

AirSpace Season 1, Episode 9

Spies in the Skies

Emily:

Are you guys nosy people?

Matt:

No.

Nick:

Yes.

Emily:

I come from a big family. If you don't know how to eavesdrop, you don't find anything out.

Nick:

It's important to have all of the information so that you know how to mind your own business. You need situational awareness. Welcome to Airspace, we're your hosts. I'm Nick...

Emily:

I'm Emily...

Matt:

And I'm Matt.

Nick:

People are nosy. People have been spying on each other forever. When it's your neighbor, it's super annoying. But when it's the military and it's a matter of National Security, it's super important.

Matt:

Today's episode is about what changed when spies upped their game, rising above their old lookout towers and taking to air balloons.

Emily:

And air surveillance started right here, where we are recording today.

Tom Crouch:

The Secretary of the Smithsonian, invited Lowe, to come to Washington and give a balloon demonstration, which Lincoln funded, but right in front of where the Air and Space Museum stands now.

Nick:

Starting with balloons, spying rose higher in both technology and altitude. We'll talk to a former pilot, one of a very elite air crew who flew SR-71s. Those planes broke speed records and traveled as high as 80,000 ft.

Buz Carpenter:

There was a mystique about that airplane. Is it an airplane or is it a spaceship?

Emily:

This episode is about reconnaissance. Spying. We'll spend time on satellite surveillance in a future episode. This one is all about air surveillance and the flying technology that populates the Earth skies.

Matt:

That's coming up next on Airspace, from the Smithsonian's National Air and Space Museum with help from PRX.

Emily:

We don't typically spend a lot of time on this podcast bragging about our own museum, but it's a pretty cool coincidence that at the National Air and Space Museum, we get to preserve and showcase air history on the site where the first air balloon was demonstrated to our president.

Nick:

I also appreciate the story because it's fun to talk about Abraham Lincoln when you're at an air and space museum. We don't have a lot of opportunity for that. All of the other institutions in Washington D.C, get all the Lincoln funds.

Matt:

Take that National Museum of American History.

Nick:

And the Capitol Building and the White House. Everybody gets to talk about Lincoln, but us.

Matt:

Well, today's our day. Dr. Tom Crouch is Senior Curator in the Aeronautics Department at the Smithsonian's National Air and Space Museum. I asked him to tell us a little bit more about early air surveillance.

Tom Crouch:

My name is Tom Crouch. I'm responsible in terms of collections for lighter than air things, kites, and those kind of things.

Matt:

Tom, I assume you've been up in a balloon. When was the first time you ever went up in a balloon?

Tom Crouch:

My first balloon flight must have been about 1976.

Matt:

What's that experience like? What do you feel, sense when you're doing that?

Tom Crouch:

When you're in a hot air balloon, there's always sound, but when you're in a gas balloon, there's no noise. It's absolutely silent. And since you're dangling underneath the big balloon, which is essentially operating as a sail, you're operating literally inside the wind, there isn't any sense of the wind or air flowing either.

Matt:

So it's calm and quiet?

Tom Crouch:

You can hear everything. It's wonderful.

Matt:

How did aerial surveillance begin?

Tom Crouch:

Aerial surveillance began in 1783, from the Champ de Mars, where the Eiffel Tower is now. In fact, Benjamin Franklin was there along with half the citizens of Paris. He was there to negotiate the treaty, ending the American Revolution. Anyway, when the balloon went up, there was a lot of excitement, but Franklin heard someone in the crowd say, "The thing flew. So what?". And Franklin is reputed to have leaned out of his carriage and said, "Sir, of what use, is a newborn babe".

Matt:

The military applications of this were immediately felt?

Tom Crouch:

Immediately.

Matt:

How did the U.S come to use balloons during the Civil War?

Tom Crouch:

To demonstrate the value of the balloons, a New Hampshire Balloonist, Thaddeus Sobieski Constantine Lowe, a very dashing guy, dark hair swept straight back, a mustache. He was a handsome devil who knew what he wanted then set out to get it. In the spring of 1861, Joseph Henry, the Secretary of the Smithsonian, invited Lowe to come to Washington and give a balloon demonstration, which Lincoln funded. Lowe was able to give demonstration flights on what's now the mall.

Matt:

Oh yeah! There's a plaque outside that commemorates that.

