



## **EHS Stories: Dramatic Tales From the 50-Year History of Environmental Health and Safety at Princeton University**

### **Episode 3**

#### **It's Gonna Blow!! The Tale of the Box in the Crawlspace**

Imagine you're a self-possessed tech worker running cable in a crawlspace when you encounter an old wooden shipping crate, covered in dust, bound with metal strips and brittle to the touch. You're a professional with a job to do, and this thing is in the way. You give it a shove, and the side collapses in a heap of rotted slats, revealing—A BOMB!

Voices: “That’s gotta be a bomb!” — “She’s gonna blow!!” etc.

What else could it be?? Cylindrical, metallic, with menacing red nubbins. A quick look at the box reveals some faded stenciling about the military. If this isn’t ordinance, I’m Steve Jobs.

What do you do? You high-tail it out of there. And call EHS.

Learn about the *rapid-fire* investigation and its *explosive* revelations in this episode of **EHS Stories: Dramatic Tales From the 50-Year History of Environmental Health and Safety at Princeton University**. I’m your host, Jim Sturdivant. Please join me yet again as we dive into the colorful and sometimes shocking annals of the always-intriguing effort to mitigate hazards, prevent illness and injury, prepare for the unexpected, and keep people safe at one of the world’s great research universities.

#### THEME MUSIC

The call came into Robin Izzo, then assistant director of EHS, overseeing the chemical safety, lab safety and industrial hygiene programs, about a suspicious-looking canister at the Butler Tract.

ROBIN: “My name is Robin Izzo. I’m the Assistant Vice President for environmental health and safety for Princeton.”

The year was 2006, late November. Robin immediately went over to her colleague Jim Boehlert.

JIM: “My name is James Boehlert, Jr. I worked at Princeton University from September 2006 to I believe just about September 2012 ... I was the program manager of chemical safety.”

“So Robin, came into my cubicle in a very excited manner as she sometimes does, but it was very hush hush. And she’s like, ‘You need to come with me. We might have a really, really big problem. Somebody thinks that they found a bomb underneath one of the buildings in Butler Tract.’”

The Butler Tract was graduate housing located on the east side of the town of Princeton.



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JIM: “I was like, well, what do you mean, what kind of bomb? She's like, a World War Two, like a bomb like goes out of a plane and I was like, Oh, this is exciting. Let's go Yeah.”

JIM: “One of the things that I had done previously, I had done high haz explosive remediation for Princeton in the old Frick laboratory before it was decommissioned. I had to deactivate 15 bottles of dimethyl ether that were way beyond expiration date and that tends to form explosive peroxides that if you shock them that they can explode. So that was a little bit of my prior experience. And so I was kind of the obvious go-to for this situation.”

“So we hopped in a club car and we rolled over and we you know, get into the building.”

ROBIN: “There were a number of connected houses that had a common crawl space below them. And some of the students would have access to those, those crawlspaces through an opening inside of a closet in I believe in the bedroom.”

JIM: “There's a trapdoor in the floor, and the buildings all cleared out. And we're kind of just looking around and you know, alright, we find the trap door. So I very carefully open it up, and I looked down, I can't see anything. And so I think Robin had brought a flashlight. And so I was like, alright, I'm gonna have to, you know, kind of lay on the floor and, you know, dip my head down and kind of see where this thing is. It's a fairly long building and it could be all the way at the end. And so, I kind of poke my head down. I'm hanging upside down a little bit and I'm looking around with this flashlight and finally I see this thing and it's probably about 30 feet in from the trapdoor. And I'm looking at it and it is a, it is spot-on an aerial bomb, like it just looked exactly, wow. Yeah. So I was like, Oh, this is this is real deal.”

There were actually two crates. One had fallen open to reveal the bomb-like object, and the other was still intact. It was clear they had been sitting down there for decades.

