

Science and space travel – Part five

Joe Edwards: "To tell you the truth, you could show up there at the age of 35, you may fly by the time you're in your 40s these days, maybe later. And we've had astronauts in their 60s. I mean, John Glenn flew in his 70s.

"But in general if you're up there for a long mission of three to four months it will take you about seven months of rehabilitation. That's a personal trainer every day, starting with swimming and the rubber bands and all that, working back up to weights and running and those kinds of things."

Leo Enright: "OK, another question here in the middle."

Audience member: "Hi Joe. Thank you for being here. You said that space exploration is for basic scientific research for humanity. Now, with the power of the Internet we can find information about just about anything. Is it possible for us to access images and information about the latest updates on space stations and rovers that are going on Mars?"

Edwards: "Absolutely. One of the most difficult professions that there are today frankly has to be a science teacher below the college level because we have so many robotic vehicles around our solar system today – in addition to all the data that's being gathered by Earth-based sensors, telescopes and what have you – that we rewrite the science textbooks every couple of weeks now throughout the world.

"It turns out that the largest amount of content on the Web is contained on the NASA websites and it's updated on a daily basis. You can download videos and images from the Martian surface and a variety of images that come from things like the X-ray telescope, the Chandra X-ray observatory.

"We have a telescope that's 21 million miles away from Earth in an Earth orbit around the Sun. Two Rovers on Mars. Two vehicles orbiting Mars. A couple around Saturn. Voyager has left the solar system. Voyager No.1 is on its way to leaving the solar system. We've got more stuff out there than you can shake a stick at and scientists all over the world that are analysing that data.

"So, yes, it's all out there and a lot of it's on the Web. If you want it you have to get it quickly because NASA puts it up there and then they get rid of it and they bring new stuff up there."

Enright: "I should just emphasise that a lot of these projects are joint ventures with other agencies including the European Space Agency who are partners for instance in the Hubble space telescope, they constructed the Ulysses mission orbiting the Sun. A lot of these are joint ventures between the United States and obviously ourselves in Europe but also Japan, Canada, a lot of other places. Sorry, you had a follow up?"

Audience member: "Initially it was a race against the Russians to get to space but now presumably it's all a global space community, it's a global effort now to explore and to release that information."

Edwards: "I would agree with you. And I hope that no one here has the impression that exploration of outer space is just an American thing. I mean, you don't, do you? I cannot think of a scientific instrument that we've launched in the last 20 years that has not been a cooperative effort with the European Space Agency at a minimum and probably several others around the globe. The data that's analysed is all over the world. It's not classified or anything, it's out there and everyone is working on it."

Enright: "OK, we have one question at the back and then we'll move on towards the front again."

Audience member: "Welcome to Ireland Joe. On the issue of governance, do you anticipate a space civil service?"

Edwards: "Well, we kind of do right now. It's called NASA, and the Russian Space Agency, and the European Space Agency, and the Japanese Space Agency. I don't envisage a Starfleet Academy any time soon, you know, but I'd sign up if we had it. So I think what will probably happen in the near term, rather than that, will be the exact opposite. That will be, to a certain extent, the commercialisation of space."

Enright: "That will keep the lawyers busy. Certainly the legal aspects of it are being hotly explored. OK, we're going to give some people up near the front a chance."

Audience member: "Hello Joe. Thanks for a very interesting conversation so far. It's very interesting that you mention the Japanese and the Europeans. The Chinese are in there now as well. They've got their man into space as well, and now are looking to go to the Moon as well. Do you feel that would force an issue in terms of a race, or are there collaborations with the Chinese in terms of setting up the base on the Moon as well?"

Edwards: "Human beings just seem to be naturally competitive, you know there's no doubt about that, but I don't foresee anything like the space race of our youth being something that we engage in with the Chinese.

"I think geopolitical circumstances were very different in that time and I don't see it happening. However, I think the more people we have that want to go do this thing, that little bit of competitive nature in man is probably a good thing because it helps push us all along.

