

Astronomy Cast  
Episode 214 for Monday, January 3, 2011  
Space Tourism

Fraser: Welcome to Astronomy Cast, our weekly facts-based journey through the Cosmos, where we help you understand not only what we know, but how we know what we know. My name is Fraser Cain, I'm the publisher of Universe Today, and with me is Dr. Pamela Gay, a professor at Southern Illinois University – Edwardsville. Hi, Pamela. How are you doing?

Pamela: I'm doing well, Fraser. How are you doing?

Fraser: I'm doing great! Alright, well let's get right into it. So, have you ever wanted to go to space, but lacked the, uh, I don't know...everything? [laughing] Being an astronaut? A whole new industry of "Space Tourism" will take you where you need to. There are now companies offering 0-G flights, sub-orbital flights, and there have even been paying customers who have gone into orbit. Is this going to be space travel for the rest of us? Let's hope so. I clearly lack the "everything" to be an astronaut, not that I've tried very hard...I don't know...did you try to be an astronaut?

Pamela: I thought about it very hard and actually thought about going to the Air Force Academy for college, and there is an aspect of me that somewhere in college discovered that physics problem sets and salsa and nacho chips are the perfect combination in life, and so that whole "8-minute mile" thing has been left so far behind...my horse can do it, and I can stay on my horse doing it, and I call that good.

Fraser: Yeah, I mean, astronauts are just such physical, mental, social specimens of human perfection, it's just like hard to compete: get your PhD, then get another one, then go be an Air Force test

pilot, then run, as you say, an 8-minute mile, then go be a volunteer....you know, it's just crazy. Now, if you got money, you'd be able to go into space, and that's what the whole space travel industry is about. But I think beyond that as well is the hope that as paying customers come for space tourism activities, it's going to drive down the costs of space flight across the board and make it more and more available. I mean it's that same argument used with air travel, right?

Pamela: Right, and it looks like we might actually be at the point that it's possible. Now, with airplanes there's the nice advantage that someone can go out in their barn and build a barnstormer, and grab the neighborhood grandma and throw her in the back of the airplane and storm a barn.

Fraser: You've got a paying customer, and you've started up your plane tourism company.

Pamela: ...go land in some farmer's pasture and charge all the neighborhood kids a nickel. It's been inflated since then.

Fraser: Yes.

Pamela: Spacecraft – there's that whole throwing up at 0-G part that requires a certain amount of preparation that you don't need for barnstorming.

Fraser: Both in terms of training, or in terms of the equipment required to get you into space?

Pamela: It's all of the above. You have to be able to cope with the physical stresses, at least emotionally cope with the physical stresses, which requires an amount of training that going up in aircraft doesn't necessarily require. I think that we're going to reach the point in the not too distant future that you don't require any actual training beyond what you get in the exit row of any commercial

airline flight of, “OK, in the case of emergency, do you agree to lift this lever, pull the door out and not block the exit from other people?” We will get there with spacecraft, but still it’s a much more demanding thing. Steven Hawking has proven with his 0-G flight that it’s not necessarily physical stress, but you need to be prepared for what you are going to experience.

Fraser: Right, so let’s take a look at the spectrum of space tourism opportunities that there are right now, and then where this might go in the future. Now, we talked about Steven Hawking’s 0-G flight, so what’s going on with this?

Pamela: There’s a neat company -- Space Adventures -- that run 0-gravity, basically “go up in an airplane, drop radically, go up in an airplane, drop radically”...It’s the chance to experience free-fall, which feels like having no gravitational pull in your body for a few seconds, roughly half a minute at a time.

Fraser: This is the vomit comet though, right? It’s got another name, but...

Pamela: That’s true, that’s true, it is the vomit comet.

Fraser: These airplanes, they take this parabolic flight path, and so as they reach the top of the parabola, and then start to head back down, or I guess as they go up into the parabola, then and start to “u” as the person inside the plane keeps moving up and it’s almost like it feels like you’re weightless, but you’re really, I guess you’ve got the inertia of the plane as you went up, or the momentum of the plane as you went up, and that makes you feel like you’re flying inside the plane as you come back down – and you’re weightless and you can do spins and fly through the air for as you say, a few seconds, and then you have to do the other half of the parabola [laughing] where the plane is sort of going back down and then you feel double-gravity, then you do the opposite again.

Pamela: Yeah, you suffer in both directions. You get accelerated upwards, you get accelerated downwards, and it's only at that peak, only for that brief period at the peak of the parabola that you get to enjoy yourself. Even then, there is a great deal of, well for lack of a better term, "puking" involved.