Tom Crouch:

Right in front of where the Air and Space Museum stands now. Lowe took a telegrapher up with him and sent a telegram to Lincoln, just down the mall, talking about the fact that he could see 50 miles around. Lincoln actually came out, talked to Lowe and invited him in. Lowe actually spent the night in the White House that night talking about the military potential for the balloons.

Matt:

So you're up in the balloon and you can see behind enemy lines. How do you then convey what you see to the troops on the ground?

Tom Crouch:

During the Civil War, if they were ascending at a commander's camp, they just yelled down to the ground and drop a note or something. They usually wanted an officer up who understood terrain and mapping, that kind of thing.

Matt:

Describe what these military balloons looked like. Were they balloons that we imagine today when we think about hot air ballooning?

Tom Crouch:

They weren't hot air balloons. They were gas balloons. And during the Civil War, Lowe being Lowe...these balloons were as conspicuous as he could make them. We tend to think of them as being dirty, gray and so on. Actually they were vibrant colors, yellow, orange, brown, that kind of thing.

Matt:

Let's fast forward to the 20th century, the airplane is invented. The Wright brothers introduced the Wright Flyer and military aircraft developed shortly after that. Was it obvious when the airplane emerged, that it was going to replace the balloon in aerial reconnaissance?

Tom Crouch:

The airplane didn't immediately put reconnaissance balloons out of business. Once airplanes developed firepower...one of the most important things fighters did was not only shoot reconnaissance airplanes, but shoot the balloons down, so the other guys couldn't see what you were doing. And of course that gave birth to the fighter plane, but 200 and how many years after. The invention of the balloon reconnaissance, the ability to look down on somebody else from a high place, remains one of the most important things you could do.

Nick:

Let's talk about balloons for a second. I don't like riding in balloons, hot air or other ones.

Matt:

Have you been in one?

Emily:

You've ridden one?

Nick:

With Tom. Yes.

Matt:

Oh, really? With Tom Crouch?

Nick:

I would never want to go into a balloon without Tom, but I also don't necessarily want to go back into a balloon with Tom. And it's not because it's Tom, it's because those balloons go pretty high, not airplane high, but they go high and that basket does not feel quite stable as I'm used to flying commercial.

Matt:

You're telling me the opposite of what Tom said when he did the interview. According to Tom, you feel totally safe inside that basket because you're kind of enclosed. Also, fun fact, Tom is not a licensed balloonist, so if you were up there with just Tom, maybe you should have felt a little bit uneasy.

Nick:

If anything had happened to us, I know that Tom's presence would ensure that my demise would've received appropriate media coverage.

Matt:

That's true.

Nick:

Even if Tom's name was the headline.

Matt:

It would be Tom Crouch and companion.

Nick:

Yeah. Always do dangerous things with famous people.

Emily:

Lesson of the day.

Nick:

You're enclosed, there's not a door into the basket, but the basket is only waist high.

Emily:

Waist high?

Nick:

Yeah. A little bit.

Emily:

That's not even code for a guardrail. Just saying.

Nick:

You've got a torch that's screaming hot fire into the balloon.

Matt:

I would be more afraid of the torch than anything else.

Nick:

I've rarely held onto a railing tighter in my life.

Emily:

One of the things that I think is really cool about the historical part of ballooning is that I forget that balloons had a practical purpose. When I think of balloons, I think New Mexico, once a year...

Nick:

Wedding proposal.

Matt:

Albuquerque.

Emily:

Wedding proposals, champagne, Wicker. Those are the kinds of things I think about. But when you think about the fact that balloons actually had a purpose and there was a Balloon Corps, I can't get over that. We had a corps.

Matt:

Apparently balloons in the battlefield during the Civil War, caused the Southern Troops to move more slow, cautiously and try to avoid being seen. So it actually slowed them down in the field.

Emily:

I keep thinking about how hard... People who are spies and who are doing surveillance, try so hard to be subtle about it, and this is a balloon in the air with a 5,000 ft telegraph cable hanging out of the basket to try and telegraph signals back to the ground so that they can get the real time. And if that doesn't work, because telegraph cables apparently aren't super stable, they're dropping canisters out of there and doing everything they can do. I'm like, did you fold it into a paper airplane and toss it out? There's nothing subtle about it.

Matt:

No.

Nick:

Did we have paper airplanes then?

Matt:

They weren't called airplanes, I'll tell you that. Obviously more modern, powerful weapons, put the balloon out of commission as a surveillance vehicle during war time. You couldn't very well fly a balloon over enemy territory once they had powerful radar systems and other things that could detect that sort of thing. So the emphasis became on flying higher, faster and avoiding detection by radar.

