AirSpace Season Five Episode 10 - Jetsream

Music up and under

Emily: Welcome to AirSpace, from the Smithsonian's National Air and Space Museum. I'm Emily.

Matt: I'm Matt.

Nick: And I'm Nick.

Matt: In our Halloween episode, we learned that keeping a steady, livable pressure in the harsh environments of high altitude and in space is key to keeping pilots and astronauts alive and functioning.

Nick: Before cockpits could be pressurized, high flying pilots needed a different way to keep the pressure steady. Enter; the pressure suit and aviator Wiley Post.

Emily: Post was an oil worker, turned armed robber, turned aviation record breaker who designed and flew in the first successful pressure suit. We're heading into the jet stream with Post and his pressure suit today on AirSpace, presented by Olay.

Music up and out

Matt: So there's a really good friend of the museum who, when he visits the museum, it's always tons of fun. He's done programs with us. He's built things with us. He likes to look at our artifacts. It's Adam Savage, formally of MythBusters, and today of Tested. And Nick, you had a chance to talk to Adam about how much he loves space suits.

Nick: Yeah. We even got to meet in person in our very own AirSpace studio at the museum. Of course, we were both masked at the time.

Nick: (From interview) So you are passionate about space suits in a way that I think transcends even people who wear space suits for a living. What do you love about space suits?

Adam Savage: *laughs* Yeah, I've spent my whole life wondering what it is that I'm obsessed about with space suits. Because the very first cosplay, the very first costume I ever built myself was a space suit. I took a Baskin-Robbins five gallon cardboard ice cream tub that they would give you once they were done with them. And I cut a hole in it and put some acetate in there and I was a spaceman at six years old. Um, I'm 54 now and I've only just realized the degree to which I have always desired protection. Like a hermit crab builds their own protection, I love how humans do. So, I'm obsessed with safety equipment as I was on MythBusters, I'm obsessed with suits of armor and most of all, the most advanced suit of

armor, the most advanced superhero suit humans have ever built is the space suit.

Nick: If you had to pick one space suit to talk about, the one with the most interesting or the least told story, what would it be and why?

Adam Savage: Oh, it's Wiley Post's suit. Wiley Post was this American pilot. He's often, and I think properly credited as one of the people that discovered the jet stream. He definitely understood earlier than most pilots in the 20s and 30s, that there was potentially a faster way to get around if you could get to thinner air, if you could survive there. And thus in 1934, he worked with B.F. Goodrich to make the very, very first pressure suit for a human to survive above a certain altitude and his pressure suit worked. It precedes the Mercury Program by decades! I love this guy.

Nick: So as we've talked about before, when you're going into space, the pressure problem is the first thing that has to be solved. Other space suits do other things and keep you alive in other ways that counter, kinda, the hostile vacuum. But the reason that Wiley Post's suit is the precursor to all modern space suits is that it dealt with the most urgent problem first, which was low pressure is really bad for you and it'll knock you out pretty quick and kill you soon thereafter.

Emily: Right, so the bottom line is that a space suit is also a pressure suit, but the suit that we're talking about today is just a pressure suit. So it wasn't designed for an extra vehicular activity. It wasn't designed for a space walk, but it was designed to be in other situations, namely airplanes, that were going to be in low pressure environments because the capsule of that airplane wasn't pressurized. So if you're in a low pressure environment, something has to be pressurized that's going to encapsulate your body.

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Emily: So what did Wiley Post even need this suit for? Sub-question, who was Wiley Post? Because I don't know.

Nick: If you had asked me before we started this episode, I would've told you, he had something to do with discovering the jet stream. He had a pressure suit and an airplane, it went really high and therefore really fast. And that was an important discovery.

Emily: Well, that's a lot more than I know.

Matt: Yeah. But it turns out he had a pretty circuitous path towards that moment of flying his high altitude airplane, right?

Nick: Circuitous is one way to describe that.

Matt: This guy didn't, like, grow up and go straight into being a pilot, yeah.

all laugh

Nick: Wiley Post was from Texas. He was born at the end of the 19th century and he grew up in Oklahoma. He joined the Army Air Service, which is where he learned to fly, but he didn't make it into service during World War I, and then he went into the oil fields where he was in an accident that cost him the use of his left eye.

Emily: And then he joined the circus? Is that what happened? Because that seemed like the next thing in this story?

Matt: That's not next. I think the next thing is armed robbery. Armed robbery… *laughs*

Nick: So it's not next!

Matt: ... Then the circus.

Emily: Armed robbery, then circus. I see. *laughs*

Nick: *laughs* But before he went off to join the circus, he was a straight up bandit in the Old West, medium Old West. And then he was a circus parachutist. So we're catching a glimpse of the kind of person it takes to want to design a pressure suit just to see whether or not he could go a little bit faster if he went a little bit higher and...

Emily: Oh, but wait, there's more.