Fraser: Yeah, if you like that kind of thing – I do not. We went to the Tower of Terror at Disneyworld, and that's what it is, I mean the tower drops out and you fall – that feeling is the 0-G, so that but more, I guess...uhhhh [laughing], but you can do this, and I'll bet you there are listeners listening right now who have done this.

Pamela: And it's the type of thing that it is cost non-prohibitive. For one of these flights it's \$2500, and I know people that have gotten the chance to do 0-G experiments through different high-school and university level science competitions, where you pitch an idea, and NASA or some other agency pays for you to fly on one of the many "vomit comets," and run your experiment while suffering, or enjoy yourself – or both suffering and enjoying yourself.

Fraser: Now, beyond doing the 0-G flight, you can also do training – again, this is one of Space Adventures. We're really going to be pushing Space Adventures -- they are not sponsors of Astronomy Cast in any way.

Pamela: They just do cool stuff.

Fraser: They just do a bunch of cool stuff, so we'll be talking about them. I know you can train at Star City in Russia.

Pamela: Yeah, and not only can you train in Star City, but they are also the agency that has teamed up with the Soviet space program to get – they don't like to be called "space tourists" – but to allow the very rich to train alongside the astronauts for a large sum of money and go into space for upwards of 10 days.

Fraser: Right, but it's not just...that's where it's \$20 million and you get to go up into space and be at the International Space Station, but I know there are packages where you can go and learn...

Pamela: Yeah, you can spend a couple of thousand dollars to go to something that's much more advanced than the adult space camp programs that we have here in the United States. The U. S. Space Camp program, I went to it growing up and it's a great program, but you're not using all of the actual simulators, you're not going through all the rigors, it's really a "let's go to camp and learn a whole lot" but there's a lot pretend.

Fraser: It's not a real centrifuge that you're going in.

Pamela: No, they do that, but the space shuttle simulators, for instance, that you're in are a couple of generations below what the actual astronauts use, so it's a really good simulation, it's a whole lot of fun, it's a worthwhile educational experience, but it's only a few days, whereas the experience you go through with Space Adventures -- you're training side-by-side with the actual astronauts with the actual astronaut training equipment, going through all the same rigors, all the same "here's how you do this, that, and the other thing" with a whole lot less make believe involved.

Fraser: That would be pretty amazing, and you can also then go and fly like MiG fighter jets, things like that, so you can experience some pretty tremendous forces on your body, but you're not actually flying out into space. Now then, the "X prize" was sort of leading up to this, which is one of these ideas, as Peter Diamandis's idea that regular commercial companies should be able to send people today into a sub-orbital flight, and I guess, eventually, into an orbital flight.

Pamela: It was, in fact, the family of these personal astronauts, one of the "not called space tourists" who went up onboard the space station with the Soviets, who funded the X Prize the Spaceshipone

the Ansari X Prize, and that was to go twice into sub-orbit and come back down safely in a very brief span of time, and that positive experience will hopefully lead to positive experiences for many more wealthy individuals coming in the future.

Fraser: Yeah, that feels so long ago, but it was 2004 was when the X Prize was won, and the goal here that a private company had to build a spacecraft capable of taking a team of three above 100 km altitude and then back down to Earth, and then do it again within a week, and in 2004 that prize was won by Burt Rutan's company Scaled Composites, and took the \$10 million prize, which was amazing, and that was like six years ago, seven years ago now. It does seem like forever, but that led into Virgin Galactic created by Richard Branson from Virgin Enterprises.

Pamela: And with all of these different projects, the goal is to eventually get things down to the price that normal human beings can afford. Right now, with Spaceshiptwo it looks like they are going to, in the next few years (it's hard to nail down what year it is – it's a moving target), but they're doing the test flights, they have the spacecraft/aircraft. They are moving forward and they will be taking people up into sub-orbit, where they'll get to experience a few minutes up above the atmosphere before they come back down, they're going to be launching out of Spaceport America, it looks like. This is moving forward and people are putting down \$20,000 deposits on a \$200,000 ticket. They've had over 400 people sign up so far.

Fraser: So that's a real business, you know, those are all the pioneers, but after those 400 have had a chance to fly and people see that they haven't died yet, other people are going to sign on and eventually the costs are going to come down, and there's going to be competing companies. You know, it's like on a cruise ship, you have competing cruise ship companies, right? So this is how this whole thing is supposed to work. And the technologies that are developed for the space tourism for the rockets and, you know,

eventually someone's going to use them to build ...use them for commercial purposes, and boom – we're exploring the solar system!

