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# AN INSPIRED DESIGN

NICK PFANNENSTIEL,  
TIMBER TIGER AIRCRAFT,  
AND THE ST-L

STORY BY HAL BRYAN  
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**LIKE SO MANY OF US, NICK PFANNENSTIEL, EAA 1085439, FOUNDER OF TIMBER TIGER AIRCRAFT, WAS FIRST HOOKED ON AVIATION AS A KID. DESIGNING AND BUILDING AIRCRAFT SEEMED TO BE HIS CALLING FROM A YOUNG AGE, UNTIL A TRAGEDY CHANGED HIS MIND.**

“I started building models as a kid, both plastic and radio control types,” he said. “I really like to design the radio control types and dream. I’m more of a dreamer than anything. I never actually completed any of them. Just like to draw them out. So, that kind of fueled the early interest. Then I went to work at Jeffco Airport, which is now Rocky Mountain Metropolitan Airport, and I worked as a janitor, scrubbing floors and toilets. That was when I was 16.”

Nick had studied engineering on his own (and collected aircraft blueprints) since he was a kid. It only made sense that he majored in mechanical engineering when he went to college in Denver. That lasted one year.

“I decided I couldn’t do that as a job,” he said. “It was too mind-numbing, I thought, at the time,” he said.

Nick went through flight training and got his certificate when he was 18. About seven months later, when Nick had about 100 hours, fate stepped in and changed his plans.

“I had a friend pass away in an aviation accident in Colorado, and it really killed the love of aviation for me,” he said. “I mean, it was gone instantly.”

Nick refocused his interest on something more earthbound.

“I started a hot rod shop and I operated that for 13 years,” he said.

“I grew a great customer base, very loyal customers, but it just wasn’t where my heart was.”

## THE WAY BACK

Nick’s hiatus from aviation wasn’t absolute. In 2008, he sketched some design ideas for an airplane. It was a scale replica of a design that first caught his attention when he was 14 and browsing the SIG Manufacturing catalog — the Ryan ST. T. Claude Ryan, founder of the Ryan Aeronautical Co., began development of the Sport Trainer, or ST, in 1933. This led to a series of variants that were used in both civil and military capacities.

“There’s something kind of Victorian about it, and that it’s a point where form meets function,” he said. “If you look at the airplane from any angle, it looks fantastic. And at the time it was a very modern design, but it still has those primitive lumps and bumps of the fabric covering, the rivets and bolts sticking out underneath the fabric. None of the rivets are flush. They’re all sticking out. They’re all protruding. So, it’s just a very interesting combination of beautiful and primitive at the same time.”

But Nick still wasn’t quite ready.

“My love of aviation still wasn’t back,” he said. “It was kind of forced, if that makes any sense.”

It took another six years for that love to come back. Nick met his wife in 2014, and she bought him a discovery flight as a birthday gift. To her surprise, he flipped the script and sat in the back while she sat up front. Watching her enjoy the flight reminded him that his real love of aviation stemmed from finding ways to help other people fly.

“I picked up the project again, had some ‘aha’ moments, and finished all the engineering and stress analysis on it,” he said. “My wife has ... been incredible. Incredibly understanding, and helpful, and there aren’t enough words to describe how awesome she’s been throughout the whole project.”

Nick’s time in the hot rod shop was where he transitioned from tinkerer to craftsman, from hobbyist to businessman. It may have seemed like a detour at the time, but, in hindsight, it served as an excellent training program for someone who has always dreamed of designing and building airplanes.

“I learned a lot about engineering,” Nick said. “I matured as a person. My knowledge — with aviation and other things in general — had matured. And having run the hot rod business, I kind of came back to the Ryan ST as a good businessman. Not just an airplane that I was passionate about, because a lot of us have it as a favorite airplane. It’s one of my many favorites, but from a market standpoint as far as replicas go, that was kind of the logical step.”



As befits an updated classic, the ST-L's cockpit is clean and simple, with modernity kept to a minimum.

## WHERE TO BEGIN

Nick purchased a set of ST blueprints drawn up by legendary “Ryan guy” Ev Cassagneres. The plan was to build what’s known in the RC airplane world as a “short kit.”