Nick: *laughs* Oh, but wait, there's more. So recall; his eye. He actually got settlement money for the accident that cost him his eye and that's what used to buy his first airplane.

Matt: Right, and he also made relationships with oil barons somehow, even though he was injured in an oil field and walked away from that career. But the plane that he actually used to make a lot of his record-breaking high altitude flights belonged to an oil baron and it was the plane, the Winnie Mae.

Emily: Right, which he eventually bought. Right, so he borrowed it and then he eventually bought it.

Matt: And that was the plane he couldn't pressurize thus creating the need for his spectacular suit.

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Emily: So we're looking at three different pictures of this suit, right?

Nick: Yeah.

Matt: Yeah.

Emily: For those of you who are driving, commuting, whatever, not staring at your smartphone while operating heavy machinery, what does this thing look like?

Matt: So the thing that comes to mind first, I would say, right, is it's got elements that look like a deep sea diver suit. It's got the big metal bucket helmet with the, sort of, submarine porthole type face shield in front of it.

Nick: Yeah. It's got a portal type opening and the helmet is metal and really cylindrical. It's not shaped like a space helmet and it's pretty tall. And that's the first thing that really strikes you. And I have heard this suit described as resembling a Scooby-Doo villain and that's pretty on the nose as well. But the first thing that always strikes me about this suit is how darn stylish it is. *(laughs)* I absolutely love the way that the boots look and, and I'm...

Matt: You like the laces, I think, yeah. You're into the laces.

Nick: No, no, the laces, they go all the way up and they've got the gauntlets and everything. It's very steampunk chic before steampunk was a thing. And part of this is that I know under that helmet, Wiley Post was a very stylish guy. The Wright brothers had really fantastic mustaches, but he upped the ante. Dude's got a white eye patch.

Matt: Yeah. There's that.

Nick: Matches his white suit.

Matt: There is that element. It looks like a really thick pair of long underwear or something, right, with a bucket on top.

Emily: I don't know how anybody thinks this doesn't look like Monty Python.

Nick: Oh, that's valid too. Yeah.

Matt: Yeah.

Emily: Yeah, but with really awesome lace up, like, corseted gloves and corseted boots and then the, what's the name of the character from Monty Python? The Black Knight? The Knight? What's his name? You know, "It's just a flesh wound." What's the name of that character?

Matt: Oh, yeah. The Black Knight.

Nick: Oh, yeah! His helmet!

Emily: It's Monty Python, but in rubber.

Nick: Yeah, yeah. No, the helmet is exactly that shape. Emily's absolutely right.

Matt: It does have that. Yeah.

Nick: Yeah.

The other notable thing that I never really noticed, like the famous museum photo of the artifact, he's got his hands on his knees and it looks like a very dignified pose. Emily, you made a point that this was not designed for a spacewalk or anything. Turns out it was more designed along the lines of a crab walk. There's another picture that we're looking at. He couldn't actually stand up because the suit was designed for him to sit down in the airplane.

Matt: Mm-hmm

Nick: So in some photos of him wearing the suit, he's actually kind of stooped over and kind of crab walking.

Matt laughs

Emily: Right, and I think one way to also describe why that would be, is as you pressurize these suits, right, there's a bunch of air pushing on the outside of the suit, right. You're inflating that suit, which makes it really impossible for you to move any of your joints because you're working against the forces that are keeping the suit essentially inflated and pressurized. And so it was designed to sit in an airplane and nothing else, right. So I think the mobility was really limited and that's what makes this third photograph of this hunched over Monty Python, Scooby-Doo villain. Kind of, like you said, Nick, very steampunk meets weird horror movie, like black and white horror movie situation because it's like some creature from the deep.

Adam Savage: And the first problem he had was, and anybody who's tried to bend a rubber raft in half has experienced this problem, was working against an inflated balloon is really difficult. So he built some metal rings into the elbows and the shoulders and the knees and he was attempting to correct a problem that NASA still has today. We think of the space suit as a solved problem because we've all grown up seeing them, but it is still a really difficult object to build. It is very hard to operate. It's hard on the body. It is exhausting. And NASA is still attempting to figure out how to make an astronaut comfortable in one of these things.

Nick: The inner layer, I think, is just that, just an inner layer. And the next layer is very uncomfortable and that's the pressure bladder. And that's the thing that's going to help you stay conscious and keep your blood from bubbling when you are up at high altitudes. And that's the thing that gets rigid and forces him to walk like a

crab, but also that's an ongoing thing with space suits. Any space suit that's made to actually protect you at a high altitude, as in outside of a pressure vessel, is itself a pressure vessel and those things are maniacally uncomfortable and difficult to work in.