Emily:

One of the first, most well-known spy plane, is the U-2, which...

Matt:

It's not just a band from Ireland.

Emily:

It's not just a band from Ireland. And I also didn't know that it's the, U-2 Dragon Lady. I always thought that was the name of an individual special U-2 plane, because you know how boats and planes, especially from the military have given names? So I always thought the Dragon Lady was an individual U-2 plane that some crew named, but it's actually the name of that type of plane. Fun fact for me.

Nick:

All U-2's are called Dragon Lady?

Emily:

All U-2's are U-2 Dragon Lady.

Matt:

Huh? I didn't know that.

Nick:

I didn't know that either.

Matt:

Emily dropping knowledge.

Nick:

And so the reconnaissance part of the U-2 was actually a camera. Advances in technologies allowed them to actually put cameras on airplanes and take high resolution photographs from extreme altitudes.

Matt:

If you've ever seen the U-2 camera that we have on display, it's a big honking camera.

Emily:

How big is honking?

Matt:

How big is honking? Bigger than a breadbox. I don't know. It's about yay big, I don't know.

Nick:

Matt's holding his hands, two or three feet apart.

Emily:

Breadboxes. My grandmother had a breadbox.

Matt:

Breadboxes are useful.

Nick:

The idea was that the U-2 flew too high for Soviet Fighter Jets and missiles couldn't reach it either, and they thought that you couldn't shoot down a U-2.

Emily:

The Soviets proved that wrong. Right? They actually shot down and collected a U-2 spy plane.

Nick:

And a U-2 pilot.

Emily:

And a U-2 pilot.

Nick:

Embarrassingly.

Emily:

Famously in the bridge movie, the Bridge of Spies, our wartime enemies were able to find out what kind of planes we were flying and how we were flying them. There became this need for a better airplane that could fly higher, faster, and be less detectable on the radar equipment that were being used to actually find these airplanes. Enter the SR-71.

Matt:

Yes.

Nick:

The SR-71, quickly became the most well-loved and well known spy planes, which is counterintuitive. But during its development in the 1960s, it was kept super top secret.

Emily:

The SR-71 was definitely super secret. Could we use the word secret more than once?

Nick:

Secret secret secret.

Emily:

Secret secret secret. The SR-71, also known as the Blackbird, was definitely not public knowledge.

Nick:

It was developed by legendary Aeronautical Designer, Engineer, Kelly Johnson, and his team at Lockheed and their super-secret workshop, the Skunk Works. I was reading an article as background research for this, and they were referred to hopeful SR-71 pilots as hopeful Habus, H-A-B-U. I had to spend a lot of time figuring out what that meant. It's a particularly deadly kind of pit viper and it sort of looks like a Blackbird. Apparently Blackbird pilots called themselves Habus. Man I had to do a little bit of unraveling to figure that out. It was not explained in the article.

Emily:

That was a name that was given to the Blackbird by the Japanese, who were our allies at the time.

Matt:

The plane definitely looked cool, and it went super-fast, faster than the missiles used to try to shoot it down. No SR-71 has ever been shot down.

Emily:

It only seems right to talk with someone who actually experienced this need for speed firsthand, pilot and spy, Buz Carpenter.

Buz Carpenter:

I normally introduce myself as Buz Carpenter, and I oftentimes mention that I'm a docent at the Air and Space Museum at Dallas Airport. First time I got into the Sr-71, it was a great sense. Anytime you got into the airplane and knew you were going to go fly it, you just felt it was a privilege because there's a mystique about that airplane. Is it an airplane or is it a spaceship? You can see almost 320 miles in any direction. You see the curvature of the earth, the sky above you is very black because 97% of the atmosphere is below you. We were flying, probably around 82,000 Ft, traveling at 2200 MPH. We were navigating off the stars. There are only 85 of us that ever flew the airplane operationally and about 85 navigators, so it's not a big group of people.

The airplane would have an average temperature of over 600 degrees. It grew three to four inches in length, an inch or two in width.

When I'm doing stuff for kids I say, "You ever help your mom or dad put a pizza in the oven? To touch the glass?"

"No, no".

I said, "Well, that's probably about 450 degrees. My windows, at least a hundred degrees hotter than that".