“You purchase from the manufacturer the difficult components to make — the cowlings, the fairings, stuff like that,” he said. “And we were going to supply blueprints for the rest.”

In addition, Nick made a choice that would lead to the single most frequently asked question about the project: Why make it 95-percent scale instead of full-size? Nick’s answer dates to Galileo’s 1638 publication, *Two New Sciences*, in which he described what we now know as the square-cube law. Simply put, that law states that the ratio of two volumes is greater than the ratio of their surfaces. From a practical standpoint, this translates into a very real benefit for the builder and pilot.

“Even though it’s only 5 percent smaller, it’s 200 pounds lighter,” he said. So, a 5 percent reduction in size delivered a roughly 20 percent reduction in weight.

Nick completed a full engineering analysis of the airplane, and then started to build it. It was a slow and repetitive process.

“When you do something by hand, and you’re trying to design as you go for ease of manufacturing, you build things three times before you get it finally how you want it exactly,” he said. “I realized quickly that it was a very, very difficult airplane to build.”

Given the complexity, he concluded that a “short kit” wouldn’t be enough for an average homebuilder, but he pressed on. Then, when the prototype was about a third of the way finished, he decided to let the world have a look at what he was up to.

“I went public with the design in 2016,” he said. “And just after I went public, Glenn Gordon who is [now] our CAD guy, found me, tracked me down and emailed me. He really is a huge reason that we’re doing kits now, because he was able to take everything and computerize it for us. All of our stuff is computer cut, water cut steel assemblies. He really made that feasible.”



**“WHAT HE WAS REALLY TRYING TO DO WAS PUT TOGETHER AN AIRFRAME KIT THAT WOULD BASICALLY GET A VERY ADVANCED BUILDER ABLE TO GET A REPLICIA INTO THE AIR.”**

— GLENN GORDON

## GOING DIGITAL

Glenn, EAA 399005, is an avid pilot, restorer, and mechanical and computer-aided design engineer who has built everything from an RV-6 to an O-gauge model railroad that runs all through his house, just below the ceiling. Like Nick, he had an affinity for Ryan designs from a young age.

“I was building radio-controlled planes in my teens, and I had a SIG catalog ... and they had a beautiful red, white, and black Ryan STA as a model in there,” Glenn said. “I never built that model, but I always knew the airplane, and I always admired the airplane.”

As an adult, after he’d completed some other building and restoration projects, he saw a classic Ryan at a fly-in, and fell in love all over again.

“I started looking for a project, not knowing projects don’t exist for these airplanes,” he said. “They’re already tucked away in someone’s collection already restored, or it’s a literal pile of junk with a data plate that I can’t afford anyway. I didn’t realize how rare they were. Only a couple hundred of the STAs were ever built, and not too many are flying.”

He started looking at replica options, and even considered building one from scratch, but realized that just wasn’t the route he wanted to take. That’s when he heard about Nick and Timber Tiger.

“I was able to track him down, and it was like 10 minutes after he went public with the fact that he wanted to do this,” Glenn said. “I was already knocking on his door saying, ‘Hey, I’m interested in what you’re doing there.’ And he had a lot of work already done on paper ... He had already determined that he was going to scale it down to 95 percent. But what he was really trying to do was put together an airframe kit that would basically get a very advanced builder able to get a replica into the air. He wasn’t planning on doing all the cowlings work, all the pretty fairings, all the fairings over the wheelpans and the cowl and the nose.”

Glenn told Nick that he wanted to help on the project and wasn’t looking for a paycheck. “The only thing I might be interested in is if this thing ever gets off the ground, I get a kit at a nice discount or something. He thought that was fair,” Glenn said. Glenn got to work right away.

“I quickly caught up with him by recreating what he had already built ... in the computer space,” Glenn said.

Having every piece of the airplane built virtually in a CAD environment enabled the two to build tooling that ensured precision, repeatability, and accuracy. Even the spacing of the rivets is scaled correctly to the original airplane. This also enabled them to predict and resolve design challenges before major subassemblies were built — routing pushrods, verifying control throws, etc.