Matt: Yeah, and I would imagine building a suit like this, if you're skilled at sewing and making clothes, right, you could make the long underwear part of this. You could make the cotton inner garment, but that outer garment, that rubber garment, not everyone can work with rubber. It's not exactly an easy substance to work with, especially if you want one, sort of, seamless, airtight air bladder, as you said. So who built this suit, in fact, for him? He designed it, but he didn't build it.

Nick: B.F. Goodrich, which of course, those are the tire people, but that's also the same company that made NASA's first space suits.

Adam Savage: In developing his suit, he did the same thing that NASA did in the 50s when it was developing its first Mercury suit, he looked for an industry that was already using something like that. B.F. Goodrich was making bladders for deep sea divers and it's a very similar kind of suit with different constrictions and different problems. But he leaned into an industry that had already been trying to solve a similar problem. NASA did the same thing with their first Mercury suit, it was basically a modified Mark IV suit and it's a very different kind of pressure suit, but it utilized a lot of the similar technology.

Nick: What we know him for now, which is his stylish suit, good looking airplane and the jet stream was after...

Emily: And the eye patch. Don't the eye patch.

Nick: And the eye patch. Was after a accomplished career as a pioneering pilot, before he suited up in his pressure suit and got high, he was famous for speed records. He set an around the world speed record in 1931 with a navigator onboard and then broke it in 1933 solo. And he was high tech for the era. He operated some of the first autopilot systems and a radio direction finder, which was how you could home in on a preset radio beacon.

Emily: So it sounds like he wasn't somebody who was totally satisfied with breaking speed records and that's sort of what created this need for a pressure suit so that he could start to try and chip away at high altitude records.

Nick: Yeah. And I think we've established in the last bit of conversation that he was no shrinking violet, but let's return to the suit for a second. The suit that we described in the photos is actually the third one. The first one, just straight up ruptured during a pressure test and the second one was so tight when they put it on him that they had to cut it off of him. So before he even went up in his

pressure suit, he had what I would consider to be some very hair raising situations, just in the design and testing phase.

Matt: Yeah. So after all of that testing, which it sounds like, you know, enough went went wrong in that testing, that would've put me off wearing the suit in an actual high altitude flight, he actually took five different high altitude flights in that suit. So, the first above Chicago in September, 1934, and he set this unofficial record of 40,000 feet. Unofficial because the instruments actually couldn't record altitude very accurately. And that was just one of the flights, that was just one of these incredible daring high altitude flights. One of the benefits of flying at higher altitudes is that you can go faster because there's less air resistance. And so this allowed Post to make flights that would take other pilots quite a long time in shorter periods. So he made, in 1935, a flight in the stratosphere between Burbank, California, and Cleveland, Ohio in just 7 hours and 19 minutes.

Nick: With a layover, Burbank to Cleveland actually could take you 7 hours. So this is, this is an advent in aviation technology that is heralding what we understand air travel to be today. It's, not very long after, it could take you a month to make that same trip, but with advances in mechanical reliability and now, really, the jet stream making all of the difference because you can go a whole lot faster on the same amount of fuel.

Emily: But I think the bottom line is to remember, we're talking about the 1930s. This kind of high altitude flight, this kind of high speed flight is really at the forefront of what's going on in aviation at the time. And, you know, I feel like a lot of the other aviation stories that we've talked about, in and around this era, we're talking about people doing barnstorming and like aerial acrobatics and all kinds of big showy stuff because that's what really helps drive people's flying habits. And Wiley Post wasn't doing those kinds of things, which is, I think maybe one reason I hadn't heard of him, but also I think if I had a layover flying from Burbank to Cleveland and I made it in 7 hours, I might be pretty cool with that. Wiley Post did it in 1935. I mean, that's really very impressive and really, I think does a good job of sort of contextualizing why his achievements are so important to know about.

Matt: So aside from inventing one of the very first pressure suits, Post is important because he was one of the first to demonstrate that flying at a high altitude, planes could take advantage of the jet stream and fly faster.

Nick: Yeah, and the lineage from the pressure suit that Wiley Post wore to modern space suits is just really straight up and very direct in addition to being the template for the pressure suit as we know it today. He's the one that first went to a tire company and said, "Do you think you can make us a pressure suit?", followed a generation later by NASA asking the exact same thing and they put their own pizazz and spin on it.

And if you look at the most advanced space suits in use today, an ISS EVA suit, you see a lot of similar features. It has metal rings at the joints. It's got separate body pieces, but it's still a pressure bladder and it's got the gloves and the boots and a helmet. It's no longer looking quite like a coffee can, but it's there and it's there for the same purpose. So you can look up at the astronauts that are doing important work on ISS today and see the similarities with the lonely flyer taking that jet stream from Burbank to Cleveland so you can too.

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Emily: AirSpace is from the Smithsonian's National Air and Space Museum. It's produced by Katie Moyer and Jennifer Weingart. Mixed by Tarek Fouda. Special thanks for this episode to Adam Savage. AirSpace is presented by Olay and distributed by PRX.

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