

TED Talk – What I learned from going blind in space

What's the scariest thing you've ever done? Or another way to say it is, what's the most dangerous thing that you've ever done? And why did you do it? I know what the most dangerous thing is that I've ever done because NASA does the math. You look back to the first five shuttle launches, the odds of a catastrophic event during the first five shuttle launches was one in nine. And even when I first flew in the shuttle back in 1995, 74 shuttle flight, the odds were still now that we look back about one in 38 or so -- one in 35, one in 40. Not great odds, so it's a really interesting day when you wake up at the Kennedy Space Center and you're going to go to space that day because you realize by the end of the day you're either going to be floating effortlessly, gloriously in space, or you'll be dead. You go into, at the Kennedy Space Center, the suit-up room, the same room that our childhood heroes got dressed in, that Neil Armstrong and Buzz Aldrin got suited in to go ride the Apollo rocket to the moon. And I got my pressure suit built around me and rode down outside in the van heading out to the launchpad -- in the Astro van -- heading out to the launchpad, and as you come around the corner at the Kennedy Space Center, it's normally predawn, and in the distance, lit up by the huge xenon lights, is your spaceship -- the vehicle that is going to take you off the planet. The crew is sitting in the Astro van sort of hushed, almost holding hands, looking at that as it gets bigger and bigger. We ride the elevator up and we crawl in, on your hands and knees into the spaceship, one at a time, and you worm your way up into your chair and plunk yourself down on your back. And the hatch is closed, and suddenly, what has been a lifetime of both dreams and denial is becoming real, something that I dreamed about, in fact, that I chose to do when I was nine years old, is now suddenly within not too many minutes of actually happening. In the astronaut business -- the shuttle is a very complicated vehicle; it's the most complicated flying machine ever built. And in the astronaut business, we have a saying, which is, there is no problem so bad that you can't make it worse. (Laughter) And so you're very conscious in the cockpit; you're thinking about all of the things that you might have to do, all the switches and all the wickets you have to go through. And as the time gets closer and closer, this excitement

is building. And then about three and a half minutes before launch, the huge nozzles on the back, like the size of big church bells, swing back and forth and the mass of them is such that it sways the whole vehicle, like the vehicle is alive underneath you, like an elephant getting up off its knees or something. And then about 30 seconds before launch, the vehicle is completely alive -- it is ready to go -- the APUs are running, the computers are all self-contained, it's ready to leave the planet. And 15 seconds before launch, this happens: (Video) Voice: 12, 11, 10, nine, eight, seven, six -- (Space shuttle preparing for takeoff) -- start, two, one, booster ignition, and liftoff of the space shuttle Discovery, returning to the space station, paving the way ... (Space shuttle taking off)

It is incredibly powerful to be on board one of these things. You are in the grip of something that is vastly more powerful than yourself. It's shaking you so hard you can't focus on the instruments in front of you. It's like you're in the jaws of some enormous dog and there's a foot in the small of your back pushing you into space, accelerating wildly straight up, shouldering your way through the air, and you're in a very complex place -- paying attention, watching the vehicle go through each one of its wickets with a steadily increasing smile on your face. After two minutes, those solid rockets explode off and then you just have the liquid engines, the hydrogen and oxygen, and it's as if you're in a dragster with your foot to the floor and accelerating like you've never accelerated. You get lighter and lighter, the force gets on us heavier and heavier. It feels like someone's pouring cement on you or something. Until finally, after about eight minutes and 40 seconds or so, we are finally at exactly the right altitude, exactly the right speed, the right direction, the engine shut off, and we're weightless. And we're alive.

It's an amazing experience. But why would we take that risk? Why would you do something that dangerous?