## SPECIFICATIONS

AIRCRAFT MAKE & MODEL: Timber Tiger ST-L  
CERTIFICATION: Experimental amateur-built

LENGTH: 20 feet, 5 inches  
WINGSPAN: 28 feet, 6 inches  
HEIGHT: 6 feet, 7 inches

MAXIMUM GROSS WEIGHT: 1,420 pounds  
(1,350 pounds as tested)  
EMPTY WEIGHT: 815 pounds  
FUEL CAPACITY: 17.2 gallons  
SEATS: 2

POWERPLANT MAKE & MODEL: Rotax 912ULS  
HORSEPOWER: 100–140 hp  
PROPELLER: Performance Propellers 76 x 55  
CRUISE SPEED/FUEL CONSUMPTION: 90 knots/5 gph  
POWER LOADING: 13.5 pounds/hp  
WING LOADING: 11.16 pounds/square foot

V<sub>NE</sub>: 150 mph  
V<sub>SO</sub>: 46 mph  
V<sub>X</sub>: 48 knots  
V<sub>Y</sub>: 55 knots



The Timber Tiger ST-L wasn't really manufactured by Ryan, of course, but it sure looks like it could have been.



The Rotax 912ULS swings a vintage-looking Performance Propellers 76 x 55 wooden prop.



Except for the headset, it might as well be 1934.

"And then we got into a lot more of the finesse work, the curvy surfaces," he said. "Rather than have a builder try to work a piece of metal down over a compound curve shape at, say, the wingtip leading edge transition, we made a fiberglass piece for it because I was able to model the exact shape. We were able to cut a tool for it, a plug, pull a mold off of it. And now we can just put a very thin piece of fiberglass up there that's perfectly shaped."

The CAD work also enabled the pair to be flexible when they needed to adapt the cowling after changing powerplants from the originally planned 125-hp six-cylinder D-Motor LF-39 (which turned out to be more expensive than they'd predicted) to a Rotax 912ULS. Builders have expressed interest in other engines as well, including a Walter Mikron inverted four-cylinder, and the Suzuki-based four-cylinder inline engine manufactured by Aeromomentum. One builder is planning on using a Rotec radial, to create more of a PT-20A look.

The prototype came together over the next four years and garnered a lot of attention when it was displayed as a work-in-progress at EAA AirVenture Oshkosh. The people who stopped to talk to Nick about the airplane really ran the gamut. Nick pointed out that there really isn't a "typical" Timber Tiger customer.

"We're all dreamers, of course," he said. "That's the one thing we have in common — we're all dreamers. But as far as financial backgrounds and ages, it's all over the map. But they're all very enthusiastic."

But, in addition to the compliments and the repeated question about why he chose 95-percent instead of full-scale, Nick was frequently prompted to clarify a common misconception.

"We get people all the time that get confused between a PT-22 and a ST, because you know the PT-22 has kind of a nasty reputation," he said. "It is a vastly, vastly different airplane than the ST, which is a much, much better-behaved airplane."

And then, in late 2020, it was time to see just how well behaved what had become known as the Timber Tiger ST-L really was.

## FLIGHT TESTS

Brooks Mershon, EAA 1271516, a software engineer and an avid powered and glider pilot and CFI, found his way to Timber Tiger through aviation's typically serendipitous series of connections. By the time he showed up on Nick's radar, Brooks had done a number of long-distance ferry flights for customers through the business he started with a friend, Boulder Pilot LLC, and had time in more than 60 types, including his Pitts S1.

"He's the real deal as far as pilots go," Nick said.

The two talked at length before they agreed to work together.

"I'm not a trained test pilot," Brooks said. "I am a guy that got a liberal arts degree in computer science. I felt that I could ask important questions before something bad happens rather than after. And [Nick] could answer them."

Brooks said he was intrigued, especially as a young man trying to move forward in aviation.

"But I also realize that it's going to be a career-ender for me if I do wreck it," he said. "And I guess I was excited by the fact that I was very confident, that I was up to the challenge. But it wouldn't be a challenge if there weren't some risk and potential for heartache."

Brooks immersed himself in the design and construction of the prototype, becoming as thoroughly acquainted with the airplane as possible. He rented scales from a local EAA chapter and worked with Nick to do an exhaustive weight and balance analysis. From there, he did a series of taxi tests. Then, on November 17, 2020, as he puts it, he ran out of excuses not to fly.