And then when we're back behind the airplane, I'll ask the kids, "When you came here today, what kind of horsepower...? Were you a Kia, 275, or were you at a Ford F-150, you had a 475?" Then I get them into a contest. "How much horsepower do you think each one of these engines produced? The horsepower is 156,000".

It was in March 1979. There was a conflict in the Arabian Peninsula between Saudi Arabia, Yemen and some others. We got a very quick notice, a Saturday night, the alert. By Sunday afternoon, my navigator and I proceeded in a tanker to a Europe. Another crew brought the airplane over. The head of their two intelligence agencies, MI5, MI6 the two star general in charge of strategic air commands, were there listening to our briefing. We proceeded, there were five refuelings, it was nine hours and 45 minutes. The president monitored this whole mission, but I'm here to tell you when we were above the Suez Canal and we're looking down and you see the Sphinx and the Great Pyramids...It was amazing. And you remind yourself, there's a mission you need to take care of.

Now, this particular mission, since they were looking for armies in engagement, we had the nose camera on. Every picture was 72 miles wide. In that one hour, we filmed over a hundred thousand square miles. The film is five inches wide and it's two miles long. The film was cut into 500 foot lengths and then you'll put it into the processor. We called it reconnaissance, but the normal term in the American public would be a form of spying. We felt very secure. No SR-71 was ever shot down. We built 32. They were built with slide rules because they started in 1958 and computers were not mature.

One of the things that my wife most liked about this airplane was the fact that we had magnificent rocket ejection seats that were good from the takeoff roll on the ground, all the way up to 82,000 feet at 2100 miles an hour.

I served the United States Air Force for 28 years. I worked retired as a Colonel. I was a Senior Pilot. And while I had a wonderful opportunity to fly a lot of different airplanes, the SR-17 is the one that most changed my life.

Emily:

When I think of a military pilot, I, as many of us do go straight to Top Gun. Right? That's the quintessential. This is what it's like to be somebody in the military who flies a plane. So you wear one of those really cool looking jumpsuits, helmet, respirator. And there're all kinds of straps, clips, patches and it looks really rad. SR-71 and U-2 pilots, are effectively going to space, right? They can see the curvature of the earth.

Nick:

Black sky.

Emily:

Black sky is what they would see out the window, instead of blue. The suits that they had to wear in order to keep themselves safe are pressurized, so they're effectively spacesuits.

Nick:

Yes.

Matt:

They have to breathe pure oxygen while they're up there.

Emily:

If you were to take a cross section of these suits and look at all the different layers that these suits are made out of...The first thing I remember when I was trying to figure out how these suits were constructed...The first that was very counterintuitive to me is you wear cotton undies, which make no sense to me. If you are somebody who goes hiking or skiing, you know that you don't want to wear cotton because it definitely makes you colder, and if you're going really high, up to me, that means colder temperatures.

Matt:

Because you are perspiring, the cotton's absorbing it and then it's getting cold.

Emily:

Right. And the cotton doesn't wick that away from you. But the SR-71 actually gets so hot that they have you wear cotton. And on top of the cotton, the first layer of the suit is this nylon layer that they equate it to feel like Teflon pants. You can slide around and it's there to help you from...

Nick:

The comfort is extreme until it's not.

Matt:

It's like wearing nothing at all.

Nick:

Nothing at all.

Matt:

Stupid, sexy man Flanders.

Emily:

So it's a weird nylon layer and then there's a rubber, bladder throughout the whole suit. That's what inflates like a balloon.

Nick:

It's a human shape balloon.

Emily:

It's a human shape balloon. This is my favorite part...On top of that, It's a fishnet stocking suit.

Nick:

It's metal.

Emily:

It's metal fish net?

Nick:

It's a metal mesh on top of the [crosstalk 00:21:26]

Emily:

To help keep it's shape, so it doesn't become a giant inflated marshmallow. And then what's on top of that? A fire retardant layer to help make [crosstalk/inaudible 00:21:38] sure you don't.

Nick:

All of it in a very tasteful, 1970s harvest gold. In the pressure chamber, where they test and train you for these things, they put you in the SR-71 suit and they sit you in the chamber. There's a beaker of water at 98.6 degrees, which is the temperature of your blood. And as they lower the pressure and increase the altitude within the chamber, it boils before your eyes. To emphasize, "Hey, keep your hat on, please remain seated at all times, do not remove your gloves at altitude".

Matt:

That's the big danger. Right? If you were to be exposed to that type of pressure, a lot of people believe that because of the way it's portrayed in movies, you would explode because of explosive decompression. But in fact, what would happen is just you would get a really bad and deadly case of the bends as the gases in your blood begin to bubble and come out of your blood.