In my case the answer is fairly straightforward. I was inspired as a youngster that this was what I wanted to do. I watched the first people walk on the moon and to me, it was just an obvious thing -- I want to somehow turn myself into that. But the real question is, how do you deal with the danger of it and the fear that comes from it? How do you deal with fear versus danger? And having the goal in mind, thinking about where it might lead, directed me to a life of looking at all of the small details to allow this to become

possible, to be able to launch and go help build a space station where you are on board a million-pound creation that's going around the world at five miles a second, eight kilometers a second, around the world 16 times a day, with experiments on board that are teaching us what the substance of the universe is made of and running 200 experiments inside. But maybe even more importantly, allowing us to see the world in a way that is impossible through any other means, to be able to look down and have -- if your jaw could drop, it would -- the jaw-dropping gorgeousness of the turning orb like a self-propelled art gallery of fantastic, constantly changing beauty that is the world itself. And you see, because of the speed, a sunrise or a sunset every 45 minutes for half a year. And the most magnificent part of all that is to go outside on a spacewalk. You are in a one-person spaceship that is your spacesuit, and you're going through space with the world. It's an entirely different perspective, you're not looking up at the universe, you and the Earth are going through the universe together. And you're holding on with one hand, looking at the world turn beside you. It's roaring silently with color and texture as it pours by mesmerizingly next to you. And if you can tear your eyes away from that and you look under your arm down at the rest of everything, it's unfathomable blackness, with a texture you feel like you could stick your hand into. and you are holding on with one hand, one link to the other seven billion people. And I was outside on my first spacewalk when my left eye went blind, and I didn't know why. Suddenly my left eye slammed shut in great pain and I couldn't figure out why my eye wasn't working. I was thinking, what do I do next? I thought, well maybe that's why we have two eyes, so I kept working. But unfortunately, without gravity, tears don't fall. So you just get a bigger and bigger ball of whatever that is mixed with your tears on your eye until eventually, the ball becomes so big that the surface tension takes it across the bridge of your nose like a tiny little waterfall and goes "goosh" into your other eye, and now I was completely blind outside the spaceship.

So what's the scariest thing you've ever done? (Laughter) Maybe it's spiders. A lot of people are afraid of spiders. I think you should be afraid of spiders -- spiders are creepy and they've got long, hairy legs, and spiders like this one, the brown recluse -- it's horrible. If a brown recluse bites you, you end with one of these horrible, big necrotic things on your leg and there might be one right now sitting on the chair behind you, in

fact. And how do you know? And so a spider lands on you, and you go through this great, spasmy attack because spiders are scary. But then you could say, well is there a brown recluse sitting on the chair beside me or not? I don't know. Are there brown recluses here? So if you actually do the research, you find out that in the world there are about 50,000 different types of spiders, and there are about two dozen that are venomous out of 50,000. And if you're in Canada, because of the cold winters here in B.C., there's about 720, 730 different types of spiders and there's one -- one -- that is venomous, and its venom isn't even fatal, it's just kind of like a nasty sting. And that spider -- not only that, but that spider has beautiful markings on it, it's like "I'm dangerous. I got a big radiation symbol on my back, it's the black widow." So, if you're even slightly careful you can avoid running into the one spider -- and it lives close the ground, you're walking along, you are never going to go through a spider web where a black widow bites you. Spider webs like this, it doesn't build those, it builds them down in the corners. And its a black widow because the female spider eats the male; it doesn't care about you. So in fact, the next time you walk into a spiderweb, you don't need to panic and go with your caveman reaction. The danger is entirely different than the fear.

How do you get around it, though? How do you change your behavior? Well, next time you see a spiderweb, have a good look, make sure it's not a black widow spider, and then walk into it. And then you see another spiderweb and walk into that one. It's just a little bit of fluffy stuff. It's not a big deal. And the spider that may come out is no more threat to you than a lady bug or a butterfly. And then I guarantee you if you walk through 100 spiderwebs you will have changed your fundamental human behavior, your caveman reaction, and you will now be able to walk in the park in the morning and not worry about that spiderweb -- or into your grandma's attic or whatever, into your own basement. And you can apply this to anything.