Pamela: And what's interesting is watching the way the different technologies are evolving because NASA is slowly getting itself out of building spacecraft and getting itself into the habit of hiring other people to reach toward goals that have both NASA purposes in mind, as well as the development of a fully-fledged commercial space flight program here in America. We have NASA spent money to basically invest in Blue Origin, in Space Acts, in Bigelow, and what's interesting is watching how all of these different companies are partnering together in different ways. Bigelow's is personally my favorite one to watch. They're a company that is aiming to build space stations, and they already have unmanned orbiting balloon space containers happily going around and around the planet filled with random stuff. They have this really neat thing where they let people launch stuff inside one of their blow-up capsules and they have cameras and you can watch your stuff float past...[laughing]

Fraser: Yeah, [laughing] which is a great way to make some of the money back, right? As they're doing their testing it's a way of doing some advertising inside the space station. Bigelow is really exciting! Again, none of these companies are sponsors of Astronomy Cast – at all, but we're going to rave about them anyway.

Pamela: No, we are sponsored by Swinbure, but we just adore the ingenuity of so many of these companies. Bigelow is focusing on taking an old NASA idea of basically building blow-up (not “explode,” but “balloon blow-up”) space stations that can be built out of a bunch of different modules that start small, bloat big and give you a whole lot of space to play in, and this is a really neat model and they're now partnered with Boeing on some crew capsule ideas. They are booked on a SpaceX launch that looks like it's booked for 2013 or 2014. They are slowly but surely making

steady progress on actually building a commercial space hotel on Orbit!

Fraser: Yeah, I mean again, we're way beyond the imagination stage. Bigelow has built prototype stations, these inflatable habitat modules, has launched them into orbit and has sort of tracked their progress, and done all their tests and stuff, and you can imagine the next stages where they're going to be connecting them together and actually having people live up in them, so Bigelow is really moving forward; a lot of these pieces are all coming together. In some cases it's feels like it's coming slower than expected, and in other cases, it's coming a lot faster.

Pamela: The frustrating thing everyone, from NASA to Bigelow, from [missing audio] to SpaceX is "how do we get the people into space?" and that's where companies like Space-Ex are looking so promising. But right now, they're the closest to having a human-ready launch vehicle that we have. I suspect that they could choose something out fairly quickly if push came to shove, but no one wants to have push come to shove with manned space flight.

Fraser: Now, isn't that sort of part of the plan, though, is definitely to make the Falcon, the SpaceX launch vehicle, human-capable at some point?

Pamela: It's currently "cheese-capable." I love the fact that they launched a thing of cheese because a big wheel of cheese is about the weight of a human being.

Fraser: [laughing] Right, if you can bring a wheel of cheese back to Earth safely, then you're on your way!

Pamela: So yes, SpaceX is definitely planning that, but *one* space company -- it has the capacity to do what NASA's been doing, but we want to do so much more. We want to get to the point that



there's a couple launches a week carrying all people back and forth from Earth orbit, or hopefully, eventually to higher [missing audio] orbit...and beyond. So we need to get more companies out there, and that's what NASA is trying to do. They're seeding funds out to Boeing, to Blue Origin, to Bigelow, to all these different companies to try and find all the different ways that we can explore getting people out exploring our solar system.

Fraser: So, do you think that there's been some kind of fundamental shift at NASA over the last few years to take a lot of this a lot more seriously?

Pamela: I think the failure for the Orion program to move smoothly and steadily forward and be embraced was an eye-opener. It was kind of a vision NASA would chew for, chew for, chew for where we'd have this heavy-lift, low-lift, human-lift trio of rockets that would go to the Moon, Earth orbit and Mars. They had the logos, they had the models, they just didn't have the launch vehicles, and when that program got so far behind budget, so far behind schedule and pretty much got canceled, it was time to sit back and say, "OK, we need to re-think how to use NASA's money wisely." The amount of money going to science is getting cut, and I've heard that some NASA centers, some NASA organizations are having anywhere from a repeat of the 2010 budget (which wasn't that bad) to cuts that take them back to 2008 budget levels or even worse. And when you have your budgets getting cut, and we have big launches like Juno and the Mars Science Laboratory/Curiosity, and all of these big projects getting added on top of current programs, that's not the time to be designing human flight rockets. That's the most expensive thing you can be doing. So, partnering with commercial that are going to make this profitable -- NASA's proven it can't make it profitable, and that's OK. Now, we look to Space-X and I really think if anyone can make space profitable, it's Elon Musk.

Fraser: So, do you think then, that...like I know that Peter

Diamandis, the SpaceX people, Space Adventures, they're all counting on space tourism as being a way that takes us into being a human space-faring society? Do you think that that's going to pan out? Will that follow the same way that the air industry worked with the tourism being the thin edge of the wedge that turned it into a more robust industry?

Pamela: I'm just not sure. One of the things I look at is when you watch airplanes getting loaded at the airport, there is always that big old pallet of shipping stuff, there's the big ol' pile of mail, and when you look around the airport, it's United, Delta, American Airlines, which is what I fly with (just a plug, I don't know why – they don't sponsor us either)...

