



Episode 905, Story 1 – Drone Propeller

Elyse Luray: This case investigates a piece of sculpted wood that may have changed the modern battlefield. World War II. High over Japan and Europe the Allies are gaining air superiority and helping win the war. But the carnage of dog fights and daylight bombing raids are taking a toll in the lives of US pilots. The nation's top industrialists are turning from peacetime manufacturing, hunting for a ground-breaking solution to the dreadful loss in trained pilots. Now, a man from Corpus Christi, Texas thinks he may have found a rare piece of military history.

Joe Haug: I've been holding onto this for over 30 years and have no idea what I have.

Elyse: I'm Elyse Luray and I'm starting my investigation with a few questions for Joe Haug. Wow! Where'd you find it?

Joe: I found it at a rural airstrip near Virgil, Illinois, which is about 30 miles from Dekalb, Illinois. Working construction, it was in a fence line, buried in some debris. I've been hauling it around with me for about 30 years, now.

Elyse: Well, that's quite a haul.

Joe: A few months ago I started cleaning it and I noticed, a US navy anchor marking, contract number, part number, serial number. I found an antique propeller site on the internet, and the gentleman that ran the site said it could be from a World War II assault drone program. So, that's kind of what piqued my interest.



Elyse: A drone program?

Joe: Yeah, evidently a very secret program toward the end of World War II, that was run for a short time.

Elyse: Today, unmanned drones such as the predator are cutting edge weapons in the US military arsenal.

Well, wow. I mean, I've heard of drones being used today, but nothing from World War II.

Joe: I hadn't either.

Elyse: What specifically do you want me to find out?

Joe: Specifically, I'd like to find out if this really was from a navy drone plane program at the end of World War II.

Elyse: Okay. Well, definitely not my area. And I can't take it with me because it's so heavy. So I think what I'm going to do, I'll take some pictures of it, take some notes, and we'll leave it in your garage and I'll go do my research.

Joe: That would be great.

Elyse: The great thing about this, and the fascinating thing for me, is that there's a lot of information on this metal piece. It says, "Koppers Company, Bartlett-



Hayward, Baltimore, Maryland.” There’s a serial number. There’s a part number. It says, “Contract: NX-16-819.” Let’s see what I can find.

This is fascinating. The navy started a pilot-less drone program called Project Option in the 1940’s. The idea was to save pilots’ lives: create a remote-controlled plane, strapped with thousands of pounds of explosives, to perform bombing raids over Europe and Japan. The Navy had used pilotless planes for artillery practice, but now they wanted to use the technology for attack. They developed a top-secret partnership with David Sarnoff at RCA who was working on a revolutionary new invention, television. With a camera mounted in the nose of the drone, a pilot in a control plane following miles away could watch the target on a TV screen, turn a dial, and release the drone’s bombs. The first drone used in combat was called a TDR-1. The Navy only ordered about 200. They were made out of wood like Joe’s propeller.

There’s a contract number on the metal center piece. But I have no idea who that’s a contract with. It has a company name, Koppers, but I can’t find anything here linking them to propellers or World War II. The Bartlett-Hayward division in Baltimore was bought by Koppers in 1928 and then disbanded. Aeromatic does come up as a maker of propeller blades. But it seems that these pilotless drones were expendable. After dropping their bombs, they would often crash-dive on or near their original targets. It might be hard to find a comparison propeller.

Wait, check this out. Of the 200 TDR-1’s built, there’s only one left, and it’s at the National Naval Aviation Museum in Pensacola. The National Naval Aviation Museum is the repository for some of the top US fighter planes. I met historian



Hill Goodspeed a few years ago when I was investigating the NC-4, the first aircraft to fly across the Atlantic.

Elyse: Hi, Hill.

Hill Goodspeed: Hi Elyse, how are you doing? Nice to see you.

Elyse: Nice to see you again. Alright, so here's my question to you. I have this photograph. I'm trying to figure out if this propeller was used on the TDR-1. Are these the original propellers that are on this plane?

Hill: These are not. These are ones that are just really put on for display purposes.

Elyse: Do these serial numbers or models mean anything to you?

Hill: Really, they don't. You do see the US and the anchor. That's a symbol that this was produced for the US Navy.

Elyse: Hill says the alphabet soup of markings reflects the many manufacturers who contributed to making the propeller. But he suspects one number may prove an especially good lead.