The flight took place at what is now the Colorado Air and Space Port (KCFO), just east of Denver. The winds were right down the runway, a little gusty, but well within Brooks' personal minimums. The airport layout meant a long taxi, and that put the takeoff quite a distance from where Nick was watching and waiting.

"Think about that," Brooks said. "I'm 2 miles away from this guy, taxiing around. He can't even see me. And I'm making decisions at the end of six years of work to put it together."

Brooks smoothly added power, constantly checking for controllability at each phase of the takeoff.

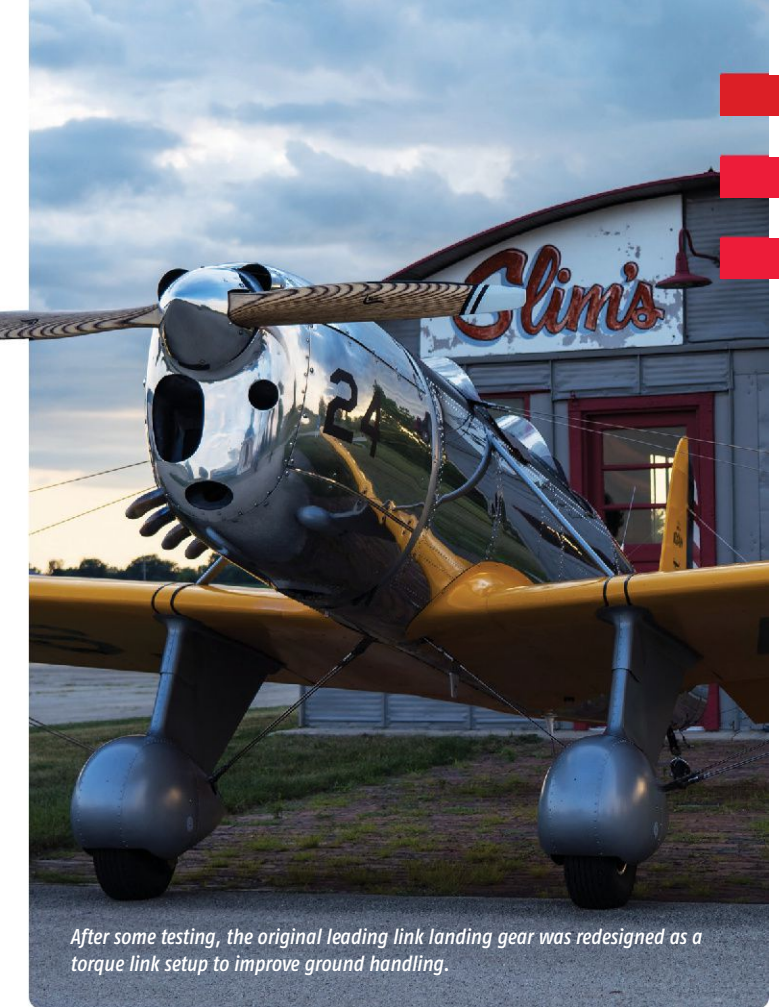
"Well, I've got aerodynamic authority; I picked my tail up," he said. "I've kept my nose perfectly straight for the most part. I can feel that I've got roll authority. Okay. And a little tiny sampling input from the ailerons. I can feel that I've got aileron authority. I have enough elevator authority to pick my nose up. So, now my next question is, 'What's going to happen when we're actually breaking out of ground effect?'"

**"YOU KNOW WHEN YOU WANT TO DO SOMETHING, YOU WORK SO HARD FOR IT, AND IT ALL KIND OF COMES TOGETHER IN ONE MOMENT? THAT'S WHAT THAT WAS."**

— NICK PFANNENSTIEL



The four-piece exhaust stack adds to the period look.



After some testing, the original leading link landing gear was redesigned as a torque link setup to improve ground handling.

What he found next was that the airplane needed an unexpected amount of back pressure to begin a climb. But he verified that he had full control with a bump of the stick, and from there, the flight was uneventful.

“I came back, ended up landing it and going into the three-point attitude as I brought my tail down,” he said. “A gust picked me up a little bit. Added a little power with the remaining mile and a quarter left of runway and just settled down again, stuck it, and brought it back. And hooray!”