JIM: “I mean, it was from that far away, looking into into darkness. With just a flashlight. I mean, you just see this big, dust covered metal cylinder with you know, kind of pointed towards the end and I think it had some fins on it, too. And there's some other pieces of metal in the area as well. And I'm like, how did this thing get here? And so I come back up from being in the trap door and I look at Robin I'm like yeah, this might be a really big problem and she gets a little more excited. So I'm like, ‘Know what? I'm gonna go look at it.’ She's like, ‘What do you mean? You just did.’ I was like, ‘No, I'm gonna hop down there. I want to look at it.’ She's like, ‘Well, that's so dangerous.’ I was like, ‘If this thing is really like, how old is Butler Tract, it's really old. Right?’ She's like, ‘Yeah.’ And so it's like if this thing hasn't gone off with all of the banging, bumping and whatnot that could have possibly occurred over however many decades that Butler Tract's been there. I think if I just kind of crawl up to nothing's going to happen.”

ROBIN: “And we climbed down into the crawlspace, which again, was just this opening, square opening that was in the in the floor of a closet, and we jumped down into the crawl space.”



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JIM: “It's, I want to say like a three or four foot drop and so I kind of hobble on over and I'm getting close to closer to it.”

ROBIN: “One of the wooden crates had been pried open. And you could see this gas canister would be a good word for it. But here it was this metal, elongated cylinder that to me looked possibly like a bomb or something. I mean, that's my first thought was, it's a bomb. And, or something, and there was some liquid that was underneath one of the one that was opened. And the only marking that I could read on it was that it was the Navy, you know, the US Navy.”

JIM: “And I'm like, wait a minute, this doesn't look right. This almost looks like maybe it's hollow. And so I get up to the side of it the way the way that it was positioned. It was you know, towards the side where you had the profile of it. But as I got closer to it, I can tell that there seemed to be an opening in the front. And so I took my flashlight and proceeded around to the front and that's when I discovered I was like, oh, this thing's just a hollow tube with some componentry little bit of componentry in it. ... it's just a shell of something. Maybe it's a shell of a bomb, but this thing is empty.”

The two felt like they could breathe a sigh of relief. Examining the crates more closely, they discovered some paperwork.

ROBIN: “The crate that had not been pried open had some papers that were attached to it, this envelope attached to it and I pulled that off and looked at it and I realized that what we were looking at was not a bomb, it was some sort of an engine. And it had from the schematics that I was looking at, it looked like it was something for a helicopter. And it had the name of the company on there and even a phone number for the company.”

The paperwork was from a company called the Hiller Aircraft Corporation. Stenciling on the side revealed the engines—or whatever they were—had been shipped from the Hiller company in Palo Alto, California to Fort Eustice, an Army base located in Newport News, Va. What they were doing in the crawlspace of a student housing complex in Princeton, NJ was anybody's guess.

After World War 2, the GI Bill brought hundreds of thousands of military veterans to college campuses across America. To accommodate the flood of students, housing was built, quickly and at low cost, for what was assumed to be a temporary influx. At many campuses around the nation, however, these 1940s structures would have a notoriously long life as the student population continued to increase in the following decades.

The Butler Tract buildings were constructed by Princeton University in 1947 as [temporary graduate housing](#), the 250 low-slung white clapboard residences meant to last two to five years. They would remain the home of grad students with families until 2015.

Despite the less-than-luxurious neighborhood nicknamed the “dear old barracks,” generations of Princetonians have fond memories of life in the Butler Tract. In 1947, rent on the units [started at](#)



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[\\$40 per month](#)—utilities included. The narrow streets and shared common spaces rang out with the sounds of children. Parents pooled resources for babysitting and homework help.

For the young grad students, it was a heady time. Princeton University emerged from World War II a hub of aeronautics and ballistics research spearheaded by influential professors like Walter Bleakney (who is profiled in episode one of this podcast). The nearby [Forrestal campus](#), today a sedate collection of research buildings, hummed with experimental aircraft, a 750-foot long reverse wind tunnel known as the “long track,” the federal Geophysical Fluid Dynamics Laboratory, the secretive Project Matterhorn—today known as the Princeton Plasma Physics Laboratory—and, most famously, the [Princeton-Pennsylvania Particle Accelerator](#).

ROBIN: “I remember when I first came here in 1992, that the Forrestal campus was much more built up than it is now. And even then it was starting to decline, a lot of the mechanical and aerospace engineering research and materials had moved to E Quad. But before E Quad was built, that place was teeming with aerospace engineering research. There was a long track, there was a helipad. The first hovercraft was there. It had a landing strip for, for planes. It was really a place where a lot of aerospace engineering research was being done, a lot of studies being done there.”