Hill: Well, the contract number – the Navy had a contract number for any contract it let. The Navy's Bureau of Aeronautics Records are in the National Archives.



Elyse: Tell me a little bit about the history of the drone program. And was it a secretive thing?

Hill: The TDR-1 program was very secretive because it was incorporating all this new technology, and that was mainly television.

Elyse: Hill explains that in 1939, as television wowed crowds at the World's Fair, the Navy saw its potential military uses. By 1940, 97-pound TVs were being tested in conjunction with drones.

Hill: There's a circular window in the nose of the TDR-1. That was where a camera, for television, was positioned.

Elyse: Images of the drone's path, filmed by the camera, were sent via radio signal to a piloted TBM avenger plane as far as eight miles away.

Hill: And it was modified so that there was another pilot who was sitting behind the pilot who was flying the avenger, and actually watched it on television, and could tell when to cause the drone to go into the target. So, it was very futuristic, and for that time, it was just unimaginable technology.

Elyse: Did any of the TDR-1's see combat in World War II?

Hill: Yes. The TDR-1's did see combat. There was a group called Stag 1, which actually took them into combat in the South Pacific.



Elyse: Hill suggests I speak to Bob Bothfeld, an aeronautical engineer on the original Stag-1 program. Bob, tell me about your involvement with the drone program.

Bob Bothfeld: I was assigned to this outfit in 1943 right from Caltech. I didn't know a thing about it until I got there.

Elyse: Bob explains that he was sent to Clinton, Oklahoma as part of Stag-1, commanded by Commodore Oscar Smith, and it was top secret.

Bob: For two years, I wasn't allowed to tell anyone where I was, or what I was doing. I could write my family and tell them that I was alive, but that's all.

Elyse: Bob's unit worked for a year testing the drones before Stag-1 shipped out to the Russell Islands, near Guadalcanal, in May, 1944. No one knew if the drones would work in combat, so on July 30, four TDRs were sent on a test run to bomb the grounded Japanese freighter, Yamazuki Maru, near Cape Esperance. Eventually, the drones served in battle, hitting their targets 21 out of 46 times, with no loss of American life. Bob says his unit knew they were doing something important.

Bob: In the islands, I had the privilege of assembling all of the ones that they used. Well, we accomplished something that was new and different. And today, what they're doing blows my mind, it's just amazing how we've progressed. I have definitely felt a lot of pride and still do.



Elyse: Bob helped the museum assemble the drone on display, but after 60 plus years, he can't tell if our propeller matches. He does tell me that Aeromatics, the name on our prop, is still in business. Hi guys, it's Elyse. Good. I need a favor. I need you to get in touch with the National Archives. I'm looking for a contract number. Kent Tarver is the owner of Aeromatic Propellers in Fallon, Nevada. The company's been in production since 1940.

Elyse: Hi!

Kent Tarver: Hi, Elyse.

Elyse: Nice to meet you.

Kent: I'm Kent. Come on in.

Elyse: What a place you have here.

Elyse: Kent tells me the Aeromatic propeller was a perfect fit for a pilot-less drone.

Kent: An Aeromatic propeller has an automatic variable pitch of the blades.

Elyse: The design of the propeller enables it to have better control over the speed and performance of the plane.



Kent: That is equivalent to having an automatic transmission in your car, as compared to a manual stick transmission. There's no pilot control on this propeller. Totally automatic.

Elyse: Well, let's look at ours.

Kent: Okay.

Elyse: Here are some photographs. Here's the label.

Kent: Oh, yeah. That's the old original egg-shaped logo. I recognize that.

Elyse: You do? Alright, here's the whole propeller. What do you think?

Kent: Oh, yes. I have a machine here that probably made this very propeller.

Elyse: Can I see it?

Kent: Yes m'am, step right this way.

Elyse: Alright!

Kent: This is a duplicating lathe.

Elyse: Okay. One side of the "double lathe" holds a pattern blade. The other side is loaded with a raw piece of wood. Using the pattern blade as a guide, the saw creates an exact replica; same weight, shape and feel. Woo. Dusty.



Kent: So you see what we do is make two identical blades, and these blades are married to the hub.

Elyse: Kent explains each propeller has a hub with an opening, or spline, made to fit the shaft of a particular engine.

Kent: This propeller's made for a size 30, which was used on a Wright R975 engine.

Elyse: Kent says that engine wasn't on the TDR-1, so our propeller is the wrong size. But he thinks our prop might still be from a drone.