If you're outside on a spacewalk and you're blinded, your natural reaction would be to panic, I think. It would make you nervous and worried. But we had considered all the venom, and we had practiced with a whole variety of different spiderwebs. We knew everything there is to know about the spacesuit and we trained underwater thousands of

times. And we don't just practice things going right, we practice things going wrong all the time, so that you are constantly walking through those spiderwebs. And not just underwater, but also in virtual reality labs with the helmet and the gloves so you feel like it's realistic. So when you finally actually get outside on a spacewalk, it feels much different than it would if you just went out first time. And even if you're blinded, your natural, panicky reaction doesn't happen. Instead you kind of look around and go, "Okay, I can't see, but I can hear, I can talk, Scott Parazynski is out here with me. He could come over and help me." We actually practiced incapacitated crew rescue, so he could float me like a blimp and stuff me into the airlock if he had to. I could find my own way back. It's not nearly as big a deal. And actually, if you keep on crying for a while, whatever that gunk was that's in your eye starts to dilute and you can start to see again, and Houston, if you negotiate with them, they will let you then keep working. We finished everything on the spacewalk and when we came back inside, Jeff got some cotton batting and took the crusty stuff around my eyes, and it turned out it was just the anti-fog, sort of a mixture of oil and soap, that got in my eye. And now we use Johnson's No More Tears, which we probably should've been using right from the very beginning. (Laughter)

But the key to that is by looking at the difference between perceived danger and actual danger, where is the real risk? What is the real thing that you should be afraid of? Not just a generic fear of bad things happening. You can fundamentally change your reaction to things so that it allows you to go places and see things and do things that otherwise would be completely denied to you ...where you could see the hardpan south of the Sahara, or you can see New York City in a way that is almost dreamlike, or the unconscious gingham of Eastern Europe fields or the Great Lakes as a collection of small puddles. You can see the fault lines of San Francisco and the way the water pours out under the bridge, just entirely different than any other way that you could have if you had not found a way to conquer your fear. You see a beauty that otherwise never would have happened.

It's time to come home at the end. This is our spaceship, the Soyuz, that little one. Three of us climb in, and then this spaceship detaches from the station and falls into the atmosphere. These two parts here actually melt, we jettison them and they burn up in the atmosphere. The only part that survives is the little bullet that we're riding in, and it falls into the atmosphere, and in essence you are riding a meteorite home, and riding meteorites is scary, and it ought to be. But instead of riding into the atmosphere just screaming, like you would if suddenly you found yourself riding a meteorite back to Earth -- (Laughter) -- instead, 20 years previously we had started studying Russian, and then once you learn Russian, then we learned orbital mechanics in Russian, and then we learned vehicle control theory, and then we got into the simulator and practiced over and over and over again. And in fact, you can fly this meteorite and steer it and land in about a 15-kilometer circle anywhere on the Earth. So in fact, when our crew was coming back into the atmosphere inside the Soyuz, we weren't screaming, we were laughing; it was fun. And when the great big parachute opened, we knew that if it didn't open there's a second parachute, and it runs on a nice little clockwork mechanism. So we came back, we came thundering back to Earth and this is what it looked like to land in a Soyuz, in Kazakhstan. (Video) (Reporter): And you can see one of those search and recovery helicopters, once again that helicopter part of dozen such Russian Mi-8 helicopters. Touchdown -- 3:14 and 48 seconds, a.m. Central Time. (Chris Hadfield): And you roll to a stop as if someone threw your spaceship at the ground and it tumbles end over end, but you're ready for it you're in a custom-built seat, you know how the shock absorber works. And then eventually the Russians reach in, drag you out, plunk you into a chair, and you can now look back at what was an incredible experience. You have taken the dreams of that nine-year-old boy, which were impossible and dauntingly scary, dauntingly terrifying, and put them into practice, and figured out a way to reprogram yourself, to change your primal fear so that it allowed you to come back with a set of experiences and a level of inspiration for other people that never could have been possible otherwise. Just to finish, they asked me to play that guitar. I know this song, and it's really a tribute to the genius of David Bowie himself, but it's also, I think, a reflection of the fact that we are not machines exploring the universe, we are people, and we're taking that ability to adapt and that ability to understand and the ability to take

our own self-perception into a new place. (Music) 🎵 This is Major Tom to ground control
🎵 I've left forevermore 🎵 And I'm floating in a most peculiar way 🎵 And the stars
look very different today 🎵 For here am I floating in the tin can 🎵 A last glimpse of
the world 🎵 Planet Earth is blue and there's so much left to do 🎵 (Music) Fear not.
(Applause) That's very nice of you. Thank you very much. Thank you.