Fraser: Not a sponsor -- call us!

Pamela: So all of these different airlines, they're carrying cargo. Then you look out and you see Fed-Ex, and the big brown planes, the big white planes -- all the cargo planes (and I know my husband and I are slowly destroying the environment one "Amazon" box at a time). Air cargo is a pretty major driver in filling up aircrafts when seats aren't there, and what I'm wondering is what is going to be the equivalent of cargo when it comes to space flight?

Fraser: Right. If it's Helium-3 off the moon, or whether it's going to be mining asteroids for their gold and other precious resources... is that going to be the thing that really gets it all rolling?

Pamela: Right. So there's this next piece that we need to find that goes beyond just tourism. Business travel is the vital underpinning of passenger flights. Astronauts will be the minority of those going up to do research as near as anyone can tell, so this is one of those things that I know there's going to be some sort of a solution, something I haven't thought of, and mining has been what every science fiction writer has always written about, so it's going to be interesting to see what in the next ten years haven't we thought of

that becomes the real reason that space flight for commercial purposes becomes necessary and cheap.

Fraser: So what are going to be some milestones in the space tourism industry that are going to happen over the next couple of years? We try not to date the show, we're talking about this in early 2011, so what are some of the plans, the things that people should keep their eyes out for over the next coming years?

Pamela: I think the three big things in my head are going to be SpaceshipTwo going into steady flight...

Fraser: When are they expecting to do their first flights?

Pamela: They keep moving the date, so since we try not to be timely I'm refusing to state a date because they keep moving it.

Fraser: In the future from when we record this episode, they should be flying. Yes.

Pamela: So, I think the next big thing is going to be (and I'm not sure which one's going to get there first), Space Ship II flying on a steady, you go to Space Port America, look at the boards, and you hop on your flight to Space-Ex getting steady launches of both astronauts to and fro from the ISS, and cargo to and fro from everywhere it needs to go – those two things are the next big step getting a commercial space agency handling the day-to-day long haul of the telecommunications research and NASA needs. Then the next thing after that I *really* think is going to be Bigelow's hotel.

Fraser: Right. I've heard he has plans to launch them as early as 2012.

Pamela: And not for the humans, but it looks like the 2013 launch will have life support onboard. I don't know when and if they're planning on trying to put humans inside of it, but it will have that

capacity, so it's 2013-aim, it's currently on the docket for 2014 unless more spacecraft become available. It sucks that that's the thing holding us back is how fast can SpaceX produce spacecraft right now.

Fraser: I can just imagine how things are there, that they've got so much resistance and so much skepticism about getting this going and now everyone's complaining that they're not getting it all done fast enough... "Where are your rockets? Come on!!" I feel bad for them. So let me ask you a question, Pamela: Would you go into space? Would you take a Virgin Galactic flight? A sub-orbital flight -- now?

Pamela: So, the reason I'm being squeamish is because the last time I went skiing at Taos, I got really bad altitude sickness. Now, admittedly, there was a lot of up and down from 5000 feet involved, and that's just never good, but if I knew I wouldn't have altitude sickness issues – in a heartbeat. I'm just not a fan of puking.

Fraser: Yeah? I don't know, I would be pretty scared, I gotta say. I would be pretty scared to do it.

Pamela: See, but you've got kids...

Fraser: I know, but I'm also just not a big fan. I'm a total coward when it comes to falling. I'm not afraid of heights, just afraid of falling, so I think... I don't like doing those "Tower of Terror" free fall-type rides.

Pamela: See, I love 'em -- love 'em all.

Fraser: I talked to Story Musgrave; I was interviewing him one time, you know, he's one of the most flying-est space shuttle astronauts ever, and I asked him, "Did you enjoy launching into space?" He's like, "Not at all. I did not like it. It's a very terrifying feeling, very anxious, and it's only when you're up there that you

can kind of relax, but when it's happening you feel really awful and scared the whole way up." I think that's a hard thing...I'm definitely not a risk-taker on that. I'm not that kind of person, so it would be really hard for me to step on a flight -- for a little while.

Pamela: See, I jump horses [laughing]...

Fraser: So ten years down the road, everything's been fine, there's been lots of good simulators, I could work my way up to it, maybe I would do it, but I definitely don't think I would do it out of the...so if Branson is wondering if he should give me and Pamela free flights as a promotion, try somebody else first.

Pamela: Hey, I'd take it!

Fraser: Pamela would take it! Right, of course!

Pamela: I'd need lots of Dramamine.

Fraser: Right. OK, well thanks, Pamela.

Pamela: OK, I'll talk to you later...bye bye.