Nick remembers the day vividly.

“He did just fine; flew around in the little thing up in the sky for about half an hour,” he said. “I had to call my wife. It hit an emotional level, let’s put it that way. You know when you want to do something, you work so hard for it, and it all kind of comes together in one moment? That’s what that was.”

Because of the size of the Phase I flight-test area, they were able to move the airplane to Boulder Municipal Airport (KBDU) for the remainder of the flight-testing. This was especially convenient for Brooks, as he lived at the airport at the time.

“I would write up extensive reports to send to Nick,” Brooks said. “It felt like the least I could do for flying his plane while he’s a six-hour drive away and paying me to do it.”

The reports would include numbers like V-speeds, but also three-plus pages of subjective, qualitative data.

“You have to do your due diligence,” Nick said. “And even if there’s a lot of conservative engineering on the plane, you’ve still got to shake it for a couple of hundred hours and see what happens.”

After the initial flight testing was completed, Glenn got checked out and put some time on the airplane as well.

“The ground handling on this is, I’d say it’s certainly not a Cub because of that high center of gravity and narrow gear,” he said. “But it sure flies like one in the air.”

He describes stalls as being very benign.

“You take the stick back nice and slow, and it’ll just mush into a stall, and you can dance on the pedals and do a little falling leaf with it. It’s entirely stable. There’s a wash out on the wings, so the ailerons are going to stay effective. ... The plane just wants to fly and fly and fly.”

Brooks has a clear recommendation for any pilot interested in flying the ST-L.

“You need to know to fly a Citabria well from the back seat,” he said. “Not passable, but have your instructor thinking that they couldn’t do much better themselves. Then you’re ready to handle this.”

## LESSONS LEARNED

Brooks’ experience on the first flight led to a change in the angle of incidence of the horizontal stabilizer. While it was -3 degrees on the original airplane, after some analysis, the team found that -1.5 degrees was the sweet spot. Another change from the original design involved the landing gear.

“The original Ryan had leading link landing gear, so as you apply a side load to the gear it changes tow-in and tow-outs,” Nick said. “It’s naturally destabilizing. Once we ground-tested the airplane, I decided to redesign the landing gear with a torque link instead of a leading link, and that did solve that issue. ... It was very time-consuming. But the airplane went from being directionally squirrely, like the originals were known for on asphalt, to tracking straight.”

When they started giving demo rides, they found that the front cockpit was a little uncomfortable, so some changes were made to the seat back, the front seatbelts, and the rudder pedals.

With those things sorted, Timber Tiger was ready to do what Nick had set out to do from the beginning — make and sell kits.



## KITTING IT OUT

The ST-L consists of a series of subkits, including the wing, tail, fuselage and landing gear, and a finishing kit. These subkits include CNC-cut honeycomb ribs, and preformed aluminum bulkheads, spars, and longerons. A lot of the welding is done for the builder, including compression struts and fittings, stabilizer hinges, landing gear structures, tail wheel support, and engine mount pads.

The kit comes standard with fiberglass fairings and wheelpants, but aluminum options are available. The seven-piece cowl is hand-fabricated out of aluminum, requiring only some final trimming by the builder, and is designed to fit either the Rotax 912 or the D-Motor LF-39 engines. Timber Tiger will work with the builder directly to accommodate other powerplant choices, as well as other customizations.

Aside from the engine, the builder needs to supply a propeller, instruments, brace wires, upholstery — though the company sells an optional kit — tires, tubes, covering, and paint. Nick estimates that it will take a typical builder approximately 1,500 hours to complete.

## THE NEXT CHAPTER

Nick’s goal for Timber Tiger and the ST-L was to enable people to build a replica of a coveted classic, a modern airplane disguised as an antique, at an affordable price. Based on the enthusiastic receptions at Oshkosh and the brisk sales that have followed, by all accounts, he and his team have succeeded.

So, how do you follow that? Well, Nick can’t help but tease us — but only a little — about what’s next.

“It’s not a replica; it’s an original design,” he said. “I can tell you, just wait until you see it. It’s pretty cool. I think it’s going to do pretty well.” *EAA*

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