Emily:

It's what you would experience if you scuba dive, except for it's in the opposite direction where it's going to be the most dangerous part, and the temperature and the lack of atmosphere.

Nick:

And the speed that you're traveling at.

Emily:

And space.

Matt:

Basically everything.

Nick:

And the fact that you are over enemy territory.

Emily:

Basically all the things will kill you. I heard a fun fact about the SR-71.

Matt:

What's that?

Emily:

One of my friends is a big nerd about planes, which I never remember until he's in the museum sometimes. So apparently the SR-71 was detectable with seismometers. It wasn't causing earthquakes, but it was so fast that it perturbed the seismometers that it flew over. So you could actually track it with seismometers.

Matt:

Wow. Because seismometers detect sound waves moving through the Earth. Right?

Emily:

Sure. That's a good way to think about it.

Nick:

Would it be just when they broke the sound barrier?

Emily:

I don't know the answer to that. It was one of those cocktail party style facts.

Nick:

That's what we like here.

Emily:

Which we like. We didn't get into the details.

Matt:

One of the remarkable things about the SR-71 is that even though it's traveling at 80,000 feet, you can still hear it on the ground. It's a notoriously loud airplane. It moves so fast that that sound isn't heard until after it's long gone, almost a minute later.

Nick:

The SR-71, even a little bit worse, double sonic boom, like the space shuttle, the particular design of the airframe means that it broke the sound barrier at two different places. Part of it would break the sound barrier and then the rest of it would break the sound barrier. So there was a double sonic boom, just like when the space shuttle would come in. That's how you knew a space shuttle was landing.

So the SR-71 was retired in the 90's and we're still flying the U-2, but why are we still using planes for surveillance when we have all of these satellites to do the job for us?

Emily:

One of my favorite things is the real time ability of an airplane to go up with the suite of instruments you want, to go spy on a specific spot, right now, gives you so much more flexibility than a satellite. When we talked in our Space Junk Episode, you put a satellite up there and it's going and it's either facing the same spot on the Earth or it's going around the Earth in one particular orbit.

Nick:

A theme that we will return to on occasion in this series is that it's not easy to steer in space as people imagine it. So it's easier to fly an airplane over a particular target, turn it around and go back.

Matt:

While we do still fly U-2's and other piloted craft, we also now rely a lot on drones to do our spying for us.

Emily:

Can a drone be as capable as something like the SR-71?

Matt:

It will probably not be as fast as the SR-71, but it's capable of getting where it needs to and getting the photos it needs.

Nick:

Maybe more capable if you consider the miles and miles of film that the SR-71 would have used to capture a timid tree like Buz described. All of that film has to be brought back down to the ground and then processed. That takes a lot of time. Now you've got smaller and better cameras that allow for real-time images.

Emily:

Drones are used for reconnaissance, but you could also use them for scientific applications, including thermal imagery and in some cases, spectral imagery, so looking at what things are made out of, their compositions...

Matt:

We know enough to be impressed by the capabilities of these drones. But there's a lot of stuff that we don't know about yet because it's classified. I don't think they can go to 80,000 feet.

Emily:

What about 70,000 feet, like the U-2? Can it go to 70,000 feet?

Matt:

I'm not sure what the maximum altitude is for a military drone.

Emily:

There's a high likelihood that they can go that high. We just won't know about it for another 20 years.

Matt:

Conspiracy.

Nick:

I was going to say the same, we won't have that kind of information.

Emily:

I'm not sure it's necessarily a conspiracy as much as there's a lot of cool technology out there that we'll eventually use as civilians, but not yet.

Matt:

So, if we're done droning on, that's it for this episode of Airspace.

Nick:

You'll find us here again in two weeks to talk about tests and the search for Exoplanets. Airspace is produced by Katie Moyer, Jocelyn Frank and Lizzie Peabody mixed by Tarek Fouda. Special thanks to Jason Orfanon and John Barth. You can subscribe to Airspace wherever you get your podcasts, and please tell a friend. This episode was supported by PRX and the Alfred P. Sloan Foundation, enhancing public understanding of science, technology, and economic performance. More information on Sloan at sloan.org.

Emily:

I actually have a bingo card in my backpack right now for IC-Satellite. Bingo.

Matt:

Ha!

Emily:

I will show it to you when we're done recording.