Robin knew that someone in Mechanical and Aerospace Engineering, or MAE, would be a good person to ask about the strange discovery in the crawlspace. She began calling around.

ROBIN “So once we got out, we took a closer look at the paperwork, and we figured this had to have been from some kind of research for the university. So I started calling around to different professors in MAE. And of course, you can never find a rocket scientist when you need one. And so it did take a little while before we found the right person. And so there was a professor Curtiss, who I finally reached, and I described what I was seeing, and he said that he knew exactly what that was.”

[Howard “Pat” Curtiss Jr.](#) was one of the legendary figures who roamed the halls and fields of Forrestal back in the 1950s, 60s and 70s. His work on helicopters unlocked the mysteries of “ground effect” aerodynamics that distort the airflow below wings and rotor blades on takeoff. His research dramatically improved the range and carrying capacity of modern helicopters. He was a go-to authority for testing new aircraft designs from the likes of Grumman and Boeing.

ROBIN: “He said that this had to do with some helicopter research or engine research that they had been doing with the Navy. And that these were ramjet engines. And these ramjet engines would be placed on the actual propeller of the planes, and would cause the propellers to spin, which seems a bit precarious, and certainly not something that you see now for helicopter technology. But that was what that was the technology at the time.”



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Back in the early 1950s, helicopters were the wild west of aeronautics, full of promise but much less reliable than fixed-wing aircraft. They had proven their usefulness in a limited capacity during World War II but were held back partly due to the weight of the piston engines needed to power the rotors. In the early 1950s, efforts were on to come up with a powerful, lightweight alternative. One of these was the ramjet engine.

The ramjet engine looks for all the world like something that just shouldn't work. It's *too simple*—a popular nickname for the ramjet in the 1950s was the stovepipe, as the engine is essentially a metal tube designed to compress and combust superheated air. It has no moving parts, unlike the better-known turbojet engines used on airplanes, making it very lightweight. Once set in motion by another means, ramjets can be a remarkably efficient way to achieve and maintain very high speeds and have proven useful as a component of long-range missiles.

In the 1950s and 60s, ramjets were one of the exotic new technologies identified popularly with nuclear power and the Space Age. Research in the 1950s used ramjet engines to successfully prototype a [nuclear rocket](#) theoretically capable of taking humans to the moon and beyond, but eventually chemically-propelled rocketry won the day. In the 1980s, the Reagan administration studied ramjet technology in its quest to develop spaceships that could take off from a runway and [continue straight into orbit](#), but complexities and budget cuts shut the effort down. While there are currently no known ramjet-powered aircraft capable of carrying humans into flight, the dream has never fully died.

In fact, ramjet technology *did* once take humans into flight. The idea of jet-powered helicopters excited Stanley Hiller, Jr., the youthful wunderkind and founder of Hiller Aircraft, whose teenage inventions—he designed the world's first coaxial, or duel-rotor, helicopter at the age of 15—were successful enough to earn him a draft deferment during World War II. By 1951, the then-27-year-old Hiller demonstrated an experimental helicopter designed with ramjets placed on the end of its rotors.

This was exactly what it sounds like: a helicopter sporting little jet engines spinning around and around. Don't believe me? There's a great newsreel video online of Stanley piloting his prototype, the Hiller YH32 Hornet, in 1951.

AUDIO CLIP: "In Palo Alto California the world's first jet helicopter is unveiled by its inventor, youthful Stanley Hiller Jr. The essence of simplicity, the helicopter is powered by two small jet engines which weigh only 11 pounds each and have no moving parts. In a matter of minutes they can be attached to the tips of the rotors."

And, it worked! The ramjet engines allowed for ultralight construction and good lifting capacity. They even eliminated the need for a tail rotor. Prototypes were tested by both the Army and the Navy and proved viable for use as a small-scale rescue and reconnaissance helicopter the military was then considering. An even more stripped-down version, nicknamed the "Sally Rand," was tested in 1957 as the first-ever helicopter gunship.