"I think, that gentleman in the grey sweater. I'm afraid his arm is going to fall off."

Audience member: "Thank you. I wanted to bring the conversation back into the spacecraft and ask you what was going through your mind three minutes before takeoff. What's the best meal you've had up there? And when was the scariest moment?"

Edwards: "The best meal is shrimp cocktail. I mentioned that NASA invented freeze dried food for space travel. When you are in space, in microgravity, your tastes changes. They're much less sensitive your tastebuds are much less sensitive than they are on Earth, so you crave spicy food.

"By the way, you crave comfort food also, meat and potatoes. When we went to Mir we would always go over to the Russians and try to trade them some food because they always had meat and potatoes and we had bean sprouts and broccoli. So the best thing I ever had up there was shrimp cocktail and they mixed that up special for us with lots of horseradish so it was very, very strong.

"One little anecdote: we were on orbit and Anatoli Solovyev, who is the space station commander on Mir 24, was over and eating dinner with us. So we gave him the shrimp cocktail which is very prized among space crews, you know, I ate it every meal.

"And the Russians don't eat spicy food at all. He didn't speak a whole lot of English at the time but he took one bit of it, looked at us and in perfect English said 'It must be good for you.' So anyway, that was the food thing, what was the next bit?"

"Oh, what was I thinking of three minutes prior to launch? You know, I would love to have some very flowery answer for you that would sound great on the Discovery Channel and all that, right? This was a 4.5 million pound vehicle with six of my best friends on it. We were going to take this thing and fly it at 25 times the speed of sound and, we believed, do something very important with it. My thoughts were completely centred on the operation of my spacecraft and the safety of my crew. Three minutes prior to launch, in particular, I was setting up for auxiliary power unit start, which powers the hydraulics on the vehicle, which occurs at T minus two minutes and thirty seconds.

"The scariest moment – I've been much more scared in airplanes than I ever have in spacecraft. At some particular moments."

Audience member: "Talking about Mars and the Moon, when you are talking about exploration there, would you be thinking about creating artificial cities?"

Edwards: "You know, I don't have the answer. The science fiction writers have ideas and what have you. But if we're going to populate Mars or if we're going to establish a permanent presence there, we have to provide for basic human needs. We have to have food. We have to have water. We have to have something to breathe.

"There are a variety of ways to do that. You can process it out of the frozen water in the surface. Is there some way to create an artificial greenhouse effect and warm that place up? I guess it's possible. Right now we're taking those baby steps before we're able to solve those kinds of problems."

Audience member: "How many sleeping bags [unclear]?"

Edwards: "How many...?"

Enright: "Sleeping bags."

Edwards: "Oh, sleeping bags. One for every crew member so seven is generally the number of people that fly on the space shuttle."

Enright: "Are they comfy?"

Edwards: "Well, they're very comfy. You're sleeping on air, man. They could be made out of steel and they'd be comfortable."

Enright: "Very good. This gentleman here at the front."

Audience member: "I have two questions. One was your question on the regenerative process after a test flight or whatever. Do your bones grow back better?"

Edwards: "No, not any better but we think we can get back to pretty much the way we were before. You think about that – for someone who is 40, 50, 60 – that's pretty remarkable."

Audience member: "What do former astronauts do or what are you doing now? Are you still working for NASA?"

Edwards: "What do former astronauts do? Actually, in my day job I work for a Fortune 100 company in the technology area. But I do spend a significant amount of my time doing things like this and other things that are related to the space programme like corporate leadership development.

"I've probably done a couple of dozen things over the last couple of years concerning industrial safety. In industry in manufacturing, you utilise the same processes and procedures as we do on the space shuttle. So other than that, raise my daughter, try to keep the wife happy."

Enright: "OK, we'll move over to this side here, the lady in the front who's been very patiently shepherding a group."

Audience member: "Thank you. I'm just thinking, when you were talking about your wife there. In my normal life, my husband comes home every day and I wait for him to help me with the kids and everything. So I was wondering, do I want my son to become an astronaut and leave his wife and children and come back in a year's time and do all this hard training and all that? I would just like you to comment, maybe, on the family life and those aspects that maybe you had the challenge to face."