Kent: The only two planes that used the R975 engine and the Aeromatic propeller during World War II were the SNC Falcon and the TDR-3 drone.

Elyse: Kent says the falcon was a navy training plane. But the TDR-3 was another generation of navy drones. Kent has no way to determine whether our propeller came this more advanced drone, but he has a suggestion for someone who may be able to help.

Kent: There's a man named Nick Spark who is a real expert on drones of World War II.

Elyse: Okay, well thank you very much.

Kent: You're welcome.



Elyse: I'm off to Reno, Nevada to meet Nick Spark. In the meantime, I get word from the National Archives that the contract number on the propeller may be a dead end. Hopefully, Nick has some answers. He's a documentary filmmaker who's spent years researching the story of America's lost drone pioneers. He says the first drone had a fatal flaw.

Nick Spark: The TDR-3 was a successor aircraft. It was intended to be faster, because it was discovered that the TDR-1 – it was a very slow aircraft. So, it was susceptible to enemy anti-aircraft fire. The intention was to make an aircraft that was faster, and could carry a bigger payload. And it had an improved television camera in it that would have allowed much better resolution, and potentially better reception. So, all around it was going to be a much better weapon system than the TDR-1. And you know, the intention was probably to make hundreds of them. Unfortunately, though, it was developed late in the war, and the entire TDR-3 program was canceled after they had only delivered about 14 of the aircraft.

Elyse: Nick says both models were built by a California-based company named Interstate who married cutting edge technology such as television with older designs and available resources.

Nick: They decided to build them out of wood. You have to remember, this is made during World War II. There were a lot of shortages.

Archival Footage: "The Army needs wool, silk, cotton, leather..."



Nick: The drone program in particular was embargoed against using military-necessity materials, such as metal.

Elyse: Nick says Interstate had to be creative. They turned to a wood manufacturing expert: the Rudolph Wurlitzer Company, the maker of musical instruments.

Nick: Wurlitzer had all sorts of proprietary techniques to bend wood. And so Wurlitzer, like a lot of other companies during the war, to do their part for the war effort, set aside all their civilian production, and the people there started building what they were told was a navy training plane. They had no idea, in fact, that they were building a sophisticated drone weapon, and they did all this work in one factory in Dekalb, Illinois.

Elyse: Dekalb, Illinois, well that is only 30 miles from where Joe found this propeller. Do you think that this propeller could have come from the TDR-3?

Nick: Well, I have something you might be really interested in seeing. This is "Air Trails Pictorial" from 1946.

Elyse: Okay, Joe. The only question you asked me, actually, was was this propeller from a TDR-1? In order to answer that question, I went to the owner of Aeromatics, who made the blades. And he said that according to the circumference of the hub, it was not a propeller that was made for a TDR-1.

Joe: Oh, disappointing.



Elyse: Then I went to Nick Spark, who is an expert on the drone programs. And this is what he showed me.

Nick: A nice, glossy photo of a TDR-3 on the front cover.

Elyse: Nick says this is one of the only photographs of a TDR-3 he knows to still exist. And there's our propeller.

Nick: I think so. It seems like you've found your prop.

Joe: It sure looks like the prop. It looks amazingly similar, yeah.

Elyse: It does look like a match. But you know what? I have to say, even though it looks exactly like your propeller, I still needed something to seal the deal. I tell Joe how this kind of propeller had also been used in a more conventional navy training plane, so at first I didn't have a definitive answer for him. But then I received another response from the National Archives who had dug deeper into their records. This is a copy of a military contract. And if you look at your piece, and you read the contract number that's on your piece, NX-16-819, and you look at the copy of this military contract, they match perfectly. And the contract is for what?

Joe: TDR-3 drone.

Elyse: That's right. For a TDR-3. And look over here, what does it say?

Joe: Dekalb, Illinois.



Elyse: Which is only 30 miles from where you found your propeller. So to me, it's a slam dunk.

Joe: It makes holding onto that thing for 30 years worth it. I don't know if my wife would say that, but it definitely makes it worth it.

Elyse: Drone plane technology has improved light years since these primitive World War II pioneers. Today, there are over 5,500 US Military drone planes in use. Operated remotely by pilots in the United States, many drones fly over Iraq and Afghanistan for up to 22 hours straight, beaming back live streaming video of troop activity and enemy encampments. Others take a more active role, launching devastating missile attacks at the push of a button halfway across the world.