flying a vehicle, especially when we're gonna put people on it.

before we start selling tickets and taking down payments until we're closer to commercial operations, we have full test program ahead of us. the vehicle we're building right now is really two vehicles. the crew capsule and the booster. the vehicles we're building right now are the ones that are designed to carry humans.

so these are the human rated articles...so we can fly these vehicles with no humans, even though they're human capable, as many times as we want until we're confident and comfortable. and then we can put humans on board...we'll take advantage of that autonomy when we test this. when that test program is done, then we'll know what our first dates will be and that will probably be a good time to start selling tickets.

i'm hopeful by the way that will still be 2018, we'll see, but it's really going to be when we're ready. as for cadence, we can build as many of these vehicles as we need. the real question is what the customer demand will be. you can do research and surveys and ask people if they want to go, it's really hard to know. really just have to do the experiment, so we're very close to finding out what the customer demand will be. I think nobody knows that for sure yet.

Q: training?

very minimal training. not more than a day of training and the system has been designed from the very beginning so that training would be minimum. you have to know how to strap yourself in...and there is lots...if you want to bring family...

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first all boosters are suborbital, there is no such thing as an orbital booster. it might be interesting to build a small second stage for this new shepard booster because we could use it to put small sats into orbit, it would be perfectly capable of being a first stage for a small orbital booster. the...are often at the detail level, it's things about when you're designed for engine life, what kind of things can you learn about where are the potholes, where the seals go, what kind of bearings do you want to use, what kind of materials do you want to choose. so on and so forth. many of those details are things that you learn and you can't learn them at the conceptual level, you have to learn them at the conceptual level.

amazingly us humans get better at everything we practice. one reason why we haven't made as much progress in spaceflight as i think many people around here would have liked to see over last 50 years is that we just haven't been able to practice that much. most used launch vehicles in the world in a good year they fly 12 times a year. that's a good year.

anything that you do 12 times a year, you never get truly great at. we need to fly at much higher frequency, but to do that, you need a mission and support staff. that's one of the reason why the tourism mission for new shepard can be so valuable because it can hopefully support a much higher flight rate than just 10 or 12 times a year.

and you will learn so much through that practice. at the same time many of the things, rockets want to be big, so one of the reasons we chose the vertical landing architecture, for new shepard,

is we knew it would scale to new glenn. when you're doing vertical landing, you're solving the inverted pendulum part. you know this already the smaller the object, the harder it is to balance on the tip of your finger. so as we go to larger and larger vehicles, that problem just gets easier and easier. the booster stage as more higher inertia, it's easier to...

so we're really excited about that step, but we need to learn so much and most of it is in the details.

Q: last year you hoped to have blue origin personnel begin....spacex....

I think we're very like minded in a lot of ways. i believe deeply in vertical landing as an architecture because it's scalable. I believe reusability is the key to lowering costs. I think we should do that first with the booster stage. many of these things are very similar. it's a little different, instead of starting with an expendable vehicle, and working the way toward a reusable one, I wanted to start with a high flight rate new shepard vehicle, learn those lessons at this scale and then build new glenn already knowing all those lessons, designed from the ground up to be reusable.

the engineering approach is a little bit different, but I think we're very very like minded....2017...we're going to go through the test program and we'll put humans on hit when we're happy. I don't think it will be 2017 at this point but I still think we can do commercial paying passengers in 2018.

Q: will blue origin be just as competitive as amazon?

we'll of course we'll be just as competitive. but how do you compete? when people say...new entrant is disruptive to an industry, what they really mean is that customers are adopting that new way. amazon, we have a lot of inventions that we were really excited about and customers didn't care at all, and believe me, those inventions were not disruptive in any way. the only thing that is disruptive is customer adoption. if you can invent a better way and customers agree, then they will use that. so that's exactly what we're trying to do.

listen, we have a system here...the whole space industry is too small. it's a very small industry. the whole launch services market is \$2.5 billion. so the reason is we don't fly very often. if airplane flight costs the same as they did in 1940. that would also be a small industry today. but actually there are millions and millions of passenger miles flown and that's because the costs have come down so significantly. we need to be there.

if we can make access to space low cost, then...will be unleashed we'll see creativity, we'll see dynamism, you'll see the same thing in space that I have witnessed on the internet in the last 20 years. and believe me, that's fun. right now you can't see that. the reason...because the price of admission is too high. if i'm a kid in my dorm room, I can create the next snapchat because the price of admission to create snapchat is low. i can't create the next planetary mission or exploration satellite or anything close to things in space that are truly interesting right now are a very high price of admission.

as a result, we can't unleash the creativity of thousand and thousand of startup companies...but if we can reduce the cost of launch, by a factor of 10 then by the factor of 100, believe me that will take time and a lot of hard work, but if we can do that, we'll be living in a completely different world. it will be a golden age of space exploration. then it will be a big industry and a dynamic and fascinating one. it will be a golden age.

Q: price for new shepard flights?

i don't have the answer to your question, I don't know yet what the ticket price is going to be, we're working on that and we'll figure something out but we still have time. it's not an urgent thing to figure out...then really the customer demand is going to be up to the customers. as I've said before, I've thrown parties before that nobody came to. I don't think that's going to be the case here, I'm super optimistic. but customers get to decide what the flight rates are. I hope they decide they want to fly.

Q: raffle off tickets?

That's a fascinating idea. I've not spent a lot of time thinking about that, but that's a fascinating idea. I kind of like that idea. want a marketing job? i use the airlines as an analogy, back in the 40s, 50s when we first started really using airlines as a mode of transportation. it was really expensive and you had to be taking an important business trip or be really well heeled in order to fly, transport yourself by aircraft. of course, fast forward to today, airline tickets are very accessible to a very large cross section of people. that's what we'll have to get to. we have to chip away at it, it's a step by step for us...

it's going to be very difficult to know in advance what the cost curve is going to be, how low it's going to come down. I am determined to lower the cost of access to space. we at blue origin, only need three things to make that happen: talented people, money and patience. and we have all three.

Q: putting up small sats with new shepard?

small satellite launchers are not necessarily low costs in terms of amount of price per pound, price per kg isn't necessarily a factor for a smallsat launcher, but it does have certain advantage if you're doing say placement of LEO constellation satellites. so there are some missions for smallsat launchers. for most satellite launches, new glenn would be a much better vehicle. but it would be interesting to put a small second stage on this and use it as a small satellite launcher, it's perfectly suited for that task.

it's a very good question...you should ask some astronauts...it takes about 3 hrs before you start to throw out. it's a delayed effect and this journey takes 10 or 11 minutes so you're gonna be fine.

Q: tickets on new shepard...

my business model right now, it's like the future business model. my business model right now for blue origin is I sell about a billion dollars a year in amazon stock and I use it to invest in blue

origin. the business model for blue origin is very robust. It's very important that blue origin stand on its own feet and be a...sustainable enterprise. that's how real progress gets made. I do not want blue origin to be a not for profit.

i want blue origin to be a thriving enterprise and to help open the gateway to this new generation of people who will have this dynamic entrepreneurial explosion in space. that's what we're going to do and that can only be done if it's sustained. it's a long road to get there and I'm happy to invest in it.

whole thing from boarding to back on the ground is 40-41 minutes, or something like that.

Q: spacex estimated it spent \$1 billion to develop...how much have you spent?

I haven't disclosed that figure. I can tell you we have spent a lot of money to date and I think new glenn is going to be on the order of \$2.5 billion or so.

my singular focus is people on space. I want humans in space. when you build something that has a high fixed cost like new glenn...business model for it, you have to have to...

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