Edwards: "Well, I think you probably hear the calling. You either hear the calling or you don't. And if you do, you end up spending the rest of your life with someone who understands that and probably wants to play a part in it as well. You touched on something that's really true and that is space travel, particularly launch and entry, can be very stressful for a family.

"Frankly I think it takes someone who is a little different, you might say someone that's special, to be able to manage the family and all the things associated with our day-to-day existence and then still perform that job as well.

"And the kids? The kids don't see you? You see, I was in the navy. I would go away for six or nine months at a time. My daughter wasn't born then but a lot of us had children and I'll tell you the way we looked at it, not to get too philosophical on you, is that when we went out on the ship or our airplanes, we believed that we were making a sacrifice that was very important to our country and to the free world, and there were some people who made those sacrifices so that other people didn't have to.

"And that's the same way we felt about space travel. So certainly it wasn't easy but rather than seeing it as a hardship when we approached middle age, frankly, we saw it, and see it, as an honour and a privilege to be able to participate in."

Enright: "OK, the young lady there behind."

Audience member: "If there is ice and water on Mars why don't you get one of the robots to scoop it up so that you can stop droughts?"

Edwards: "The reason is that the ice is actually several feet below the Martian surface. We're actually using pretty high-level scientific knowledge to indirectly deduce that that ice is there. So there certainly could come a day when we could drill down there and actually tap that ice itself and do something useful with it. That's a great question by the way."

Enright: "OK we have a young gentleman there."

Audience member: "Would it take you a couple of minutes to learn how to walk again when you touched down on Earth?"

Edwards: "What do they teach you in school around here? These questions are so good. Does it take a while to get used to gravity when you come back? Yes it does actually. The longer you're there the longer it takes you to recover.

"It turns out that it's not unusual to have a little nausea when you first get into orbit because your body's changing tremendously. You're getting rid of all this extra blood plasma that you have.

"As soon as the main engines cut off you become weightless and all the organs in your body cavity start riding up against your diaphragm, and the fluids in your body start to move up from your lower extremities to your upper torso and your head. Your face kind of swells up a little bit. And if you haven't managed to conquer the nausea, if you have it within 36 hours, your brain will finally flick a switch and say 'I've had enough of it. I can't take it anymore.' And it will ignore the signals that it's getting from your semicircular canals and your cochlea in your middle and inner ear.

"When you're coming back into the atmosphere during entry to land the vehicle, as gravity is building up, your brain doesn't know to turn that switch back on. So as you're flying through the atmosphere, streaking through it at 25 times the speed of sound, you start to get a little bit of gravity any time you move your head. Your brain thinks your body is translating through space. It doesn't understand what head movements are any more.

"So when the space shuttle comes in to land, it may look nice and easy but the pilot has a pretty severe case of vertigo throughout the entire manoeuvre. Why do we have these military test pilots to fly the airplanes? Because the worst vertigo I've ever had is not landing the space shuttle, it's landing on a boat in the middle of a dark night in a thunderstorm.

"So I had experiences, and we want all the astronauts to have experiences that they can translate into the experience of flying a spacecraft because so much of it is foreign to us."

Crew member: "Leo, we have time for one more question."

Enright: "OK, do we have a microphone? Oh right, we'll take this young man here who hasn't had a chance to ask a question."

Audience member: "Can you go toilet on space?"

Edwards: "Was I tired in space? [Muffled sounds from audience] Can you go to the toilet in space? Thank goodness you can. We actually have a toilet on the space shuttle and on the space station. And if I had a picture of it, which I do not, it would look pretty much like a regular toilet to you but it's somewhat sophisticated in its operation to mitigate some of the more unpleasant aspects of performing those bodily functions in microgravity."

Enright: "So it sucks."

Edwards: "It actually has a suction mechanism to it. It's not very effective though."