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But it was not to be. The YH32 and its variants were noisy, and its jets produced flames visible at night. It consumed a lot of fuel, negatively impacting its range. These drawbacks, plus the development of the lightweight turboshaft gasoline engine, doomed the ramjet helicopter.

Fewer than 20 Hornets were ever manufactured. Examples of the helicopter can be viewed today at a few museums around the country, including the National Air and Space Museum's location in Chantilly, Virginia and the Hiller Aviation Museum in San Carlos, California. Only a very small number of people have ever laid eyes on one of these little engines up close, but count among those fortunate few the staff of Princeton EHS in the late fall of 2006.

Now that Robin knew what these little buggers were, the question became, what to do with them?

ROBIN: "So since we had that paperwork, I was really happy to find that the company was still in business. So all that paperwork listed this one manufacturer, and so I contacted them and explained what I had. And they could not be more excited. I described it and they said to me, I sent a picture to them. And they said that was the very first ramjet engine. That was the very first ramjet engine ever to get approval from the CAA, which is now known as the FAA. And so it was historic for them."

So these weren't just rare – they were the rarest of the rare! The original article.

ROBIN: "So they called me back the next day, and they had a whole team of people on the other side of that phone. And they said it was like Christmas, because they didn't have that anymore. They didn't have any models of this. They had no examples of this anymore. And so they asked if I would send these engines back to them, because they wanted to put it in their museum. It was really part of their history. And they said it feels like Christmas. They were so excited about it. And so we did do that.

Of course, EHS was happy to send the ramjet engines back to Hiller. But all that talk of Christmas had given them an idea.

ROBIN: "But first, we *might* have put some poinsettias in them and took our holiday photo with the engines and use that as our holiday card that year. That *could* have happened. But we did send them back. And they were very, very grateful for it."

So the engines were returned, and most likely reside today in the private collection of the Hiller family. I contacted the collections manager at the Hiller Aviation Museum, who kindly shared with me photos of the ramjet engines on loan from the family in the museum's collection. None of them look exactly like the ones found by Robin and Jim, but the engines discovered at Princeton are no doubt in good hands.



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Which leaves only one unanswered question. How did those ramjet engines wind up in the crawlspace of graduate student housing at Princeton?

Professor Curtiss, who passed away in 2012, was not sure, but he was no doubt correct to connect the presence of them to the research being done in the 1950s at Forrestal.

ROBIN: “And so probably a graduate student, at some point might have taken one of those engines and put them in the basement. That is what made the most sense.”

“I guess we could have tried looking back at records of who had been in that space. But again, because this is a shared crawlspace it would be really hard to find out.”

Robin provided one final funny anecdote about these mysterious engines, which everyone initially feared must surely be explosive.

ROBIN: “Yeah, well, what's funny is that — So the first thing that went through my mind is, this looks like a bomb. And the next thing that went through my mind is that at the time, I had a friend named Dave, who was stationed in Afghanistan. So he was in the Air Force stationed in Afghanistan and I had been writing to him back and forth for quite a while. And the last thing that he had written to me was about how he and his friend had built Adirondack chairs out of some scrap wood that they had right outside of their barracks. And they talked about, you know, watching movies and things like that. And so the first thing that came to my mind was, great. I'm in Princeton, and I'm about to be blown up, and here Dave's in Afghanistan, sitting in an Adirondack chair, watching movies. What's wrong with this picture?”

Thankfully, there was no bomb, and Robin and her friend Dave are both doing fine to this day.

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There you will find a media player, a transcript of this episode, photos of the engines as they were discovered and decked out for the holidays, photos of *other* ramjets and historical items of interest, and links to sources. You will also find information and resources related to the 50<sup>th</sup> anniversary of the Princeton University Office of Environmental Health and Safety.

EHS Stories is a production of the Princeton University Office of Environmental Health and Safety.

This show is produced, written, edited and narrated by me, Jim Sturdivant. The music was written and recorded by me, Jim Sturdivant. Our logo was designed by Chelsea McDonnell.



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Thanks to Robin Izzo and Jim Boehlert for sharing their stories with me.

The views expressed here do not reflect nor do they represent Princeton University or the Princeton University Office of Environmental Health and Safety.

Thanks so much for listening! And join us for the next episode of EHS Stories, coming soon to your favorite podcast platform.